July 22, 2014

Ms. Jean Fraser, Planner
Planning and Urban Development Department
City of Portland, Maine
389 Congress Street
Portland, Maine 04101-3509

**Subject: Convenience Store and Fuel Station Development**
**2282 Congress Street**
**Amended Site Plan Application**
**Applicant: Portland Property Holdings, LLC**

Dear Jean:

On behalf of Portland Property Holdings, LLC, we are pleased to provide the accompanying package of Amended Site Plan submission materials related to the proposed Convenience Store/Fuel Station at 2282 Congress Street. This submission package is intended to meet the City's typical Plan Submission Requirements as outlined in the Level III Final Site Plan Application procedures. These materials represent the ongoing design development for the proposed Convenience Store for the property generally bounded by Congress Street (north), Maine Turnpike (east), Skyway Drive (south) and Community Substance Abuse Center (west). As you know, the project was previously approved by the Planning Board on May 20, 2013. Since then, the Applicant has been negotiating tenant agreements which have resulted in some minor adjustments to the plan. It is currently the Applicant's intent to construct a 3,850 s.f. convenience store and fuel station. The development site is an approximately 3.24-acre area that is currently undeveloped. Previously submitted evidence of the applicant's interest in the property remains in effect. Under City Council Order 154 – 12/13, the Applicant successfully received a Conditional Rezoning Agreement with the City of Portland. The Conditional Rezone Agreement allows the proposed uses as well as those uses allowed within the I-M Zone.

Accompanying this cover letter are the following materials:

- Amended Level III Site Plan Application
- Section 1: Written Description of Project
- Section 2: Written Assessment of Proposed Project's Compliance with Applicable Zoning and Land Use Requirements
- Section 3 Amended Stormwater Management Report and Computations
- Reduced Sized Plans

778 Main Street, Suite 8
South Portland, ME 04106
T: 207.775.1121
F: 207.879.0896
www.fstinc.com

FAY, SPOFFORD & THORNDIKE
Offices in: Massachusetts, New Hampshire, Maine, Connecticut and New York

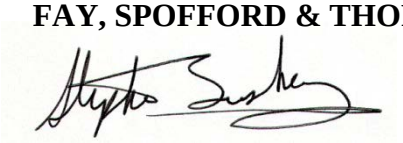
You will find in the accompanying materials, information including the Amended Site Plan, Lighting Package and supporting plans that provide details for the building development activities. Information pertaining to the project's utilities needs and statements regarding compliance with the City's Standards are contained within this submission. The findings of previously approved materials including the Traffic Impact Study remain unchanged.

On behalf of the Portland Property Holdings, LLC, we look forward to your continued assistance on the project and we look forward to the possibility for a staff level review. Please find one (1) hard copy of the application materials including one set of 11 x 17 and full size plans, along with a CD containing PDF files for all submitted materials.

If you have any questions regarding these materials please contact this office.

Sincerely,

**FAY, SPOFFORD & THORNDIKE**



Stephen R. Bushey, P.E.
Senior Principal Engineer

SRB/cmd

Attachments

c: David Latulippe, Portland Property Holdings, LLC
Wes Thames, Priority Group

*R:\3118-Convenience Store, Portland, ME\Admin\Permitting\Local\Amended Level III Application 07.14.2014\3118 2014.07.21 Fraser (Cover Letter).docx*

Portland, Maine Yes. Life's good here.

Jeff Levine, AICP, Director
Planning & Urban Development Department

# ***Electronic Signature and Fee Payment Confirmation***

*Notice: Your electronic signature is considered a legal signature per state law.*

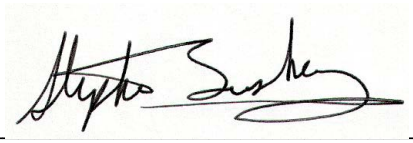
By digitally signing the attached document(s), you are signifying your understanding this is a legal document and your electronic signature is considered a ***legal signature*** per Maine state law. You are also signifying your intent on paying your fees by the opportunities below.

I, the undersigned, intend and acknowledge that no Site Plan or Historic Preservation Applications can be reviewed until payment of appropriate application fees are ***paid in full*** to the Inspections Office, City of Portland Maine by method noted below:

☐ Within 24-48 hours, once my complete application and corresponding paperwork has been electronically delivered, I intend to **call the Inspections Office** at 207-874-8703 and speak to an administrative representative and provide a credit/debit card over the phone.

☐ Within 24-48 hours, once my application and corresponding paperwork has been electronically delivered, I intend to **call the Inspections Office** at 207-874-8703 and speak to an administrative representative and provide a credit/debit card over the phone.

☒ I intend to deliver a payment method ~~through the U.S. Postal~~ Service mail once my application paperwork has been electronically delivered. Owner will Hand Deliver



Applicant Signature: July 22, 2014 Date:

Stephen R. Bushey, P.E. July 22, 2014

I have provided digital copies and sent them on: Date:

NOTE: All electronic paperwork must be delivered to buildinginspections@portlandmaine.gov or by physical means i.e. a thumb drive or CD to the Inspections Office, City Hall, 3rd Floor, Room 315.

# Level III – Preliminary and Final Site Plans
# Development Review Application
# Portland, Maine

Planning and Urban Development Department
Planning Division

Portland's Planning and Urban Development Department coordinates the development review process for site plan, subdivision and other applications under the City's Land Use Code. Attached is the application form for a Level III: Preliminary or Final Site Plan. Please note that Portland has delegated review from the State of Maine for reviews under the Site Location of Development Act, Chapter 500 Stormwater Permits, and Traffic Movement Permits.

**Level III: Site Plan Development includes:**

- New structures with a total floor area of 10,000 sq. ft. or more except in Industrial Zones.
- New structures with a total floor area of 20,000 sq. ft. or more in Industrial Zones.
- New temporary or permanent parking area(s) or paving of existing unpaved parking areas for more than 75 vehicles.
- Building addition(s) with a total floor area of 10,000 sq. ft. or more (cumulatively within a 3 year period) except in Industrial Zones.
- Building addition(s) with a total floor area of 20,000 sq. ft. or more in Industrial Zones.
- A change in the use of a total floor area of 20,000 sq. ft. or more in any existing building (cumulatively within a 3 year period).
- Multiple family development (3 or more dwelling units) or the addition of any additional dwelling unit if subject to subdivision review.
- Any new major or minor auto business in the B-2 or B-5 Zone, or the construction of any new major or minor auto business greater than 10,000 sq. ft. of building area in any other permitted zone.
- Correctional prerelease facilities.
- Park improvements: New structures greater than 10,000 sq. ft. and/or facilities encompassing 20,000 sq. ft. or more (excludes rehabilitation or replacement of existing facilities); new nighttime outdoor lighting of sports, athletic or recreation facilities not previously illuminated.
- Land disturbance of 3 acres or more (includes stripping, grading, grubbing, filling or excavation).

Portland's development review process and requirements are outlined in the Land Use Code (Chapter 14) which is available on our website:

Land Use Code: http://me-portland.civicplus.com/DocumentCenter/Home/View/1080
Design Manual: http://me-portland.civicplus.com/DocumentCenter/View/2355
Technical Manual: http://me-portland.civicplus.com/DocumentCenter/View/2356

**Planning Division**
Fourth Floor, City Hall
389 Congress Street
(207) 874-8719

**Office Hours**
Monday thru Friday
8:00 a.m. – 4:30 p.m.

Updated: April 23, 2014

**PROJECT NAME:** Convenience Store with Fuel Station - Amended Site Plan Application

**PROPOSED DEVELOPMENT ADDRESS:**

2282 Congress Street - Portland, Maine

**PROJECT DESCRIPTION:**

New commercial development on a 3.24 acre property located on the south side of Congress Street, west of the MTA. The project includes a 3,850 SF C-Store/Fuel Station with 10 filling dispenser positions. An ATM drive-thru will be provided. Site access will be off Congress Street.

**CHART/BLOCK/LOT:** 237/A/012

**PRELIMINARY PLAN** _____ (date)
**~~FINAL~~ PLAN** July 22, 2014 (date)
AMENDED

**CONTACT INFORMATION:**

| | |
|---|---|
| **Applicant – must be owner, Lessee or Buyer**<br>Name: Portland Property Holdings, LLC<br>Business Name, if applicable:<br>Address: 2 Main Street<br>City/State : Topsham, ME Zip Code: 04086 | **Applicant Contact Information**<br>Work # 207-865-4323<br>Home# 207-865-4305<br>Cell # 207-240-1074 Fax#<br>e-mail: ddlatulip@aol.com |
| **Owner** – (if different from Applicant)<br>Name: Hutchcourt LLC<br>Address: 1000 Market Street, Building 1<br>City/State : Portsmouth, NH Zip Code: 03801 | **Owner Contact Information**<br>Work #<br>Home#<br>Cell # Fax#<br>e-mail: rich.ade@oceanprop.com |
| **Agent/ Representative**<br>Name: David Latulippe<br>Address: 35 Primrose Lane<br>City/State : Freeport, ME Zip Code: 04032 | **Agent/Representative Contact information**<br>Work # 207-865-4323<br>Cell # 207-865-4305<br>e-mail: ddlatulip@aol.com |
| **Billing Information**<br>Name: CJ Developers, Inc.<br>Address: 35 Primrose Lane<br>City/State : Freeport, ME Zip Code: 04032 | **Billing Information**<br>Work # 207-865-4323<br>Cell # 207-865-4305 Fax#<br>e-mail: ddlatulip@aol.com |

| | |
|---|---|
| **Engineer**<br>Name: Steve Bushey, P.E.<br>Fay, Spofford & Thorndike<br>Address: 778 Main Street, Suite 8<br>City/State : South Portland, ME Zip Code: 04106 | **Engineer Contact Information**<br>Work # 207-775-1121<br>Cell # 207-756-9359 Fax# 207-879-0896<br>e-mail: sbushey@fstinc.com |
| **Surveyor**<br>Name: Rex Croteau<br>Titcomb Associates<br>Address: 13 Gray Road<br>City/State : Falmouth, ME Zip Code: 04105 | **Surveyor Contact Information**<br>Work # 207-797-9197<br>Cell # Fax# 207-878-3142<br>e-mail: rcroteau@titcombsurvey.com |
| **Architect**<br>Name: Alpha Architects<br>Address: 17 Chestnut Street, Suite 201<br>City/State : Portland, ME Zip Code: 04101 | **Architect Contact Information**<br>Work # 207-761-9500<br>Cell # 207-617-4110 Fax#<br>e-mail: mark@alphaarchitects.com |
| **Attorney**<br>Name: John Moncure<br>Moncure & Barnicle<br>Address: 9 Bowdoin Mill Island<br>City/State : Topsham, ME Zip Code: 04086 | **Attorney Contact Information**<br>Work # 207-729-0856<br>Cell # Fax# 207-729-7790<br>e-mail: JMoncure@mb-law.com |

**APPLICATION FEES:**

**Check all reviews that apply. (Payment may be made by Credit Card, Cash or Check payable to the City of Portland.)**

| | |
|---|---|
| **Level III Development (check applicable reviews)**<br>___ Less than 50,000 sq. ft. ($500.00)<br>___ 50,000 - 100,000 sq. ft. ($1,000)<br>___ 100,000 – 200,000 sq. ft. ($2,000)<br>___ 200,000 – 300,000 sq. ft. ($3,000)<br>___ over $300,00 sq. ft. ($5,000)<br>___ Parking lots over 11 spaces ($1,000)<br>___ After-the-fact Review ($1,000.00 plus applicable application fee)<br><br>**Plan Amendments (check applicable reviews)**<br>_X_ Planning Staff Review ($250)<br>___ Planning Board Review ($500)<br>_____<br>The City invoices separately for the following:<br>• Notices ($.75 each)<br>• Legal Ad (% of total Ad)<br>• Planning Review ($40.00 hour)<br>• Legal Review ($75.00 hour)<br>Third party review fees are assessed separately. Any outside reviews or analysis requested from the Applicant as part of the development review, are the responsibility of the Applicant and are separate from any application or invoice fees. | **Other Reviews (check applicable reviews)**<br><br>___ Traffic Movement ($1,000)<br>_X_ Stormwater Quality ($250)<br>___ Subdivisions ($500 + $25/lot)<br># of Lots ___ x $25/lot = _____<br>___ Site Location ($3,000, except for residential projects which shall be $200/lot)<br># of Lots ___ x $200/lot = _____<br>___ Other _____<br>___ Change of Use<br>___ Flood Plain<br>___ Shoreland<br>___ Design Review<br>___ Housing Replacement<br>___ Historic Preservation |

**APPLICATION SUBMISSION:**

**1.** All site plans and written application materials must be submitted electronically on a CD or thumb drive with each plan submitted as separate files, with individual file which can be found on the **Electronic Plan and Document Submittal** page of the City's website at http://me-portland.civicplus.com/764/Electronic-Plan-and-Document-Submittal

**2. In addition, one (1) paper set of the plans (full size), one (1) paper set of plans (11 x 17), paper copy of written materials, and the application fee must be submitted to the Building Inspections Office to start the review process.**

**The application must be complete, including but not limited to the contact information, project data, application checklists, wastewater capacity, plan for fire department review, and applicant signature. The submissions shall include one (1) paper packet with folded plans containing the following materials:**

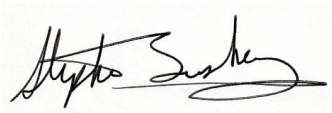
1. **One (1) full size site plans** that must be **folded.**
2. One (1) copy of all written materials or as follows, unless otherwise noted:
   a. Application form that is completed and signed.
   b. Cover letter stating the nature of the project.
   c. All Written Submittals (Sec. 14-525 2. (c), including evidence of right, title and interest.
3. A stamped standard boundary survey prepared by a registered land surveyor at a scale not less than one inch to 50 feet.
4. Plans and maps based upon the boundary survey and containing the information found in the attached sample plan checklist.
5. One (1) set of plans reduced to 11 x 17.

**Please refer to the application checklist (attached) for a detailed list of submission requirements.**

**APPLICANT SIGNATURE:**

I hereby certify that I am the Owner of record of the named property, or that the owner of record authorizes the proposed work and that I have been authorized by the owner to make this application as his/her authorized agent. I agree to conform to all applicable laws of this jurisdiction. In addition, if a permit for work described in this application is issued, I certify that the Planning Authority and Code Enforcement's authorized representative shall have the authority to enter all areas covered by this permit at any reasonable hour to enforce the provisions of the codes applicable to this permit.

**This application is for a Level II Site Plan review. It is not a permit to begin construction. An approved site plan, a Performance Guarantee, Inspection Fee, Building Permit, and associated fees will be required prior to construction. Other Federal, State or local permits may be required prior to construction, which are the responsibility of the applicant to obtain.**

| **Signature of Applicant:**  | **Date:** July 22, 2014 |
|---|---|

# PROJECT DATA

**The following information is required where applicable, in order to complete the application.**

| | |
|---|---|
| **Total Area of Site** | 146,361 SF (Total) 141,134 SF (Parcel) 5,227 SF (MTA Easement Area) |
| **Proposed Total Disturbed Area of the Site** | 93,218 sq. ft. |
| If the proposed disturbance is greater than one acre, then the applicant shall apply for a Maine Construction General Permit (MCGP) with DEP and a Stormwater Management Permit, Chapter 500, with the City of Portland. | |
| | |
| **Impervious Surface Area** | |
| Impervious Area (Total Existing) | 0 sq. ft. |
| Impervious Area (Total Proposed) | 51,836 sq. ft. |
| | |
| **Building Ground Floor Area and Total Floor Area** | |
| Building Footprint (Total Existing) | 0 sq. ft. |
| Building Footprint (Total Proposed) | 4,066 SF (Total) 3,850 SF (C-store) & 216 SF (Farm Stand) |
| Building Floor Area (Total Existing) | 0 sq. ft. |
| Building Floor Area (Total Proposed) | 4,066 SF (Total) 3,850 SF (C-store) & 216 SF (Farm Stand) |
| | |
| **Zoning** | |
| Existing | I-M |
| Proposed, if applicable | Conditional Zoning Agreement |
| | |
| **Land Use** | |
| Existing | Undeveloped |
| Proposed | C-Store, Fuel Station & Farm Stand |
| | |
| **Residential, If applicable** | N/A |
| # of Residential Units (Total Existing) | |
| # of Residential Units (Total Proposed) | |
| # of Lots (Total Proposed) | |
| # of Affordable Housing Units (Total Proposed) | |
| | |
| **Proposed Bedroom Mix** | N/A |
| # of Efficiency Units (Total Proposed) | |
| # of One-Bedroom Units (Total Proposed) | |
| # of Two-Bedroom Units (Total Proposed) | |
| # of Three-Bedroom Units (Total Proposed) | |
| | |
| **Parking Spaces** | |
| # of Parking Spaces (Total Existing) | 0 |
| # of Parking Spaces (Total Proposed) | 27 |
| # of Handicapped Spaces (Total Proposed) | 2 |
| | |
| **Bicycle Parking Spaces** | |
| # of Bicycle Spaces (Total Existing) | 0 |
| # of Bicycle Spaces (Total Proposed) | 8 |
| | |
| **Estimated Cost of Project** | $2-3 Million |

Not Applicable - See Final Checklist

| PRELIMINARY PLAN (Optional) - Level III Site Plan | | | |
|---|---|---|---|
| Applicant Checklist | Planner Checklist | # of Copies | **GENERAL WRITTEN SUBMISSIONS CHECKLIST** |
| | | 1 | Completed Application form |
| | | 1 | Application fees |
| | | 1 | Written description of project |
| | | 1 | Evidence of right, title and interest |
| | | 1 | Evidence of state and/or federal approvals, if applicable |
| | | 1 | Written assessment of proposed project's compliance with applicable zoning requirements |
| | | 1 | Summary of existing and/or proposed easement, covenants, public or private rights-of-way, or other burdens on the site |
| | | 1 | Written requests for waivers from site plan or technical standards, if applicable. |
| | | 1 | Evidence of financial and technical capacity |
| | | 1 | Traffic Analysis (may be preliminary, in nature, during the preliminary plan phase) |
| Applicant Checklist | Planner Checklist | # of Copies | **SITE PLAN SUBMISSIONS CHECKLIST** |
| | | 1 | Boundary Survey meeting the requirements of Section 13 of the City of Portland's Technical Manual |
| | | 1 | **Preliminary Site Plan including the following: (information provided may be preliminary in nature during preliminary plan phase)** |
| | | Proposed grading and contours; | |
| | | Existing structures with distances from property line; | |
| | | Proposed site layout and dimensions for all proposed structures (including piers, docks or wharves in Shoreland Zone), paved areas, and pedestrian and vehicle access ways; | |
| | | Preliminary design of proposed stormwater management system in accordance with Section 5 of the Technical Manual (note that Portland has a separate applicability section); | |
| | | Preliminary infrastructure improvements; | |
| | | Preliminary Landscape Plan in accordance with Section 4 of the Technical Manual; | |
| | | Location of significant natural features (including wetlands, ponds, watercourses, floodplains, significant wildlife habitats and fisheries or other important natural features) located on the site as defined in Section 14-526 (b) (1); | |
| | | Proposed buffers and preservation measures for significant natural features, as defined in Section 14-526 (b) (1); | |
| | | Location , dimensions and ownership of easements, public or private rights of way, both existing and proposed; | |
| | | Exterior building elevations. | |

| FINAL PLAN - Level III Site Plan | | | |
|---|---|---|---|
| Applicant Checklist | Planner Checklist | # of Copies | **GENERAL WRITTEN SUBMISSIONS CHECKLIST (* If applicant chooses to submit a Preliminary Plan, then the * items were submitted for that phase and only updates are required)** |
| X | | 1 | * Completed Application form |
| X | | 1 | * Application fees |
| X | | 1 | * Written description of project |
| X | | 1 | * Evidence of right, title and interest |
| X | | 1 | * Evidence of state and/or federal permits |
| X | | 1 | * Written assessment of proposed project's specific compliance with applicable Zoning requirements |
| X | | 1 | * Summary of existing and/or proposed easements, covenants, public or private rights-of-way, or other burdens on the site |
| X | | 1 | * Evidence of financial and technical capacity |
| X | | 1 | Construction Management Plan |
| X | | 1 | A traffic study and other applicable transportation plans in accordance with Section 1 of the technical Manual, where applicable. |
| X | | 1 | Written summary of significant natural features located on the site (Section 14-526 (b) (a)) |
| X | | 1 | Stormwater management plan and stormwater calculations |
| X | | 1 | Written summary of project's consistency with related city master plans |
| X | | 1 | Evidence of utility capacity to serve |
| X | | 1 | Written summary of solid waste generation and proposed management of solid waste |
| X | | 1 | A code summary referencing NFPA 1 and all Fire Department technical standards |
| X | | 1 | Where applicable, an assessment of the development's consistency with any applicable design standards contained in Section 14-526 and in City of Portland Design Manual |
| X | | 1 | Manufacturer’s verification that all proposed HVAC and manufacturing equipment meets applicable state and federal emissions requirements. |

| Applicant Checklist | Planner Checklist | # of Copies | **SITE PLAN SUBMISSIONS CHECKLIST**<br>**(* If applicant chooses to submit a Preliminary Plan, then the * items were submitted for that phase and only updates are required)** |
|---|---|---|---|
| X | | 1 | * Boundary Survey meeting the requirements of Section 13 of the City of Portland's Technical Manual |
| X | | 1 | **Final Site Plans including the following:** |
| X | | Existing and proposed structures, as applicable, and distance from property line (including location of proposed piers, docks or wharves if in Shoreland Zone); | |
| X | | Existing and proposed structures on parcels abutting site; | |
| X | | All streets and intersections adjacent to the site and any proposed geometric modifications to those streets or intersections; | |
| X | | Location, dimensions and materials of all existing and proposed driveways, vehicle and pedestrian access ways, and bicycle access ways, with corresponding curb lines; | |
| X | | Engineered construction specifications and cross-sectional drawings for all proposed driveways, paved areas, sidewalks; | |
| X | | Location and dimensions of all proposed loading areas including turning templates for applicable design delivery vehicles; | |
| X | | Existing and proposed public transit infrastructure with applicable dimensions and engineering specifications; | |
| X | | Location of existing and proposed vehicle and bicycle parking spaces with applicable dimensional and engineering information; | |
| X | | Location of all snow storage areas and/or a snow removal plan; | |
| X | | A traffic control plan as detailed in Section 1 of the Technical Manual; | |
| X | | Proposed buffers and preservation measures for significant natural features, where applicable, as defined in Section 14-526(b)(1); | |
| X | | Location and proposed alteration to any watercourse; | |
| X | | A delineation of wetlands boundaries prepared by a qualified professional as detailed in Section 8 of the Technical Manual; | |
| X | | Proposed buffers and preservation measures for wetlands; | |
| X | | Existing soil conditions and location of test pits and test borings; | |
| X | | Existing vegetation to be preserved, proposed site landscaping, screening and proposed street trees, as applicable; | |
| X | | A stormwater management and drainage plan, in accordance with Section 5 of the Technical Manual; | |
| X | | Grading plan; | |
| X | | Ground water protection measures; | |
| X | | Existing and proposed sewer mains and connections; | |

*- Continued on next page -*

| | | |
|---|---|---|
| X | | Location of all existing and proposed fire hydrants and a life safety plan in accordance with Section 3 of the Technical Manual; |
| X | | Location, sizing, and directional flows of all existing and proposed utilities within the project site and on all abutting streets; |
| X | | Location and dimensions of off-premises public or publicly accessible infrastructure immediately adjacent to the site; |
| X | | Location and size of all on site solid waste receptacles, including on site storage containers for recyclable materials for any commercial or industrial property; |
| X | | Plans showing the location, ground floor area, floor plans and grade elevations for all buildings; |
| X | | A shadow analysis as described in Section 11 of the Technical Manual, if applicable; |
| X | | A note on the plan identifying the Historic Preservation designation and a copy of the Application for Certificate of Appropriateness, if applicable, as specified in Section Article IX, the Historic Preservation Ordinance; |
| X | | Location and dimensions of all existing and proposed HVAC and mechanical equipment and all proposed screening, where applicable; |
| X | | An exterior lighting plan in accordance with Section 12 of the Technical Manual; |
| X | | A signage plan showing the location, dimensions, height and setback of all existing and proposed signs; |
| X | | Location, dimensions and ownership of easements, public or private rights of way, both existing and proposed. |

July 22, 2014

Captain Chris Pirone
City of Portland Fire Department
380 Congress Street
Portland, ME 04101

**Subject: Convenience Store with Fuel Station – Amended Site Plan**
**2282 Congress Street**
**Fire Department Site Review Checklist**

Dear Captain Pirone:

In accordance with instructions in the City's Level III Site Plan Review packet, please find enclosed the drawings necessary for your review of the proposed amended project. We have listed each item in your checklist below, followed by our response.

1. *Name, address, telephone number of applicant.*

   Portland Property Holdings, LLC
   2 Main Street
   Topsham, ME 04086
   (207) 865-4323

2. *Name, address, telephone number of architect.*

   Project Architect: Alpha Architects
   17 Chestnut Street, Suite 201
   Portland, ME 04101
   Attn: Mark Sengelman
   207-761-9500

3. *Proposed uses of any structures (NFPA and IBC classification).*

| Building | IBC Code | NFPA Code |
|---|---|---|
| C-Store | Mercantile | Mercantile |

4. *Square footage of all structures (total and per story).*

   3,850 SF

5. *Elevation of all structures.*

   The building finish floor elevation will be elevation 99.6'. The building height will be approximately 27'-6".

6. *Proposed fire protection of all structures.*

   The proposed store will have a domestic water supply only and will not be sprinkled.

778 Main Street, Suite 8
South Portland, ME 04106
T: 207.775.1121
F: 207.879.0896
www.fstinc.com

FAY, SPOFFORD & THORNDIKE
Offices in: Massachusetts, New Hampshire, Maine, Connecticut and New York

Multiple fire extinguishers will be provided in the building and a code compliant foam suppression system will be provided within the fuel canopies over the dispensers.

*7. Hydrant locations.*

A fire hydrant is currently located on the opposite side of Congress Street from the project site's 60' street frontage.

*8. Water main(s) size and location.*

The Portland Water District maintains a 12" water supply line in Congress Street.

*9. Access to all structures (min. 2 sides).*

The structure will be accessible from all four sides.

*10. A code summary shall be included referencing NFPA 1 and all fire department technical standards.*

**NFPA 1 – Chapter 18 Fire Department Access and Water Supply**

18.2 Fire Department Access:

The project site is located on an arterial road and is bordered by public streets on three sides. The following street widths are currently available:

| Street | Width |
|---|---|
| Congress Street | > 40 ft. |
| Skyway Drive | > 36 ft. |

Per NFPA 1 – Chapter 18.2.3.2.2.1, all first story floors shall be located not more than 450 ft. from a Fire Department access road.

**City of Portland Technical Manual – Section 3 Public Safety**

*3.4.1 Every dead-end roadway more than one hundred fifty (150') feet in length shall provide a turnaround at the closed end. Turnarounds shall be designed to facilitate future street connectivity and shall always be designed to the right (refer to Figure I-5).*

Supporting Evidence: Not Applicable

*3.4.2 Where possible, developments shall provide access for Fire Department vehicles to at least two sides of all structures. Access may be from streets, access roads, emergency access lanes, or parking areas.*

Supporting Evidence: The Site Plan includes an access drive that circles the building and will provide four-sided access to the building.

*3.4.3 Building setbacks, where required by zoning, shall be adequate to allow for emergency vehicle access and related emergency response activities and shall be evaluated based on the following factors:*

- *Building Height.*
- *Building Occupancy.*
- *Construction Type.*
- *Impediments to the Structures.*
- *Safety Features Provided.*

Supporting Evidence: The proposed building and fuel station canopy will be fully accessible to emergency equipment.

*3.4.4. Fire Dept. access roads shall extend to within 50' of an exterior door providing access to the interior of the structure.*

Supporting Evidence: The access drive will allow an emergency vehicle to pull within 10' of the structure.

*3.4.5. Site access shall provide a minimum of nine (9) feet clearance height to accommodate ambulance access.*

Supporting Evidence: There are no vertical obstructions into the site and the fuel canopies will be at least fourteen feet above grade.

*3.4.6. Elevators shall be sized to accommodate an 80 x 24 inch stretcher.*

Supporting Evidence: Not Applicable.

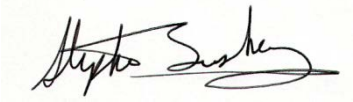
*3.4.7. All structures are required to display the assigned street number. Numbers shall be clearly visible from the public right of way.*

Supporting Evidence: The applicant will work with the City's Public Services Division to assign street addresses and numbering to meet City Standards.

If you need any further information, please contact our office.

Sincerely,

**FAY, SPOFFORD & THORNDIKE**



Stephen R. Bushey, P.E., C.P.E.S.C.
Senior Principal Engineer

SRB/cmd

Enclosures:

c: Jean Fraser, City of Portland Planning Department
David Latullipe, Portland Property Holdings, LLC
Wes Thames, Priority Group

# CITY OF PORTLAND WASTEWATER CAPACITY APPLICATION

Department of Public Services,
55 Portland Street,
Portland, Maine 04101-2991

Date: July 22, 2014

Mr. Frank J. Brancely,
Senior Engineering Technician,
Phone #: (207) 874-8832,
Fax #: (207) 874-8852,
E-mail:fjb@portlandmaine.gov

**1. Please, Submit Utility, Site, and Locus Plans.**

Site Address: 2282 Congress Street

Chart Block Lot Number: 237, A, 012

Proposed Use: Mixed-Use Commercial

Previous Use: Undeveloped

Existing Sanitary Flows: 0 GPD

Existing Process Flows: 0 GPD

Description and location of City sewer that is to receive the proposed building sewer lateral.

The site does not currently have a sewer service.

| Site Category | | |
|---|---|---|
| | Commercial *(see part 4 below)* | X |
| | Industrial *(complete part 5 below)* | |
| | Governmental | |
| | Residential | |
| | Other *(specify)* | |

***(Clearly, indicate the proposed connections, on the submitted plans)***

**2. Please, Submit Contact Information.**

City Planner's Name: Jean Fraser Phone: 207-874-8728

Owner/Developer Name: Portland Property Holdings, LLC c/o CJ Developers, Inc.

Owner/Developer Address: 2 Main Street - Topsham, ME 04086

Phone: 207-865-4323 Fax: E-mail: ddlatulip@aol.com

Engineering Consultant Name: Bo Kennedy, Fay, Spofford & Thorndike

Engineering Consultant Address: 778 Main Street, Suite 8 - So. Portland, ME 04106

Phone: 207-775-1121 Fax: 207-879-0896 E-mail: bkennedy@fstinc.com

***(Note: Consultants and Developers should allow +/- 15 days, for capacity status, prior to Planning Board Review)***

**3. Please, Submit Domestic Wastewater Design Flow Calculations.**

Estimated Domestic Wastewater Flow Generated: 460 GPD

Peaking Factor/ Peak Times: *

Specify the source of design guidelines: *(i.e._"Handbook of Subsurface Wastewater Disposal in Maine," __ "Plumbers and Pipe Fitters Calculation Manual," __ Portland Water District Records, _ Other (specify)*

See attached letter dated March 26, 2013

*Estimated to be 8 times daily flow and equal to 2.5 gal/min. Peak time is projected to be 11:00am-2:00pm (lunchtime)

***(Note: Please submit calculations showing the derivation of your design flows, either on the following page, in the space provided, or attached, as a separate sheet)***

**4. Please, Submit External Grease Interceptor Calculations.**

Total Drainage Fixture Unit (DFU) Values: _____

Size of External Grease Interceptor: _____

Retention Time: _____

Peaking Factor/ Peak Times: _____

***(Note: In determining your restaurant process water flows, and the size of your external grease interceptor, please use The Uniform Plumbing Code. Note: In determining the retention time, sixty (60) minutes is the minimum retention time. Note: Please submit detailed calculations showing the derivation of your restaurant process water design flows, and please submit detailed calculations showing the derivation of the size of your external grease interceptor, either in the space provided below, or attached, as a separate sheet)***

**5. Please, Submit Industrial Process Wastewater Flow Calculations**

Estimated Industrial Process Wastewater Flows Generated: N/A GPD

Do you currently hold Federal or State discharge permits? Yes ____ No ____

Is the process wastewater termed categorical under CFR 40? Yes ____ No ____

OSHA Standard Industrial Code (SIC): *http://www.osha.gov/oshstats/sicser.html*

Peaking Factor/Peak Process Times: N/A

***(Note: On the submitted plans, please show where the building's domestic sanitary sewer laterals, as well as the building's industrial-commercial process wastewater sewer laterals exits the facility. Also, show where these building sewer laterals enter the city's sewer. Finally, show the location of the wet wells, control manholes, or other access points; and, the locations of filters, strainers, or grease traps)***

***(Note: Please submit detailed calculations showing the derivation of your design flows, either in the space provided below, or attached, as a separate sheet)***

Notes, Comments or Calculation

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Section 1: Attachment A – Amended Lighting Package
Attachment B – AutoTURN Templates

Section 3: Amended Stormwater Management Report and Computations

## LIST OF PLANS

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|---|---|
| C-1.0 | COVER SHEET |
| C-1.1 | GENERAL NOTES AND LEGEND |
| C-1.2 | EXISTING CONDITIONS SURVEY / BOUNDARY SURVEY |
| C-1.3 | EXISTING CONDITIONS PLAN |
| C-2.0 | AMENDED SITE LAYOUT PLAN |
| C-3.0 | AMENDED GRADING AND DRAINAGE PLAN |
| C-4.0 | AMENDED UTILITY PLAN |
| C-5.0 | AMENDED LANDSCAPE PLAN |
| C-6.0 | EROSION AND SEDIMENT CONTROL PLAN |
| C-7.0 | LIGHTING PLAN CANOPY ON |
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| C-8.0 | LANDSCAPING DETAILS |
| C-8.1 | UTILITY DETAILS |
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| C-8.3 | SITE DETAILS |
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| C-12.1* | ACCESS DRIVE PROFILES |
| C-13.0 | VACANT |
| C-14.0 | PREDEVELOPMENT WATERSHED MAP |
| C-14.1 | POSTDEVELOPMENT WATERSHED MAP |

* Plan not included with this submission. To be released for construction documents.

# 1. DEVELOPMENT DESCRIPTION

## 1.1 PROJECT OVERVIEW

Portland Property Holdings, LLC proposes to construct, own, and operate a 3,850 SF Convenience Store and Fuel Station at 2282 Congress Street, just west of the Maine Turnpike Overpass, in Portland, Maine. The project was previously reviewed and approved by the Planning Board on May 14, 2013. The Applicant is currently seeking an Amendment to the Site Plan Approved associated with minor changes to the site layout.

Our tenant has reevaluated this local market area and has determined that there is a greater demand for diesel from small to mid-size vehicles as opposed to tractor trailers. Therefore, the stand alone, high speed diesel pumps are not required and diesel can be incorporated into the two end dispensers of the reconfigured dispenser island. To accommodate the diesel vehicles, the dispenser layout has been changed from 6 stacked dispensers to 5 "dive" in dispensers.

The development includes new building construction, fuel canopy and UST installation, pavement for parking and circulation and a new entrance off Congress Street generally opposite Blueberry Drive. The Amended plans include the installation of the following:

- Primary site access off Congress Street consisting of a 14 foot entry lane and two 12' wide exit lanes. The driveway radii have been configured to allow ease of movement for semi trailer vehicles;

- A Fuel canopy area that will contain five two-way (10 pumps total) dispensers and an overhead canopy (the two dispensers will include both gasoline and diesel);

- A 55' x 70' Convenience Store with a building appendage housing an ATM for drive thru service. The building will be oriented to face the Turnpike and the ATM will be positioned on the southerly side of the building generally facing Skyway Drive. Parking is located around the perimeter of the building and its been configured to allow for ease of entry and exit from the Congress Street driveway. Within the C-Store, retail space will include areas for coolers, merchandise display, and checkout counter;

- Landscape buffering along the rear property boundary, Congress Street, and Skyway Drive;

- Internal pedestrian circulation and connectivity;

- Enclosed waste container area for dumpsters;

- Lighting meeting the City's Standards;

- Underground utilities including multiple underground fuel storage tanks that will be installed in accordance with Local, State and Federal Regulations;

- The development will include a stormwater management system consisting of a closed drainage collection system and management basin to achieve compliance with the MeDEP Chapter 500 Requirements including Basic and General Standards. This includes quantity controls in accordance with the Flooding Standards as well as water quality treatment under the General Standards. The proposed system has been modestly revised and reduced in scale due to the amended layout. The primary stormwater management measure will be an

underdrained filter basin located on the easterly side of the site. The site is within the Long Creek Watershed which is an urban impaired watershed. The plans include closed drainage systems and water quality treatment measures to meet the applicable standards. The project requires an Amended Stormwater Permit from the City of Portland under their delegated authority;

- Entry identification and directional signage; and

- Stormwater treatment and detention measures. A summary of the project's stormwater management analysis is included in Section 3.

The following is a summary of the resulting minor site plan revisions:

| | May 2013 Original Plan | July 2014 Amended Plan | Reduction |
|---|---|---|---|
| **Developed Area** | 2.25 acres | 2.14 acres | 0.11 acres |
| **Impervious Area** | 1.57 acres | 1.19 acres | 0.38 acres |
| **Fuel Dispensers** | 6 plus 2 diesel | 5 w/ diesel included | 3 dispensers |
| **Parking Spaces** | 26 plus 14 at the dispensers | 27 plus 10 at the dispensers | 3 spaces |

## 1.2 SITE OWNERSHIP AND LOCATION

There are no changes to the site ownership conditions or Applicant's interest in the property.

## 1.3 PROJECT PURPOSE AND NEED

As outlined and approved in the Conditional Zone Agreement, the property is considered unique due to its somewhat isolated location with streets/roads on three sides of the property and a developed parcel on its fourth side. Because of its smaller size the parcel is ideal for the development of the services proposed which will serve the broader surrounding industrial and commercial area. Currently, there is a deficit of available services for the nearby businesses as well as to serve the MTA interchange. This finding is supported by various letters from landowners and business operators in the area that were submitted to the City during the CZA discussions and hearings. In approving the Conditional Zone Agreement, the City has found that the proposed use is compatible and reasonable for the land and will fit in with the character of the area, subject to the CZA provisions for landscaping, lighting and building design. We believe these circumstances remain fully applicable to the Amended Site Plan.

## 1.4 EXISTING CONDITIONS

There are no substantial changes to the sites existing conditions since the original approval.

The development site is undeveloped and was generally cleared of any major timber, except along its edges, within the past ten years. No evidence of any previous structures or development is apparent. Existing development in the area includes the following:

- Congress Street and the intersection of Blueberry Drive are located to the north of the site. There are several commercial buildings on each side of Blueberry Lane. The Eco-Maine facility is located at the end of Blueberry Lane.

- The MTA southbound highway is located to the east of the site. The site has approximately 264 LF of frontage along the highway. There is an existing 40' wide utility easement serving an underground natural gas line along the MTA frontage.

- The Merrimack River Medical Services Methadone Clinic is a tenant with the existing building located to the west of the site.

- The site has approximately 479 LF of frontage along Skyway Drive to the south. This frontage is currently restricted by a Control of Access by the MTA.

- The MTA owns a strip of property between much of the Congress Street frontage and the site boundary. The MTA currently leases a portion of their parcel for the placement of a Natural Gas Regulator station.

## 1.5 ACCESS CONDITIONS

The site's primary access will be developed from a new driveway to be located generally opposite Blueberry Drive on Congress Street. The proposed access driveway will contain a single 14' wide entrance lane and separate 12' wide left-thru and right turn lanes. The access driveway will allow direct entrance into the fuel canopy area as well as to parking that will be provided around the perimeter of the C-Store.

As approved in the original Traffic Study, the site entrance will remain an unsignalized intersection and that the Congress Street improvements include lane striping and median construction.

The site access will continue to include a bituminous asphalt sidewalk that will extend out to Congress Street and to a crosswalk that will be provided on the west side of the intersection. The crosswalk will connect to the existing sidewalk located on the north side of Congress Street.

The site development plans currently do not include any access onto Skyway Drive.

## 1.6 SITE UTILITIES

The site contains access to several active utility lines. The primary utilities are identified as follows:

- The City of Portland maintains an 8" sanitary sewer line along Congress Street that ends approximately 190 feet west of the site. Existing easements are in place along the property frontage of the adjacent parcel to allow an extension of the sewer from the proposed development site to the existing terminus point. It remains the applicant's intent to extend an 8' gravity sewer to tie into the existing sewer. The work will involve trenching and surface restoration behind the curb line on Congress Street.

- The Portland Water District maintains a 12" water main in Congress Street in front of the site. The applicant continues to propose to extend a 2" domestic service from the main into the site, generally within the property's 60' of frontage along Congress Street.

- Unitil maintains a natural gas line along the site's MTA Congress Street frontage. A service main from Congress Street to the building is proposed for the building's heating needs.

- Power to the site will be supplied by Central Maine Power. The Development Team is currently working with CMP and Fairpoint to determine any improvements that may be necessary from the existing overhead lines on Congress Street into the site. An onsite transformer may be required and it will be appropriately screened and in compliance with CMP standards.

## 1.7 TOPOGRAPHY, STORMWATER AND DRAINAGE

The development site is currently undeveloped and mostly cleared of mature vegetation. The accompanying Survey Plan and Amended Grading Plan include topographic information based on the City's NGVD29 datum. The site contains approximately 28' of relief and slopes from west to east towards the MTA ROW. There is evidence of rock outcroppings nearby, so it is believed that much of the site may be underlain by shallow bedrock.

The project's stormwater management needs involve the new construction of treatment and control systems. Under Basic Standards Compliance the Applicant proposes the following:

- During construction the Applicant's contractor will be required to maintain temporary and permanent sediment capture measures including, but not limited to, installation of erosion control barriers on the down hill side of all disturbed ground surfaces, silt sacks or approved equivalent at new catch basin structures, street sweeping, and temporary and permanent ground stabilization as may be necessary.
- The Applicant will continue to be responsible for the routine maintenance of all onsite drainage systems. This will include semi-annual inspections of all drainage systems and prompt cleaning of systems to assure proper functioning. Evidence of draft maintenance agreement(s) will be supplied to the City prior to the issuance of a Building Permit.

## 1.8 LAND ORDINANCE REVIEW

### 1.8.1 OVERVIEW

The applicant has pursued a Conditional Zone agreement with the City of Portland, which was approved under City Council Order 154 – 12/13 on March 4, 2013. A copy of the Conditional Zone Agreement is contained in the City's records.

**Permitted Uses**

Those uses allowed in the I-M Zone. In addition, the Property shall be permitted to be used for the following uses:

a. Major Auto Service Station. Natural gas and electricity fuel shall be included in the fuels that the major auto service station is allowed to sell.
b. Bank or ATM (with a drive through)
c. Convenience Store (without a drive through)
d. Restaurant (without a drive through)

The following dimensional requirements apply and will be complied within the I-M District:

| Dimensional Standard | Requirement |
|---|---|
| Minimum Lot Size | None |
| Minimum Frontage | 60 feet |
| Front Yard Setback | 1' from the property line for each 1' of building height |
| Side and Rear Yard Setback | 1' from each side or rear line for each 1' of building height up to 25' |
| Pavement setback from boundary line | 10' |
| Maximum Lot Coverage | 100% |
| Maximum impervious surface ratio | 75% |
| Maximum Building Height | 75' |

## 1.9 TRAFFIC/PARKING

The proposed project will not result in significant impacts to previously approved Traffic Impact Study. Based on findings of the Traffic Impact Study, the approved offsite road improvements will be limited to some pavement striping/markings improvements and minor shoulder widening along Congress Street in front of the site.

According to Section 14-332 (c) of the Land Use Ordinance, retail establishments shall require one (1) parking space for each 200 square feet in excess of 2,000 SF. Based on a floor area of 3,850 SF a parking supply of 18 spaces is required per the code. The proposed Site Layout Plan includes 27 parking spaces plus space for an additional 10 vehicles at the fueling positions. The applicant is proposing more spaces than required by Code as they anticipate a robust Convenience Store business during breakfast and lunch periods and they want to assure ease of access and parking for patrons in/out of the facility.

## 1.10 APPROVAL REQUIREMENTS

The following permits are anticipated:

- City of Portland Planning Board Level III Amended Site Plan Approval
- City of Portland Building Permit(s)
- Traffic Movement Permit by the City of Portland under delegated review
- Amended Stormwater Permit by the City of Portland under delegated review
- Post construction discharge in Urban Impaired Stream Watershed (See Order ME 550006)

## 1.11 ATTACHMENTS

Attachment A – Amended Lighting Package

Attachment B – AutoTURN Figures

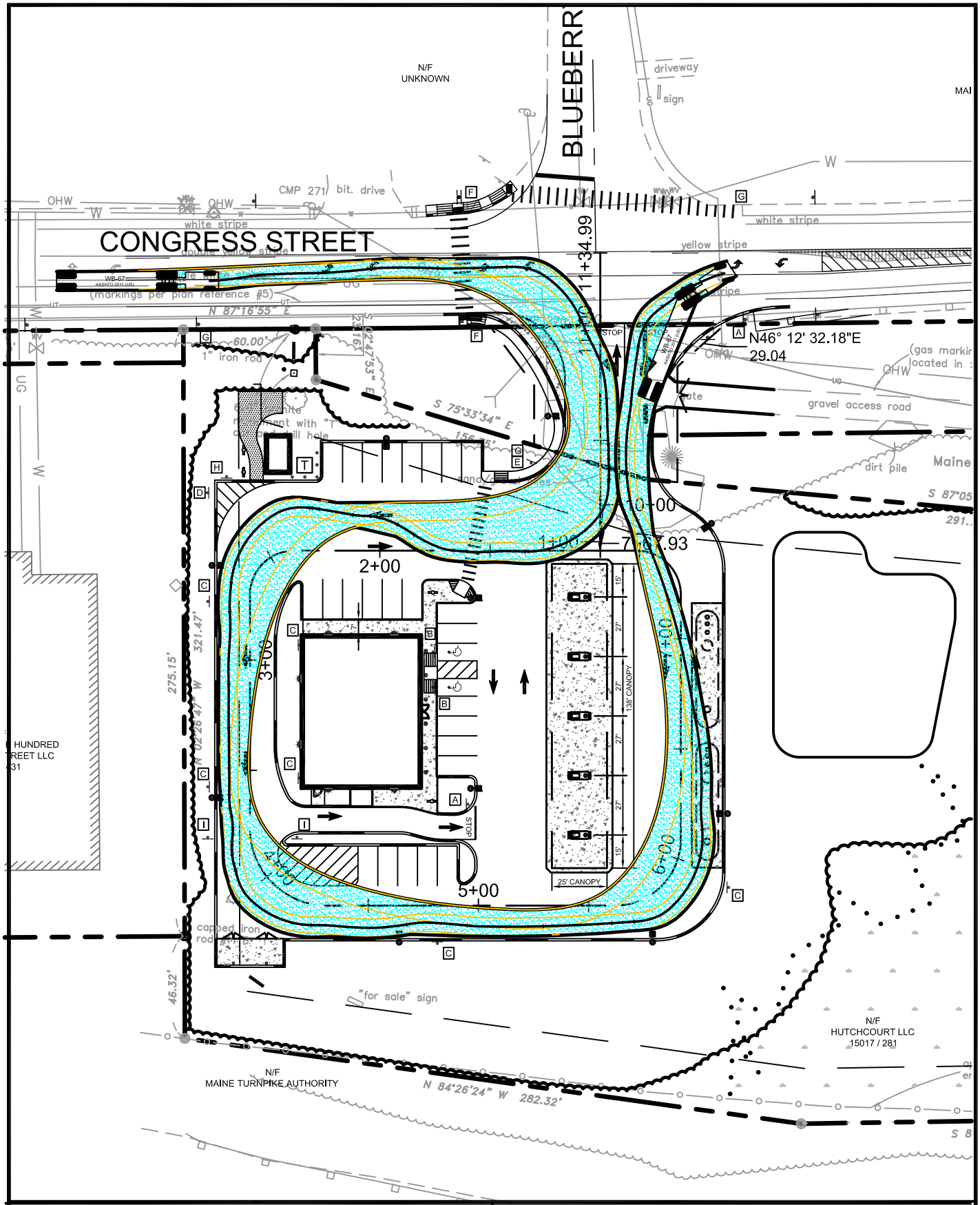
# ATTACHMENT A

## Amended Lighting Package

(To be submitted under separate cover)

# ATTACHMENT B

## AutoTURN Figures




# CONVENIENCE STORE AND FUEL STATION PORTLAND, ME

# WB-67 AUTOTURN SIMULATION

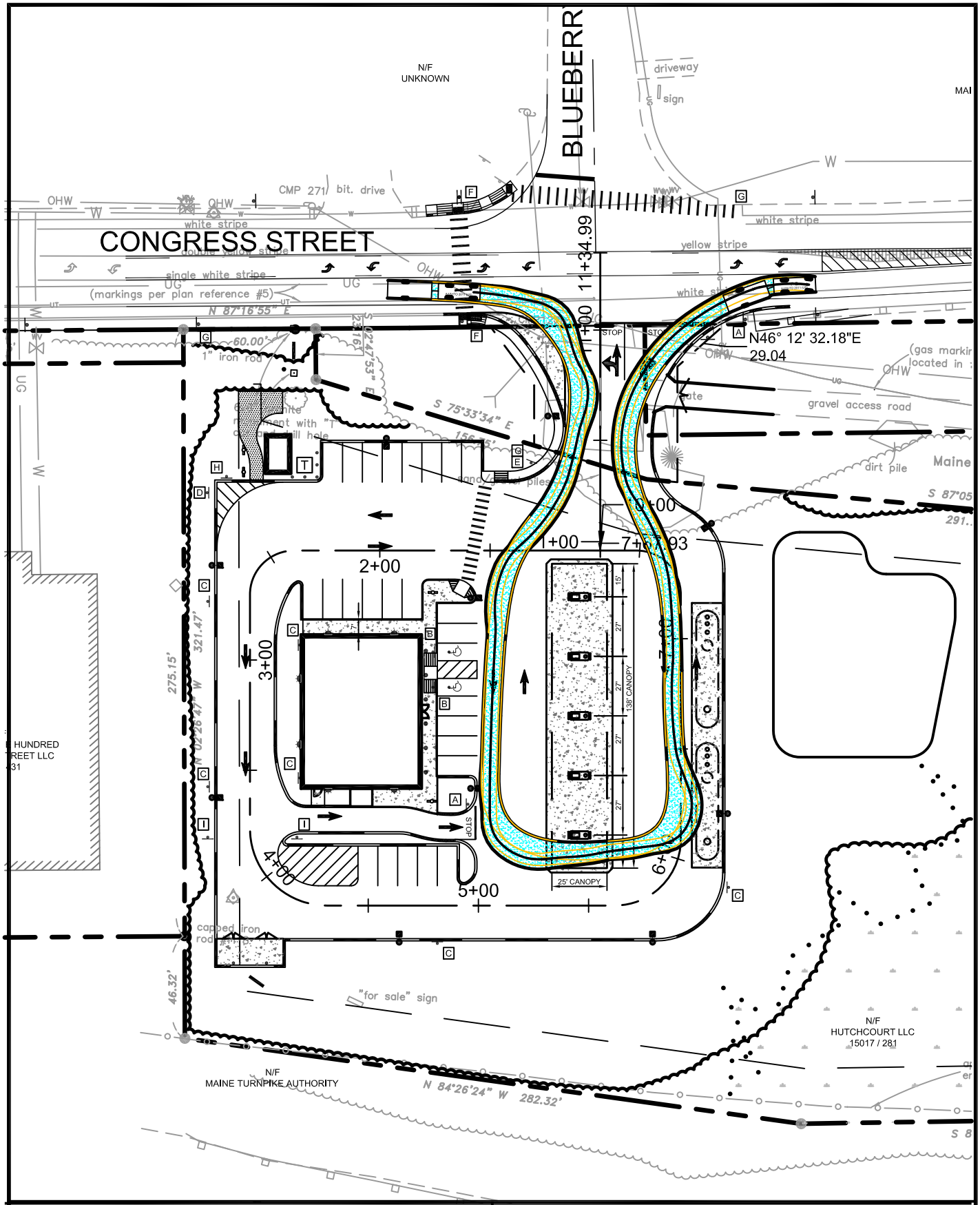

FST 100 YEARS

**FAY, SPOFFORD & THORNDIKE**
ENGINEERS · PLANNERS · SCIENTISTS
778 MAIN ST, SUITE 8, SOUTH PORTLAND, ME 04106


| | | | |
|---|---|---|---|
| DRAWN: | JRP | DATE: | JULY 22 2014 |
| DESIGNED: | BEK | SCALE: | 1"=60' |
| CHECKED: | SRB | JOB NO. | 3118 |
| FILE NAME: | 3118-AT1 | | |

FIGURE 1

R:\3118-Convenience Store, Portland, ME\Cadd\Amended Permit Set\dwg\3118-AT1.dwg peller_j 7/22/2014 10:57 AM




# CONVENIENCE STORE AND FUEL STATION PORTLAND, ME

# CAR AND TRAILER AUTOTURN SIMULATION

FST 100 YEARS
FAY, SPOFFORD & THORNDIKE
ENGINEERS · PLANNERS · SCIENTISTS
778 MAIN ST, SUITE 8, SOUTH PORTLAND, ME 04106

| | | | |
|---|---|---|---|
| DRAWN: | JRP | DATE: | JULY 22 2014 |
| DESIGNED: | BEK | SCALE: | 1"=60' |
| CHECKED: | SRB | JOB NO. | 3118 |
| FILE NAME: | 3118-AT1 | | |

FIGURE 2

# 2. CONFORMITY WITH APPLICABLE DESIGN STANDARDS (Amended Site Plan)

The following statements are made in accordance with the City of Portland Code of Ordinances, Chapter 14 Land Use, Article V Section 14-526.

## 2.1 OVERVIEW

This project conforms with all the applicable design standards of Section 14-526 as demonstrated in the following narrative.

**(a) Transportation Standards**

1. Impact on Surrounding Street Systems:

   Gorrill-Palmer Consulting Engineers has completed a Traffic Impact Study with findings that the proposed development can adequately be served with a driveway off Congress Street opposite Blueberry Drive. Minor road improvements including lane markings and center median work will be used to define turning movements through this unsignalized intersection. Based on the traffic analysis, the surrounding street system will continue to appropriate at satisfactory levels of service.

2. Access and Circulation:

   a. Site Access and Circulation.

      (i) The development provides primary access off Congress Street with a two way unsignalized driveway consisting of a 16' wide entrance lane, an 11' wide left-thru exit lane and 11' wide right exit lane. The driveway radii have been designed to accommodate the turning movements of a WB-67 semi-trailer vehicle. Site distances in each direction exceed the minimum requirements for the posted speed limit in the area. The internal circulation includes 24' (minimum) wide drive aisles and perpendicular parking for ease of entry and exit.

      (ii) Access and egress have been designed to avoid conflicts with existing turning movements and traffic flows.

      (iii) The site does feature drive up ATM service which has been positioned on the south side of the building to allow for ample queuing capacity (greater than 4 vehicles). Queued vehicles will not back into any adjacent streets.

   b. Loading and Servicing.

      (i) The site circulation and pavement areas will adequately allow larger delivery vehicles the opportunity to exit off Congress Street and be able to unload without needing to park or otherwise maneuver within the street. There will remain adequate circulation space for vehicle and patrons to move around the site during deliveries.

c. Sidewalks.

(i) The applicant is proposing to extend a sidewalk from the interior of the site along the proposed Congress Street entrance out to Congress Street. We propose to install a crosswalk on the westerly side of the intersection for pedestrian connectivity to the existing sidewalk on the north side of Congress Street. The applicant is not proposing to install a sidewalk within the site's 60' of property frontage since there currently is no sidewalk on the south side of Congress Street, between the Skyway Drive intersection and the MTA overpass. The applicant was previously granted a waiver from the curb and sidewalk requirements as outlined in Section 14-506 (b) of the code per the following conditions in existence:

*Sidewalks*

2. *There is no sidewalk in existence or expected within 1000 feet and the construction of sidewalks does not contribute to the development of a pedestrian oriented infrastructure.*
3. *A safe alternative-walking route is reasonably and safely available, for example, by way of a sidewalk on the other side of the street that is lightly traveled.*

*Curbing*

3. *The street has been rehabilitated without curbing in the last 60 months.*
5. *Runoff from the development site or within the street does not require curbing for stormwater management.*

3. Public Transit Access

a. The development contains no residential uses; therefore, Public Transit access is not applicable.

b. A new Transit stop is not proposed.

c. A new Transit stop is not proposed.

d. Waiver: The Applicant requests a waiver of the Transit facility requirement.

4. Parking:

a. Location and Required Number of Vehicle Parking Spaces:

(i) The Applicant is proposing to provide 27 parking spaces as well as 10 dispensing spaces for a total of 37 spaces for patrons to park in. Fourteen spaces are proposed adjacent the building to allow for ease of direct access into the store. Zoning Code requirements for retail use require only 18 parking spaces.

(ii) The Applicant has not prepared a TDM strategy, as it is not applicable to the intended uses.

(iii) The Applicant proposes the amount of parking which is appropriate for the anticipated uses of this site.

(iv) All parking spaces and drive aisles meet the City Standard 9' x 18' parking space dimension and 24' wide aisle width. Pavement will be used throughout the parking lot.

b. Location and Required Number of Bicycle Parking Spaces:

(i) The Applicant is providing bicycle parking measures at the front entrance to the store and near the proposed seasonal farm stand.

c. Motorcycles and Scooter Parking:

(i) Based on the number of available full size parking spaces being provided, we believe that adequate spaces for motorcycles or scooters will be available around the site without need for specifically dimensioning such spaces.

d. Snow Storage:

(i) Snow storage will be provided around the perimeter of the site. There will remain ample space to push and pile snow off the edges of the pavement surfaces.

3. Transportation Demand Management (TDM):

a. A TDM Plan is not required for the project.

**(b) Environmental Quality Standards**

1. Preservation of Significant Natural Features:

a. The existing site retains no prominent significant natural features; therefore, no issue related to the preservation of these features applies.

b. The Applicant is not requesting a waiver from this standard.

2. Landscaping and Landscaping Preservation:

a. Landscape Preservation.

(i) There are numerous trees along the property boundaries that will remain. The Applicant is considering some modest street planting around the perimeter of the parking lot. Existing vegetation down in the lower wetland areas will remain as is.

(ii) Not applicable

(iii) Not applicable

(iv) The Applicant will request a waiver from this standard.

b. Site Landscaping.

(i) Landscaped Buffers:

(a) There are no service or loading areas observable from nearby sidewalks or residential properties. The dumpster pad area will be screened with a chain link fence and vinyl slats enclosure.

(b) The development is not subject to residential zoning setbacks or buffering requirements.

(c) Not applicable.

(ii) Parking Lot Landscaping:

a) thru d) The landscaping plan has been prepared in a manner to fulfill these requirements.

3. Water Quality, Stormwater Management and Erosion Control:

a. Stormwater:

(i) The site lies at the outer extent of a drainage boundary with a small portion of the site draining towards the Stroudwater River and the majority of the site draining to Long Creek. No offsite drainage will be impeded.

(ii) The project will not adversely impact adjacent lots or the City street system. Measures will be provided to control runoff release rates from the site in order to meet pre and post development peak runoff restrictions as outlined in the City's Stormwater regulations. An Amended Stormwater Analysis Report accompanies this submission.

(iii) The project will not adversely impact adjacent lots or the City street system.

(iv) The project will not adversely impact adjacent lots or the City street system.

b. A Stormwater Management Plan is proposed based on site use and size.

c. The project is located in the Long Creek Watershed which is an urban impaired stream, thus measures meeting the requirements of the Chapter 500 Regulations will be provided. See Stormwater Report for details.

d. N/A

e. The project is serviced by both a public wastewater system and public water supply system. All underground storage tank installations will be performed in accordance with current MeDEP and City Standards and requirements. The project will not pose a risk of groundwater contamination.

f. The project will be connected to the public sanitary sewer system which is adequately sized for the project flows.

**(c) Public Infrastructure and Community Safety Standards.**

1. Consistency with City Master Plans:

    a. The project has been designed to be consistent with the City's Zoning Ordinance and off-site infrastructure in accordance with the findings from the Planning Authority and Portland City Council related to the approved Conditional Zoning Agreement.

    b. The Applicant will coordinate with utility representatives for the extension of services related to utility infrastructure entering the site.

2. Public Safety and Fire Prevention:

    a. The site has been designed to promote safe and inviting customer access.

    b. No change to emergency access conditions within the surrounding streets is proposed.

    c. Fire hydrants are located within the adjacent street system.

3. Availability and Adequate Capacity of Public Utilities:

    a. The Applicant has previously secured letters from all applicable utilities stating their ability to serve this project.

    b. Secondary power into the site will be underground.

    c. All new utility infrastructure will meet the provisions of the Technical Manual.

    d. The project will extend a new service connection to the sewer system.

    e. The sanitary sewer collection system will be designed to meet all applicable sections of the Technical Manual. Wastewater flows are expected to consist of regular domestic flows only.

    f. Not applicable.

**(d) Site Design Standards.**

1. Massing, Ventilation and Wind Impact:

    a. The bulk, location and height of the building do not appear to result in adverse impacts to abutting properties. There are no substantive changes to the building plans from the approved plans.

    b. HVAC venting is proposed to be directed to the building roof and directed away from public spaces. We understand that all HVAC equipment must meet maximum noise regulations for the I-M District.

2. Shadows:

    a. The development is located in the I-M Zone and this standard is not applicable.

3. Snow and Ice Loading:

    a. The proposed building will be designed and located such that accumulated snow and ice will not fall onto adjacent properties or public ways.

4. View Corridors:

    a. The project site is located outside the Downtown Vision View Corridor Protection Plan.

5. Historic Resources:

    a. The site is not subject to Historic Landmark or Historic building review.

6. Exterior Lighting:

    a. Site Lighting.

        (i) Exterior lighting will be designed to meet the requirements of Section 12 of the Technical Manual. An Amended Lighting Report has been prepared and is included with this submission.

7. Noise and Vibration:

    The project noise levels will be designed to meet the permitted levels as outlined in the I-M Zone. All HVAC and mechanical equipment is proposed to be mounted on the roof or ground mounted and concealed from nearby properties.

8. Signage and Wayfinding:

    a. All street and wayfinding signage shall meet the requirements of the Manual on Uniform Traffic Devices (MUTCD) and Division 22 of the City Code.

        (i) The project is not located in a historic district or subject to Article IX.

        (ii) Proposed commercial signage is still being designed and subject to a condition of approval.

        (iii) All street and wayfinding signage shall meet the requirements of the Manual on Uniform Traffic Devices (MUTCD) and Division 22 of the City Code.

9. Zoning Related Design Standards:

    a. The project is within the IM and zoning related design standards are not applicable.

# 3. AMENDED STORMWATER MANAGEMENT REPORT AND COMPUTATIONS

# AMENDED STORMWATER MANAGEMENT REPORT (BASIC, GENERAL, FLOODING AND URBAN IMPAIRED STREAM STANDARDS)

## CONVENIENCE STORE AND FUEL STATION
## PORTLAND, ME

**PREPARED FOR:**

**PORTLAND PROPERTY HOLDINGS, LLC**
**2 MAIN STREET**
**TOPSHAM, MAINE 04086**
**(207) 865-4323**

**PREPARED BY:**

**FAY, SPOFFORD AND THORNDIKE**
**778 MAIN STREET, SUITE 8**
**SOUTH PORTLAND, MAINE 04106**
**(207) 775-1121**

**APRIL 2013**
**UPDATED JULY 2014**

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**Appendices**

# STORMWATER MANAGEMENT REPORT

**This report has been amended to reflect changes associated with the July 2014 Amended Site Plan Application. The text highlighted in yellow indicates additions/changes to the document.**

## 1.0 Introduction

Fay, Spofford & Thorndike has been retained by Portland Property Holdings, LLC for the preparation of site design and site permitting for a proposed convenience store/fuel station at 2282 Congress Street in Portland, Maine. The development will include a convenience store, drive-thru ATM and fueling facilities. In May of 2013 the project's stormwater management was approved by the City under delegated review. In October 2013, the MaineDEP approved an Individual Waste Discharge Permit (#ME55006). Since that time changes to the site have been made requiring an update to the stormwater management report.

The designed project proposes a total of 2.14 acre of developed area of which 1.19 acre will be new structure area (building and other impervious surfaces) within the 3.36 acre project boundary (3.24 acre parcel plus 0.12 acre Access Easement). The original project involved 2.25 acres of developed area and 1.57 acres of impervious area. This project continues to meet the thresholds which require a MaineDEP Stormwater Law permit which can be reviewed by the City of Portland under their delegated review authority. The stormwater management design presented herein will show that it continues to meet the criterion of the City of Portland Stormwater Requirements and the adopted MeDEP Chapter 500 Regulations. The applicant received MaineDEP Waste Discharge approval in October 2013, for which an amended approval is being sought concurrent with the City submission.

The site flows easterly to a 24" RCP Culvert adjacent to the I-95 Interstate which flows southerly under Skyway Dr. and ultimately drains to the North Branch of Long Creek. Because the site is within the Long Creek Watershed the applicant will be required to apply for a Maine Waste Discharge Permit with the MeDEP and it must meet the urban impaired stream requirements described in MeDEP Chapter 500 Regulations.

Runoff from the proposed site will drain to a new inlet and the conveyance system will discharge to an open stormwater detention basin. The stormwater detention basin will provide channel protection storage meeting the MeDEP General Standards Requirements. The open detention basin system will meet the flooding standards and manage the release of the 2, 10 and 25-year storm event to below predevelopment conditions as required by the City of Portland Stormwater Regulations. A grassed underdrain or focal point filter has been designed to meet stormwater quality standards required under the general standards as outlined in the adopted MeDEP Chapter 500 Stormwater Management Technical Manual. The grassed underdrain soil filter system will provide water quality treatment for approximately 82% of the proposed development.

On behalf of the applicant, Fay, Spofford & Thorndike has prepared this Amended report to show the proposed Stormwater Management Plan meets the City's General Stormwater Standards, as well as standards applicable to project's in the Long Creek Watershed.

## 2.0 Existing Site Conditions

The site is 3.24 acres and is currently undeveloped with the following land cover:

| TABLE 1 – LAND COVER | |
|---|---|
| **Current Land Cover** | **Area (acre)** |
| Woods (Emerging) | 3.04 |
| Meadow (Natural Gas Easement) | 0.20 |
| **Total** | **3.24** |

Topography slopes from west to east with slopes ranging from 3% to 14%. The site elevations range from 73 to 102 based on NGVD29. Existing topography sheet flows across the southerly and easterly property lines and drainage is towards a 24" RCP culvert adjacent to the abutting I-95 interstate highway (SB lanes).

The soils on the site are shown on the USDA medium intensity soils map to be primarily Hollis fine sandy loam and Scantic silt loam. Geotechnical explorations by SW Cole in March 2013 show that the soils are predominantly silty sand overlying sandy silt with gravel overlying relatively shallow bedrock.

The site is in the IM Industrial Zone and has been approved by the City of Portland as a permitted use through a Conditional Zone Agreement.

The existing conditions are shown on Drawing C-1.3 and supplemented by photographs appended to the end of this narrative in Appendix B.

The site is not located in a mapped 100-year floodplain and is denoted as Zone X based upon the Dec. 8, 1998 FEMA mapping and depicted on Figure 7 provided by MGIS Firm Panel # 230051 Panel #12-C.

The drainage is divided into two areas; the majority of the site is tributary to the North Branch of the Long Creek Subwatershed C as identified in the Long Creek Watershed Management Plan. A small portion of the Northwest corner of the site flows westerly along Congress Street and is tributary to the Stroudwater River.

Figures 8, 9, and 10 appended to the original report provide the USDA medium intensity soils, sand and gravel aquifers maps, and surficial geology map for the site.

## 3.0 Updates To The Proposed Project

Updates to the proposed project are generally described below and are shown on Drawing C-2.0. The project will develop 2.14 acres of the 3.24 acre wooded site. Updates to the site design of the project will reduce the overall developed foot print of the site from 2.25 ac to 2.14 acres. Impervious area will be reduced from 1.57 acres to 1.19 acres.

The following table shows the changes in proposed land cover from the approved design to the current design:

| TABLE 2 – LAND USE (ONSITE ONLY) | | | |
|---|---|---|---|
| **Proposed Land Cover** | **May 2013 Design Area (acre)** | **July 2014 Design Area Update (acre)** | **Change Due to 2014 Update (acre)** |
| Woods | 0.99 | 0.94 | (0.05) |
| Meadow (Natural Gas Easement) | 0.20 | 0.20 | 0.0 |
| Meadow (Vegetated Fill Slopes) | 0.42 | 0.92 | 0.50 |
| Lawn/Landscaped Planting Areas | 0.01 | 0.03 | 0.02 |
| Pavement | 1.48 | 1.06 | (0.420) |
| Roof | 0.09 | 0.09 | 0.00 |
| Rip Rap Slope | 0.05 | 0.00 | (0.05) |
| **Total** | **3.24** | **3.24** | **-** |

Due to the reduction in developed and impervious area a grassed underdrain soil filter is able to be utilized, eliminating the need for a StormTreat system and its related underground storage components.

## 4.0 Watershed Delineation Method

The following resources were used for watershed delineation:

- USGS Topographic Mapping
- Field Reconnaissance

  *Bo Kennedy P.E., Project Engineer, Fay, Spofford & Thorndike*
  *Reviewed by Stephen Bushey, P.E., Fay, Spofford & Thorndike*

- Site Topographic Survey

  *Titcomb Associates, Inc., dated March, 2013.*

- Hydrologic Soil Group Information

  *USDA SCS Medium Intensity Mapping with interpretation of wetland delineation by Albert Frick Associates.*

## 5.0 References


- Urban Hydrology for Small Watersheds from the USDA SCC *Technical Release SS, dated 1986*
- Erosion and Sediment *Maine Erosion and Sediment Control BMPs", published by the MeDEP in 2003 http://www.maine.gov/dep/blwg/docstand/escbmps/index.htm*
- City of Portland – Code of Ordinances, Section 32 Rev. 9-17-09
- Portland Stormwater Management – Section 5 Adopted 7-19-10.
- Stormwater Management for Maine Volume III – BMP Technical Design Manual
- Chapter 500 DEP Rules, revision October 2010.

## 6.0 Modeling Software

- HydroCAD Stormwater Modeling System, version 8.5, Applied Microcomputer Systems – used for modeling underground storage facilities.

- Microsoft Excel 2007, Microsoft Corporation – used for spreadsheet computations.

## 7.0 Design Storms

| TABLE 3 – RAINFALL | |
|---|---|
| **Rainfall Amount (inches)** | |
| 2-Year Storm | 3.0 |
| 10-Year Storm | 4.7 |
| 25-Year Storm | 5.5 |

Hydrologic Parameters: Cumberland County SE Type III Distribution: Antecedent Moisture Condition 2, SCS 24 Hour Distribution as per MeDEP Stormwater Best Management Practices (page 25).

## 8.0 Presentation of Analysis

The stormwater analysis has been performed for the project to determine the requirements of the City of Portland, Section 5 and adopted MeDEP Chapter 500 Stormwater Rules and to show a plan which will generally meet the requirements with the exceptions noted herein. The analysis is documented with supporting HydroCAD models appended to this narrative.

## 9.0 Modeling Assumptions

- Inlets modeled as ponds with cylindrical storage based on invert to rim depth and structure diameter. It is assumed that all stormwater can enter at inlets.
- Analysis was run with pipe lengths (modeled as culvert outlets). Pipe sizes were generated using the HydroCAD modeling flow computations.
- The Tc flow paths were assumed to be a min. of 6 minutes as recommended in the TR-55 technical manual. In instances where flow paths were computed to be less then 6 minutes a direct entry command was used.

## 10.0 Predevelopment Analysis

Runoff from the site flows from the northwest corner in a southeasterly direction and generally passes over the property line as sheet flow. Flow begins to concentrate beyond the property line in road side ditches along Skyway Dr. to the south and I-95 to the east. Runoff discharges through a 24" RCP culvert crossing under Skyway Dr. flowing southerly through a channel to Long Creek's North Branch. The site is considered part of Long Creek Subwatershed C as defined in the Long Creek Watershed Management Plan. Long Creek is considered an Urban Impaired Stream as classified by the MeDEP.

For the purpose of this analysis, the offsite area downstream of the property boundaries tributary to the 24" culvert have been omitted for clarity and is not considered relevant to this particular project. This peripheral area is small and does not produce a significant amount of runoff. The predevelopment analysis considers the sheet flow across the

southerly and easterly property boundaries to the 24" culvert as the Point of Interest (POI) 1. The postdevelopment analysis analyzes the same POI and assumes that any concentrated flows will be redistributed to match predevelopment sheet flows as discussed in the following Postdevelopment Analysis section. The Predevelopment Watershed Map C-14.0 is enclosed as part of the plan set.

Peak flows at POI 1 are as follows:

**TABLE 4**
**PREDEVELOPMENT FLOWS (PEAK DISCHARGE RATES) AT POI 1**

| POI # | 2 Yr Storm Event (CFS) | 10 Yr Storm Event (CFS) | 25 Yr Storm Event (CFS) |
|---|---|---|---|
| 1 | 2.86 | 7.18 | 9.42 |

Runoff from a small portion of the site in the northwestern corner flows westerly along Congress Street and ultimately enters the City of Portland storm drainage system tributary to the Stroudwater River. This area of the site is by in large excluded from the development area and therefore the analysis. A small piece of this area, which is development, is captured, redirected, treated and discharged to the Long Creek Watershed.

## 11.0 Postdevelopment Analysis

The postdevelopment analysis breaks up the site into two categories; the first category includes proposed vegetated fill slopes around the southeast perimeter of the development and undeveloped area downstream of the development. This area is identified as Subcatchment 101 in the postdevelopment analysis and shown on the Postdevelopment Watershed Map C-14.1 enclosed in the plan set. Subcatchment 101 is best described as the remaining portion of the predevelopment subcatchment directly tributary to POI 1 and it characteristics have changed as shown in Table 5. July 2014 changes to the data are presented in bold lettering.

**TABLE 5**
**PREDEVELOPMENT VS. POSTDEVELOPMENT**
**COMPARISON OF SUBCATCHMENT 1**

| Subcatchment ID | Peak Flows (CFS) | | | CN | Area (Ac.) | Hydrologic Time of Concentration (min.) |
|---|---|---|---|---|---|---|
| | 2 Yr Storm Event | 10 Yr Storm Event | 25 Yr Storm Event | | | |
| 1 | 2.86 | 7.18 | 9.42 | 74 | 4.16 | 18.3 |
| 101 | ~~1.99~~ **2.03** | ~~4.73~~ **4.82** | ~~6.13~~ **6.25** | 76 | ~~2.33~~ **2.45** | ~~14.9~~ **16.1** |

***Bold indicates July 2014**

The second category includes the area of the project development which drains to a new inlet and conveyance system. This area is released in two discharge locations as shown on the Grading and Drainage Plan C-3.0 and is described below:

| TABLE 6<br>SUMMARY OF POSTDEVELOPMENT DISCHARGES | |
|---|---|
| **Discharge Location ID** | **Description** |
| ~~1~~ | ~~Channel Protection discharge from StormTreat Treatment tanks with riprap apron directly to the southerly property line.~~ |
| 1 | Discharge from open detention and grassed underdrain filter with riprap apron and level lip spreader. |
| 2 | Culvert discharge from Subcatchment C1 (access drive) with riprap apron. |

***Bold indicates July 2014**

The developed area is broken into seven (7) subcatchments which enter a series of catch basin inlets, flow to a central stormwater management area and are tributary to discharge location 1. An eighth subcatchment identified as C1, located in the access drive that is discharged at location 2 and bypasses the stormwater management facility. Each subcatchment has been modeled and routed to a catch basin inlet modeled as a pond. The inlets are routed together such that HydroCad can combine all of the hydrographs and compute the peak flow rates entering the stormwater detention basins. The model assumes each subcatchment has a minimum Time of Concentration (Tc) of 6.0 min.

Discharge from the development enters the open detention basin (DET O) that is equipped with a pretreatment sediment forebay. Runoff will travel through an underdrained soil filter system which is also designed to detain water to meet flooding standards. Runoff in excess of 1" or equivalent to the water quality volume will exceed the storage capacity of the underdrain soil filter causing it to fill the open detention basin.

Flows entering the stormwater management basin are summarized in the table below:

| TABLE 7<br>POSTDEVELOPMENT FLOWS INTO DETENTION POND (DET O) | |
|---|---|
| **Storm Event Interval** | **Peak Flows (CFS)** |
| **2-Year** | ~~4.45~~ **3.91** |
| **10-Year** | ~~7.62~~ **6.87** |
| **25-Year** | ~~9.12~~ **8.29** |

***Bold indicates July 2014 update**

Peak flows from the basin are routed to POI 1 using overland flow reaches with a high manning's coefficient typically seen in a wooded sheet flow application and combined with flows from Subcatchment 101. Postdevelopment flows tributary to POI 1 without any attenuation of flow are compared to Predevelopment in the following table and computations are attached in Appendix C:

| TABLE 8<br>PEAK FLOW RATES AT POI 1<br>(WITHOUT DETENTION STORAGE) | | | |
|---|---|---|---|
| | **2 Yr Storm Event (CFS)** | **10 Yr Storm Event (CFS)** | **25 Yr Storm Event (CFS)** |
| Predevelopment | 2.86 | 7.18 | 9.42 |
| Postdevelopment | ~~5.54~~ **5.12** | ~~10.90~~ **10.31** | ~~13.55~~ **12.89** |
| Net | ~~+2.68~~ **+2.26** | ~~+3.72~~**+3.13** | ~~+4.13~~ **+3.47** |

***Bold indicates July 2014**

As evident from the table above, it is necessary to attenuate flow in the proposed subsurface detention area to meet the MeDEP Flooding standard objective as noted below.

## 12.0 Stormwater Management Objectives

The goal of the Stormwater Management Plan is to design, operate, and maintain the development to avoid downstream erosion or significant water quality impairment.

This goal will be achieved by:

- Designing the project to meet the Portland Stormwater Management Standards adopted 7/19/10 and Basic Standards, General Standards, and Flooding Standards of MeDEP (revised October 2010).
- Designing water quality measures to provide long-term removal of non-point contaminants.
- Implementing a plan to control erosion, sedimentation, or fugitive dust emissions during construction.
- Maintenance of the Stormwater Management System in accordance with the Stormwater O&M Manual (provided as a separate document).

The plan has been designed in accordance with the City of Portland Stormwater Rules.

## 13.0 Stormwater Management Quantity Summary

To meet the Flooding Standards of the MeDEP Chapter 500 Stormwater Rules the project has been designed to store runoff in an open detention area located on the easterly end of the development. ~~The open detention area will be constructed of large arched chambers manufactured by StormTech® and backfilled with crushed stone having approximately 40% porosity. Design plans require the entering row of chambers be constructed as an isolator row with inspection ports and terminus maintenance manhole.~~

Flow from the detention area will be restricted through a 1' long broad crested weir located in an outlet control manhole (A1). Flows and storage characteristics of the system are as follows:

| TABLE 9<br>SUMMARY OF DETENTION SYSTEM (DET 2) | | | | |
|---|---|---|---|---|
| **Storm Event Interval** | **Peak Flows In (CFS)** | **Peak Flows Out (CFS)** | **Storage (CF)** | **Peak Elevation (FT)** |
| **2-Year** | ~~4.43~~ **3.91** | ~~1.34~~ **0.43** | ~~7,874~~ **7,585** | ~~91.22~~ **90.06** |
| **10-Year** | ~~6.53~~ **6.87** | ~~2.65~~ **2.05** | ~~12,302~~ **11,298** | ~~91.51~~ **90.72** |
| **25-Year** | ~~9.08~~ **8.29** | ~~3.07~~ **3.02** | ~~13,860~~ **12,745** | ~~91.55~~ **90.96** |

***Bold indicates July 2014**

Detaining flows results in the following comparison of peak flows at POI 1:

| TABLE 10<br>PEAK FLOW RATES AT POI 1<br>(WITH DETENTION STORAGE) | | | |
|---|---|---|---|
| | **2 Yr Storm Event (CFS)** | **10 Yr Storm Event (CFS)** | **25 Yr Storm Event (CFS)** |
| Predevelopment | 2.86 | 7.18 | 9.42 |
| Postdevelopment | ~~2.51~~ **2.18** | ~~7.06~~ **6.34** | ~~9.17~~ **8.84** |
| Net | ~~-0.35~~ **-0.68** | ~~-0.12~~ **-0.78** | ~~-0.25~~ **-0.58** |

***Bold indicates July 2014**

The postdevelompent flows are lower then those in predevelopment conditions at point of interest 1 and therefore the Flooding Standard Goal has been met. Postdevelopment computations are contained in Appendices D & E.

## 14.0 Stormwater Management Quality Summary

### Approach

To meet the General Standards, our office has reviewed the implementation of the 4 approved treatment strategies listed below. Our findings are as follows:

- **Wetpond** – Wetponds were considered for part of the project's stormwater management strategy; however, due to physical and natural resource site constraints. The depth to bedrock and poor normal pool geometry make this option not feasible. ~~and the required limits of proposed development, there is insufficient space to utilize this method of water quality treatment without eliminating proposed development area or filling wetlands. Generally speaking, the approximately 2.25 acres of treated development area would require a wet pond of approximately 0.30 acres in size or 3 times the size of basin currently designed; thus this option is not feasible.~~
- **Filter** – Filters cover a broad range of techniques including pre-approved proprietary stormwater treatment devices. The preliminary stormwater management strategy presented herein focuses on filters to meet the General Standard requirements.

- **Infiltration** – Our office has reviewed the Geotechnical Report about the site and the USDA medium intensity soil survey. The medium intensity soil survey maps the site as predominantly Hollis fine sandy loam and Scantic Silt loam. These soils are commonly found to be somewhat excessively drained to poorly drained. The limiting factor to effective infiltration is the restrictive layer (i.e. bedrock, depth to groundwater, and infiltration rates of receiving soils). Despite the favorable drainage category as classified by the USDA soils mapping, the presence of a restrictive layer (high groundwater table and bedrock) will make infiltration very difficult to incorporate into this site. Geotechnical explorations show that bedrock is present around 1.5 ft to 5 ft below existing grade and seasonally high groundwater table approximately 2 ft below existing grade. Due to the proximity to the groundwater table and bedrock, our office is proposing the use of an impermeable liner around all of the stormwater storage areas.
- **Buffers** – Buffers were not considered as part of the site's stormwater management due to insufficient space. As an example, a minimum forested or meadow buffer width needs to be 75 ft, 100 ft or 150 ft with a slope of 0% - 8%, none of which is attainable on the site. Additionally, buffers are required to be encumbered by a conservation easement and deed restrictions.

**Implementation**

Our office has laid out a plan which utilizes proprietary water quality treatment filters as described in Chapter 7.0 Filtration BMPs of the MeDEP Volume III BMPs Technical Design Manual to meet the minimum treatment standards as required by the General Standards. The plan shown on Sheet C-3.0 incorporates a grassed underdrain soil filter or Focal Point™ Filter[1] (approved equal) to best utilize the site conditions. The plan sheets detailing this system is enclosed in the full plan set.

A water quality summary chart of the project is appended with this application in Appendix G. The basis of design of the underdrain soil filter treatment method is as follows:

- **Grassed Underdrain Soil Filter:**

  The grassed underdrain soil filter has been designed to treat at least 95% of the new structure area and 80 % of the developed area.

  To meet Chapter 500, the Channel Protection Volume provided must be equal to or greater than the following:

  1"/12 x impervious area (1.17 ac) plus 0.4"/12 x landscaped area (0.58 ac) = Water Quality Volume (5,077 cubic feet)

  Amended computations of the water quality volume are appended in Appendix G.

  The water quality volume provided is equal to 5,343 cubic feet in an open detention basin at an elevation of 89.62. The pond stage storage calculations are appended in Appendix F.

[1] Focal Point™ bio-filtration system by ACF Environmental

Based on Chapter 7 of the MaineDEP Best Stormwater Practices, grassed underdrained soil filters are required to be sized to be 5% of total tributary impervious area and 2% of total tributary pervious area.

The required filter size for this project is = (50,748*.05)+(25,454*.02)= 3,047 SF
The provided filter size for this project is 3,518 SF.

Underdrained soil filters must draw down the required water quality volume between 24-36 hours. Soil Filters are designed such that water passes vertically down through a filter media section before reaching an underdrain outlet system. The underdrain has been designed with an outlet flow control orifice located in DMH A1. The orifice for this project was computed to be 1". The 1" orifice allows the system to drain in 32 hours if maintained properly. The orifice drawdown computations are appended in Appendix H.

Discharge from larger storm events overflow over a 0.5 foot long broad crested weir housed in a precast concrete outlet control structure set at elevation 89.62 (i.e. the basin stage when water quality volume has been reached), and a 1.0 foot long broad crested weir set at 90.50 (in order to control different flooding events). The overflow piping network is sized to handle runoff from a 25-year storm event. A rain event exceeding the storm drainage network capacity would flood the channel protection basin and detention basin and discharge over the reinforced turf overflow spillway at the northeast corner of the basin.

Pretreatment for flow entering from all inlet pipes to the storage area will be provided via the installation a riprap lined sediment forebay.

Therefore, water quality goals for the Grassed Underdrain Soil Filter System meet the General Stormwater Standards of the November 2005 Chapter 500 Rules of MeDEP (rev. October 2010).

## 15.0 Chapter 500 Treatment Percent Compliance

The proposed redevelopment project creates ~~1.57~~ **1.19** acres of newly constructed impervious area and ~~0.68~~ **0.95** acres of pervious area for a total disturbed area of about ~~2.25~~ **2.14** acres.

Of the ~~1.57~~ **1.19** acres of impervious area the proposed Stormwater Management Plan provides treatment for ~~1.53~~ **1.17** acres or ~~97.42~~ **98.19** percent. The disturbed area as part of this redevelopment is approximately ~~2.25~~ **2.14** acres. Of the ~~2.25~~ **2.14** acres the proposed Stormwater Management Plan provides treatment for ~~2.01~~ **1.75** acres or ~~89.32~~ **81.56** percent. Hence, the strategies proposed herein meets the minimum requirements stated in the General Standards.

## 16.0 Erosion Control

An Erosion Control Narrative, Plan, and Details have been prepared for the project are on file with the City of Portland and the MaineDEP.

## 17.0 Operations and Maintenance

An Operations & Maintenance Manual has been amended and accompanies this application in Appendix K.

## 18.0 Permit Requirements

City of Portland review and permitting of the Stormwater Management Plan is required and will be completed with the review of the Site Plan Application submitted to the City of Portland Planning Authority. This review will also meet the requirements of the MeDEP Stormwater Management Regulations and permit. A separate but concurrent review with the Long Creek Watershed District will be performed.

## 19.0 Drainage Network Pipe Sizing

The drainage network has been sized using the flows computed using HydroCad modeling software. The pipe sizes are noted on the drawings.

## 20.0 Appendices

A – Figures **(on file with MaineDEP – not included with this submission)**
B – Existing Conditions Photographs **(on file with MaineDEP – not included with this submission)**
C – Predevelopment Computations (2, 10 and 25-year Storm Event HydroCAD Computations) (on file with MaineDEP – not included with this submission) **on file with MaineDEP – not included with this submission)**
D – Postdevelopmnet Computations without Detention (2, 10 and 25-year Storm Event HydroCAD Computations)
E – Postdevelopment Computations (2, 10 and 25-year Storm Event HydroCAD Computations)
F – Open Detention Basin Stage Storage Computations
G – Water Quality Summary Chart and Computations
H – Orifice Drawdown Computations
I – Geotechnical Exploration Test Pit Logs **(on file with MaineDEP – not included with this submission)**
J – Erosion Control Plan **(on file with MaineDEP – not included with this submission)**
K – Amended Inspection & Maintenance Manual for Stormwater Management and Related Stormwater Facilities

# APPENDIX A

## Figures

**(On file with original submission – not included with this submission)**

# APPENDIX B

## Existing Conditions Photographs

**(On file with original submission – not included with this submission)**

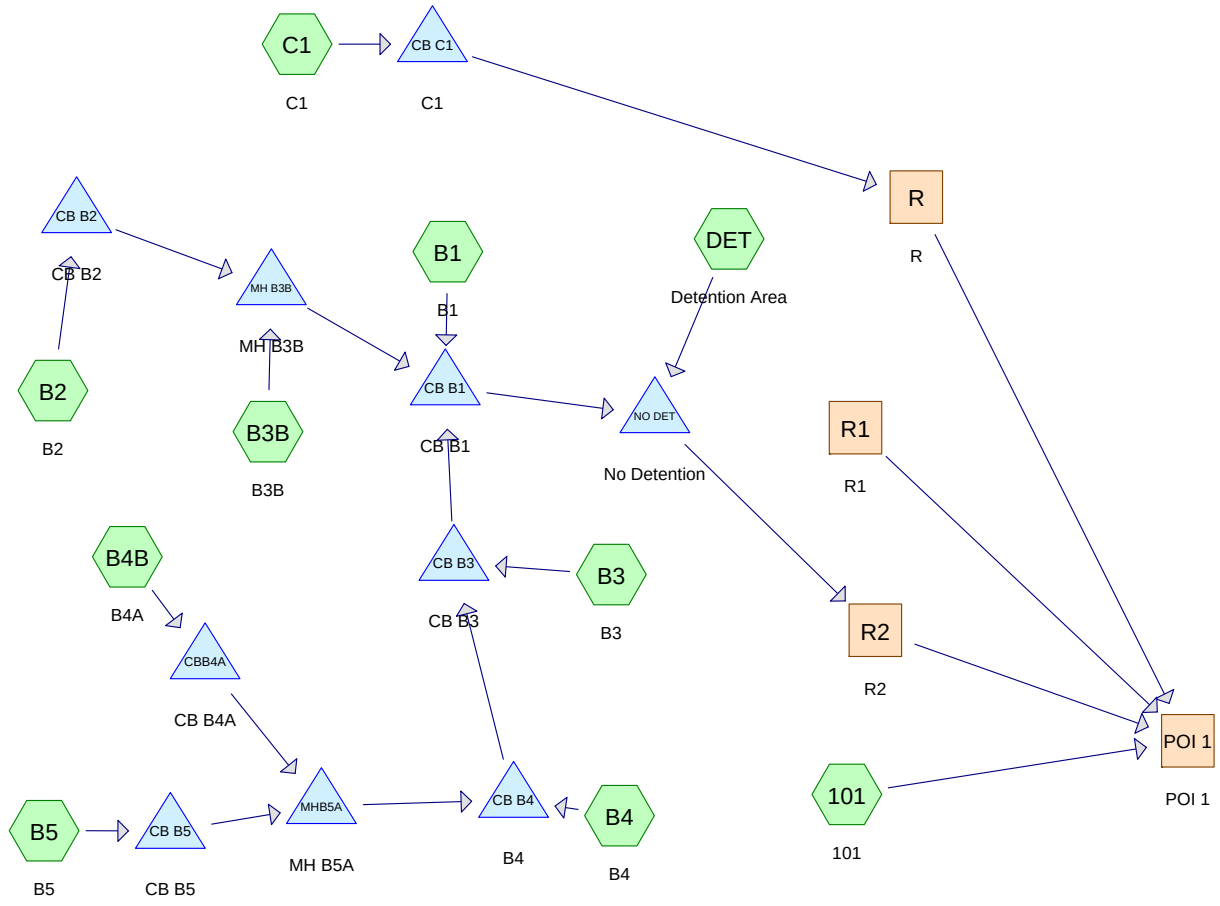
# APPENDIX C

## Predevelopment Computations

**(On file with original submission – not included with this submission)**

# APPENDIX D

## Postdevelopment Computations Without Detention




Subcat Reach Pond Link

**Drainage Diagram for 2014.07.10 POSTDEVELOPMENT**
Prepared by {enter your company name here}, Printed 7/22/2014

## Area Listing (selected nodes)

| Area (acres) | CN | Description (subcatchment-numbers) |
|---|---|---|
| 0.439 | 70 | Woods, Good, HSG C (101,B2,B5) |
| 1.016 | 71 | Meadow, non-grazed, HSG C (101,B2,B5) |
| 0.307 | 74 | >75% Grass cover, Good, HSG C (B2,B4B,B5,DET) |
| 0.743 | 77 | Woods, Good, HSG D (101) |
| 0.241 | 78 | Meadow, non-grazed, HSG D (101) |
| 0.099 | 89 | Gravel roads, HSG C (101) |
| 0.294 | 98 | Paved parking & roofs (B3B,B4B) |
| 1.160 | 98 | Paved roads w/curbs & sewers (101,B1,B2,B3,B4,B5,C1) |
| **4.299** | | **TOTAL AREA** |

## Soil Listing (selected nodes)

| Area (acres) | Soil Goup | Subcatchment Numbers |
|---|---|---|
| 0.000 | HSG A | |
| 0.000 | HSG B | |
| 1.861 | HSG C | 101, B2, B4B, B5, DET |
| 0.984 | HSG D | 101 |
| 1.454 | Other | 101, B1, B2, B3, B3B, B4, B4B, B5, C1 |
| **4.299** | | **TOTAL AREA** |

Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

**Subcatchment 101: 101** Runoff Area=106,667 sf 7.69% Impervious Runoff Depth=1.02"
Flow Length=102' Tc=16.1 min CN=76 Runoff=2.03 cfs 0.207 af

**Subcatchment B1: B1** Runoff Area=8,879 sf 100.00% Impervious Runoff Depth=2.77"
Tc=6.0 min CN=98 Runoff=0.59 cfs 0.047 af

**Subcatchment B2: B2** Runoff Area=22,113 sf 55.19% Impervious Runoff Depth=1.66"
Tc=6.0 min CN=86 Runoff=0.99 cfs 0.070 af

**Subcatchment B3: B3** Runoff Area=4,242 sf 100.00% Impervious Runoff Depth=2.77"
Tc=6.0 min CN=98 Runoff=0.28 cfs 0.022 af

**Subcatchment B3B: B3B** Runoff Area=4,562 sf 100.00% Impervious Runoff Depth=2.77"
Tc=6.0 min CN=98 Runoff=0.30 cfs 0.024 af

**Subcatchment B4: B4** Runoff Area=2,843 sf 100.00% Impervious Runoff Depth=2.77"
Tc=6.0 min CN=98 Runoff=0.19 cfs 0.015 af

**Subcatchment B4B: B4A** Runoff Area=8,504 sf 96.88% Impervious Runoff Depth=2.66"
Tc=6.0 min CN=97 Runoff=0.56 cfs 0.043 af

**Subcatchment B5: B5** Runoff Area=14,208 sf 68.83% Impervious Runoff Depth=1.98"
Tc=6.0 min CN=90 Runoff=0.75 cfs 0.054 af

**Subcatchment C1: C1** Runoff Area=4,401 sf 100.00% Impervious Runoff Depth=2.77"
Tc=6.0 min CN=98 Runoff=0.29 cfs 0.023 af

**Subcatchment DET: Detention Area** Runoff Area=10,851 sf 0.00% Impervious Runoff Depth=0.91"
Tc=6.0 min CN=74 Runoff=0.25 cfs 0.019 af

**Reach POI 1: POI 1** Inflow=5.12 cfs 0.525 af
Outflow=5.12 cfs 0.525 af

**Reach R: R** Avg. Depth=0.04' Max Vel=0.19 fps Inflow=0.29 cfs 0.023 af
n=0.200 L=354.0' S=0.0593 '/' Capacity=18.75 cfs Outflow=0.14 cfs 0.023 af

**Reach R1: R1** Avg. Depth=0.00' Max Vel=0.00 fps
n=0.200 L=196.0' S=0.0306 '/' Capacity=64.45 cfs Outflow=0.00 cfs 0.000 af

**Reach R2: R2** Avg. Depth=0.21' Max Vel=0.41 fps Inflow=3.91 cfs 0.295 af
n=0.200 L=138.0' S=0.0435 '/' Capacity=121.42 cfs Outflow=3.27 cfs 0.295 af

**Pond CB B1: CB B1** Inflow=3.67 cfs 0.276 af
Primary=3.67 cfs 0.276 af

**Pond CB B2: CB B2** Inflow=0.99 cfs 0.070 af
Primary=0.99 cfs 0.070 af

**Pond CB B3: CB B3** Inflow=1.78 cfs 0.135 af
Primary=1.78 cfs 0.135 af

**Pond CB B4: B4** Inflow=1.50 cfs 0.112 af
Primary=1.50 cfs 0.112 af

**Pond CB B5: CB B5** Inflow=0.75 cfs 0.054 af
Primary=0.75 cfs 0.054 af

**Pond CB C1: C1** Inflow=0.29 cfs 0.023 af
Primary=0.29 cfs 0.023 af

**Pond CBB4A: CB B4A** Inflow=0.56 cfs 0.043 af
Primary=0.56 cfs 0.043 af

**Pond MH B3B: MH B3B** Inflow=1.29 cfs 0.094 af
Primary=1.29 cfs 0.094 af

**Pond MHB5A: MH B5A** Inflow=1.31 cfs 0.097 af
Primary=1.31 cfs 0.097 af

**Pond NO DET: No Detention** Inflow=3.91 cfs 0.295 af
Primary=3.91 cfs 0.295 af

**Total Runoff Area = 4.299 ac Runoff Volume = 0.526 af Average Runoff Depth = 1.47"**
**66.17% Pervious = 2.845 ac 33.83% Impervious = 1.454 ac**

## Summary for Subcatchment 101: 101

Runoff = 2.03 cfs @ 12.24 hrs, Volume= 0.207 af, Depth= 1.02"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 YR Rainfall=3.00"

| Area (sf) | CN | Description |
|---|---|---|
| 8,201 | 98 | Paved roads w/curbs & sewers |
| 4,313 | 89 | Gravel roads, HSG C |
| 13,704 | 70 | Woods, Good, HSG C |
| 37,589 | 71 | Meadow, non-grazed, HSG C |
| 10,508 | 78 | Meadow, non-grazed, HSG D |
| 32,352 | 77 | Woods, Good, HSG D |
| 106,667 | 76 | Weighted Average |
| 98,466 | | Pervious Area |
| 8,201 | | Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 15.9 | 90 | 0.0370 | 0.09 | | **Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.00" |
| 0.2 | 12 | 0.0400 | 1.00 | | **Shallow Concentrated Flow,** Woodland Kv= 5.0 fps |
| 16.1 | 102 | Total | | | |

## Summary for Subcatchment B1: B1

Runoff = 0.59 cfs @ 12.08 hrs, Volume= 0.047 af, Depth= 2.77"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 YR Rainfall=3.00"

| Area (sf) | CN | Description |
|---|---|---|
| 8,879 | 98 | Paved roads w/curbs & sewers |
| 8,879 | | Impervious Area |

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

## Summary for Subcatchment B2: B2

Runoff = 0.99 cfs @ 12.09 hrs, Volume= 0.070 af, Depth= 1.66"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 YR Rainfall=3.00"

| Area (sf) | CN | Description |
|---|---|---|
| 12,204 | 98 | Paved roads w/curbs & sewers |
| 3,238 | 70 | Woods, Good, HSG C |
| 5,811 | 71 | Meadow, non-grazed, HSG C |
| 860 | 74 | >75% Grass cover, Good, HSG C |
| 22,113 | 86 | Weighted Average |
| 9,909 | | Pervious Area |
| 12,204 | | Impervious Area |

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

## Summary for Subcatchment B3: B3

Runoff = 0.28 cfs @ 12.08 hrs, Volume= 0.022 af, Depth= 2.77"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 YR Rainfall=3.00"

| Area (sf) | CN | Description |
|---|---|---|
| 4,242 | 98 | Paved roads w/curbs & sewers |
| 4,242 | | Impervious Area |

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

## Summary for Subcatchment B3B: B3B

Runoff = 0.30 cfs @ 12.08 hrs, Volume= 0.024 af, Depth= 2.77"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 YR Rainfall=3.00"

| Area (sf) | CN | Description |
|---|---|---|
| 4,562 | 98 | Paved parking & roofs |
| 4,562 | | Impervious Area |

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

## Summary for Subcatchment B4: B4

Runoff = 0.19 cfs @ 12.08 hrs, Volume= 0.015 af, Depth= 2.77"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 YR Rainfall=3.00"

| Area (sf) | CN | Description |
|---|---|---|
| 2,843 | 98 | Paved roads w/curbs & sewers |
| 2,843 | | Impervious Area |

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

## Summary for Subcatchment B4B: B4A

Runoff = 0.56 cfs @ 12.08 hrs, Volume= 0.043 af, Depth= 2.66"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 YR Rainfall=3.00"

| Area (sf) | CN | Description |
|---|---|---|
| 8,239 | 98 | Paved parking & roofs |
| 265 | 74 | >75% Grass cover, Good, HSG C |
| 8,504 | 97 | Weighted Average |
| 265 | | Pervious Area |
| 8,239 | | Impervious Area |

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

## Summary for Subcatchment B5: B5

Runoff = 0.75 cfs @ 12.09 hrs, Volume= 0.054 af, Depth= 1.98"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 YR Rainfall=3.00"

| Area (sf) | CN | Description |
|---|---|---|
| 9,780 | 98 | Paved roads w/curbs & sewers |
| 2,175 | 70 | Woods, Good, HSG C |
| 868 | 71 | Meadow, non-grazed, HSG C |
| 1,385 | 74 | >75% Grass cover, Good, HSG C |
| 14,208 | 90 | Weighted Average |
| 4,428 | | Pervious Area |
| 9,780 | | Impervious Area |

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

## Summary for Subcatchment C1: C1

Runoff = 0.29 cfs @ 12.08 hrs, Volume= 0.023 af, Depth= 2.77"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 YR Rainfall=3.00"

| Area (sf) | CN | Description |
|---|---|---|
| 4,401 | 98 | Paved roads w/curbs & sewers |
| 4,401 | | Impervious Area |

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

## Summary for Subcatchment DET: Detention Area

Runoff = 0.25 cfs @ 12.10 hrs, Volume= 0.019 af, Depth= 0.91"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 YR Rainfall=3.00"

| Area (sf) | CN | Description |
|---|---|---|
| 10,851 | 74 | >75% Grass cover, Good, HSG C |
| 10,851 | | Pervious Area |

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

## Summary for Reach POI 1: POI 1

Inflow Area = 4.299 ac, 33.83% Impervious, Inflow Depth = 1.47" for 2 YR event
Inflow = 5.12 cfs @ 12.17 hrs, Volume= 0.525 af
Outflow = 5.12 cfs @ 12.17 hrs, Volume= 0.525 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

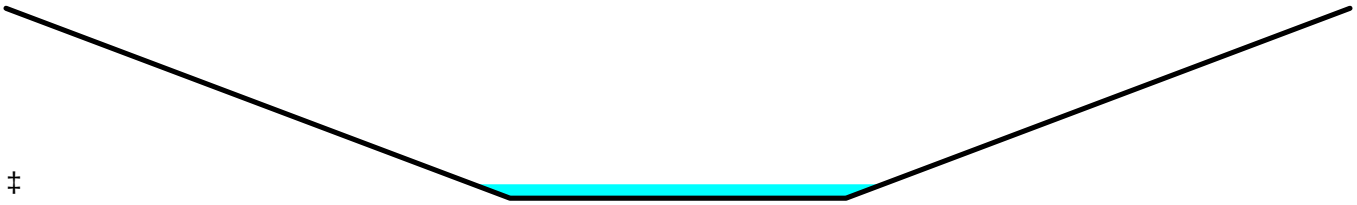
## Summary for Reach R: R

Inflow Area = 0.101 ac,100.00% Impervious, Inflow Depth = 2.77" for 2 YR event
Inflow = 0.29 cfs @ 12.08 hrs, Volume= 0.023 af
Outflow = 0.14 cfs @ 12.24 hrs, Volume= 0.023 af, Atten= 53%, Lag= 9.4 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.19 fps, Min. Travel Time= 31.3 min
Avg. Velocity = 0.07 fps, Avg. Travel Time= 90.2 min

Peak Storage= 261 cf @ 12.24 hrs, Average Depth at Peak Storage= 0.04'
Bank-Full Depth= 0.50', Capacity at Bank-Full= 18.75 cfs

18.00' x 0.50' deep channel, n= 0.200 Sheet flow: Woods+light brush
Side Slope Z-value= 54.0 '/' Top Width= 72.00'
Length= 354.0' Slope= 0.0593 '/'
Inlet Invert= 95.00', Outlet Invert= 74.00'



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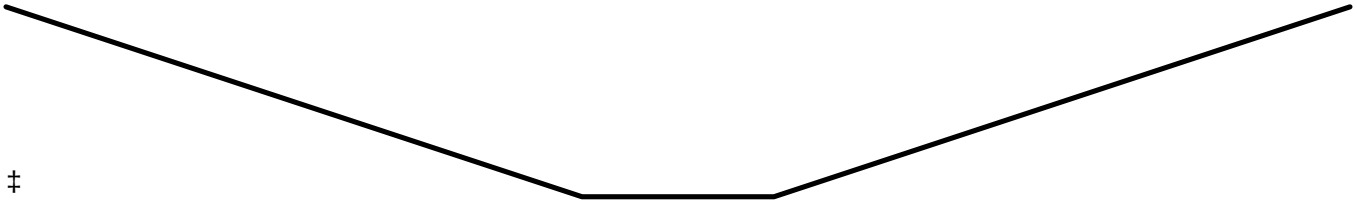
## Summary for Reach R1: R1

Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs, Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 1.00', Capacity at Bank-Full= 64.45 cfs

18.00' x 1.00' deep channel, n= 0.200 Sheet flow: Woods+light brush
Side Slope Z-value= 54.0 '/' Top Width= 126.00'
Length= 196.0' Slope= 0.0306 '/'
Inlet Invert= 80.00', Outlet Invert= 74.00'



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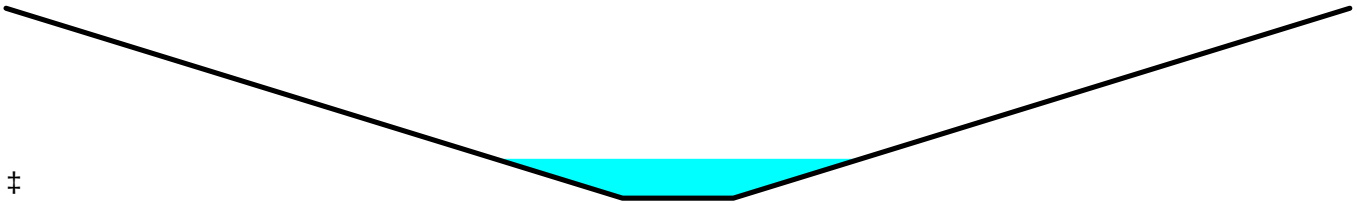
## Summary for Reach R2: R2

Inflow Area = 1.749 ac, 66.60% Impervious, Inflow Depth = 2.02" for 2 YR event
Inflow = 3.91 cfs @ 12.09 hrs, Volume= 0.295 af
Outflow = 3.27 cfs @ 12.14 hrs, Volume= 0.295 af, Atten= 17%, Lag= 3.2 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.41 fps, Min. Travel Time= 5.6 min
Avg. Velocity = 0.12 fps, Avg. Travel Time= 18.5 min

Peak Storage= 1,106 cf @ 12.14 hrs, Average Depth at Peak Storage= 0.21'
Bank-Full Depth= 1.00', Capacity at Bank-Full= 121.42 cfs

18.00' x 1.00' deep channel, n= 0.200 Sheet flow: Woods+light brush
Side Slope Z-value= 100.0 '/' Top Width= 218.00'
Length= 138.0' Slope= 0.0435 '/'
Inlet Invert= 80.00', Outlet Invert= 74.00'



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## Summary for Pond CB B1: CB B1

Inflow Area = 1.500 ac, 77.66% Impervious, Inflow Depth = 2.21" for 2 YR event
Inflow = 3.67 cfs @ 12.09 hrs, Volume= 0.276 af
Primary = 3.67 cfs @ 12.09 hrs, Volume= 0.276 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

## Summary for Pond CB B2: CB B2

Inflow Area = 0.508 ac, 55.19% Impervious, Inflow Depth = 1.66" for 2 YR event
Inflow = 0.99 cfs @ 12.09 hrs, Volume= 0.070 af
Primary = 0.99 cfs @ 12.09 hrs, Volume= 0.070 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

## Summary for Pond CB B3: CB B3

Inflow Area = 0.684 ac, 84.25% Impervious, Inflow Depth = 2.36" for 2 YR event
Inflow = 1.78 cfs @ 12.08 hrs, Volume= 0.135 af
Primary = 1.78 cfs @ 12.08 hrs, Volume= 0.135 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

## Summary for Pond CB B4: B4

Inflow Area = 0.587 ac, 81.64% Impervious, Inflow Depth = 2.30" for 2 YR event
Inflow = 1.50 cfs @ 12.09 hrs, Volume= 0.112 af
Primary = 1.50 cfs @ 12.09 hrs, Volume= 0.112 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

## Summary for Pond CB B5: CB B5

Inflow Area = 0.326 ac, 68.83% Impervious, Inflow Depth = 1.98" for 2 YR event
Inflow = 0.75 cfs @ 12.09 hrs, Volume= 0.054 af
Primary = 0.75 cfs @ 12.09 hrs, Volume= 0.054 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

## Summary for Pond CB C1: C1

Inflow Area = 0.101 ac,100.00% Impervious, Inflow Depth = 2.77" for 2 YR event
Inflow = 0.29 cfs @ 12.08 hrs, Volume= 0.023 af
Primary = 0.29 cfs @ 12.08 hrs, Volume= 0.023 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

## Summary for Pond CBB4A: CB B4A

Inflow Area = 0.195 ac, 96.88% Impervious, Inflow Depth = 2.66" for 2 YR event
Inflow = 0.56 cfs @ 12.08 hrs, Volume= 0.043 af
Primary = 0.56 cfs @ 12.08 hrs, Volume= 0.043 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

## Summary for Pond MH B3B: MH B3B

Inflow Area = 0.612 ac, 62.85% Impervious, Inflow Depth = 1.85" for 2 YR event
Inflow = 1.29 cfs @ 12.09 hrs, Volume= 0.094 af
Primary = 1.29 cfs @ 12.09 hrs, Volume= 0.094 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

## Summary for Pond MHB5A: MH B5A

Inflow Area = 0.521 ac, 79.34% Impervious, Inflow Depth = 2.24" for 2 YR event
Inflow = 1.31 cfs @ 12.09 hrs, Volume= 0.097 af
Primary = 1.31 cfs @ 12.09 hrs, Volume= 0.097 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

## Summary for Pond NO DET: No Detention

Inflow Area = 1.749 ac, 66.60% Impervious, Inflow Depth = 2.02" for 2 YR event
Inflow = 3.91 cfs @ 12.09 hrs, Volume= 0.295 af
Primary = 3.91 cfs @ 12.09 hrs, Volume= 0.295 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

**Subcatchment 101: 101** Runoff Area=106,667 sf 7.69% Impervious Runoff Depth=2.29"
Flow Length=102' Tc=16.1 min CN=76 Runoff=4.82 cfs 0.467 af

**Subcatchment B1: B1** Runoff Area=8,879 sf 100.00% Impervious Runoff Depth=4.46"
Tc=6.0 min CN=98 Runoff=0.94 cfs 0.076 af

**Subcatchment B2: B2** Runoff Area=22,113 sf 55.19% Impervious Runoff Depth=3.19"
Tc=6.0 min CN=86 Runoff=1.88 cfs 0.135 af

**Subcatchment B3: B3** Runoff Area=4,242 sf 100.00% Impervious Runoff Depth=4.46"
Tc=6.0 min CN=98 Runoff=0.45 cfs 0.036 af

**Subcatchment B3B: B3B** Runoff Area=4,562 sf 100.00% Impervious Runoff Depth=4.46"
Tc=6.0 min CN=98 Runoff=0.48 cfs 0.039 af

**Subcatchment B4: B4** Runoff Area=2,843 sf 100.00% Impervious Runoff Depth=4.46"
Tc=6.0 min CN=98 Runoff=0.30 cfs 0.024 af

**Subcatchment B4B: B4A** Runoff Area=8,504 sf 96.88% Impervious Runoff Depth=4.35"
Tc=6.0 min CN=97 Runoff=0.89 cfs 0.071 af

**Subcatchment B5: B5** Runoff Area=14,208 sf 68.83% Impervious Runoff Depth=3.59"
Tc=6.0 min CN=90 Runoff=1.33 cfs 0.098 af

**Subcatchment C1: C1** Runoff Area=4,401 sf 100.00% Impervious Runoff Depth=4.46"
Tc=6.0 min CN=98 Runoff=0.46 cfs 0.038 af

**Subcatchment DET: Detention Area** Runoff Area=10,851 sf 0.00% Impervious Runoff Depth=2.13"
Tc=6.0 min CN=74 Runoff=0.62 cfs 0.044 af

**Reach POI 1: POI 1** Inflow=10.31 cfs 1.028 af
Outflow=10.31 cfs 1.028 af

**Reach R: R** Avg. Depth=0.05' Max Vel=0.23 fps Inflow=0.46 cfs 0.038 af
n=0.200 L=354.0' S=0.0593 '/' Capacity=18.75 cfs Outflow=0.24 cfs 0.038 af

**Reach R1: R1** Avg. Depth=0.00' Max Vel=0.00 fps
n=0.200 L=196.0' S=0.0306 '/' Capacity=64.45 cfs Outflow=0.00 cfs 0.000 af

**Reach R2: R2** Avg. Depth=0.27' Max Vel=0.48 fps Inflow=6.87 cfs 0.523 af
n=0.200 L=138.0' S=0.0435 '/' Capacity=121.42 cfs Outflow=5.92 cfs 0.523 af

**Pond CB B1: CB B1** Inflow=6.26 cfs 0.478 af
Primary=6.26 cfs 0.478 af

**Pond CB B2: CB B2** Inflow=1.88 cfs 0.135 af
Primary=1.88 cfs 0.135 af

**Pond CB B3: CB B3** Inflow=2.97 cfs 0.229 af
Primary=2.97 cfs 0.229 af

**Pond CB B4: B4** Inflow=2.52 cfs 0.193 af
Primary=2.52 cfs 0.193 af

**Pond CB B5: CB B5** Inflow=1.33 cfs 0.098 af
Primary=1.33 cfs 0.098 af

**Pond CB C1: C1** Inflow=0.46 cfs 0.038 af
Primary=0.46 cfs 0.038 af

**Pond CBB4A: CB B4A** Inflow=0.89 cfs 0.071 af
Primary=0.89 cfs 0.071 af

**Pond MH B3B: MH B3B** Inflow=2.36 cfs 0.174 af
Primary=2.36 cfs 0.174 af

**Pond MHB5A: MH B5A** Inflow=2.22 cfs 0.168 af
Primary=2.22 cfs 0.168 af

**Pond NO DET: No Detention** Inflow=6.87 cfs 0.523 af
Primary=6.87 cfs 0.523 af

**Total Runoff Area = 4.299 ac Runoff Volume = 1.028 af Average Runoff Depth = 2.87"**
**66.17% Pervious = 2.845 ac 33.83% Impervious = 1.454 ac**

## Summary for Subcatchment 101: 101

Runoff = 4.82 cfs @ 12.22 hrs, Volume= 0.467 af, Depth= 2.29"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 YR Rainfall=4.70"

| Area (sf) | CN | Description |
|---|---|---|
| 8,201 | 98 | Paved roads w/curbs & sewers |
| 4,313 | 89 | Gravel roads, HSG C |
| 13,704 | 70 | Woods, Good, HSG C |
| 37,589 | 71 | Meadow, non-grazed, HSG C |
| 10,508 | 78 | Meadow, non-grazed, HSG D |
| 32,352 | 77 | Woods, Good, HSG D |
| 106,667 | 76 | Weighted Average |
| 98,466 | | Pervious Area |
| 8,201 | | Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 15.9 | 90 | 0.0370 | 0.09 | | **Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.00" |
| 0.2 | 12 | 0.0400 | 1.00 | | **Shallow Concentrated Flow,** Woodland Kv= 5.0 fps |
| 16.1 | 102 | Total | | | |

## Summary for Subcatchment B1: B1

Runoff = 0.94 cfs @ 12.08 hrs, Volume= 0.076 af, Depth= 4.46"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 YR Rainfall=4.70"

| Area (sf) | CN | Description |
|---|---|---|
| 8,879 | 98 | Paved roads w/curbs & sewers |
| 8,879 | | Impervious Area |

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

## Summary for Subcatchment B2: B2

Runoff = 1.88 cfs @ 12.09 hrs, Volume= 0.135 af, Depth= 3.19"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 YR Rainfall=4.70"

| Area (sf) | CN | Description |
|---|---|---|
| 12,204 | 98 | Paved roads w/curbs & sewers |
| 3,238 | 70 | Woods, Good, HSG C |
| 5,811 | 71 | Meadow, non-grazed, HSG C |
| 860 | 74 | >75% Grass cover, Good, HSG C |
| 22,113 | 86 | Weighted Average |
| 9,909 | | Pervious Area |
| 12,204 | | Impervious Area |

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

## Summary for Subcatchment B3: B3

Runoff = 0.45 cfs @ 12.08 hrs, Volume= 0.036 af, Depth= 4.46"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 YR Rainfall=4.70"

| Area (sf) | CN | Description |
|---|---|---|
| 4,242 | 98 | Paved roads w/curbs & sewers |
| 4,242 | | Impervious Area |

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

## Summary for Subcatchment B3B: B3B

Runoff = 0.48 cfs @ 12.08 hrs, Volume= 0.039 af, Depth= 4.46"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 YR Rainfall=4.70"

| Area (sf) | CN | Description |
|---|---|---|
| 4,562 | 98 | Paved parking & roofs |
| 4,562 | | Impervious Area |

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

## Summary for Subcatchment B4: B4

Runoff = 0.30 cfs @ 12.08 hrs, Volume= 0.024 af, Depth= 4.46"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 YR Rainfall=4.70"

| Area (sf) | CN | Description |
|---|---|---|
| 2,843 | 98 | Paved roads w/curbs & sewers |
| 2,843 | | Impervious Area |

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

## Summary for Subcatchment B4B: B4A

Runoff = 0.89 cfs @ 12.08 hrs, Volume= 0.071 af, Depth= 4.35"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 YR Rainfall=4.70"

| Area (sf) | CN | Description |
|---|---|---|
| 8,239 | 98 | Paved parking & roofs |
| 265 | 74 | >75% Grass cover, Good, HSG C |
| 8,504 | 97 | Weighted Average |
| 265 | | Pervious Area |
| 8,239 | | Impervious Area |

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

## Summary for Subcatchment B5: B5

Runoff = 1.33 cfs @ 12.09 hrs, Volume= 0.098 af, Depth= 3.59"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 YR Rainfall=4.70"

| Area (sf) | CN | Description |
|---|---|---|
| 9,780 | 98 | Paved roads w/curbs & sewers |
| 2,175 | 70 | Woods, Good, HSG C |
| 868 | 71 | Meadow, non-grazed, HSG C |
| 1,385 | 74 | >75% Grass cover, Good, HSG C |
| 14,208 | 90 | Weighted Average |
| 4,428 | | Pervious Area |
| 9,780 | | Impervious Area |

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

## Summary for Subcatchment C1: C1

Runoff = 0.46 cfs @ 12.08 hrs, Volume= 0.038 af, Depth= 4.46"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 YR Rainfall=4.70"

| Area (sf) | CN | Description |
|---|---|---|
| 4,401 | 98 | Paved roads w/curbs & sewers |
| 4,401 | | Impervious Area |

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

## Summary for Subcatchment DET: Detention Area

Runoff = 0.62 cfs @ 12.09 hrs, Volume= 0.044 af, Depth= 2.13"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 YR Rainfall=4.70"

| Area (sf) | CN | Description |
|---|---|---|
| 10,851 | 74 | >75% Grass cover, Good, HSG C |
| 10,851 | | Pervious Area |

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

## Summary for Reach POI 1: POI 1

Inflow Area = 4.299 ac, 33.83% Impervious, Inflow Depth = 2.87" for 10 YR event
Inflow = 10.31 cfs @ 12.16 hrs, Volume= 1.028 af
Outflow = 10.31 cfs @ 12.16 hrs, Volume= 1.028 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

## Summary for Reach R: R

Inflow Area = 0.101 ac,100.00% Impervious, Inflow Depth = 4.46" for 10 YR event
Inflow = 0.46 cfs @ 12.08 hrs, Volume= 0.038 af
Outflow = 0.24 cfs @ 12.22 hrs, Volume= 0.038 af, Atten= 48%, Lag= 7.9 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.23 fps, Min. Travel Time= 25.9 min
Avg. Velocity = 0.07 fps, Avg. Travel Time= 80.8 min

Peak Storage= 372 cf @ 12.22 hrs, Average Depth at Peak Storage= 0.05'
Bank-Full Depth= 0.50', Capacity at Bank-Full= 18.75 cfs

18.00' x 0.50' deep channel, n= 0.200 Sheet flow: Woods+light brush
Side Slope Z-value= 54.0 '/' Top Width= 72.00'
Length= 354.0' Slope= 0.0593 '/'
Inlet Invert= 95.00', Outlet Invert= 74.00'

‡

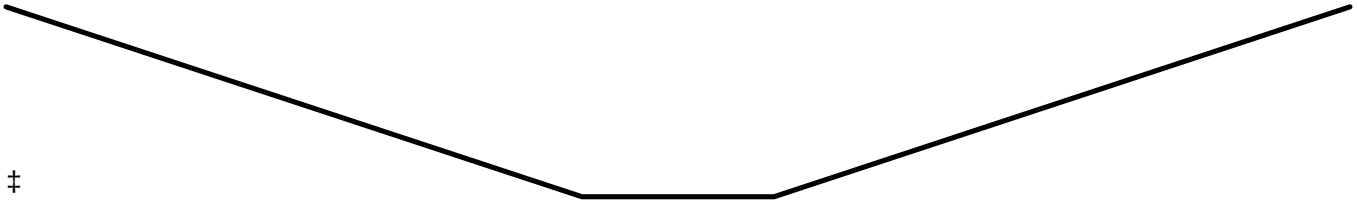
## Summary for Reach R1: R1

Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs, Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 1.00', Capacity at Bank-Full= 64.45 cfs

18.00' x 1.00' deep channel, n= 0.200 Sheet flow: Woods+light brush
Side Slope Z-value= 54.0 '/' Top Width= 126.00'
Length= 196.0' Slope= 0.0306 '/'
Inlet Invert= 80.00', Outlet Invert= 74.00'



‡

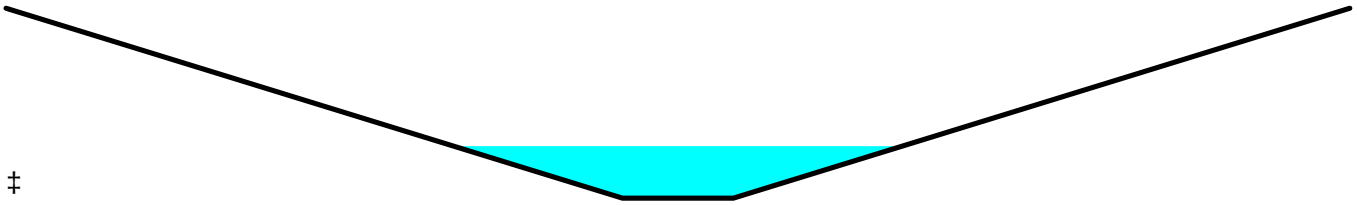
## Summary for Reach R2: R2

Inflow Area = 1.749 ac, 66.60% Impervious, Inflow Depth = 3.58" for 10 YR event
Inflow = 6.87 cfs @ 12.09 hrs, Volume= 0.523 af
Outflow = 5.92 cfs @ 12.13 hrs, Volume= 0.523 af, Atten= 14%, Lag= 2.8 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.48 fps, Min. Travel Time= 4.8 min
Avg. Velocity = 0.15 fps, Avg. Travel Time= 15.8 min

Peak Storage= 1,714 cf @ 12.13 hrs, Average Depth at Peak Storage= 0.27'
Bank-Full Depth= 1.00', Capacity at Bank-Full= 121.42 cfs

18.00' x 1.00' deep channel, n= 0.200 Sheet flow: Woods+light brush
Side Slope Z-value= 100.0 '/' Top Width= 218.00'
Length= 138.0' Slope= 0.0435 '/'
Inlet Invert= 80.00', Outlet Invert= 74.00'



‡

## Summary for Pond CB B1: CB B1

Inflow Area = 1.500 ac, 77.66% Impervious, Inflow Depth = 3.83" for 10 YR event
Inflow = 6.26 cfs @ 12.08 hrs, Volume= 0.478 af
Primary = 6.26 cfs @ 12.08 hrs, Volume= 0.478 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

## Summary for Pond CB B2: CB B2

Inflow Area = 0.508 ac, 55.19% Impervious, Inflow Depth = 3.19" for 10 YR event
Inflow = 1.88 cfs @ 12.09 hrs, Volume= 0.135 af
Primary = 1.88 cfs @ 12.09 hrs, Volume= 0.135 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

## Summary for Pond CB B3: CB B3

Inflow Area = 0.684 ac, 84.25% Impervious, Inflow Depth = 4.01" for 10 YR event
Inflow = 2.97 cfs @ 12.08 hrs, Volume= 0.229 af
Primary = 2.97 cfs @ 12.08 hrs, Volume= 0.229 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

## Summary for Pond CB B4: B4

Inflow Area = 0.587 ac, 81.64% Impervious, Inflow Depth = 3.94" for 10 YR event
Inflow = 2.52 cfs @ 12.08 hrs, Volume= 0.193 af
Primary = 2.52 cfs @ 12.08 hrs, Volume= 0.193 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

## Summary for Pond CB B5: CB B5

Inflow Area = 0.326 ac, 68.83% Impervious, Inflow Depth = 3.59" for 10 YR event
Inflow = 1.33 cfs @ 12.09 hrs, Volume= 0.098 af
Primary = 1.33 cfs @ 12.09 hrs, Volume= 0.098 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

## Summary for Pond CB C1: C1

Inflow Area = 0.101 ac,100.00% Impervious, Inflow Depth = 4.46" for 10 YR event
Inflow = 0.46 cfs @ 12.08 hrs, Volume= 0.038 af
Primary = 0.46 cfs @ 12.08 hrs, Volume= 0.038 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

## Summary for Pond CBB4A: CB B4A

Inflow Area = 0.195 ac, 96.88% Impervious, Inflow Depth = 4.35" for 10 YR event
Inflow = 0.89 cfs @ 12.08 hrs, Volume= 0.071 af
Primary = 0.89 cfs @ 12.08 hrs, Volume= 0.071 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

## Summary for Pond MH B3B: MH B3B

Inflow Area = 0.612 ac, 62.85% Impervious, Inflow Depth = 3.41" for 10 YR event
Inflow = 2.36 cfs @ 12.09 hrs, Volume= 0.174 af
Primary = 2.36 cfs @ 12.09 hrs, Volume= 0.174 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

## Summary for Pond MHB5A: MH B5A

Inflow Area = 0.521 ac, 79.34% Impervious, Inflow Depth = 3.87" for 10 YR event
Inflow = 2.22 cfs @ 12.08 hrs, Volume= 0.168 af
Primary = 2.22 cfs @ 12.08 hrs, Volume= 0.168 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

## Summary for Pond NO DET: No Detention

Inflow Area = 1.749 ac, 66.60% Impervious, Inflow Depth = 3.58" for 10 YR event
Inflow = 6.87 cfs @ 12.09 hrs, Volume= 0.523 af
Primary = 6.87 cfs @ 12.09 hrs, Volume= 0.523 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

**Subcatchment 101: 101** Runoff Area=106,667 sf 7.69% Impervious Runoff Depth=2.95"
Flow Length=102' Tc=16.1 min CN=76 Runoff=6.25 cfs 0.603 af

**Subcatchment B1: B1** Runoff Area=8,879 sf 100.00% Impervious Runoff Depth=5.26"
Tc=6.0 min CN=98 Runoff=1.10 cfs 0.089 af

**Subcatchment B2: B2** Runoff Area=22,113 sf 55.19% Impervious Runoff Depth=3.94"
Tc=6.0 min CN=86 Runoff=2.30 cfs 0.167 af

**Subcatchment B3: B3** Runoff Area=4,242 sf 100.00% Impervious Runoff Depth=5.26"
Tc=6.0 min CN=98 Runoff=0.52 cfs 0.043 af

**Subcatchment B3B: B3B** Runoff Area=4,562 sf 100.00% Impervious Runoff Depth=5.26"
Tc=6.0 min CN=98 Runoff=0.56 cfs 0.046 af

**Subcatchment B4: B4** Runoff Area=2,843 sf 100.00% Impervious Runoff Depth=5.26"
Tc=6.0 min CN=98 Runoff=0.35 cfs 0.029 af

**Subcatchment B4B: B4A** Runoff Area=8,504 sf 96.88% Impervious Runoff Depth=5.15"
Tc=6.0 min CN=97 Runoff=1.05 cfs 0.084 af

**Subcatchment B5: B5** Runoff Area=14,208 sf 68.83% Impervious Runoff Depth=4.36"
Tc=6.0 min CN=90 Runoff=1.60 cfs 0.119 af

**Subcatchment C1: C1** Runoff Area=4,401 sf 100.00% Impervious Runoff Depth=5.26"
Tc=6.0 min CN=98 Runoff=0.54 cfs 0.044 af

**Subcatchment DET: Detention Area** Runoff Area=10,851 sf 0.00% Impervious Runoff Depth=2.77"
Tc=6.0 min CN=74 Runoff=0.81 cfs 0.057 af

**Reach POI 1: POI 1** Inflow=12.89 cfs 1.280 af
Outflow=12.89 cfs 1.280 af

**Reach R: R** Avg. Depth=0.06' Max Vel=0.24 fps Inflow=0.54 cfs 0.044 af
n=0.200 L=354.0' S=0.0593 '/' Capacity=18.75 cfs Outflow=0.29 cfs 0.044 af

**Reach R1: R1** Avg. Depth=0.00' Max Vel=0.00 fps
n=0.200 L=196.0' S=0.0306 '/' Capacity=64.45 cfs Outflow=0.00 cfs 0.000 af

**Reach R2: R2** Avg. Depth=0.30' Max Vel=0.50 fps Inflow=8.29 cfs 0.633 af
n=0.200 L=138.0' S=0.0435 '/' Capacity=121.42 cfs Outflow=7.21 cfs 0.633 af

**Pond CB B1: CB B1** Inflow=7.48 cfs 0.575 af
Primary=7.48 cfs 0.575 af

**Pond CB B2: CB B2** Inflow=2.30 cfs 0.167 af
Primary=2.30 cfs 0.167 af

**Pond CB B3: CB B3** Inflow=3.52 cfs 0.274 af
Primary=3.52 cfs 0.274 af

**Pond CB B4: B4** Inflow=3.00 cfs 0.231 af
Primary=3.00 cfs 0.231 af

**Pond CB B5: CB B5** Inflow=1.60 cfs 0.119 af
Primary=1.60 cfs 0.119 af

**Pond CB C1: C1** Inflow=0.54 cfs 0.044 af
Primary=0.54 cfs 0.044 af

**Pond CBB4A: CB B4A** Inflow=1.05 cfs 0.084 af
Primary=1.05 cfs 0.084 af

**Pond MH B3B: MH B3B** Inflow=2.86 cfs 0.212 af
Primary=2.86 cfs 0.212 af

**Pond MHB5A: MH B5A** Inflow=2.64 cfs 0.202 af
Primary=2.64 cfs 0.202 af

**Pond NO DET: No Detention** Inflow=8.29 cfs 0.633 af
Primary=8.29 cfs 0.633 af

**Total Runoff Area = 4.299 ac Runoff Volume = 1.280 af Average Runoff Depth = 3.57"**
**66.17% Pervious = 2.845 ac 33.83% Impervious = 1.454 ac**

## Summary for Subcatchment 101: 101

Runoff = 6.25 cfs @ 12.22 hrs, Volume= 0.603 af, Depth= 2.95"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 YR Rainfall=5.50"

| Area (sf) | CN | Description |
|---|---|---|
| 8,201 | 98 | Paved roads w/curbs & sewers |
| 4,313 | 89 | Gravel roads, HSG C |
| 13,704 | 70 | Woods, Good, HSG C |
| 37,589 | 71 | Meadow, non-grazed, HSG C |
| 10,508 | 78 | Meadow, non-grazed, HSG D |
| 32,352 | 77 | Woods, Good, HSG D |
| 106,667 | 76 | Weighted Average |
| 98,466 | | Pervious Area |
| 8,201 | | Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 15.9 | 90 | 0.0370 | 0.09 | | **Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.00" |
| 0.2 | 12 | 0.0400 | 1.00 | | **Shallow Concentrated Flow,** Woodland Kv= 5.0 fps |
| 16.1 | 102 | Total | | | |

## Summary for Subcatchment B1: B1

Runoff = 1.10 cfs @ 12.08 hrs, Volume= 0.089 af, Depth= 5.26"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 YR Rainfall=5.50"

| Area (sf) | CN | Description |
|---|---|---|
| 8,879 | 98 | Paved roads w/curbs & sewers |
| 8,879 | | Impervious Area |

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

## Summary for Subcatchment B2: B2

Runoff = 2.30 cfs @ 12.09 hrs, Volume= 0.167 af, Depth= 3.94"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 YR Rainfall=5.50"

| Area (sf) | CN | Description |
|---|---|---|
| 12,204 | 98 | Paved roads w/curbs & sewers |
| 3,238 | 70 | Woods, Good, HSG C |
| 5,811 | 71 | Meadow, non-grazed, HSG C |
| 860 | 74 | >75% Grass cover, Good, HSG C |
| 22,113 | 86 | Weighted Average |
| 9,909 | | Pervious Area |
| 12,204 | | Impervious Area |

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

## Summary for Subcatchment B3: B3

Runoff = 0.52 cfs @ 12.08 hrs, Volume= 0.043 af, Depth= 5.26"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 YR Rainfall=5.50"

| Area (sf) | CN | Description |
|---|---|---|
| 4,242 | 98 | Paved roads w/curbs & sewers |
| 4,242 | | Impervious Area |

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

## Summary for Subcatchment B3B: B3B

Runoff = 0.56 cfs @ 12.08 hrs, Volume= 0.046 af, Depth= 5.26"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 YR Rainfall=5.50"

| Area (sf) | CN | Description |
|---|---|---|
| 4,562 | 98 | Paved parking & roofs |
| 4,562 | | Impervious Area |

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

## Summary for Subcatchment B4: B4

Runoff = 0.35 cfs @ 12.08 hrs, Volume= 0.029 af, Depth= 5.26"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 YR Rainfall=5.50"

| Area (sf) | CN | Description |
|---|---|---|
| 2,843 | 98 | Paved roads w/curbs & sewers |
| 2,843 | | Impervious Area |

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

## Summary for Subcatchment B4B: B4A

Runoff = 1.05 cfs @ 12.08 hrs, Volume= 0.084 af, Depth= 5.15"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 YR Rainfall=5.50"

| Area (sf) | CN | Description |
|---|---|---|
| 8,239 | 98 | Paved parking & roofs |
| 265 | 74 | >75% Grass cover, Good, HSG C |
| 8,504 | 97 | Weighted Average |
| 265 | | Pervious Area |
| 8,239 | | Impervious Area |

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

## Summary for Subcatchment B5: B5

Runoff = 1.60 cfs @ 12.08 hrs, Volume= 0.119 af, Depth= 4.36"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 YR Rainfall=5.50"

| Area (sf) | CN | Description |
|---|---|---|
| 9,780 | 98 | Paved roads w/curbs & sewers |
| 2,175 | 70 | Woods, Good, HSG C |
| 868 | 71 | Meadow, non-grazed, HSG C |
| 1,385 | 74 | >75% Grass cover, Good, HSG C |
| 14,208 | 90 | Weighted Average |
| 4,428 | | Pervious Area |
| 9,780 | | Impervious Area |

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

## Summary for Subcatchment C1: C1

Runoff = 0.54 cfs @ 12.08 hrs, Volume= 0.044 af, Depth= 5.26"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 YR Rainfall=5.50"

| Area (sf) | CN | Description |
|---|---|---|
| 4,401 | 98 | Paved roads w/curbs & sewers |
| 4,401 | | Impervious Area |

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

## Summary for Subcatchment DET: Detention Area

Runoff = 0.81 cfs @ 12.09 hrs, Volume= 0.057 af, Depth= 2.77"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 YR Rainfall=5.50"

| Area (sf) | CN | Description |
|---|---|---|
| 10,851 | 74 | >75% Grass cover, Good, HSG C |
| 10,851 | | Pervious Area |

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

## Summary for Reach POI 1: POI 1

Inflow Area = 4.299 ac, 33.83% Impervious, Inflow Depth = 3.57" for 25 YR event
Inflow = 12.89 cfs @ 12.16 hrs, Volume= 1.280 af
Outflow = 12.89 cfs @ 12.16 hrs, Volume= 1.280 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

## Summary for Reach R: R

Inflow Area = 0.101 ac,100.00% Impervious, Inflow Depth = 5.26" for 25 YR event
Inflow = 0.54 cfs @ 12.08 hrs, Volume= 0.044 af
Outflow = 0.29 cfs @ 12.21 hrs, Volume= 0.044 af, Atten= 47%, Lag= 7.6 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.24 fps, Min. Travel Time= 24.2 min
Avg. Velocity = 0.08 fps, Avg. Travel Time= 77.1 min

Peak Storage= 421 cf @ 12.21 hrs, Average Depth at Peak Storage= 0.06'
Bank-Full Depth= 0.50', Capacity at Bank-Full= 18.75 cfs

18.00' x 0.50' deep channel, n= 0.200 Sheet flow: Woods+light brush
Side Slope Z-value= 54.0 '/' Top Width= 72.00'
Length= 354.0' Slope= 0.0593 '/'
Inlet Invert= 95.00', Outlet Invert= 74.00'

‡

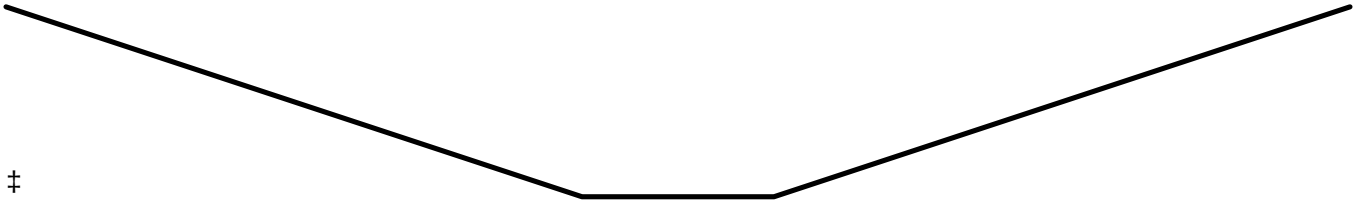
## Summary for Reach R1: R1

Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs, Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 1.00', Capacity at Bank-Full= 64.45 cfs

18.00' x 1.00' deep channel, n= 0.200 Sheet flow: Woods+light brush
Side Slope Z-value= 54.0 '/' Top Width= 126.00'
Length= 196.0' Slope= 0.0306 '/'
Inlet Invert= 80.00', Outlet Invert= 74.00'



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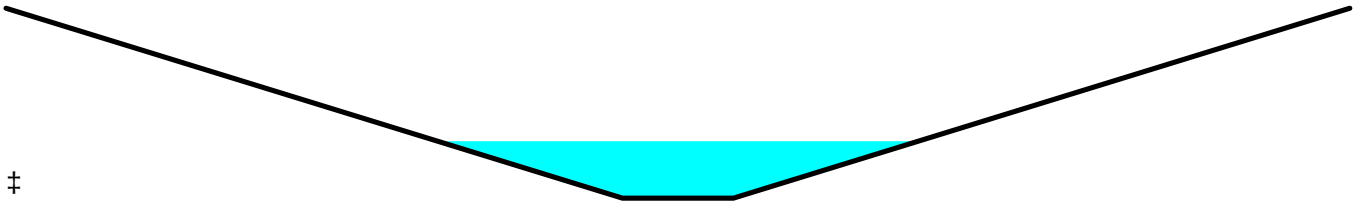
## Summary for Reach R2: R2

Inflow Area = 1.749 ac, 66.60% Impervious, Inflow Depth = 4.34" for 25 YR event
Inflow = 8.29 cfs @ 12.09 hrs, Volume= 0.633 af
Outflow = 7.21 cfs @ 12.13 hrs, Volume= 0.633 af, Atten= 13%, Lag= 2.7 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.50 fps, Min. Travel Time= 4.6 min
Avg. Velocity = 0.15 fps, Avg. Travel Time= 15.0 min

Peak Storage= 1,982 cf @ 12.13 hrs, Average Depth at Peak Storage= 0.30'
Bank-Full Depth= 1.00', Capacity at Bank-Full= 121.42 cfs

18.00' x 1.00' deep channel, n= 0.200 Sheet flow: Woods+light brush
Side Slope Z-value= 100.0 '/' Top Width= 218.00'
Length= 138.0' Slope= 0.0435 '/'
Inlet Invert= 80.00', Outlet Invert= 74.00'



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## Summary for Pond CB B1: CB B1

Inflow Area = 1.500 ac, 77.66% Impervious, Inflow Depth = 4.60" for 25 YR event
Inflow = 7.48 cfs @ 12.08 hrs, Volume= 0.575 af
Primary = 7.48 cfs @ 12.08 hrs, Volume= 0.575 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

## Summary for Pond CB B2: CB B2

Inflow Area = 0.508 ac, 55.19% Impervious, Inflow Depth = 3.94" for 25 YR event
Inflow = 2.30 cfs @ 12.09 hrs, Volume= 0.167 af
Primary = 2.30 cfs @ 12.09 hrs, Volume= 0.167 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

## Summary for Pond CB B3: CB B3

Inflow Area = 0.684 ac, 84.25% Impervious, Inflow Depth = 4.80" for 25 YR event
Inflow = 3.52 cfs @ 12.08 hrs, Volume= 0.274 af
Primary = 3.52 cfs @ 12.08 hrs, Volume= 0.274 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

## Summary for Pond CB B4: B4

Inflow Area = 0.587 ac, 81.64% Impervious, Inflow Depth = 4.72" for 25 YR event
Inflow = 3.00 cfs @ 12.08 hrs, Volume= 0.231 af
Primary = 3.00 cfs @ 12.08 hrs, Volume= 0.231 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

## Summary for Pond CB B5: CB B5

Inflow Area = 0.326 ac, 68.83% Impervious, Inflow Depth = 4.36" for 25 YR event
Inflow = 1.60 cfs @ 12.08 hrs, Volume= 0.119 af
Primary = 1.60 cfs @ 12.08 hrs, Volume= 0.119 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

## Summary for Pond CB C1: C1

Inflow Area = 0.101 ac,100.00% Impervious, Inflow Depth = 5.26" for 25 YR event
Inflow = 0.54 cfs @ 12.08 hrs, Volume= 0.044 af
Primary = 0.54 cfs @ 12.08 hrs, Volume= 0.044 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

## Summary for Pond CBB4A: CB B4A

Inflow Area = 0.195 ac, 96.88% Impervious, Inflow Depth = 5.15" for 25 YR event
Inflow = 1.05 cfs @ 12.08 hrs, Volume= 0.084 af
Primary = 1.05 cfs @ 12.08 hrs, Volume= 0.084 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

## Summary for Pond MH B3B: MH B3B

Inflow Area = 0.612 ac, 62.85% Impervious, Inflow Depth = 4.16" for 25 YR event
Inflow = 2.86 cfs @ 12.09 hrs, Volume= 0.212 af
Primary = 2.86 cfs @ 12.09 hrs, Volume= 0.212 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

## Summary for Pond MHB5A: MH B5A

Inflow Area = 0.521 ac, 79.34% Impervious, Inflow Depth = 4.65" for 25 YR event
Inflow = 2.64 cfs @ 12.08 hrs, Volume= 0.202 af
Primary = 2.64 cfs @ 12.08 hrs, Volume= 0.202 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

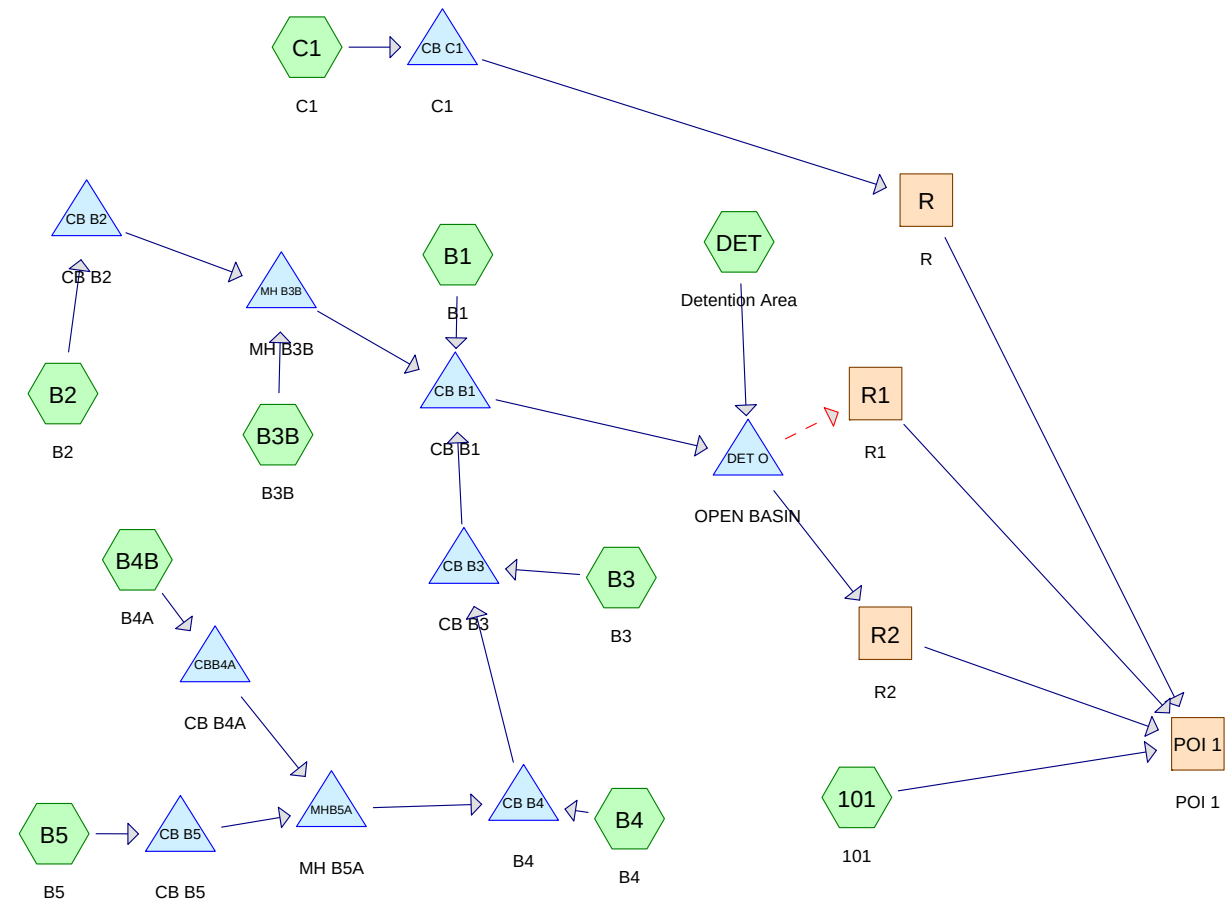
## Summary for Pond NO DET: No Detention

Inflow Area = 1.749 ac, 66.60% Impervious, Inflow Depth = 4.34" for 25 YR event
Inflow = 8.29 cfs @ 12.09 hrs, Volume= 0.633 af
Primary = 8.29 cfs @ 12.09 hrs, Volume= 0.633 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

# APPENDIX E

## Postdevelopment Computations with Detention Storage




Subcat Reach Pond Link

**Drainage Diagram for 2014.07.10 POSTDEVELOPMENT**
Prepared by {enter your company name here}, Printed 7/22/2014

## Area Listing (selected nodes)

| Area (acres) | CN | Description (subcatchment-numbers) |
|---|---|---|
| 0.439 | 70 | Woods, Good, HSG C (101,B2,B5) |
| 1.016 | 71 | Meadow, non-grazed, HSG C (101,B2,B5) |
| 0.307 | 74 | >75% Grass cover, Good, HSG C (B2,B4B,B5,DET) |
| 0.743 | 77 | Woods, Good, HSG D (101) |
| 0.241 | 78 | Meadow, non-grazed, HSG D (101) |
| 0.099 | 89 | Gravel roads, HSG C (101) |
| 0.294 | 98 | Paved parking & roofs (B3B,B4B) |
| 1.160 | 98 | Paved roads w/curbs & sewers (101,B1,B2,B3,B4,B5,C1) |
| **4.299** | | **TOTAL AREA** |

## Soil Listing (selected nodes)

| Area (acres) | Soil Goup | Subcatchment Numbers |
|---|---|---|
| 0.000 | HSG A | |
| 0.000 | HSG B | |
| 1.861 | HSG C | 101, B2, B4B, B5, DET |
| 0.984 | HSG D | 101 |
| 1.454 | Other | 101, B1, B2, B3, B3B, B4, B4B, B5, C1 |
| **4.299** | | **TOTAL AREA** |

Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

**Subcatchment 101: 101** Runoff Area=106,667 sf 7.69% Impervious Runoff Depth=1.02"
Flow Length=102' Tc=16.1 min CN=76 Runoff=2.03 cfs 0.207 af

**Subcatchment B1: B1** Runoff Area=8,879 sf 100.00% Impervious Runoff Depth=2.77"
Tc=6.0 min CN=98 Runoff=0.59 cfs 0.047 af

**Subcatchment B2: B2** Runoff Area=22,113 sf 55.19% Impervious Runoff Depth=1.66"
Tc=6.0 min CN=86 Runoff=0.99 cfs 0.070 af

**Subcatchment B3: B3** Runoff Area=4,242 sf 100.00% Impervious Runoff Depth=2.77"
Tc=6.0 min CN=98 Runoff=0.28 cfs 0.022 af

**Subcatchment B3B: B3B** Runoff Area=4,562 sf 100.00% Impervious Runoff Depth=2.77"
Tc=6.0 min CN=98 Runoff=0.30 cfs 0.024 af

**Subcatchment B4: B4** Runoff Area=2,843 sf 100.00% Impervious Runoff Depth=2.77"
Tc=6.0 min CN=98 Runoff=0.19 cfs 0.015 af

**Subcatchment B4B: B4A** Runoff Area=8,504 sf 96.88% Impervious Runoff Depth=2.66"
Tc=6.0 min CN=97 Runoff=0.56 cfs 0.043 af

**Subcatchment B5: B5** Runoff Area=14,208 sf 68.83% Impervious Runoff Depth=1.98"
Tc=6.0 min CN=90 Runoff=0.75 cfs 0.054 af

**Subcatchment C1: C1** Runoff Area=4,401 sf 100.00% Impervious Runoff Depth=2.77"
Tc=6.0 min CN=98 Runoff=0.29 cfs 0.023 af

**Subcatchment DET: Detention Area** Runoff Area=10,851 sf 0.00% Impervious Runoff Depth=0.91"
Tc=6.0 min CN=74 Runoff=0.25 cfs 0.019 af

**Reach POI 1: POI 1** Inflow=2.18 cfs 0.399 af
Outflow=2.18 cfs 0.399 af

**Reach R: R** Avg. Depth=0.04' Max Vel=0.19 fps Inflow=0.29 cfs 0.023 af
n=0.200 L=354.0' S=0.0593 '/' Capacity=18.75 cfs Outflow=0.14 cfs 0.023 af

**Reach R1: R1** Avg. Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.200 L=196.0' S=0.0306 '/' Capacity=64.45 cfs Outflow=0.00 cfs 0.000 af

**Reach R2: R2** Avg. Depth=0.07' Max Vel=0.23 fps Inflow=0.43 cfs 0.169 af
n=0.200 L=138.0' S=0.0435 '/' Capacity=121.42 cfs Outflow=0.42 cfs 0.169 af

**Pond CB B1: CB B1** Inflow=3.67 cfs 0.276 af
Primary=3.67 cfs 0.276 af

**Pond CB B2: CB B2** Inflow=0.99 cfs 0.070 af
Primary=0.99 cfs 0.070 af

**Pond CB B3: CB B3** Inflow=1.78 cfs 0.135 af
Primary=1.78 cfs 0.135 af

**Pond CB B4: B4** Inflow=1.50 cfs 0.112 af
Primary=1.50 cfs 0.112 af

**Pond CB B5: CB B5** Inflow=0.75 cfs 0.054 af
Primary=0.75 cfs 0.054 af

**Pond CB C1: C1** Inflow=0.29 cfs 0.023 af
Primary=0.29 cfs 0.023 af

**Pond CBB4A: CB B4A** Inflow=0.56 cfs 0.043 af
Primary=0.56 cfs 0.043 af

**Pond DET O: OPEN BASIN** Peak Elev=90.06' Storage=7,585 cf Inflow=3.91 cfs 0.295 af
Primary=0.43 cfs 0.169 af Secondary=0.00 cfs 0.000 af Outflow=0.43 cfs 0.169 af

**Pond MH B3B: MH B3B** Inflow=1.29 cfs 0.094 af
Primary=1.29 cfs 0.094 af

**Pond MHB5A: MH B5A** Inflow=1.31 cfs 0.097 af
Primary=1.31 cfs 0.097 af

**Total Runoff Area = 4.299 ac Runoff Volume = 0.526 af Average Runoff Depth = 1.47"**
**66.17% Pervious = 2.845 ac 33.83% Impervious = 1.454 ac**

## Summary for Subcatchment 101: 101

Runoff = 2.03 cfs @ 12.24 hrs, Volume= 0.207 af, Depth= 1.02"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 YR Rainfall=3.00"

| Area (sf) | CN | Description |
|---|---|---|
| 8,201 | 98 | Paved roads w/curbs & sewers |
| 4,313 | 89 | Gravel roads, HSG C |
| 13,704 | 70 | Woods, Good, HSG C |
| 37,589 | 71 | Meadow, non-grazed, HSG C |
| 10,508 | 78 | Meadow, non-grazed, HSG D |
| 32,352 | 77 | Woods, Good, HSG D |
| 106,667 | 76 | Weighted Average |
| 98,466 | | Pervious Area |
| 8,201 | | Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 15.9 | 90 | 0.0370 | 0.09 | | **Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.00" |
| 0.2 | 12 | 0.0400 | 1.00 | | **Shallow Concentrated Flow,** Woodland Kv= 5.0 fps |
| 16.1 | 102 | Total | | | |

## Summary for Subcatchment B1: B1

Runoff = 0.59 cfs @ 12.08 hrs, Volume= 0.047 af, Depth= 2.77"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 YR Rainfall=3.00"

| Area (sf) | CN | Description |
|---|---|---|
| 8,879 | 98 | Paved roads w/curbs & sewers |
| 8,879 | | Impervious Area |

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

## Summary for Subcatchment B2: B2

Runoff = 0.99 cfs @ 12.09 hrs, Volume= 0.070 af, Depth= 1.66"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 YR Rainfall=3.00"

| Area (sf) | CN | Description |
|---|---|---|
| 12,204 | 98 | Paved roads w/curbs & sewers |
| 3,238 | 70 | Woods, Good, HSG C |
| 5,811 | 71 | Meadow, non-grazed, HSG C |
| 860 | 74 | >75% Grass cover, Good, HSG C |
| 22,113 | 86 | Weighted Average |
| 9,909 | | Pervious Area |
| 12,204 | | Impervious Area |

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

## Summary for Subcatchment B3: B3

Runoff = 0.28 cfs @ 12.08 hrs, Volume= 0.022 af, Depth= 2.77"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 YR Rainfall=3.00"

| Area (sf) | CN | Description |
|---|---|---|
| 4,242 | 98 | Paved roads w/curbs & sewers |
| 4,242 | | Impervious Area |

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

## Summary for Subcatchment B3B: B3B

Runoff = 0.30 cfs @ 12.08 hrs, Volume= 0.024 af, Depth= 2.77"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 YR Rainfall=3.00"

| Area (sf) | CN | Description |
|---|---|---|
| 4,562 | 98 | Paved parking & roofs |
| 4,562 | | Impervious Area |

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

## Summary for Subcatchment B4: B4

Runoff = 0.19 cfs @ 12.08 hrs, Volume= 0.015 af, Depth= 2.77"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 YR Rainfall=3.00"

| Area (sf) | CN | Description |
|---|---|---|
| 2,843 | 98 | Paved roads w/curbs & sewers |
| 2,843 | | Impervious Area |

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

## Summary for Subcatchment B4B: B4A

Runoff = 0.56 cfs @ 12.08 hrs, Volume= 0.043 af, Depth= 2.66"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 YR Rainfall=3.00"

| Area (sf) | CN | Description |
|---|---|---|
| 8,239 | 98 | Paved parking & roofs |
| 265 | 74 | >75% Grass cover, Good, HSG C |
| 8,504 | 97 | Weighted Average |
| 265 | | Pervious Area |
| 8,239 | | Impervious Area |

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

## Summary for Subcatchment B5: B5

Runoff = 0.75 cfs @ 12.09 hrs, Volume= 0.054 af, Depth= 1.98"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 YR Rainfall=3.00"

| Area (sf) | CN | Description |
|---|---|---|
| 9,780 | 98 | Paved roads w/curbs & sewers |
| 2,175 | 70 | Woods, Good, HSG C |
| 868 | 71 | Meadow, non-grazed, HSG C |
| 1,385 | 74 | >75% Grass cover, Good, HSG C |
| 14,208 | 90 | Weighted Average |
| 4,428 | | Pervious Area |
| 9,780 | | Impervious Area |

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

## Summary for Subcatchment C1: C1

Runoff = 0.29 cfs @ 12.08 hrs, Volume= 0.023 af, Depth= 2.77"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 YR Rainfall=3.00"

| Area (sf) | CN | Description |
|---|---|---|
| 4,401 | 98 | Paved roads w/curbs & sewers |
| 4,401 | | Impervious Area |

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

## Summary for Subcatchment DET: Detention Area

Runoff = 0.25 cfs @ 12.10 hrs, Volume= 0.019 af, Depth= 0.91"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 YR Rainfall=3.00"

| Area (sf) | CN | Description |
|---|---|---|
| 10,851 | 74 | >75% Grass cover, Good, HSG C |
| 10,851 | | Pervious Area |

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

## Summary for Reach POI 1: POI 1

Inflow Area = 4.299 ac, 33.83% Impervious, Inflow Depth > 1.11" for 2 YR event
Inflow = 2.18 cfs @ 12.24 hrs, Volume= 0.399 af
Outflow = 2.18 cfs @ 12.24 hrs, Volume= 0.399 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

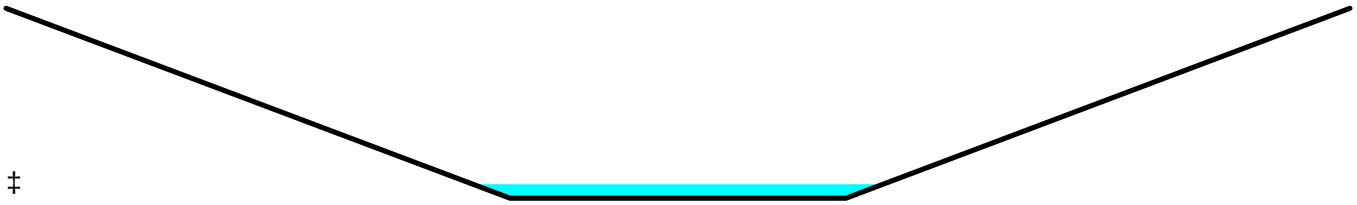
## Summary for Reach R: R

Inflow Area = 0.101 ac,100.00% Impervious, Inflow Depth = 2.77" for 2 YR event
Inflow = 0.29 cfs @ 12.08 hrs, Volume= 0.023 af
Outflow = 0.14 cfs @ 12.24 hrs, Volume= 0.023 af, Atten= 53%, Lag= 9.4 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.19 fps, Min. Travel Time= 31.3 min
Avg. Velocity = 0.07 fps, Avg. Travel Time= 90.2 min

Peak Storage= 261 cf @ 12.24 hrs, Average Depth at Peak Storage= 0.04'
Bank-Full Depth= 0.50', Capacity at Bank-Full= 18.75 cfs

18.00' x 0.50' deep channel, n= 0.200 Sheet flow: Woods+light brush
Side Slope Z-value= 54.0 '/' Top Width= 72.00'
Length= 354.0' Slope= 0.0593 '/'
Inlet Invert= 95.00', Outlet Invert= 74.00'



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## Summary for Reach R1: R1

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

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs, Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 1.00', Capacity at Bank-Full= 64.45 cfs

18.00' x 1.00' deep channel, n= 0.200 Sheet flow: Woods+light brush
Side Slope Z-value= 54.0 '/' Top Width= 126.00'
Length= 196.0' Slope= 0.0306 '/'
Inlet Invert= 80.00', Outlet Invert= 74.00'

‡

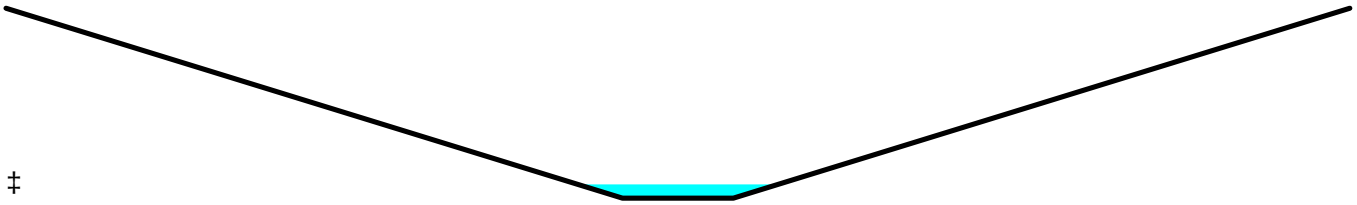
## Summary for Reach R2: R2

Inflow Area = 1.749 ac, 66.60% Impervious, Inflow Depth > 1.16" for 2 YR event
Inflow = 0.43 cfs @ 12.84 hrs, Volume= 0.169 af
Outflow = 0.42 cfs @ 13.01 hrs, Volume= 0.169 af, Atten= 1%, Lag= 10.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.23 fps, Min. Travel Time= 10.1 min
Avg. Velocity = 0.13 fps, Avg. Travel Time= 17.1 min

Peak Storage= 254 cf @ 13.01 hrs, Average Depth at Peak Storage= 0.07'
Bank-Full Depth= 1.00', Capacity at Bank-Full= 121.42 cfs

18.00' x 1.00' deep channel, n= 0.200 Sheet flow: Woods+light brush
Side Slope Z-value= 100.0 '/' Top Width= 218.00'
Length= 138.0' Slope= 0.0435 '/'
Inlet Invert= 80.00', Outlet Invert= 74.00'



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## Summary for Pond CB B1: CB B1

Inflow Area = 1.500 ac, 77.66% Impervious, Inflow Depth = 2.21" for 2 YR event
Inflow = 3.67 cfs @ 12.09 hrs, Volume= 0.276 af
Primary = 3.67 cfs @ 12.09 hrs, Volume= 0.276 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

## Summary for Pond CB B2: CB B2

Inflow Area = 0.508 ac, 55.19% Impervious, Inflow Depth = 1.66" for 2 YR event
Inflow = 0.99 cfs @ 12.09 hrs, Volume= 0.070 af
Primary = 0.99 cfs @ 12.09 hrs, Volume= 0.070 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

## Summary for Pond CB B3: CB B3

Inflow Area = 0.684 ac, 84.25% Impervious, Inflow Depth = 2.36" for 2 YR event
Inflow = 1.78 cfs @ 12.08 hrs, Volume= 0.135 af
Primary = 1.78 cfs @ 12.08 hrs, Volume= 0.135 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

## Summary for Pond CB B4: B4

Inflow Area = 0.587 ac, 81.64% Impervious, Inflow Depth = 2.30" for 2 YR event
Inflow = 1.50 cfs @ 12.09 hrs, Volume= 0.112 af
Primary = 1.50 cfs @ 12.09 hrs, Volume= 0.112 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

## Summary for Pond CB B5: CB B5

Inflow Area = 0.326 ac, 68.83% Impervious, Inflow Depth = 1.98" for 2 YR event
Inflow = 0.75 cfs @ 12.09 hrs, Volume= 0.054 af
Primary = 0.75 cfs @ 12.09 hrs, Volume= 0.054 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

## Summary for Pond CB C1: C1

Inflow Area = 0.101 ac,100.00% Impervious, Inflow Depth = 2.77" for 2 YR event
Inflow = 0.29 cfs @ 12.08 hrs, Volume= 0.023 af
Primary = 0.29 cfs @ 12.08 hrs, Volume= 0.023 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

## Summary for Pond CBB4A: CB B4A

Inflow Area = 0.195 ac, 96.88% Impervious, Inflow Depth = 2.66" for 2 YR event
Inflow = 0.56 cfs @ 12.08 hrs, Volume= 0.043 af
Primary = 0.56 cfs @ 12.08 hrs, Volume= 0.043 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

## Summary for Pond DET O: OPEN BASIN

Inflow Area = 1.749 ac, 66.60% Impervious, Inflow Depth = 2.02" for 2 YR event
Inflow = 3.91 cfs @ 12.09 hrs, Volume= 0.295 af
Outflow = 0.43 cfs @ 12.84 hrs, Volume= 0.169 af, Atten= 89%, Lag= 45.3 min
Primary = 0.43 cfs @ 12.84 hrs, Volume= 0.169 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 90.06' @ 12.84 hrs Surf.Area= 5,316 sf Storage= 7,585 cf

Plug-Flow detention time= 312.4 min calculated for 0.169 af (57% of inflow)
Center-of-Mass det. time= 200.4 min ( 992.1 - 791.7 )

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 88.42' | 19,677 cf | **Custom Stage Data (Prismatic)**Listed below (Recalc) |

| Elevation (feet) | Surf.Area (sq-ft) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) |
|---|---|---|---|
| 88.42 | 3,965 | 0 | 0 |
| 89.00 | 4,433 | 2,435 | 2,435 |
| 90.00 | 5,263 | 4,848 | 7,283 |
| 91.00 | 6,192 | 5,728 | 13,011 |
| 92.00 | 7,141 | 6,667 | 19,677 |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 85.99' | **24.0" x 60.0' long Culvert** CPP, projecting, no headwall, Ke= 0.900<br>Outlet Invert= 81.50' S= 0.0748 '/' Cc= 0.900 n= 0.012 |
| #2 | Secondary | 91.00' | **13.0' long x 14.0' breadth Broad-Crested Rectangular Weir**<br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60<br>Coef. (English) 2.64 2.67 2.70 2.65 2.64 2.65 2.65 2.63 |
| #3 | Device 1 | 89.62' | **0.5' long x 0.5' breadth Broad-Crested Rectangular Weir**<br>Head (feet) 0.20 0.40 0.60 0.80 1.00<br>Coef. (English) 2.80 2.92 3.08 3.30 3.32 |
| #4 | Device 1 | 90.50' | **0.5' long x 0.5' breadth Broad-Crested Rectangular Weir** |

Head (feet) 0.20 0.40 0.60 0.80 1.00
Coef. (English) 2.80 2.92 3.08 3.30 3.32

**Primary OutFlow** Max=0.43 cfs @ 12.84 hrs HW=90.06' TW=80.07' (Dynamic Tailwater)
└─**1=Culvert** (Passes 0.43 cfs of 20.91 cfs potential flow)
  ├─**3=Broad-Crested Rectangular Weir** (Weir Controls 0.43 cfs @ 1.95 fps)
  └─**4=Broad-Crested Rectangular Weir** ( Controls 0.00 cfs)

**Secondary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=88.42' TW=80.00' (Dynamic Tailwater)
└─**2=Broad-Crested Rectangular Weir** ( Controls 0.00 cfs)

## Summary for Pond MH B3B: MH B3B

Inflow Area = 0.612 ac, 62.85% Impervious, Inflow Depth = 1.85" for 2 YR event
Inflow = 1.29 cfs @ 12.09 hrs, Volume= 0.094 af
Primary = 1.29 cfs @ 12.09 hrs, Volume= 0.094 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

## Summary for Pond MHB5A: MH B5A

Inflow Area = 0.521 ac, 79.34% Impervious, Inflow Depth = 2.24" for 2 YR event
Inflow = 1.31 cfs @ 12.09 hrs, Volume= 0.097 af
Primary = 1.31 cfs @ 12.09 hrs, Volume= 0.097 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

**Subcatchment 101: 101** Runoff Area=106,667 sf 7.69% Impervious Runoff Depth=2.29"
Flow Length=102' Tc=16.1 min CN=76 Runoff=4.82 cfs 0.467 af

**Subcatchment B1: B1** Runoff Area=8,879 sf 100.00% Impervious Runoff Depth=4.46"
Tc=6.0 min CN=98 Runoff=0.94 cfs 0.076 af

**Subcatchment B2: B2** Runoff Area=22,113 sf 55.19% Impervious Runoff Depth=3.19"
Tc=6.0 min CN=86 Runoff=1.88 cfs 0.135 af

**Subcatchment B3: B3** Runoff Area=4,242 sf 100.00% Impervious Runoff Depth=4.46"
Tc=6.0 min CN=98 Runoff=0.45 cfs 0.036 af

**Subcatchment B3B: B3B** Runoff Area=4,562 sf 100.00% Impervious Runoff Depth=4.46"
Tc=6.0 min CN=98 Runoff=0.48 cfs 0.039 af

**Subcatchment B4: B4** Runoff Area=2,843 sf 100.00% Impervious Runoff Depth=4.46"
Tc=6.0 min CN=98 Runoff=0.30 cfs 0.024 af

**Subcatchment B4B: B4A** Runoff Area=8,504 sf 96.88% Impervious Runoff Depth=4.35"
Tc=6.0 min CN=97 Runoff=0.89 cfs 0.071 af

**Subcatchment B5: B5** Runoff Area=14,208 sf 68.83% Impervious Runoff Depth=3.59"
Tc=6.0 min CN=90 Runoff=1.33 cfs 0.098 af

**Subcatchment C1: C1** Runoff Area=4,401 sf 100.00% Impervious Runoff Depth=4.46"
Tc=6.0 min CN=98 Runoff=0.46 cfs 0.038 af

**Subcatchment DET: Detention Area** Runoff Area=10,851 sf 0.00% Impervious Runoff Depth=2.13"
Tc=6.0 min CN=74 Runoff=0.62 cfs 0.044 af

**Reach POI 1: POI 1** Inflow=6.34 cfs 0.901 af
Outflow=6.34 cfs 0.901 af

**Reach R: R** Avg. Depth=0.05' Max Vel=0.23 fps Inflow=0.46 cfs 0.038 af
n=0.200 L=354.0' S=0.0593 '/' Capacity=18.75 cfs Outflow=0.24 cfs 0.038 af

**Reach R1: R1** Avg. Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.200 L=196.0' S=0.0306 '/' Capacity=64.45 cfs Outflow=0.00 cfs 0.000 af

**Reach R2: R2** Avg. Depth=0.16' Max Vel=0.36 fps Inflow=2.05 cfs 0.396 af
n=0.200 L=138.0' S=0.0435 '/' Capacity=121.42 cfs Outflow=1.99 cfs 0.396 af

**Pond CB B1: CB B1** Inflow=6.26 cfs 0.478 af
Primary=6.26 cfs 0.478 af

**Pond CB B2: CB B2** Inflow=1.88 cfs 0.135 af
Primary=1.88 cfs 0.135 af

**Pond CB B3: CB B3** Inflow=2.97 cfs 0.229 af
Primary=2.97 cfs 0.229 af

**Pond CB B4: B4** Inflow=2.52 cfs 0.193 af
Primary=2.52 cfs 0.193 af

**Pond CB B5: CB B5** Inflow=1.33 cfs 0.098 af
Primary=1.33 cfs 0.098 af

**Pond CB C1: C1** Inflow=0.46 cfs 0.038 af
Primary=0.46 cfs 0.038 af

**Pond CBB4A: CB B4A** Inflow=0.89 cfs 0.071 af
Primary=0.89 cfs 0.071 af

**Pond DET O: OPEN BASIN** Peak Elev=90.72' Storage=11,298 cf Inflow=6.87 cfs 0.523 af
Primary=2.05 cfs 0.396 af Secondary=0.00 cfs 0.000 af Outflow=2.05 cfs 0.396 af

**Pond MH B3B: MH B3B** Inflow=2.36 cfs 0.174 af
Primary=2.36 cfs 0.174 af

**Pond MHB5A: MH B5A** Inflow=2.22 cfs 0.168 af
Primary=2.22 cfs 0.168 af

**Total Runoff Area = 4.299 ac Runoff Volume = 1.028 af Average Runoff Depth = 2.87"**
**66.17% Pervious = 2.845 ac 33.83% Impervious = 1.454 ac**

## Summary for Subcatchment 101: 101

Runoff = 4.82 cfs @ 12.22 hrs, Volume= 0.467 af, Depth= 2.29"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 YR Rainfall=4.70"

| Area (sf) | CN | Description |
|---|---|---|
| 8,201 | 98 | Paved roads w/curbs & sewers |
| 4,313 | 89 | Gravel roads, HSG C |
| 13,704 | 70 | Woods, Good, HSG C |
| 37,589 | 71 | Meadow, non-grazed, HSG C |
| 10,508 | 78 | Meadow, non-grazed, HSG D |
| 32,352 | 77 | Woods, Good, HSG D |
| 106,667 | 76 | Weighted Average |
| 98,466 | | Pervious Area |
| 8,201 | | Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 15.9 | 90 | 0.0370 | 0.09 | | **Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.00" |
| 0.2 | 12 | 0.0400 | 1.00 | | **Shallow Concentrated Flow,** Woodland Kv= 5.0 fps |
| 16.1 | 102 | Total | | | |

## Summary for Subcatchment B1: B1

Runoff = 0.94 cfs @ 12.08 hrs, Volume= 0.076 af, Depth= 4.46"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 YR Rainfall=4.70"

| Area (sf) | CN | Description |
|---|---|---|
| 8,879 | 98 | Paved roads w/curbs & sewers |
| 8,879 | | Impervious Area |

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

## Summary for Subcatchment B2: B2

Runoff = 1.88 cfs @ 12.09 hrs, Volume= 0.135 af, Depth= 3.19"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 YR Rainfall=4.70"

| Area (sf) | CN | Description |
|---|---|---|
| 12,204 | 98 | Paved roads w/curbs & sewers |
| 3,238 | 70 | Woods, Good, HSG C |
| 5,811 | 71 | Meadow, non-grazed, HSG C |
| 860 | 74 | >75% Grass cover, Good, HSG C |
| 22,113 | 86 | Weighted Average |
| 9,909 | | Pervious Area |
| 12,204 | | Impervious Area |

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

## Summary for Subcatchment B3: B3

Runoff = 0.45 cfs @ 12.08 hrs, Volume= 0.036 af, Depth= 4.46"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 YR Rainfall=4.70"

| Area (sf) | CN | Description |
|---|---|---|
| 4,242 | 98 | Paved roads w/curbs & sewers |
| 4,242 | | Impervious Area |

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

## Summary for Subcatchment B3B: B3B

Runoff = 0.48 cfs @ 12.08 hrs, Volume= 0.039 af, Depth= 4.46"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 YR Rainfall=4.70"

| Area (sf) | CN | Description |
|---|---|---|
| 4,562 | 98 | Paved parking & roofs |
| 4,562 | | Impervious Area |

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

## Summary for Subcatchment B4: B4

Runoff = 0.30 cfs @ 12.08 hrs, Volume= 0.024 af, Depth= 4.46"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 YR Rainfall=4.70"

| Area (sf) | CN | Description |
|---|---|---|
| 2,843 | 98 | Paved roads w/curbs & sewers |
| 2,843 | | Impervious Area |

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

## Summary for Subcatchment B4B: B4A

Runoff = 0.89 cfs @ 12.08 hrs, Volume= 0.071 af, Depth= 4.35"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 YR Rainfall=4.70"

| Area (sf) | CN | Description |
|---|---|---|
| 8,239 | 98 | Paved parking & roofs |
| 265 | 74 | >75% Grass cover, Good, HSG C |
| 8,504 | 97 | Weighted Average |
| 265 | | Pervious Area |
| 8,239 | | Impervious Area |

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

## Summary for Subcatchment B5: B5

Runoff = 1.33 cfs @ 12.09 hrs, Volume= 0.098 af, Depth= 3.59"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 YR Rainfall=4.70"

| Area (sf) | CN | Description |
|---|---|---|
| 9,780 | 98 | Paved roads w/curbs & sewers |
| 2,175 | 70 | Woods, Good, HSG C |
| 868 | 71 | Meadow, non-grazed, HSG C |
| 1,385 | 74 | >75% Grass cover, Good, HSG C |
| 14,208 | 90 | Weighted Average |
| 4,428 | | Pervious Area |
| 9,780 | | Impervious Area |

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

## Summary for Subcatchment C1: C1

Runoff = 0.46 cfs @ 12.08 hrs, Volume= 0.038 af, Depth= 4.46"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 YR Rainfall=4.70"

| Area (sf) | CN | Description |
|---|---|---|
| 4,401 | 98 | Paved roads w/curbs & sewers |
| 4,401 | | Impervious Area |

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

## Summary for Subcatchment DET: Detention Area

Runoff = 0.62 cfs @ 12.09 hrs, Volume= 0.044 af, Depth= 2.13"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 YR Rainfall=4.70"

| Area (sf) | CN | Description |
|---|---|---|
| 10,851 | 74 | >75% Grass cover, Good, HSG C |
| 10,851 | | Pervious Area |

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

## Summary for Reach POI 1: POI 1

Inflow Area = 4.299 ac, 33.83% Impervious, Inflow Depth > 2.51" for 10 YR event
Inflow = 6.34 cfs @ 12.26 hrs, Volume= 0.901 af
Outflow = 6.34 cfs @ 12.26 hrs, Volume= 0.901 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

## Summary for Reach R: R

Inflow Area = 0.101 ac,100.00% Impervious, Inflow Depth = 4.46" for 10 YR event
Inflow = 0.46 cfs @ 12.08 hrs, Volume= 0.038 af
Outflow = 0.24 cfs @ 12.22 hrs, Volume= 0.038 af, Atten= 48%, Lag= 7.9 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.23 fps, Min. Travel Time= 25.9 min
Avg. Velocity = 0.07 fps, Avg. Travel Time= 80.8 min

Peak Storage= 372 cf @ 12.22 hrs, Average Depth at Peak Storage= 0.05'
Bank-Full Depth= 0.50', Capacity at Bank-Full= 18.75 cfs

18.00' x 0.50' deep channel, n= 0.200 Sheet flow: Woods+light brush
Side Slope Z-value= 54.0 '/' Top Width= 72.00'
Length= 354.0' Slope= 0.0593 '/'
Inlet Invert= 95.00', Outlet Invert= 74.00'

‡

## Summary for Reach R1: R1

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

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs, Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 1.00', Capacity at Bank-Full= 64.45 cfs

18.00' x 1.00' deep channel, n= 0.200 Sheet flow: Woods+light brush
Side Slope Z-value= 54.0 '/' Top Width= 126.00'
Length= 196.0' Slope= 0.0306 '/'
Inlet Invert= 80.00', Outlet Invert= 74.00'

‡

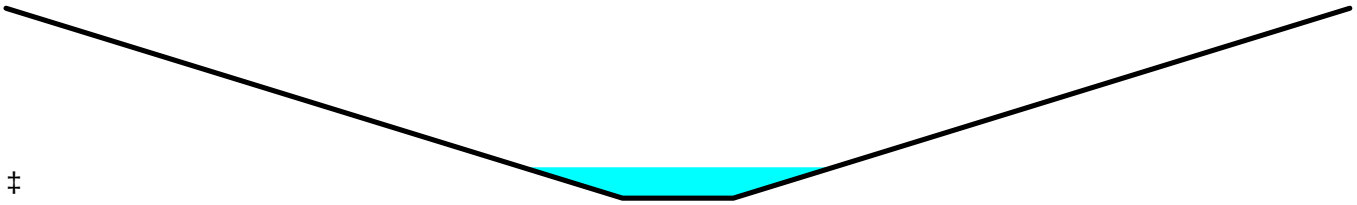
## Summary for Reach R2: R2

Inflow Area = 1.749 ac, 66.60% Impervious, Inflow Depth > 2.72" for 10 YR event
Inflow = 2.05 cfs @ 12.41 hrs, Volume= 0.396 af
Outflow = 1.99 cfs @ 12.51 hrs, Volume= 0.396 af, Atten= 3%, Lag= 5.5 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.36 fps, Min. Travel Time= 6.4 min
Avg. Velocity = 0.16 fps, Avg. Travel Time= 14.1 min

Peak Storage= 771 cf @ 12.51 hrs, Average Depth at Peak Storage= 0.16'
Bank-Full Depth= 1.00', Capacity at Bank-Full= 121.42 cfs

18.00' x 1.00' deep channel, n= 0.200 Sheet flow: Woods+light brush
Side Slope Z-value= 100.0 '/' Top Width= 218.00'
Length= 138.0' Slope= 0.0435 '/'
Inlet Invert= 80.00', Outlet Invert= 74.00'



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## Summary for Pond CB B1: CB B1

Inflow Area = 1.500 ac, 77.66% Impervious, Inflow Depth = 3.83" for 10 YR event
Inflow = 6.26 cfs @ 12.08 hrs, Volume= 0.478 af
Primary = 6.26 cfs @ 12.08 hrs, Volume= 0.478 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

## Summary for Pond CB B2: CB B2

Inflow Area = 0.508 ac, 55.19% Impervious, Inflow Depth = 3.19" for 10 YR event
Inflow = 1.88 cfs @ 12.09 hrs, Volume= 0.135 af
Primary = 1.88 cfs @ 12.09 hrs, Volume= 0.135 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

## Summary for Pond CB B3: CB B3

Inflow Area = 0.684 ac, 84.25% Impervious, Inflow Depth = 4.01" for 10 YR event
Inflow = 2.97 cfs @ 12.08 hrs, Volume= 0.229 af
Primary = 2.97 cfs @ 12.08 hrs, Volume= 0.229 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

## Summary for Pond CB B4: B4

Inflow Area = 0.587 ac, 81.64% Impervious, Inflow Depth = 3.94" for 10 YR event
Inflow = 2.52 cfs @ 12.08 hrs, Volume= 0.193 af
Primary = 2.52 cfs @ 12.08 hrs, Volume= 0.193 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

## Summary for Pond CB B5: CB B5

Inflow Area = 0.326 ac, 68.83% Impervious, Inflow Depth = 3.59" for 10 YR event
Inflow = 1.33 cfs @ 12.09 hrs, Volume= 0.098 af
Primary = 1.33 cfs @ 12.09 hrs, Volume= 0.098 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

## Summary for Pond CB C1: C1

Inflow Area = 0.101 ac,100.00% Impervious, Inflow Depth = 4.46" for 10 YR event
Inflow = 0.46 cfs @ 12.08 hrs, Volume= 0.038 af
Primary = 0.46 cfs @ 12.08 hrs, Volume= 0.038 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

## Summary for Pond CBB4A: CB B4A

Inflow Area = 0.195 ac, 96.88% Impervious, Inflow Depth = 4.35" for 10 YR event
Inflow = 0.89 cfs @ 12.08 hrs, Volume= 0.071 af
Primary = 0.89 cfs @ 12.08 hrs, Volume= 0.071 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

## Summary for Pond DET O: OPEN BASIN

Inflow Area = 1.749 ac, 66.60% Impervious, Inflow Depth = 3.58" for 10 YR event
Inflow = 6.87 cfs @ 12.09 hrs, Volume= 0.523 af
Outflow = 2.05 cfs @ 12.41 hrs, Volume= 0.396 af, Atten= 70%, Lag= 19.7 min
Primary = 2.05 cfs @ 12.41 hrs, Volume= 0.396 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 90.72' @ 12.41 hrs Surf.Area= 5,929 sf Storage= 11,298 cf

Plug-Flow detention time= 220.3 min calculated for 0.396 af (76% of inflow)
Center-of-Mass det. time= 134.8 min ( 915.7 - 780.9 )

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 88.42' | 19,677 cf | **Custom Stage Data (Prismatic)**Listed below (Recalc) |

| Elevation (feet) | Surf.Area (sq-ft) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) |
|---|---|---|---|
| 88.42 | 3,965 | 0 | 0 |
| 89.00 | 4,433 | 2,435 | 2,435 |
| 90.00 | 5,263 | 4,848 | 7,283 |
| 91.00 | 6,192 | 5,728 | 13,011 |
| 92.00 | 7,141 | 6,667 | 19,677 |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 85.99' | **24.0" x 60.0' long Culvert** CPP, projecting, no headwall, Ke= 0.900<br>Outlet Invert= 81.50' S= 0.0748 '/' Cc= 0.900 n= 0.012 |
| #2 | Secondary | 91.00' | **13.0' long x 14.0' breadth Broad-Crested Rectangular Weir**<br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60<br>Coef. (English) 2.64 2.67 2.70 2.65 2.64 2.65 2.65 2.63 |
| #3 | Device 1 | 89.62' | **0.5' long x 0.5' breadth Broad-Crested Rectangular Weir**<br>Head (feet) 0.20 0.40 0.60 0.80 1.00<br>Coef. (English) 2.80 2.92 3.08 3.30 3.32 |
| #4 | Device 1 | 90.50' | **0.5' long x 0.5' breadth Broad-Crested Rectangular Weir** |

Head (feet) 0.20 0.40 0.60 0.80 1.00
Coef. (English) 2.80 2.92 3.08 3.30 3.32

**Primary OutFlow** Max=2.05 cfs @ 12.41 hrs HW=90.72' TW=80.16' (Dynamic Tailwater)
└**1=Culvert** (Passes 2.05 cfs of 23.06 cfs potential flow)
  └**3=Broad-Crested Rectangular Weir** (Weir Controls 1.91 cfs @ 3.48 fps)
  └**4=Broad-Crested Rectangular Weir** (Weir Controls 0.14 cfs @ 1.31 fps)

**Secondary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=88.42' TW=80.00' (Dynamic Tailwater)
└**2=Broad-Crested Rectangular Weir** ( Controls 0.00 cfs)

## Summary for Pond MH B3B: MH B3B

Inflow Area = 0.612 ac, 62.85% Impervious, Inflow Depth = 3.41" for 10 YR event
Inflow = 2.36 cfs @ 12.09 hrs, Volume= 0.174 af
Primary = 2.36 cfs @ 12.09 hrs, Volume= 0.174 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

## Summary for Pond MHB5A: MH B5A

Inflow Area = 0.521 ac, 79.34% Impervious, Inflow Depth = 3.87" for 10 YR event
Inflow = 2.22 cfs @ 12.08 hrs, Volume= 0.168 af
Primary = 2.22 cfs @ 12.08 hrs, Volume= 0.168 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

**Subcatchment 101: 101** Runoff Area=106,667 sf 7.69% Impervious Runoff Depth=2.95"
Flow Length=102' Tc=16.1 min CN=76 Runoff=6.25 cfs 0.603 af

**Subcatchment B1: B1** Runoff Area=8,879 sf 100.00% Impervious Runoff Depth=5.26"
Tc=6.0 min CN=98 Runoff=1.10 cfs 0.089 af

**Subcatchment B2: B2** Runoff Area=22,113 sf 55.19% Impervious Runoff Depth=3.94"
Tc=6.0 min CN=86 Runoff=2.30 cfs 0.167 af

**Subcatchment B3: B3** Runoff Area=4,242 sf 100.00% Impervious Runoff Depth=5.26"
Tc=6.0 min CN=98 Runoff=0.52 cfs 0.043 af

**Subcatchment B3B: B3B** Runoff Area=4,562 sf 100.00% Impervious Runoff Depth=5.26"
Tc=6.0 min CN=98 Runoff=0.56 cfs 0.046 af

**Subcatchment B4: B4** Runoff Area=2,843 sf 100.00% Impervious Runoff Depth=5.26"
Tc=6.0 min CN=98 Runoff=0.35 cfs 0.029 af

**Subcatchment B4B: B4A** Runoff Area=8,504 sf 96.88% Impervious Runoff Depth=5.15"
Tc=6.0 min CN=97 Runoff=1.05 cfs 0.084 af

**Subcatchment B5: B5** Runoff Area=14,208 sf 68.83% Impervious Runoff Depth=4.36"
Tc=6.0 min CN=90 Runoff=1.60 cfs 0.119 af

**Subcatchment C1: C1** Runoff Area=4,401 sf 100.00% Impervious Runoff Depth=5.26"
Tc=6.0 min CN=98 Runoff=0.54 cfs 0.044 af

**Subcatchment DET: Detention Area** Runoff Area=10,851 sf 0.00% Impervious Runoff Depth=2.77"
Tc=6.0 min CN=74 Runoff=0.81 cfs 0.057 af

**Reach POI 1: POI 1** Inflow=8.84 cfs 1.153 af
Outflow=8.84 cfs 1.153 af

**Reach R: R** Avg. Depth=0.06' Max Vel=0.24 fps Inflow=0.54 cfs 0.044 af
n=0.200 L=354.0' S=0.0593 '/' Capacity=18.75 cfs Outflow=0.29 cfs 0.044 af

**Reach R1: R1** Avg. Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.200 L=196.0' S=0.0306 '/' Capacity=64.45 cfs Outflow=0.00 cfs 0.000 af

**Reach R2: R2** Avg. Depth=0.20' Max Vel=0.40 fps Inflow=3.02 cfs 0.506 af
n=0.200 L=138.0' S=0.0435 '/' Capacity=121.42 cfs Outflow=2.94 cfs 0.506 af

**Pond CB B1: CB B1** Inflow=7.48 cfs 0.575 af
Primary=7.48 cfs 0.575 af

**Pond CB B2: CB B2** Inflow=2.30 cfs 0.167 af
Primary=2.30 cfs 0.167 af

**Pond CB B3: CB B3** Inflow=3.52 cfs 0.274 af
Primary=3.52 cfs 0.274 af

**Pond CB B4: B4** Inflow=3.00 cfs 0.231 af
Primary=3.00 cfs 0.231 af

**Pond CB B5: CB B5** Inflow=1.60 cfs 0.119 af
Primary=1.60 cfs 0.119 af

**Pond CB C1: C1** Inflow=0.54 cfs 0.044 af
Primary=0.54 cfs 0.044 af

**Pond CBB4A: CB B4A** Inflow=1.05 cfs 0.084 af
Primary=1.05 cfs 0.084 af

**Pond DET O: OPEN BASIN** Peak Elev=90.96' Storage=12,745 cf Inflow=8.29 cfs 0.633 af
Primary=3.02 cfs 0.506 af Secondary=0.00 cfs 0.000 af Outflow=3.02 cfs 0.506 af

**Pond MH B3B: MH B3B** Inflow=2.86 cfs 0.212 af
Primary=2.86 cfs 0.212 af

**Pond MHB5A: MH B5A** Inflow=2.64 cfs 0.202 af
Primary=2.64 cfs 0.202 af

**Total Runoff Area = 4.299 ac Runoff Volume = 1.280 af Average Runoff Depth = 3.57"**
**66.17% Pervious = 2.845 ac 33.83% Impervious = 1.454 ac**

## Summary for Subcatchment 101: 101

Runoff = 6.25 cfs @ 12.22 hrs, Volume= 0.603 af, Depth= 2.95"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 YR Rainfall=5.50"

| Area (sf) | CN | Description |
|---|---|---|
| 8,201 | 98 | Paved roads w/curbs & sewers |
| 4,313 | 89 | Gravel roads, HSG C |
| 13,704 | 70 | Woods, Good, HSG C |
| 37,589 | 71 | Meadow, non-grazed, HSG C |
| 10,508 | 78 | Meadow, non-grazed, HSG D |
| 32,352 | 77 | Woods, Good, HSG D |
| 106,667 | 76 | Weighted Average |
| 98,466 | | Pervious Area |
| 8,201 | | Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 15.9 | 90 | 0.0370 | 0.09 | | **Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.00" |
| 0.2 | 12 | 0.0400 | 1.00 | | **Shallow Concentrated Flow,** Woodland Kv= 5.0 fps |
| 16.1 | 102 | Total | | | |

## Summary for Subcatchment B1: B1

Runoff = 1.10 cfs @ 12.08 hrs, Volume= 0.089 af, Depth= 5.26"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 YR Rainfall=5.50"

| Area (sf) | CN | Description |
|---|---|---|
| 8,879 | 98 | Paved roads w/curbs & sewers |
| 8,879 | | Impervious Area |

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

## Summary for Subcatchment B2: B2

Runoff = 2.30 cfs @ 12.09 hrs, Volume= 0.167 af, Depth= 3.94"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 YR Rainfall=5.50"

| Area (sf) | CN | Description |
|---|---|---|
| 12,204 | 98 | Paved roads w/curbs & sewers |
| 3,238 | 70 | Woods, Good, HSG C |
| 5,811 | 71 | Meadow, non-grazed, HSG C |
| 860 | 74 | >75% Grass cover, Good, HSG C |
| 22,113 | 86 | Weighted Average |
| 9,909 | | Pervious Area |
| 12,204 | | Impervious Area |

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

## Summary for Subcatchment B3: B3

Runoff = 0.52 cfs @ 12.08 hrs, Volume= 0.043 af, Depth= 5.26"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 YR Rainfall=5.50"

| Area (sf) | CN | Description |
|---|---|---|
| 4,242 | 98 | Paved roads w/curbs & sewers |
| 4,242 | | Impervious Area |

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

## Summary for Subcatchment B3B: B3B

Runoff = 0.56 cfs @ 12.08 hrs, Volume= 0.046 af, Depth= 5.26"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 YR Rainfall=5.50"

| Area (sf) | CN | Description |
|---|---|---|
| 4,562 | 98 | Paved parking & roofs |
| 4,562 | | Impervious Area |

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

## Summary for Subcatchment B4: B4

Runoff = 0.35 cfs @ 12.08 hrs, Volume= 0.029 af, Depth= 5.26"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 YR Rainfall=5.50"

| Area (sf) | CN | Description |
|---|---|---|
| 2,843 | 98 | Paved roads w/curbs & sewers |
| 2,843 | | Impervious Area |

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

## Summary for Subcatchment B4B: B4A

Runoff = 1.05 cfs @ 12.08 hrs, Volume= 0.084 af, Depth= 5.15"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 YR Rainfall=5.50"

| Area (sf) | CN | Description |
|---|---|---|
| 8,239 | 98 | Paved parking & roofs |
| 265 | 74 | >75% Grass cover, Good, HSG C |
| 8,504 | 97 | Weighted Average |
| 265 | | Pervious Area |
| 8,239 | | Impervious Area |

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

## Summary for Subcatchment B5: B5

Runoff = 1.60 cfs @ 12.08 hrs, Volume= 0.119 af, Depth= 4.36"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 YR Rainfall=5.50"

| Area (sf) | CN | Description |
|---|---|---|
| 9,780 | 98 | Paved roads w/curbs & sewers |
| 2,175 | 70 | Woods, Good, HSG C |
| 868 | 71 | Meadow, non-grazed, HSG C |
| 1,385 | 74 | >75% Grass cover, Good, HSG C |
| 14,208 | 90 | Weighted Average |
| 4,428 | | Pervious Area |
| 9,780 | | Impervious Area |

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

## Summary for Subcatchment C1: C1

Runoff = 0.54 cfs @ 12.08 hrs, Volume= 0.044 af, Depth= 5.26"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 YR Rainfall=5.50"

| Area (sf) | CN | Description |
|---|---|---|
| 4,401 | 98 | Paved roads w/curbs & sewers |
| 4,401 | | Impervious Area |

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

## Summary for Subcatchment DET: Detention Area

Runoff = 0.81 cfs @ 12.09 hrs, Volume= 0.057 af, Depth= 2.77"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 YR Rainfall=5.50"

| Area (sf) | CN | Description |
|---|---|---|
| 10,851 | 74 | >75% Grass cover, Good, HSG C |
| 10,851 | | Pervious Area |

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

## Summary for Reach POI 1: POI 1

Inflow Area = 4.299 ac, 33.83% Impervious, Inflow Depth > 3.22" for 25 YR event
Inflow = 8.84 cfs @ 12.25 hrs, Volume= 1.153 af
Outflow = 8.84 cfs @ 12.25 hrs, Volume= 1.153 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

## Summary for Reach R: R

Inflow Area = 0.101 ac,100.00% Impervious, Inflow Depth = 5.26" for 25 YR event
Inflow = 0.54 cfs @ 12.08 hrs, Volume= 0.044 af
Outflow = 0.29 cfs @ 12.21 hrs, Volume= 0.044 af, Atten= 47%, Lag= 7.6 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.24 fps, Min. Travel Time= 24.2 min
Avg. Velocity = 0.08 fps, Avg. Travel Time= 77.1 min

Peak Storage= 421 cf @ 12.21 hrs, Average Depth at Peak Storage= 0.06'
Bank-Full Depth= 0.50', Capacity at Bank-Full= 18.75 cfs

18.00' x 0.50' deep channel, n= 0.200 Sheet flow: Woods+light brush
Side Slope Z-value= 54.0 '/' Top Width= 72.00'
Length= 354.0' Slope= 0.0593 '/'
Inlet Invert= 95.00', Outlet Invert= 74.00'

‡

## Summary for Reach R1: R1

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

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs, Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 1.00', Capacity at Bank-Full= 64.45 cfs

18.00' x 1.00' deep channel, n= 0.200 Sheet flow: Woods+light brush
Side Slope Z-value= 54.0 '/' Top Width= 126.00'
Length= 196.0' Slope= 0.0306 '/'
Inlet Invert= 80.00', Outlet Invert= 74.00'

‡

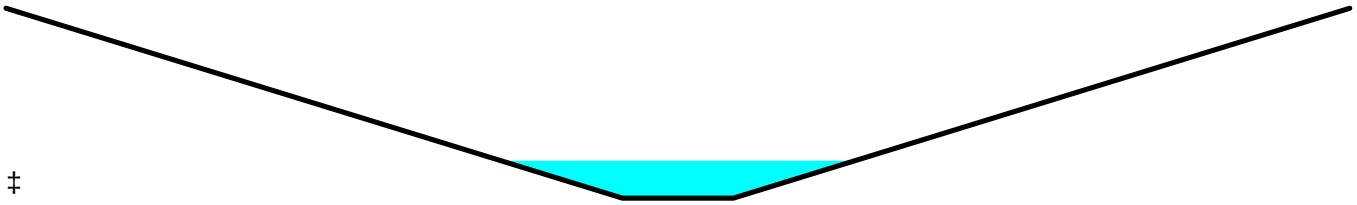
## Summary for Reach R2: R2

Inflow Area = 1.749 ac, 66.60% Impervious, Inflow Depth > 3.47" for 25 YR event
Inflow = 3.02 cfs @ 12.34 hrs, Volume= 0.506 af
Outflow = 2.94 cfs @ 12.43 hrs, Volume= 0.506 af, Atten= 3%, Lag= 5.5 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.40 fps, Min. Travel Time= 5.8 min
Avg. Velocity = 0.17 fps, Avg. Travel Time= 13.4 min

Peak Storage= 1,025 cf @ 12.43 hrs, Average Depth at Peak Storage= 0.20'
Bank-Full Depth= 1.00', Capacity at Bank-Full= 121.42 cfs

18.00' x 1.00' deep channel, n= 0.200 Sheet flow: Woods+light brush
Side Slope Z-value= 100.0 '/' Top Width= 218.00'
Length= 138.0' Slope= 0.0435 '/'
Inlet Invert= 80.00', Outlet Invert= 74.00'



‡

## Summary for Pond CB B1: CB B1

Inflow Area = 1.500 ac, 77.66% Impervious, Inflow Depth = 4.60" for 25 YR event
Inflow = 7.48 cfs @ 12.08 hrs, Volume= 0.575 af
Primary = 7.48 cfs @ 12.08 hrs, Volume= 0.575 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

## Summary for Pond CB B2: CB B2

Inflow Area = 0.508 ac, 55.19% Impervious, Inflow Depth = 3.94" for 25 YR event
Inflow = 2.30 cfs @ 12.09 hrs, Volume= 0.167 af
Primary = 2.30 cfs @ 12.09 hrs, Volume= 0.167 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

## Summary for Pond CB B3: CB B3

Inflow Area = 0.684 ac, 84.25% Impervious, Inflow Depth = 4.80" for 25 YR event
Inflow = 3.52 cfs @ 12.08 hrs, Volume= 0.274 af
Primary = 3.52 cfs @ 12.08 hrs, Volume= 0.274 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

## Summary for Pond CB B4: B4

Inflow Area = 0.587 ac, 81.64% Impervious, Inflow Depth = 4.72" for 25 YR event
Inflow = 3.00 cfs @ 12.08 hrs, Volume= 0.231 af
Primary = 3.00 cfs @ 12.08 hrs, Volume= 0.231 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

## Summary for Pond CB B5: CB B5

Inflow Area = 0.326 ac, 68.83% Impervious, Inflow Depth = 4.36" for 25 YR event
Inflow = 1.60 cfs @ 12.08 hrs, Volume= 0.119 af
Primary = 1.60 cfs @ 12.08 hrs, Volume= 0.119 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

## Summary for Pond CB C1: C1

Inflow Area = 0.101 ac,100.00% Impervious, Inflow Depth = 5.26" for 25 YR event
Inflow = 0.54 cfs @ 12.08 hrs, Volume= 0.044 af
Primary = 0.54 cfs @ 12.08 hrs, Volume= 0.044 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

## Summary for Pond CBB4A: CB B4A

Inflow Area = 0.195 ac, 96.88% Impervious, Inflow Depth = 5.15" for 25 YR event
Inflow = 1.05 cfs @ 12.08 hrs, Volume= 0.084 af
Primary = 1.05 cfs @ 12.08 hrs, Volume= 0.084 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

## Summary for Pond DET O: OPEN BASIN

Inflow Area = 1.749 ac, 66.60% Impervious, Inflow Depth = 4.34" for 25 YR event
Inflow = 8.29 cfs @ 12.09 hrs, Volume= 0.633 af
Outflow = 3.02 cfs @ 12.34 hrs, Volume= 0.506 af, Atten= 64%, Lag= 15.4 min
Primary = 3.02 cfs @ 12.34 hrs, Volume= 0.506 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 90.96' @ 12.34 hrs Surf.Area= 6,152 sf Storage= 12,745 cf

Plug-Flow detention time= 199.0 min calculated for 0.506 af (80% of inflow)
Center-of-Mass det. time= 122.0 min ( 899.3 - 777.3 )

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 88.42' | 19,677 cf | **Custom Stage Data (Prismatic)**Listed below (Recalc) |

| Elevation (feet) | Surf.Area (sq-ft) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) |
|---|---|---|---|
| 88.42 | 3,965 | 0 | 0 |
| 89.00 | 4,433 | 2,435 | 2,435 |
| 90.00 | 5,263 | 4,848 | 7,283 |
| 91.00 | 6,192 | 5,728 | 13,011 |
| 92.00 | 7,141 | 6,667 | 19,677 |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 85.99' | **24.0" x 60.0' long Culvert** CPP, projecting, no headwall, Ke= 0.900<br>Outlet Invert= 81.50' S= 0.0748 '/' Cc= 0.900 n= 0.012 |
| #2 | Secondary | 91.00' | **13.0' long x 14.0' breadth Broad-Crested Rectangular Weir**<br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60<br>Coef. (English) 2.64 2.67 2.70 2.65 2.64 2.65 2.65 2.63 |
| #3 | Device 1 | 89.62' | **0.5' long x 0.5' breadth Broad-Crested Rectangular Weir**<br>Head (feet) 0.20 0.40 0.60 0.80 1.00<br>Coef. (English) 2.80 2.92 3.08 3.30 3.32 |
| #4 | Device 1 | 90.50' | **0.5' long x 0.5' breadth Broad-Crested Rectangular Weir** |

Head (feet) 0.20 0.40 0.60 0.80 1.00
Coef. (English) 2.80 2.92 3.08 3.30 3.32

**Primary OutFlow** Max=3.02 cfs @ 12.34 hrs HW=90.96' TW=80.19' (Dynamic Tailwater)
└**1=Culvert** (Passes 3.02 cfs of 23.79 cfs potential flow)
  ├**3=Broad-Crested Rectangular Weir** (Weir Controls 2.57 cfs @ 3.84 fps)
  └**4=Broad-Crested Rectangular Weir** (Weir Controls 0.46 cfs @ 2.00 fps)

**Secondary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=88.42' TW=80.00' (Dynamic Tailwater)
└**2=Broad-Crested Rectangular Weir** ( Controls 0.00 cfs)

## Summary for Pond MH B3B: MH B3B

Inflow Area = 0.612 ac, 62.85% Impervious, Inflow Depth = 4.16" for 25 YR event
Inflow = 2.86 cfs @ 12.09 hrs, Volume= 0.212 af
Primary = 2.86 cfs @ 12.09 hrs, Volume= 0.212 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

## Summary for Pond MHB5A: MH B5A

Inflow Area = 0.521 ac, 79.34% Impervious, Inflow Depth = 4.65" for 25 YR event
Inflow = 2.64 cfs @ 12.08 hrs, Volume= 0.202 af
Primary = 2.64 cfs @ 12.08 hrs, Volume= 0.202 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

**Subcatchment 101: 101** Runoff Area=106,667 sf 7.69% Impervious Runoff Depth=3.99"
Flow Length=102' Tc=16.1 min CN=76 Runoff=8.45 cfs 0.814 af

**Subcatchment B1: B1** Runoff Area=8,879 sf 100.00% Impervious Runoff Depth=6.46"
Tc=6.0 min CN=98 Runoff=1.34 cfs 0.110 af

**Subcatchment B2: B2** Runoff Area=22,113 sf 55.19% Impervious Runoff Depth=5.08"
Tc=6.0 min CN=86 Runoff=2.93 cfs 0.215 af

**Subcatchment B3: B3** Runoff Area=4,242 sf 100.00% Impervious Runoff Depth=6.46"
Tc=6.0 min CN=98 Runoff=0.64 cfs 0.052 af

**Subcatchment B3B: B3B** Runoff Area=4,562 sf 100.00% Impervious Runoff Depth=6.46"
Tc=6.0 min CN=98 Runoff=0.69 cfs 0.056 af

**Subcatchment B4: B4** Runoff Area=2,843 sf 100.00% Impervious Runoff Depth=6.46"
Tc=6.0 min CN=98 Runoff=0.43 cfs 0.035 af

**Subcatchment B4B: B4A** Runoff Area=8,504 sf 96.88% Impervious Runoff Depth=6.34"
Tc=6.0 min CN=97 Runoff=1.28 cfs 0.103 af

**Subcatchment B5: B5** Runoff Area=14,208 sf 68.83% Impervious Runoff Depth=5.53"
Tc=6.0 min CN=90 Runoff=2.00 cfs 0.150 af

**Subcatchment C1: C1** Runoff Area=4,401 sf 100.00% Impervious Runoff Depth=6.46"
Tc=6.0 min CN=98 Runoff=0.66 cfs 0.054 af

**Subcatchment DET: Detention Area** Runoff Area=10,851 sf 0.00% Impervious Runoff Depth=3.78"
Tc=6.0 min CN=74 Runoff=1.11 cfs 0.079 af

**Reach POI 1: POI 1** Inflow=13.34 cfs 1.542 af
Outflow=13.34 cfs 1.542 af

**Reach R: R** Avg. Depth=0.06' Max Vel=0.26 fps Inflow=0.66 cfs 0.054 af
n=0.200 L=354.0' S=0.0593 '/' Capacity=18.75 cfs Outflow=0.37 cfs 0.054 af

**Reach R1: R1** Avg. Depth=0.15' Max Vel=0.30 fps Inflow=2.16 cfs 0.036 af
n=0.200 L=196.0' S=0.0306 '/' Capacity=64.45 cfs Outflow=1.17 cfs 0.036 af

**Reach R2: R2** Avg. Depth=0.22' Max Vel=0.42 fps Inflow=4.01 cfs 0.638 af
n=0.200 L=138.0' S=0.0435 '/' Capacity=121.42 cfs Outflow=3.77 cfs 0.637 af

**Pond CB B1: CB B1** Inflow=9.31 cfs 0.722 af
Primary=9.31 cfs 0.722 af

**Pond CB B2: CB B2** Inflow=2.93 cfs 0.215 af
Primary=2.93 cfs 0.215 af

**Pond CB B3: CB B3** Inflow=4.35 cfs 0.341 af
Primary=4.35 cfs 0.341 af

**Pond CB B4: B4** Inflow=3.71 cfs 0.289 af
Primary=3.71 cfs 0.289 af

**Pond CB B5: CB B5** Inflow=2.00 cfs 0.150 af
Primary=2.00 cfs 0.150 af

**Pond CB C1: C1** Inflow=0.66 cfs 0.054 af
Primary=0.66 cfs 0.054 af

**Pond CBB4A: CB B4A** Inflow=1.28 cfs 0.103 af
Primary=1.28 cfs 0.103 af

**Pond DET O: OPEN BASIN** Peak Elev=91.16' Storage=14,004 cf Inflow=10.41 cfs 0.801 af
Primary=4.01 cfs 0.638 af Secondary=2.16 cfs 0.036 af Outflow=6.17 cfs 0.674 af

**Pond MH B3B: MH B3B** Inflow=3.62 cfs 0.271 af
Primary=3.62 cfs 0.271 af

**Pond MHB5A: MH B5A** Inflow=3.28 cfs 0.253 af
Primary=3.28 cfs 0.253 af

**Total Runoff Area = 4.299 ac Runoff Volume = 1.669 af Average Runoff Depth = 4.66"**
**66.17% Pervious = 2.845 ac 33.83% Impervious = 1.454 ac**

## Summary for Subcatchment 101: 101

Runoff = 8.45 cfs @ 12.22 hrs, Volume= 0.814 af, Depth= 3.99"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 YR Rainfall=6.70"

| Area (sf) | CN | Description |
|---|---|---|
| 8,201 | 98 | Paved roads w/curbs & sewers |
| 4,313 | 89 | Gravel roads, HSG C |
| 13,704 | 70 | Woods, Good, HSG C |
| 37,589 | 71 | Meadow, non-grazed, HSG C |
| 10,508 | 78 | Meadow, non-grazed, HSG D |
| 32,352 | 77 | Woods, Good, HSG D |
| 106,667 | 76 | Weighted Average |
| 98,466 | | Pervious Area |
| 8,201 | | Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 15.9 | 90 | 0.0370 | 0.09 | | **Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.00" |
| 0.2 | 12 | 0.0400 | 1.00 | | **Shallow Concentrated Flow,** Woodland Kv= 5.0 fps |
| 16.1 | 102 | Total | | | |

## Summary for Subcatchment B1: B1

Runoff = 1.34 cfs @ 12.08 hrs, Volume= 0.110 af, Depth= 6.46"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 YR Rainfall=6.70"

| Area (sf) | CN | Description |
|---|---|---|
| 8,879 | 98 | Paved roads w/curbs & sewers |
| 8,879 | | Impervious Area |

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

## Summary for Subcatchment B2: B2

Runoff = 2.93 cfs @ 12.09 hrs, Volume= 0.215 af, Depth= 5.08"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 YR Rainfall=6.70"

| Area (sf) | CN | Description |
|---|---|---|
| 12,204 | 98 | Paved roads w/curbs & sewers |
| 3,238 | 70 | Woods, Good, HSG C |
| 5,811 | 71 | Meadow, non-grazed, HSG C |
| 860 | 74 | >75% Grass cover, Good, HSG C |
| 22,113 | 86 | Weighted Average |
| 9,909 | | Pervious Area |
| 12,204 | | Impervious Area |

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

## Summary for Subcatchment B3: B3

Runoff = 0.64 cfs @ 12.08 hrs, Volume= 0.052 af, Depth= 6.46"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 YR Rainfall=6.70"

| Area (sf) | CN | Description |
|---|---|---|
| 4,242 | 98 | Paved roads w/curbs & sewers |
| 4,242 | | Impervious Area |

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

## Summary for Subcatchment B3B: B3B

Runoff = 0.69 cfs @ 12.08 hrs, Volume= 0.056 af, Depth= 6.46"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 YR Rainfall=6.70"

| Area (sf) | CN | Description |
|---|---|---|
| 4,562 | 98 | Paved parking & roofs |
| 4,562 | | Impervious Area |

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

## Summary for Subcatchment B4: B4

Runoff = 0.43 cfs @ 12.08 hrs, Volume= 0.035 af, Depth= 6.46"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 YR Rainfall=6.70"

| Area (sf) | CN | Description |
|---|---|---|
| 2,843 | 98 | Paved roads w/curbs & sewers |
| 2,843 | | Impervious Area |

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

## Summary for Subcatchment B4B: B4A

Runoff = 1.28 cfs @ 12.08 hrs, Volume= 0.103 af, Depth= 6.34"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 YR Rainfall=6.70"

| Area (sf) | CN | Description |
|---|---|---|
| 8,239 | 98 | Paved parking & roofs |
| 265 | 74 | >75% Grass cover, Good, HSG C |
| 8,504 | 97 | Weighted Average |
| 265 | | Pervious Area |
| 8,239 | | Impervious Area |

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

## Summary for Subcatchment B5: B5

Runoff = 2.00 cfs @ 12.08 hrs, Volume= 0.150 af, Depth= 5.53"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 YR Rainfall=6.70"

| Area (sf) | CN | Description |
|---|---|---|
| 9,780 | 98 | Paved roads w/curbs & sewers |
| 2,175 | 70 | Woods, Good, HSG C |
| 868 | 71 | Meadow, non-grazed, HSG C |
| 1,385 | 74 | >75% Grass cover, Good, HSG C |
| 14,208 | 90 | Weighted Average |
| 4,428 | | Pervious Area |
| 9,780 | | Impervious Area |

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

## Summary for Subcatchment C1: C1

Runoff = 0.66 cfs @ 12.08 hrs, Volume= 0.054 af, Depth= 6.46"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 YR Rainfall=6.70"

| Area (sf) | CN | Description |
|---|---|---|
| 4,401 | 98 | Paved roads w/curbs & sewers |
| 4,401 | | Impervious Area |

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

## Summary for Subcatchment DET: Detention Area

Runoff = 1.11 cfs @ 12.09 hrs, Volume= 0.079 af, Depth= 3.78"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 YR Rainfall=6.70"

| Area (sf) | CN | Description |
|---|---|---|
| 10,851 | 74 | >75% Grass cover, Good, HSG C |
| 10,851 | | Pervious Area |

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

## Summary for Reach POI 1: POI 1

Inflow Area = 4.299 ac, 33.83% Impervious, Inflow Depth > 4.30" for 100 YR event
Inflow = 13.34 cfs @ 12.25 hrs, Volume= 1.542 af
Outflow = 13.34 cfs @ 12.25 hrs, Volume= 1.542 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

## Summary for Reach R: R

Inflow Area = 0.101 ac,100.00% Impervious, Inflow Depth = 6.46" for 100 YR event
Inflow = 0.66 cfs @ 12.08 hrs, Volume= 0.054 af
Outflow = 0.37 cfs @ 12.20 hrs, Volume= 0.054 af, Atten= 45%, Lag= 7.1 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.26 fps, Min. Travel Time= 22.4 min
Avg. Velocity = 0.08 fps, Avg. Travel Time= 72.7 min

Peak Storage= 491 cf @ 12.20 hrs, Average Depth at Peak Storage= 0.06'
Bank-Full Depth= 0.50', Capacity at Bank-Full= 18.75 cfs

18.00' x 0.50' deep channel, n= 0.200 Sheet flow: Woods+light brush
Side Slope Z-value= 54.0 '/' Top Width= 72.00'
Length= 354.0' Slope= 0.0593 '/'
Inlet Invert= 95.00', Outlet Invert= 74.00'

‡

## Summary for Reach R1: R1

Inflow = 2.16 cfs @ 12.19 hrs, Volume= 0.036 af
Outflow = 1.17 cfs @ 12.32 hrs, Volume= 0.036 af, Atten= 46%, Lag= 7.5 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.30 fps, Min. Travel Time= 10.7 min
Avg. Velocity = 0.08 fps, Avg. Travel Time= 42.8 min

Peak Storage= 756 cf @ 12.32 hrs, Average Depth at Peak Storage= 0.15'
Bank-Full Depth= 1.00', Capacity at Bank-Full= 64.45 cfs

18.00' x 1.00' deep channel, n= 0.200 Sheet flow: Woods+light brush
Side Slope Z-value= 54.0 '/' Top Width= 126.00'
Length= 196.0' Slope= 0.0306 '/'
Inlet Invert= 80.00', Outlet Invert= 74.00'

‡

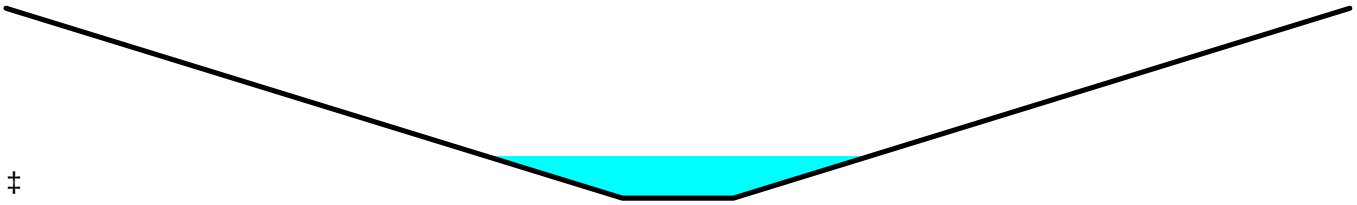
## Summary for Reach R2: R2

Inflow Area = 1.749 ac, 66.60% Impervious, Inflow Depth > 4.37" for 100 YR event
Inflow = 4.01 cfs @ 12.19 hrs, Volume= 0.638 af
Outflow = 3.77 cfs @ 12.30 hrs, Volume= 0.637 af, Atten= 6%, Lag= 6.6 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.42 fps, Min. Travel Time= 5.4 min
Avg. Velocity = 0.18 fps, Avg. Travel Time= 12.7 min

Peak Storage= 1,230 cf @ 12.30 hrs, Average Depth at Peak Storage= 0.22'
Bank-Full Depth= 1.00', Capacity at Bank-Full= 121.42 cfs

18.00' x 1.00' deep channel, n= 0.200 Sheet flow: Woods+light brush
Side Slope Z-value= 100.0 '/' Top Width= 218.00'
Length= 138.0' Slope= 0.0435 '/'
Inlet Invert= 80.00', Outlet Invert= 74.00'



‡

## Summary for Pond CB B1: CB B1

Inflow Area = 1.500 ac, 77.66% Impervious, Inflow Depth = 5.78" for 100 YR event
Inflow = 9.31 cfs @ 12.08 hrs, Volume= 0.722 af
Primary = 9.31 cfs @ 12.08 hrs, Volume= 0.722 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

## Summary for Pond CB B2: CB B2

Inflow Area = 0.508 ac, 55.19% Impervious, Inflow Depth = 5.08" for 100 YR event
Inflow = 2.93 cfs @ 12.09 hrs, Volume= 0.215 af
Primary = 2.93 cfs @ 12.09 hrs, Volume= 0.215 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

## Summary for Pond CB B3: CB B3

Inflow Area = 0.684 ac, 84.25% Impervious, Inflow Depth = 5.98" for 100 YR event
Inflow = 4.35 cfs @ 12.08 hrs, Volume= 0.341 af
Primary = 4.35 cfs @ 12.08 hrs, Volume= 0.341 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

## Summary for Pond CB B4: B4

Inflow Area = 0.587 ac, 81.64% Impervious, Inflow Depth = 5.90" for 100 YR event
Inflow = 3.71 cfs @ 12.08 hrs, Volume= 0.289 af
Primary = 3.71 cfs @ 12.08 hrs, Volume= 0.289 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

## Summary for Pond CB B5: CB B5

Inflow Area = 0.326 ac, 68.83% Impervious, Inflow Depth = 5.53" for 100 YR event
Inflow = 2.00 cfs @ 12.08 hrs, Volume= 0.150 af
Primary = 2.00 cfs @ 12.08 hrs, Volume= 0.150 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

## Summary for Pond CB C1: C1

Inflow Area = 0.101 ac,100.00% Impervious, Inflow Depth = 6.46" for 100 YR event
Inflow = 0.66 cfs @ 12.08 hrs, Volume= 0.054 af
Primary = 0.66 cfs @ 12.08 hrs, Volume= 0.054 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

## Summary for Pond CBB4A: CB B4A

Inflow Area = 0.195 ac, 96.88% Impervious, Inflow Depth = 6.34" for 100 YR event
Inflow = 1.28 cfs @ 12.08 hrs, Volume= 0.103 af
Primary = 1.28 cfs @ 12.08 hrs, Volume= 0.103 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

## Summary for Pond DET O: OPEN BASIN

Inflow Area = 1.749 ac, 66.60% Impervious, Inflow Depth = 5.49" for 100 YR event
Inflow = 10.41 cfs @ 12.08 hrs, Volume= 0.801 af
Outflow = 6.17 cfs @ 12.19 hrs, Volume= 0.674 af, Atten= 41%, Lag= 6.4 min
Primary = 4.01 cfs @ 12.19 hrs, Volume= 0.638 af
Secondary = 2.16 cfs @ 12.19 hrs, Volume= 0.036 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 91.16' @ 12.19 hrs Surf.Area= 6,342 sf Storage= 14,004 cf

Plug-Flow detention time= 174.8 min calculated for 0.673 af (84% of inflow)
Center-of-Mass det. time= 108.0 min ( 880.9 - 772.8 )

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 88.42' | 19,677 cf | **Custom Stage Data (Prismatic)**Listed below (Recalc) |

| Elevation (feet) | Surf.Area (sq-ft) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) |
|---|---|---|---|
| 88.42 | 3,965 | 0 | 0 |
| 89.00 | 4,433 | 2,435 | 2,435 |
| 90.00 | 5,263 | 4,848 | 7,283 |
| 91.00 | 6,192 | 5,728 | 13,011 |
| 92.00 | 7,141 | 6,667 | 19,677 |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 85.99' | **24.0" x 60.0' long Culvert** CPP, projecting, no headwall, Ke= 0.900<br>Outlet Invert= 81.50' S= 0.0748 '/' Cc= 0.900 n= 0.012 |
| #2 | Secondary | 91.00' | **13.0' long x 14.0' breadth Broad-Crested Rectangular Weir**<br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60<br>Coef. (English) 2.64 2.67 2.70 2.65 2.64 2.65 2.65 2.63 |
| #3 | Device 1 | 89.62' | **0.5' long x 0.5' breadth Broad-Crested Rectangular Weir**<br>Head (feet) 0.20 0.40 0.60 0.80 1.00<br>Coef. (English) 2.80 2.92 3.08 3.30 3.32 |
| #4 | Device 1 | 90.50' | **0.5' long x 0.5' breadth Broad-Crested Rectangular Weir** |

Head (feet) 0.20 0.40 0.60 0.80 1.00
Coef. (English) 2.80 2.92 3.08 3.30 3.32

**Primary OutFlow** Max=4.01 cfs @ 12.19 hrs HW=91.16' TW=80.21' (Dynamic Tailwater)
└**1=Culvert** (Passes 4.01 cfs of 24.38 cfs potential flow)
  ├**3=Broad-Crested Rectangular Weir** (Weir Controls 3.17 cfs @ 4.12 fps)
  └**4=Broad-Crested Rectangular Weir** (Weir Controls 0.84 cfs @ 2.55 fps)

**Secondary OutFlow** Max=2.16 cfs @ 12.19 hrs HW=91.16' TW=80.09' (Dynamic Tailwater)
└**2=Broad-Crested Rectangular Weir** (Weir Controls 2.16 cfs @ 1.05 fps)

## Summary for Pond MH B3B: MH B3B

Inflow Area = 0.612 ac, 62.85% Impervious, Inflow Depth = 5.31" for 100 YR event
Inflow = 3.62 cfs @ 12.08 hrs, Volume= 0.271 af
Primary = 3.62 cfs @ 12.08 hrs, Volume= 0.271 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

## Summary for Pond MHB5A: MH B5A

Inflow Area = 0.521 ac, 79.34% Impervious, Inflow Depth = 5.83" for 100 YR event
Inflow = 3.28 cfs @ 12.08 hrs, Volume= 0.253 af
Primary = 3.28 cfs @ 12.08 hrs, Volume= 0.253 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

# APPENDIX F

## Open Detention Basin Stage Storage Computations

# STAGE STORAGE CALCULATIONS

**Sediment Forebay Volume**

| Stage | Elevation (ft) | Area (sq.ft) | Volume (cubic.ft) |
|---|---|---|---|
| 0 | 86 | 25 | 0 |
| 1 | 87 | 118 | 72 |
| 2 | 88 | 301 | 281 |

**Basin Stage Storage**

| Stage | Elevation (ft) | Area (sq.ft) | Volume (cubic.ft) | |
|---|---|---|---|---|
| 0 | 88.42 | 3965 | 0 | |
| 0.58 | 89 | 4443 | 2,438 | |
| 1.58 | 90 | 5263 | 7,291 | 5077 WQV required |
| 2.58 | 91 | 6192 | 13,019 | |
| 3.58 | 92 | 7141 | 19,685 | |

# APPENDIX G

## Water Quality Summary Chart and Computations

# Stormwater Quality Treatment Computation Sheet
## Grassed Underdrain Filter - Updated July 15, 2014

**Area Tributary to the WQ Treatment Area**

| Subcatchment ID | Pervious Area | Impervious Area | Total Area |
|---|---|---|---|
| B1 | 0 | 8,879 | 8,879 |
| B2 | 9,909 | 12,204 | 22,113 |
| B3 | 0 | 4,242 | 4,242 |
| B3B | 0 | 4,562 | 4,562 |
| B4 | 0 | 2,843 | 2,843 |
| B4A | 266 | 8,238 | 8,504 |
| B5 | 4,428 | 9,780 | 14,208 |
| Sub Total (B Series) | 14,603 | 50,748 | 65,351 |
| Sub Total (B Series) | 0.34 | 1.17 | 1.50 |
| | | | |
| DET (SF) | 10,851 | 0 | 10,851 |
| DET (AC) | 0.25 | 0.00 | 0.25 |
| | | | |
| Treatement Total (SF) | 25,454 | 50,748 | 76,202 |
| Treatement Total (AC) | 0.58 | 1.17 | 1.75 |

**Site Area**

| AREA | UNIT | DESCRIPTION |
|---|---|---|
| 3.24 | AC | Original Parcel |
| 0.12 | AC | Entrance Easement Area |
| | | |
| 3.36 | AC | Total Project Parcel |

| | | | |
|---|---|---|---|
| Offisite Area Being Treated | 6,572 | 1,343 | SF |
| Onsite Developed Area NOT Being Treated | 22,869 | 2,279 | SF |
| | | | |
| Total Onsite Impervious Area (SF) | | 51,684 | SF |
| Total Onsite Impervious Area (AC) | | 1.19 | AC |
| | | | |
| Total Onsite Developed Pervious Area (SF) | 41,751 | | SF |
| Total Onsite Development Pervious Area (AC) | 0.96 | | AC |

| | | | | |
|---|---|---|---|---|
| Total Onsite Developed Area (SF) | 41,751 | 51,684 | 93,435 | SF |
| Total Onsite Developed Area (AC) | 0.96 | 1.19 | 2.14 | AC |
| **Percent of Impervious Area Treated** | | 98.19% | | ≥ 95% Required |
| **Percent of Devolped Area Treated** | | | 81.56% | ≥ 80% Required |
| | | | | |
| **Water Quality Volume Required (CF)** | 848 | 4,229 | 5,077 | CF |
| **Water Quality Volume Provided (CF)** | | | 5,343 | CF |
| ***Underdrain Soil Filter Area Required (SF)** | | | 3,046 | SF |
| **Underdrain Soil Filter Area Provided (SF)** | | | 3,518 | SF |

*** Underdrain Soil Filters are required to be 5% of total impervious area + 2 % of total pervious area according to Chapter 7.1, Volume III of the Maine Dep Storm Water BMP manual.**

# APPENDIX H

## Orifice Drawdown Computations

Underdrained Soil Filter

DRAWDOWN CALCULATIONS
Convenience Store
Portland, ME

3118
JRP
July 2014

**ORIFICE DIAMETER FOR GRASSED UNDERDRAIN SOIL FILTER-DET 0**

| Elevation | Depth (ft) | Surface Area (sq.ft) | Area End (sq.ft) | Area End Depth (ft) | Incremental Stage Volume (c.f) | Cumulative Volume (c.f.) | Head (ft) | Orifice Flow (cfs) | Drawdown Time (secs) | Drawdown Time (hours) |
|---|---|---|---|---|---|---|---|---|---|---|
| 89.62 | 1.20 | 4,948.00 | 4690.50 | 0.62 | 2908.11 | 5343.53 | 3.53 | 0.049 | 58962.69 | 16.4 |
| 89.00 | 0.58 | 4,433.00 | 4199.00 | 0.58 | 2435.42 | 2435.42 | 2.91 | 0.045 | 54385.26 | 15.1 |
| 88.42 | 0.00 | 3,965.00 | 0.00 | 0.00 | 0.00 | 0.00 | 2.33 | 0.040 | 0.00 | 0.0 |
| | | | | | | | TOTAL | 0.134 | ***TOTAL*** | ***31.5*** |

Note: Water Quality Volume Achieved at 89.62, 24-36 hour draw down requirements based on water quality depth

**$CA\ (2gh)^{1/2}$**

| Orifice Diameter | 1 | inch |
|---|---|---|
| Area | 0.0055 | sq.ft |
| Head | | feet |
| g | 32.174 | $ft/s^2$ |
| C | 0.6 | Orifice/Grate |

# APPENDIX I

## Geotechnical Exploration Test Pit Logs

**(On file with original submission – not included with this submission)**

# APPENDIX J

## Erosion Control Plan

**(On file with original submission – not included with this submission)**

# APPENDIX K

**AMENDED**

## Inspection & Maintenance Manual for Stormwater Management and Related Stormwater Facilities

# INSPECTION AND MAINTENANCE MANUAL FOR STORMWATER MANAGEMENT AND RELATED STORMWATER FACILITIES

# CONVENIENCE STORE AND FUEL STATION PORTLAND, ME

**PREPARED FOR:**

**PORTLAND PROPERTY HOLDINGS, LLC**
**2 MAIN STREET**
**TOPSHAM, MAINE 04086**
**(207) 865-4323**

**PREPARED BY:**

**FAY, SPOFFORD & THORNDIKE**
**778 MAIN STREET, SUITE 8**
**SOUTH PORTLAND, MAINE 04106**
**(207) 775-1121**

**APRIL 2013**
**UPDATED JULY 21, 2014**

# TABLE OF CONTENTS

# I. INTRODUCTION

Relatively complex stormwater management facilities are commonly installed in development projects including, commercial facilities, and many other developments. The complexity and goals of these systems vary with the nature of the receiving water, as well as the type of development. Runoff from developed areas of the project, including rooftops, paved or lawn areas, typically contain materials that can impact the receiving waters. Source control and the installation of wet ponds, infiltration galleries, and water quality units, often combined with pretreatment measures or followed by vegetated buffer strips and other best management practices, can significantly reduce the non-point pollution discharge from the developed area. These measures are particularly important to projects in the watersheds of sensitive water bodies, or projects with potential impacts to groundwater. With the increased cost of land and development, there is an increased tendency to construct portions of the stormwater management systems underground.

The effectiveness of water quality management provisions and other components of the stormwater management system are dependent on their design, upkeep, and maintenance to assure they meet their intended function over an extended period of years. It is critical that the stormwater management facilities are regularly inspected, and that maintenance is performed on an as-needed basis. It must also be recognized that the effectiveness of these facilities, and their maintenance requirements, are related to the stormwater drainage facilities that collect and transport the flow to the ponds, infiltration galleries, and other treatment measures. Thus, maintenance should be directed to the total system, not just the pond or primary stormwater management facility.

The purpose of this document is to define, in detail, the inspection and maintenance requirements deemed necessary to assure that the stormwater management facilities function as intended when they were designed. Subsequent sections identify individual maintenance items, give a brief commentary of the function and need for the item, a description of the work required, and a suggested frequency of accomplishment. While the suggested programs and schedules must be adapted to specific projects, the material presented should provide guidance for a successful long-term program for operation and maintenance. A supplemental section provides guidance for construction monitoring of the facilities during their installation and more detailed checklists. Certain facilities, specifically the groundwater recharge and infiltration beds are not intended to be placed in service until the tributary catchment area has the permanent cover in place and any contributing turf areas have achieved a 90% catch of vegetation (i.e. established).

## A. GUIDELINES OVERVIEW

A summary of the individual components of stormwater management facilities has been prepared. The format used in the summary is as follows:

Preface: A general description of what function/benefit the element is intended to provide. This is a short summary and not intended to provide the design basis which can be found in other sources.

Inspection: This section provides the inspection requirements for the individual component.

Maintenance: The section provides general information on the routine maintenance requirements of this element.

Frequency: This section outlines the best judgment of the designer on the system to the frequency of maintenance.

Comments: This section provides any particular comment on the site-specific features of this element. This is a summary only. The owner/operator should review the design drawings and documents carefully to understand the particular elements of the project. The end of this section should allow for the owner/operator to make notes on the specific program. This may include the selected maintenance procedure, cross-references to applicable design drawings, etc.

A list of the individual inspection/maintenance elements is provided in the table of contents. The guidelines are proposed for initial use with adjustments made as appropriate based upon specific project experience.

## II. PROJECT OVERVIEW

Key permits issued (or applied for) on the project include:

- MeDEP Stormwater Permit (City of Portland Delegated Review Authority)
- City of Portland Site Plan Review
- MeDEP Waste Discharge Permit – Post-Construction Stormwater Discharge to the Long Creek Watershed

The permit applications pending for the project include the design information for the stormwater system.

A copy of the permits for the project should be appended to this manual as Appendix B. The Owner/Operator of the stormwater management system should review these permits for a general description and background of the project, as well as any specific permit conditions or requirements of the project.

The applicant has retained Fay, Spofford & Thorndike (FST) for civil engineering for the Convenience Store and Fuel Station development in Portland, Maine. FST has prepared the design for the stormwater management facilities and may be contacted at:

Fay, Spofford & Thorndike
778 Main Street, Suite 8
South Portland, Maine 04106
(207) 775-1121

It is recommended the preparer of the plan be contacted with any particular questions on the design intent or similar issues.

The applicable plans/design documents which apply to the project are:

1. Civil Site Plans/Permit Applications Prepared by Fay, Spofford & Thorndike
2. The Erosion Control/Sedimentation Control Plan for the project.
3. The Stormwater Management Plan for the project.

A copy of these documents should be retained with the manual.

The site is tributary to the Long Creek Watershed.

The proposed design will include deep sump catch basins, oil absorbent sorbent booms, underground detention including the use of an arched chamber system and StormTreat™ system tank, and collection, conveyance, and discharge systems.

The project is subject to the requirements of the City of Portland Code of Ordinances, Chapter 32. Specifically the post construction stormwater management plan. The City requirements have been reiterated for ease of reference; however, the owner shall be responsible to meet the current City code.

*"Any person owning, operating or otherwise having control over a BMP required by a post construction stormwater management plan shall maintain the BMP's in accordance with the approved plan and shall demonstrate compliance with that plan as follows:*

*(a) Inspections. The owner of operator of a BMP shall hire a qualified post-construction stormwater inspector to at least annually, inspect the BMP's, 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 an 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 BMP's."*

## III. STANDARD INSPECTION/MAINTENANCE DESCRIPTIONS

The following narratives describe the inspection/maintenance provisions for the Stormwater Management area. These O&M procedures will complement scheduled sweeping of the pavement areas anticipated to occur at least twice per year. The MeDEP will require the stormwater system be certified to meet the basis of design at five year increments. Proper O&M is necessary to make sure the system can be certified.

### A. POND OVERFLOW

Preface: The stormwater detention facilities proposed for the project include an open detention basin. The storage portion of the detention basin will travel to a level-lip spreader and discharge to the wetlands on the easterly side of the property. The open graded detention basin will store the water quality volume processed by the Grassed Underdrained Soil filter. If the detention storage volume were exceeded, water would spill over the emergency overflows weir at the northeast corner of the detention basin.

Inspection: There are inspection ports that should be checked semiannually to make sure that water is not ponded due to blockage.

Maintenance: The upstream measures are intended to reduce and presumably eliminate maintenance cleanings. Major cleaning would likely require excavation of the system although some success has been reported with fire flow flushing.

### B. CONTROL STRUCTURES

Preface: The water quality volume will be detained in the open detention basin and bleed through the treatment measure (Soil Filter). A 6 ft dia. Manhole will control to the release from the Underdrained Soil Filter with an orifice cap on the outlet underdrain pipe. Runoff for storm events larger than 1" will overflow a 1 ft long Broad Crested weir. The outlet control structure has been designed to detain the runoff from the 2, 10, and 25-year storm events with a slow release over the Broad Crested Weir. Therefore, flow is anticipated to be released during and after every major storm event. Minor events will filter through the underdrained filter. The control structure will be designed to be inspected by removing the manhole covers and inspection of the orifice, weir, and channels. Debris should be removed whenever observed and reported to key maintenance personnel since any debris would indicate lack of proper system O&M in the collection and conveyance system. Entry may require CONFINED SPACE ENTRY procedures and appropriately trained personnel.

Inspection: The outlet control structures must be inspected to assure it maintains its intended hydraulic characteristics. The inspection would note any debris or sediment which may accumulate in the structure and in the inlet and outlet pipes. It is noted that it does not take much debris or silt to alter the hydraulic characteristics of the discharge. The inlet should be inspected to

assure it is not blocked or restricted or there is sediment to the extent that its flow characteristics may be altered.

Maintenance: Maintenance of the control structure will consist primarily of removing debris which may accumulate and sealing the bulkhead if leakage occurs.

Frequency: The control structure should be inspected quarterly, and after a high intensity rainfall event (in excess of 3 inches in a 24-hour period.

Maintenance/Inspection Responsibility:

Inspection Personnel: The maintenance personnel will be an outside agent hired by Portland Property Holdings, LLC and will perform the scheduled maintenance/inspection.

Dates of inspections, maintenance performed, and any observed problems should be noted in the logs/records maintained by the outside agent.

Outside Contract Services: The outlet structure should be opened/inspected by the outside agent of Portland Property Holdings, LLC on a quarterly basis. The logs and records of inspections and maintenance of the control structures should be maintained during each 5-year re-certification interval.

Replacement Parts/Repairs: No normal replacement parts are required. Inspection personnel should have a bucket to remove debris from the structure. If leakage of the bulkhead occurs, it is recommended that repairs be made by a professional contractor familiar with hydraulic grouts.

## C. STORMWATER INLETS

Preface: The success of any stormwater facility relies on the ability to intercept stormwater runoff at the design locations. Stormwater inlets may include catch basins, open culverts, culverts with bar screens, and field inlets. Inlets exist throughout the system at the points of collection as well as at the outlet of many ponds. Bar racks are common on many inlet locations which intercept an open channel. This section is directed at maintenance of the actual inlet point. A later section addresses more substantive maintenance of the structures and conveyance facilities. The inlets contain oil absorbent sorbent booms to retain oils and avoid discharge to downgradient areas. These will become saturated with oil over time and require replacement.

Inspection: The inspection of inlet points will need to be coordinated with other maintenance items, these include:

- Roadway/parking lot maintenance areas
- Building maintenance areas
- Grounds maintenance

The key elements of the inspection are to assure the inlet entry point is clear of debris and will allow the intended water entry.

Maintenance: The key maintenance is the removal of any blockage which restricts the entry of stormwater to the inlet. The removed material should be

taken out of the area of the inlet and placed where it will not reenter the runoff collection system. Snow should be removed from inlets in parking lots/roadway areas. Grass clippings and leaves should be bagged and removed particularly near the yard inlets near the building.

Frequency: All inlets should be inspected on a quarterly basis, and after/during significant storm events. A windshield survey is suitable for most inlets but off road inlets and pond structures require more rigorous inspection.

Maintenance/Inspection Responsibility:

Maintenance Personnel: The outside agent will perform the normal maintenance/inspections of the inlets and culvert crossings.

Comments: Maintenance of inlets is critical on this project.

**POORLY STABILIZED INLET ALLOWS ENTRANCE OF DEBRIS AND REDUCED CAPACITY**

**STABILIZED INLETS REDUCE DEBRIS ACCUMULATION AND MAINTAIN DESIGN CAPACITY**

## D. TRIBUTARY DRAINAGE SYSTEM

Preface: Stormwater from most of the project will be directed through a conveyance system that transports the flow to water quality units. This conveyance system will be principally overland flow discharging to piped drain systems. Most of the sediment carried by the drainage system is intended to be trapped in the catch basin, sediment forebay, isolator row or water quality units. Maintenance of this system can play a major role in the long-term maintenance costs and the effectiveness of the treatment systems.

Inspection: The tributary drainage system should be periodically inspected to assure that it is operating as intended, and that its carrying capacity has not been diminished by accumulations of debris and sediment or other hydraulic impediments. On piped systems the inlets must be inspected to ensure the rims are set at the proper elevation to optimize flow entry and are not clogged with leaves or other debris. The inlet basins are normally equipped with sumps which will remove large sediment particles from the flow stream with hooded outlets. The inlet basins may be equipped with oil absorbent sorbent booms which should be inspected for saturation. Once the boom becomes saturated it will appear brown or black in color and will be ineffective at removing oils.

The level of sediment in the sumps should be checked to assure their effectiveness. Pipelines connecting the inlets should be checked to determine if siltation is occurring. This will be most critical on drain lines laid at minimal slopes. This can usually be accomplished by a light and mirror procedure.

In some projects most of the stormwater is carried in open swales, channels, or ditches. These conveyance channels may be rip rapped or vegetated, depending on the gradient and expected flow velocities. These facilities must be inspected to insure debris or sedimentation does not reduce their carrying capacity. Excess vegetative growth must also be noted. The surface protection for the channels, either stone or vegetation, must be inspected to insure its integrity. Any areas subject to erosion should be noted.

Maintenance: Maintenance of the storm drainage system must assure that it continues to serve its design function on a long term basis, and that its operation does not transport excessive sedimentation to any downstream detention pond, or the receiving waters. Elevations on the rim of catch basins should be adjusted as needed to assure optimal water entry. Depending on the frost susceptibility of the soil, the rims may become elevated over time causing flow to circumvent the inlet. When the sump in an inlet restricts capacity and is half full with silt or other deleterious materials, the catch basin cleaning would normally be accomplished with vacuum trucks contracted as a maintenance service for the development center. The removed material must be disposed of at an approved site for such materials. The removed and replaced sorbent boom shall be disposed of in accordance with local and state regulations.

If sediment in the pipeline exceeds 20% of the diameter of the pipe, it should be removed. This may be accomplished by hydraulic flushing, or by mechanical means. If hydraulic flushing is used the downstream conditions should be analyzed. In general a sump or sediment trap should be used where it can be

flushed into the underground detention pond, since it will reduce pond volume and hasten the time when it must be cleaned.

Frequency: The piped drainage system should be inspected on an annual basis. Adjustment of inlet rim elevations should be on an as needed basis. Cleaning catch basin sumps and pipelines will depend on the rate of accumulation.

Maintenance/Inspection Responsibility:

Maintenance Personnel: Outside agent appointed by Portland Property Holdings, LLC.

Special Services: The owner will elect to contract with an independent agent for cleaning catch basins, sumps, pipelines, and replacement of sorbent booms. Remedial source control measures may be performed by the owner or an outside service depending upon the nature of the particular situation.

Comments: Maintenance of inlets is critical on this project.

**A WELL STABILIZED VEGETATED SWALE SHOWS LITTLE SIGNS OF EROSIVE VELOCITIES OR FLOWS. THIS SWALE ALSO FUNCTIONS AS A POND SPILLWAY**

## E. WATER QUALITY FILTERS (ABOVE GROUND)

Preface: The soil filter is an underdrain system with multi-media aggregates. A typical section is in the site drawings for the project. This section is applicable to the underdrained grass soil filter.

Inspection: The soil filter can be inspected visually. A good time for inspection is within one day of a substantial rain event.

Maintenance:

*Inlets*
Inlets to each soil filter area should be kept open and in good working condition. This is particularly important around curb breaks and sidewalk culvert. These locations should be marked on the roadway at the completion of construction to allow for winter snow dam removal. All eroded areas should be repaired.

*Initial Turf Maintenance (when applicable)*

Grassed soil filters should be allowed to develop for one full growing season post-construction prior to their first mowing. This allows for natural reseeding of grass seed mixes and establishment of a healthy stand of grass.

*Long-Term Turf Maintenance (when applicable)*
It is preferable to only mow grassed soil filter two to three times per year. While grassed soil filters can be mown during routine lawn maintenance, excessive mowing reduces the viability of grasses and grass roots and can overcompact the surface layer of the soil filter media.

*Large Debris*
Large debris within the ponding area should be removed.

*Erosion in the Soil Filter Area*
Any eroded areas should be repaired as soon as practicable.

*Weeds in the Soil Filter Area*
Periodic weeding of the soil filter area may be necessary, particularly in the landscaped soil filters. Hand weeding is required as the use of herbicides is not recommended.

*Surface Mulch Layer (when applicable)*
Areas devoid of mulch should be re-mulched by hand. Every year, in the spring, a fresh layer of mulch should be added to the soil filter area.

*Sedimentation (or Clogging) of Soil Filter Area*
If the soil filter area is holding water for a period longer than 48-72 hours, the soil mix has, more than likely, become clogged with sediment and/or the underdrains have clogged. To correct a standing water problem, the following remedial actions are recommended:

1. Evaluate the drainage area to the soil filter area to identify any potential sources of sediment, such as an erosive condition, that may be contributing to the clogging of the device. If a source is identified, it is recommended that that source be eliminated to the fullest extent practicable before proceeding with the remaining recommendations provided below.

2. Flush the underdrains. Use cleanouts to flush the underdrains. Sediment in the drains may be preventing the soil mix from draining. Make sure to provide a way to capture any flushed sediment before it enters the stream environment or storm drain system downstream of the device. If, after flushing the underdrains, the device continues to hold water, the soil mix may be contaminated. As such, following the guidelines provided below is recommended.

3. Gage the extent of soil contamination. To do this, it is recommended that one or more test pits be dug with a shovel and that the soil layer be evaluated for contamination. Once the levels of contamination have been determined (for example, the top 4" of soil appears to be contaminated), it is recommended that you proceed with the remaining remedial actions.

4. Harvest the plants (when applicable). Care should be taken in the removal and temporary storage of the plants so that as many as possible can be

harvested for replanting in the soil filter area once the functioning of the device has been restored sufficiently.

5. Remove the mulch layer.
6. Remove the top few inches of contaminated soil plus an additional 2-inch of soil, and replace the removed soil with a clean soil mix in accordance with the soil mix specification applicable to the particular soil filter area.
7. Monitor the functioning of the soil filter area during the next two to three rain events. If the device appears to be draining as intended (e.g., there is no standing water 48-72 following a rain event), proceed with the remaining remedial actions. If the area continues to hold standing water, then the entire soil filter area soil mix and the underdrains may need to be removed and replaced. Reuse of any undamaged underdrains may be possible once they have been cleaned thoroughly.
8. Replant the harvested plants, and replace any plants that were rendered unusable during or following their removal from the soil filter area.
9. Replace the removed mulch layer with fresh mulch.
10. Water the plants in the soil filter for the next two or more weeks unless there is sufficient rainfall. This will help the plants to reestablish themselves.

Frequency: The water quality filters should be inspected semi-annually and maintained as needed.

Applicability: The development has one filter. **Snow storage with-in the filter should be prohibited by Maintenance Personnel.**

## F. SEDIMENT FOREBAY

Preface: The detention basin above the Underdrained Grassed Soil Filter will be constructed with a forebay sump constructed by installing a rip rap pool to separate the inlet from most of the pond. The purpose of this sump is to collect and detain sediment void before it is transported to the treatment units through the inlet pipe.

Inspection: During dry periods it should be possible to inspect the forebay sump and to measure the sediment accumulation.

Maintenance: If a significant accumulation of sediment is recorded in the sump it should be removed. The material removed from the sump should be disposed of in accordance with local practice for disposing of catch basin cleanings.

Frequency: The forebay sump should be inspected four times a year if possible, preferably in the early summer after spring runoff, during late summer, and in the fall. The frequency of sump cleaning will depend on the rate of sediment buildup. Cleaning on a 1 to 2 year basis is likely. It is noted that cleaning of the forebay sump will lengthen the time between filter bed cleanings.

The rate of sediment buildup will depend on the tributary drainage facilities, i.e., faster buildup with open ditch transport systems and buildup from pipe systems

with sumped catch basins. Maintenance practiced for the tributary drainage system will also impact sediment buildups.

Comments: None.

**THIS SEDIMENT SUMP ALSO FUNCTIONS AS AN OUTLET PLUNGE POOL TO PROVIDE PROTECTION AND REDUCE VELOCITIES PRIOR TO DISCHARGE TO POND AREAS**

## G. SORBENT BOOMS

Preface: During construction, sorbent booms will be installed in the catch basins which have pavement areas. The intent of these is to absorb oil and runoff from new pavement surfaces. These will be removed and replaced when construction of the project is complete and should be inspected quarterly and replaced annually or as required.

Inspection: The sorbent boom should be raised out of the inlet, inspected, and replaced if necessary. Inspection should occur for the first year and annually thereafter concurrent with the catch basin cleaning.

Recommendation: It is recommended this project have additional sorbent booms or pillows onsite in the event of an unexpected spill or if oil sheen is observed frequently on any inlet.

Maintenance: The inspection and replacement should be conducted as part of a third party O&M contract and require disposal of used sorbent booms as “special wastes”.

## H. PARKING LOT CLEANING

To protect the catch basin sediment sumps, underground storage, and StormTreat™ water quality filter, it is recommended the parking lot be 4 times between April and November and that power washing with an appropriate

vacuum/power wash vehicle be done once a year or as required by the Long Creek Watershed Management District.

Maintenance: It is recommended this service be contract with the firm that maintains lawns and landscaping.

### I. LITTER

Litter should be removed as a matter of course by workers and a part of the grounds maintenance contract.

### J. SUMMARY CHECKLIST

The above described inspection and maintenance items have been summarized on a checklist appended hereto as Appendix C.

## IV. PROGRAM ADMINISTRATION

### A. GENERAL

A reliable administrative structure must be established to assure implementation of the maintenance programs described in the foregoing section. Key factors that must be considered in establishing a responsive administrative structure include:

1. Administrative body must be responsible for long-term operation and maintenance of the facilities.

2. Administrative body must have the financial resources to accomplish the inspection and maintenance program over the life of the facility.

3. The administrative body must have a responsible administrator to manage the inspection and maintenance programs.

4. The administrative body must have the staff to accomplish the inspection and maintenance programs, or must have authority to contract for the required services.

5. The administrative body must have a management information system sufficient to file, retain, and retrieve all inspection and maintenance records associated with the inspection and maintenance programs.

If any of the above criteria cannot be met by the entity assigned inspection and maintenance responsibilities, it is likely that the system will fail to meet its water quality objectives at some point during its life. While each of the above criteria may be met by a variety of formats, it is critical to clearly establish the assigned administrative body in a responsible and sustainable manner.

### B. RECORD KEEPING

Records of all inspections and maintenance work accomplished must be kept and maintained to document facility operations. These records should be filed and retained for a minimum 5-year time span. The filing system should be capable of ready retrieval of data for periodic reviews by appropriate regulatory bodies. Where possible, copies of such records should also be filed with the

designated primary regulatory agency for their review for compliance with permit conditions. Typical inspection and maintenance record forms are attached hereto as Appendix A.

## C. CONTRACT SERVICES

In some instances or at specific times, the Maintenance Personnel may not have the staff to conduct the required inspection and/or maintenance programs as outlined in this document. In such cases the work should be accomplished on a contractual basis with a firm or organization that has the staff and equipment to accomplish the required work.

The service contract for inspection and maintenance should be formal, well written legal document which clearly defines the services to be provided, the contractual conditions that will apply, and detailed payment schedules. Liability insurance should be required in all contracts.

# APPENDIX A

## Sample Inspection Logs

***CONVENIENCE STORE AND FUEL STATION***
**PORTLAND, MAINE**

STORMWATER MANAGEMENT
UNDERGROUND DETENTION
ANNUAL INSPECTION & MAINTENANCE LOG

| | | | |
|---|---|---|---|
| **FACILITY:** | | **YEAR:** | |
| **LOCATION:** | | **CONTRACTOR:** | |
| **FUNCTION:** | | **INSPECTOR:** | |
| **DATE OF INSPECTION:** | | | |
| **ITEM IDENTIFICATION** | **DESCRIPTION OF CONDITIONS** | **MAINTENANCE ACCOMPLISHED** | **DATE OF MAINTENANCE** |
| | | | |
| | | | |
| | | | |
| GENERAL COMMENTS: | | | |

***CONVENIENCE STORE AND FUEL STATION***
**PORTLAND, MAINE**

STORMWATER MANAGEMENT
UNDERGROUND DETENTION
MONTHLY INSPECTION & MAINTENANCE LOG

| | | | | | | |
|---|---|---|---|---|---|---|
| FACILITY: | | | YEAR: | | | |
| LOCATION: | | | CONTRACTOR: | | | |
| FUNCTION: | | | | | | |
| | | | | OVERFLOW WEIR | | |
| MONTH | DAY | INSPECTOR | WATER DEPTH | CLEAR | DEBRIS | WEIR CONDITION |
| JANUARY | | | | | | |
| FEBRUARY | | | | | | |
| MARCH | | | | | | |
| APRIL | | | | | | |
| MAY | | | | | | |
| JUNE | | | | | | |
| JULY | | | | | | |
| AUGUST | | | | | | |
| SEPTEMBER | | | | | | |
| OCTOBER | | | | | | |
| NOVEMBER | | | | | | |
| DECEMBER | | | | | | |
| LIST SPECIAL MAINTENANCE UNDERTAKEN: | | | | | | |

***CONVENIENCE STORE AND FUEL STATION***
**PORTLAND, MAINE**

STORMWATER MANAGEMENT
UNDERGROUND DETENTION
SEMI-ANNUAL INSPECTION & MAINTENANCE LOG

| | |
|---|---|
| **SEMI-ANNUAL INSPECT 1.2** | FACILITY: |
| DATE: | LOCATION: |
| INSPECTOR: | FUNCTION: |
| WEIR CONDITION: | |
| OUTLET CONDITION | |

| FORE BAY SUMP | EST. DEPTH SED. | REMOVED? Y/N | EST. VOL. CY | WHERE DISPOSED OF | STRUCTURAL CONDITION |
|---|---|---|---|---|---|
| | | | | | |

| |
|---|
| CONTROL STRUCTURE: |
| DESCRIBE CONDITIONS FOUND & MAINTENANCE ACCOMPLISHED: |

# APPENDIX B

## Permits for Project

## (To be Added at a Subsequent Time)

# APPENDIX C

## Summary Checklist
## Inspection and Maintenance

## Stormwater Management System
## Maintenance Program
## Summary Checklist

| Item | Commentary | Frequency | | | | |
|---|---|---|---|---|---|---|
| | | Monthly | Quarterly | Semi-Annual | Annual | Long Term |
| Control Structure | Inspect outlet control to assure it maintains its hydraulic characteristics. Inspect inlets for blockage. | | X | | | |
| Stormwater Inlets in Series | Stormwater inlets allow flow entry from a surface swale to a piped system. Entry may or may not be equipped with a bar rack. Inspect entry for debris accumulation. Remove debris to allow unimpeded entry. Lawn clippings and leaves should be removed from yard areas. | | X | | X Clearing | |
| Tributary Drainage | Inspect to assure that the carrying capacity has not been diminished by debris, sediment or other hydraulic impediments. | | | | X | |
| Sediment Monitoring/ Water Quality Filters | Inspect for standing water longer than 48 hours, sedimentation, outlet control, and healthy grass growth. | | | X | | X |
| Sediment in Forebay | | | | X | | |
| Sorbent Booms | Sorbent boom should be raised out of the inlet, inspected, and replaced if necessary. | | X | | X | |
| Parking Lot Cleaning | Parking lot should be swept 4 times between April and November. Power washing with an appropriate vacuum/power wash vehicle should be done once a year or as required by the Long Creek Watershed Management District. | | X | | X | |
| Litter | Litter should be removed daily. | | | | | |
| | | | | | | |
| | | | | | | |

# APPENDIX D

## Draft Stormwater Maintenance, Housekeeping and Inspection Contract

**(submitted with original submission – not included with this submission)**