

**NHDES WETLANDS PERMIT APPLICATION –  
STANDARD DREDGE & FILL**

**North Mill Pond Outfall Improvements & Marsh  
Restoration**

In conjunction with  
**Fleet Street Area Improvements – Phase 1:  
Maplewood Avenue Drainage Improvements**

*May 2024*

**City of Portsmouth  
680 Peverly Hill Road  
Portsmouth, NH 03801**



**Portsmouth, New Hampshire**

## NHDES Wetlands Permit Application

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# STANDARD DREDGE AND FILL WETLANDS PERMIT APPLICATION

Water Division / Land Resources Management  
[Check the Status of your Application](#)



**RSA/Rule:** RSA 482-A/Env-Wt 100-900

**APPLICANT'S NAME:**

**TOWN NAME:**

|                               |                               |                               |            |
|-------------------------------|-------------------------------|-------------------------------|------------|
| Administrative<br>Use<br>Only | Administrative<br>Use<br>Only | Administrative<br>Use<br>Only | File No.:  |
|                               |                               |                               | Check No.: |
|                               |                               |                               | Amount:    |
|                               |                               |                               | Initials:  |

A person may request a waiver of the requirements in Rules Env-Wt 100-900 to accommodate situations where strict adherence to the requirements would not be in the best interest of the public or the environment but is still in compliance with RSA 482-A. A person may also request a waiver of the standards for existing dwellings over water pursuant to RSA 482-A:26, III(b). For more information, please consult the [Waiver Request Form](#).

**SECTION 1 - REQUIRED PLANNING FOR ALL PROJECTS (Env-Wt 306.05; RSA 482-A:3, I(d)(2))**  
Please use the [Wetland Permit Planning Tool \(WPPT\)](#), the Natural Heritage Bureau (NHB) [DataCheck Tool](#), the [Aquatic Restoration Mapper](#), or other sources to assist in identifying key features such as: [Priority Resource Areas \(PRAs\)](#), [protected species or habitats](#), coastal areas, designated rivers, or designated prime wetlands.

|  |  |
|--|--|
| Has the required planning been completed?  | <input type="checkbox"/> Yes <input type="checkbox"/> No   |
| Does the property contain a PRA? If yes, provide the following information: <ul style="list-style-type: none"> <li>• Does the project qualify for an Impact Classification Adjustment (e.g. NH Fish and Game Department (NHFG) and NHB agreement for a classification downgrade) or a Project-Type Exception (e.g. Maintenance or Statutory Permit-by-Notification (SPN) project)? See Env-Wt 407.02 and Env-Wt 407.04.</li> <li>• Protected species or habitat?                         <ul style="list-style-type: none"> <li>○ If yes, species or habitat name(s):</li> <li>○ NHB Project ID #:</li> </ul> </li> <li>• Bog?</li> <li>• Floodplain wetland contiguous to a tier 3 or higher watercourse?</li> <li>• Designated prime wetland or duly-established 100-foot buffer?</li> <li>• Sand dune, tidal wetland, tidal water, or undeveloped tidal buffer zone?</li> </ul> | <input type="checkbox"/> Yes <input type="checkbox"/> No<br><br><input type="checkbox"/> Yes <input type="checkbox"/> No<br><br><input type="checkbox"/> Yes <input type="checkbox"/> No<br><br><input type="checkbox"/> Yes <input type="checkbox"/> No<br><br><input type="checkbox"/> Yes <input type="checkbox"/> No<br><br><input type="checkbox"/> Yes <input type="checkbox"/> No |
| Is the property within a Designated River corridor? If yes, provide the following information: <ul style="list-style-type: none"> <li>• Name of Local River Management Advisory Committee (LAC):</li> <li>• A copy of the application was sent to the LAC on Month:      Day:      Year:</li> </ul>  | <input type="checkbox"/> Yes <input type="checkbox"/> No   |

|   |  |
|---|--|
| For dredging projects, is the subject property contaminated?<br>• If yes, list contaminant: | <input type="checkbox"/> Yes <input type="checkbox"/> No |
|---|--|

|   |  |
|---|--|
| Is there potential to impact impaired waters, class A waters, or outstanding resource waters? | <input type="checkbox"/> Yes <input type="checkbox"/> No |
|---|--|

For stream crossing projects, provide watershed size (see [WPPT](#) or Stream Stats):

**SECTION 2 - PROJECT DESCRIPTION (Env-Wt 311.04(i))**  
 Provide a description of the project and the purpose of the project, the need for the proposed impacts to jurisdictional areas, an outline-of the scope of work to be performed, and whether impacts are temporary or permanent.

**SECTION 3 - PROJECT LOCATION**  
 Separate wetland permit applications must be submitted for each municipality within which wetland impacts occur.

ADDRESS:

TOWN/CITY:

TAX MAP/BLOCK/LOT/UNIT:

US GEOLOGICAL SURVEY (USGS) TOPO MAP WATERBODY NAME:  
 N/A

(Optional) LATITUDE/LONGITUDE in decimal degrees (to five decimal places):

|  |        |           |
|--|--------|-----------|
| <b>SECTION 4 - APPLICANT (DESIRED PERMIT HOLDER) INFORMATION (Env-Wt 311.04(a))</b>  |        |           |
| If the applicant is a trust or a company, then complete with the trust or company information.   |        |           |
| NAME:  |        |           |
| MAILING ADDRESS:   |        |           |
| TOWN/CITY:   | STATE: | ZIP CODE: |
| EMAIL ADDRESS:   |        |           |
| FAX:   | PHONE: |           |
| ELECTRONIC COMMUNICATION: By initialing here, I hereby authorize NHDES to communicate all matters relative to this application electronically. |        |           |
| <b>SECTION 5 - AUTHORIZED AGENT INFORMATION (Env-Wt 311.04(c))</b>   |        |           |
| <input type="checkbox"/> N/A   |        |           |
| LAST NAME, FIRST NAME, M.I.:   |        |           |
| COMPANY NAME:  |        |           |
| MAILING ADDRESS:   |        |           |
| TOWN/CITY:   | STATE: | ZIP CODE: |
| EMAIL ADDRESS:   |        |           |
| FAX:   | PHONE: |           |
| ELECTRONIC COMMUNICATION: By initialing here, I hereby authorize NHDES to communicate all matters relative to this application electronically. |        |           |
| <b>SECTION 6 - PROPERTY OWNER INFORMATION (IF DIFFERENT THAN APPLICANT) (Env-Wt 311.04(b))</b>   |        |           |
| If the owner is a trust or a company, then complete with the trust or company information.   |        |           |
| <input type="checkbox"/> Same as applicant   |        |           |
| NAME:  |        |           |
| MAILING ADDRESS:   |        |           |
| TOWN/CITY:   | STATE: | ZIP CODE: |
| EMAIL ADDRESS:   |        |           |
| FAX:   | PHONE: |           |
| ELECTRONIC COMMUNICATION: By initialing here, I hereby authorize NHDES to communicate all matters relative to this application electronically. |        |           |

[irm@des.nh.gov](mailto:irm@des.nh.gov) or (603) 271-2147

29 Hazen Drive, PO Box 95, Concord, NH 03302-0095

[des.nh.gov](http://des.nh.gov)

**SECTION 7 - RESOURCE-SPECIFIC CRITERIA ESTABLISHED IN Env-Wt 400, Env-Wt 500, Env-Wt 600, Env-Wt 700, OR Env-Wt 900 HAVE BEEN MET (Env-Wt 313.01(a)(3))**

Describe how the resource-specific criteria have been met for each chapter listed above (please attach information about stream crossings, coastal resources, prime wetlands, or non-tidal wetlands and surface waters):

**SECTION 8 - AVOIDANCE AND MINIMIZATION**

Impacts within wetland jurisdiction must be avoided to the maximum extent practicable (Env-Wt 313.03(a)).\* Any project with unavoidable jurisdictional impacts must then be minimized as described in the [Wetlands Best Management Practice Techniques For Avoidance and Minimization](#) and the [Wetlands Permitting: Avoidance, Minimization and Mitigation fact sheet](#). For minor or major projects, a functional assessment of all wetlands on the project site is required (Env-Wt 311.03(b)(10)).\*

Please refer to the application checklist to ensure you have attached all documents related to avoidance and minimization, as well as functional assessment (where applicable). Use the [Avoidance and Minimization Checklist](#), the [Avoidance and Minimization Narrative](#), or your own avoidance and minimization narrative.

*\*See Env-Wt 311.03(b)(6) and Env-Wt 311.03(b)(10) for shoreline structure exemptions.*

**SECTION 9 - MITIGATION REQUIREMENT (Env-Wt 311.02)**

If unavoidable jurisdictional impacts require mitigation, a mitigation [pre-application meeting](#) must occur at least 30 days but not more than 90 days prior to submitting this Standard Dredge and Fill Permit Application.

Mitigation Pre-Application Meeting Date: Month: Day: Year: April 2, 2024

N/A - Mitigation is not required

**SECTION 10 - THE PROJECT MEETS COMPENSATORY MITIGATION REQUIREMENTS (Env-Wt 313.01(a)(1)c)**

Confirm that you have submitted a compensatory mitigation proposal that meets the requirements of Env-Wt 800 for all permanent unavoidable impacts that will remain after avoidance and minimization techniques have been exercised to the maximum extent practicable:  I confirm submittal.

N/A – Compensatory mitigation is not required

**SECTION 11 - IMPACT AREA (Env-Wt 311.04(g))**

For each jurisdictional area that will be/has been impacted, provide square feet (SF) and, if applicable, linear feet (LF) of impact, and note whether the impact is after-the-fact (ATF; i.e., work was started or completed without a permit).

For intermittent and ephemeral streams, the linear footage of impact is measured along the thread of the channel. *Please note, installation of a stream crossing in an ephemeral stream may be undertaken without a permit per Rule Env-Wt 309.02(d), however other dredge or fill impacts should be included below.*

For perennial streams/ivers, the linear footage of impact is calculated by summing the lengths of disturbances to the channel and banks.

Permanent (PERM.) impacts are impacts that will remain after the project is complete (e.g., changes in grade or surface materials).

Temporary (TEMP.) impacts are impacts not intended to remain (and will be restored to pre-construction conditions) after the project is completed.

| JURISDICTIONAL AREA |  | PERM.<br>SF | PERM.<br>LF | PERM.<br>ATF             | TEMP.<br>SF | TEMP.<br>LF | TEMP.<br>ATF             |
|---------------------|--|-------------|-------------|--------------------------|-------------|-------------|--------------------------|
| Wetlands            | Forested Wetland                               |             |             | <input type="checkbox"/> |             |             | <input type="checkbox"/> |
|                     | Scrub-shrub Wetland                            |             |             | <input type="checkbox"/> |             |             | <input type="checkbox"/> |
|                     | Emergent Wetland                               |             |             | <input type="checkbox"/> |             |             | <input type="checkbox"/> |
|                     | Wet Meadow                                     |             |             | <input type="checkbox"/> |             |             | <input type="checkbox"/> |
|                     | Vernal Pool                                    |             |             | <input type="checkbox"/> |             |             | <input type="checkbox"/> |
|                     | Designated Prime Wetland                       |             |             | <input type="checkbox"/> |             |             | <input type="checkbox"/> |
|                     | Duly-established 100-foot Prime Wetland Buffer |             |             | <input type="checkbox"/> |             |             | <input type="checkbox"/> |
| Surface             | Intermittent / Ephemeral Stream                |             |             | <input type="checkbox"/> |             |             | <input type="checkbox"/> |
|                     | Perennial Stream or River                      |             |             | <input type="checkbox"/> |             |             | <input type="checkbox"/> |
|                     | Lake / Pond                                    |             |             | <input type="checkbox"/> |             |             | <input type="checkbox"/> |
|                     | Docking - Lake / Pond                          |             |             | <input type="checkbox"/> |             |             | <input type="checkbox"/> |
|                     | Docking - River                                |             |             | <input type="checkbox"/> |             |             | <input type="checkbox"/> |
| Banks               | Bank - Intermittent Stream                     |             |             | <input type="checkbox"/> |             |             | <input type="checkbox"/> |
|                     | Bank - Perennial Stream / River                |             |             | <input type="checkbox"/> |             |             | <input type="checkbox"/> |
|                     | Bank / Shoreline - Lake / Pond                 |             |             | <input type="checkbox"/> |             |             | <input type="checkbox"/> |
| Tidal               | Tidal Waters                                   |             |             | <input type="checkbox"/> |             |             | <input type="checkbox"/> |
|                     | Tidal Marsh                                    |             |             | <input type="checkbox"/> |             |             | <input type="checkbox"/> |
|                     | Sand Dune                                      |             |             | <input type="checkbox"/> |             |             | <input type="checkbox"/> |
|                     | Undeveloped Tidal Buffer Zone (TBZ)            |             |             | <input type="checkbox"/> |             |             | <input type="checkbox"/> |
|                     | Previously-developed TBZ                       |             |             | <input type="checkbox"/> |             |             | <input type="checkbox"/> |
|                     | Docking - Tidal Water                          |             |             | <input type="checkbox"/> |             |             | <input type="checkbox"/> |
| <b>TOTAL</b>        |  |             |             |                          |             |             |                          |

**SECTION 12 - APPLICATION FEE (RSA 482-A:3, I)**

- MINIMUM IMPACT FEE:** Flat fee of \$400.
- NON-ENFORCEMENT RELATED, PUBLICLY-FUNDED AND SUPERVISED RESTORATION PROJECTS, REGARDLESS OF IMPACT CLASSIFICATION:** Flat fee of \$400 (refer to RSA 482-A:3, 1(c) for restrictions).
- MINOR OR MAJOR IMPACT FEE:** Calculate using the table below:

|   |    |            |    |
|---|----|------------|----|
| Permanent and temporary (non-docking):                                | SF | × \$0.40 = | \$ |
| Seasonal docking structure:   | SF | × \$2.00 = | \$ |
| Permanent docking structure:  | SF | × \$4.00 = | \$ |
| Projects proposing shoreline structures (including docks) add \$400 = |    |            | \$ |
| Total =   |    |            | \$ |

*The application fee for minor or major impact is the above calculated total or \$400, whichever is greater = \$*



**SECTION 13 - PROJECT CLASSIFICATION (Env-Wt 306.05)**  
 Indicate the project classification.

|   |  |   |
|---|--|---|
| <input type="checkbox"/> Minimum Impact Project | <input type="checkbox"/> Minor Project | <input checked="" type="checkbox"/> Major Project |
|---|--|---|

**SECTION 14 - REQUIRED CERTIFICATIONS (Env-Wt 311.11)**

**Initial each box below to certify:**

|                         |   |
|-------------------------|---|
| Initials:<br><i>DSR</i> | To the best of the signer's knowledge and belief, all required notifications have been provided.  |
| Initials:<br><i>DSR</i> | The information submitted on or with the application is true, complete, and not misleading to the best of the signer's knowledge and belief.  |
| Initials:<br><i>DSR</i> | The signer understands that: <ul style="list-style-type: none"> <li>• The submission of false, incomplete, or misleading information constitutes grounds for NHDES to:                         <ol style="list-style-type: none"> <li>1. Deny the application.</li> <li>2. Revoke any approval that is granted based on the information.</li> <li>3. If the signer is a certified wetland scientist, licensed surveyor, or professional engineer licensed to practice in New Hampshire, refer the matter to the joint board of licensure and certification established by RSA 310-A:1.</li> </ol> </li> </ul> |
| Initials:<br><i>DSR</i> | If the applicant is not the owner of the property, each property owner signature shall constitute certification by the signer that he or she is aware of the application being filed and does not object to the filing.   |

**SECTION 15 - REQUIRED SIGNATURES (Env-Wt 311.04(d); Env-Wt 311.11)**

|   |  |                         |
|---|--|-------------------------|
| SIGNATURE (OWNER):<br><i>Sean Mahoney, As Manager</i>                 | PRINT NAME LEGIBLY: <i>90 Maplewood Ave LLC</i><br><i>Sean Mahoney, As Manager</i> | DATE:<br><i>6/21/24</i> |
| SIGNATURE (APPLICANT, IF DIFFERENT FROM OWNER):<br><i>Peter C. R.</i> | PRINT NAME LEGIBLY:<br><i>Peter C. R.</i>  | DATE:<br><i>6/11/24</i> |
| SIGNATURE (AGENT, IF APPLICABLE):<br><i>Daniel J. Rochette</i>        | PRINT NAME LEGIBLY:<br><b>Daniel J. Rochette</b>                                   | DATE:<br><b>5-6-24</b>  |

**SECTION 16 - TOWN / CITY CLERK SIGNATURE (Env-Wt 311.04(f))**

As required by RSA 482-A:3, I(a)(1), I hereby certify that the applicant has filed four application forms, four detailed plans, and four UGS location maps with the town/city indicated below.

|   |  |
|---|--|
| TOWN/CITY CLERK SIGNATURE:<br><i>Kelli L. Barnaby</i> | PRINT NAME LEGIBLY:<br><i>Kelli L. Barnaby</i> |
| TOWN/CITY: Portsmouth                                 | DATE: <i>July 11, 2024</i>                     |

**DIRECTIONS FOR TOWN/CITY CLERK:**

Per RSA 482-A:3, I(a)(1)

1. IMMEDIATELY sign the original application form and four copies in the signature space provided above.
2. Return the signed original application form and attachments to the applicant so that the applicant may submit the application form and attachments to NHDES by mail or hand delivery.
3. IMMEDIATELY distribute a copy of the application with one complete set of attachments to each of the following bodies: the municipal Conservation Commission, the local governing body (Board of Selectmen or Town/City Council), and the Planning Board.
4. Retain one copy of the application form and one complete set of attachments and make them reasonably accessible for public review.

**DIRECTIONS FOR APPLICANT:**

Submit the original permit application form bearing the signature of the Town/City Clerk, additional materials, and the application fee to NHDES by mail or hand delivery at the address at the bottom of this page. Make check or money order payable to "Treasurer – State of NH".



# **ATTACHMENT A**

## **Attachment A: Minor and Major Projects**





STANDARD DREDGE AND FILL  
WETLANDS PERMIT APPLICATION  
ATTACHMENT A: MINOR AND MAJOR PROJECTS



Water Division/Land Resources Management  
Wetlands Bureau

[Check the Status of your Application](#)

**RSA/ Rule:** RSA 482-A/ Env-Wt 311.10; Env-Wt 313.01(a)(1); Env-Wt 313.03

**APPLICANT'S NAME:** City of Portsmouth

**TOWN NAME:** City of Portsmouth

Attachment A is required for *all minor and major projects*, and must be completed *in addition* to the [Avoidance and Minimization Narrative](#) or [Checklist](#) that is required by Env-Wt 307.11.

For projects involving construction or modification of non-tidal shoreline structures over areas of surface waters having an absence of wetland vegetation, only Sections I.X through I.XV are required to be completed.

**PART I: AVOIDANCE AND MINIMIZATION**

In accordance with Env-Wt 313.03(a), the Department shall not approve any alteration of any jurisdictional area unless the applicant demonstrates that the potential impacts to jurisdictional areas have been avoided to the maximum extent practicable and that any unavoidable impacts have been minimized, as described in the [Wetlands Best Management Practice Techniques For Avoidance and Minimization](#).

**SECTION I.I - ALTERNATIVES (Env-Wt 313.03(b)(1))**

Describe how there is no practicable alternative that would have a less adverse impact on the area and environments under the Department's jurisdiction.

THE ADDITION OF THE NEW PIPE PARALLEL TO THE EXISTING OUTFALL WILL LIMIT IMPACTS TO TIDAL EMBANKMENT WHERE EXISTING UTILITIES ALREADY EXIST. THIS IS MORE DESIREABLE THAN PROPOSING AN OUTFALL IN A NEW LOCATION THAT HAS BEEN PREVIOUSLY UNDISTURBED. THE GENERAL LOCATION OF THE OUTFALL IS ALSO ADJACENT TO A LOCATION THAT HAS BEEN PRE-DEVELOPED (PAVED LOT AND WAREHOUSE OR STABILIZED SHORE LINE). THEREFORE, OF ALL PRACTICABLE ALTERNATIVES, THE PROPOSED ALTERNATIVE WILL HAVE THE LEAST ADVERSE IMPACT ON THE AREA AND ENVIRONMENTS UNDER THE DEPARTMENT'S JURISDICTION.

**SECTION I.II - MARSHES (Env-Wt 313.03(b)(2))**

Describe how the project avoids and minimizes impacts to tidal marshes and non-tidal marshes where documented to provide sources of nutrients for finfish, crustacean, shellfish, and wildlife of significant value.

Proposed mitigation work adjacent to the outfall will re-establish a marsh in an area where they may have been one historically. The WPPT shows some limited marsh just to the east of the impact area and there is evidence of localized high marsh adjacent to the outfall and on the edge of the marsh restoration area. See Photos #9 and #11

**SECTION I.III - HYDROLOGIC CONNECTION (Env-Wt 313.03(b)(3))**

Describe how the project maintains hydrologic connections between adjacent wetland or stream systems.

The proposed work will not impact any existing hydrologic connections between adjacent wetland or stream systems.

**SECTION I.IV - JURISDICTIONAL IMPACTS (Env-Wt 313.03(b)(4))**

Describe how the project avoids and minimizes impacts to wetlands and other areas of jurisdiction under RSA 482-A, especially those in which there are exemplary natural communities, vernal pools, protected species and habitat, documented fisheries, and habitat and reproduction areas for species of concern, or any combination thereof.

The proposed work will be limited to the tidal embankment at North Mill Pond where an outfall currently exists. Per the Natural Heritage Bureau (NHB) data check one instance of the american eel was reported in the vicinity of the project area. A consultation with HFG has been requested to complete their environmental review for the project. Per the WPPT there are no prime wetlands or aquaculture sites in the vicinity of the project area.

**SECTION I.V - PUBLIC COMMERCE, NAVIGATION, OR RECREATION (Env-Wt 313.03(b)(5))**

Describe how the project avoids and minimizes impacts that eliminate, depreciate or obstruct public commerce, navigation, or recreation.

Impacts that eliminate, depreciate or obstruct public commerce, navigation, or recreation are not anticipated as a result of this project.



**SECTION I.VI - FLOODPLAIN WETLANDS (Env-Wt 313.03(b)(6))**

Describe how the project avoids and minimizes impacts to floodplain wetlands that provide flood storage.

There are no are no floodplains in the project area and impacts to those types or wetlands are not anticipated.

**SECTION I.VII - RIVERINE FORESTED WETLAND SYSTEMS AND SCRUB-SHRUB – MARSH COMPLEXES (Env-Wt 313.03(b)(7))**

Describe how the project avoids and minimizes impacts to natural riverine forested wetland systems and scrub-shrub – marsh complexes of high ecological integrity.

The WPPT described the impact area as mud flats. Therefore, no impacts to the wetlands categories listed.

**SECTION I.VIII - DRINKING WATER SUPPLY AND GROUNDWATER AQUIFER LEVELS (Env-Wt 313.03(b)(8))**

Describe how the project avoids and minimizes impacts to wetlands that would be detrimental to adjacent drinking water supply and groundwater aquifer levels.

There are no drinking water supplies in the vicinity of the project area.

**SECTION I.IX - STREAM CHANNELS (Env-Wt 313.03(b)(9))**

Describe how the project avoids and minimizes adverse impacts to stream channels and the ability of such channels to handle runoff of waters.

The project area is an outfall to a pond and no stream channels are impacted.

**SECTION I.X - SHORELINE STRUCTURES - CONSTRUCTION SURFACE AREA (Env-Wt 313.03(c)(1))**

Describe how the project has been designed to use the minimum construction surface area over surface waters necessary to meet the stated purpose of the structures.

The project will not require construction surface area over surface waters.

**SECTION I.XI - SHORELINE STRUCTURES - LEAST INTRUSIVE UPON PUBLIC TRUST (Env-Wt 313.03(c)(2))**

Describe how the type of construction proposed is the least intrusive upon the public trust that will ensure safe docking on the frontage.

North Mill Pond which has no docks is tidal with no water craft access due to the culvert/arch which connects the pond hydraulically to the Piscataqua River. Therefore, the proposed work will not impact docking on the shoreline.

**SECTION I.XII - SHORELINE STRUCTURES – ABUTTING PROPERTIES (Env-Wt 313.03(c)(3))**

Describe how the structures have been designed to avoid and minimize impacts on ability of abutting owners to use and enjoy their properties.

The proposed drainage improvements are directly adjacent to existing drainage systems already located on abutting properties. The pipe have been placed as far to the edge as practical so that future development is not hindered. Abutting property owners have been provided draft easment documents and preliminary design plans for the outfall improvements and comments have been received. The proposed mitigation work is located within the tidal waters of the state and will not negatively impact future development by abutters.

**SECTION I.XIII - SHORELINE STRUCTURES – COMMERCE AND RECREATION (Env-Wt 313.03(c)(4))**

Describe how the structures have been designed to avoid and minimize impacts to the public’s right to navigation, passage, and use of the resource for commerce and recreation.

The project impact area will be limited to the tidal embankment at North Mill Pond and will not cause any impacts to the public's right to navigation, passage, and use of the pond for commerce and recreation. The project is generally located on private property and public right to passge is limited. The project will improve grading at the outfall so that pipes and headwalls are no longer exposed as they are now. The stone apron will also allow for foot traffic (if any) to pass in front of the outfall at low tide rather than through the mud as is currently necessary. The outfall headwall will be relocated further into the bank and protrude less into the pond which will improve navigation of the shoreland for anyone recreating on the pond.

**SECTION I.XIV - SHORELINE STRUCTURES – WATER QUALITY, AQUATIC VEGETATION, WILDLIFE AND FINFISH HABITAT (Env-Wt 313.03(c)(5))**

Describe how the structures have been designed, located, and configured to avoid impacts to water quality, aquatic vegetation, and wildlife and finfish habitat.

The project impact area will be limited to the tidal embankment at North Mill Pond. Drainage improvements will include stormwater treatment to decrease the amount of nutrient pollutants discharged into North Mill Pond. Protective measures including temporary and permanent erosion control devices will be in place during construction to minimize any potential impacts that may occur. The outfall headwall will be relocated further into the bank and protrude less into the pond which will reduce its impact on the habitat. The proposed mitigation area will increase habitat diversity at the project site by re-establishing a marsh.

**SECTION I.XV - SHORELINE STRUCTURES – VEGETATION REMOVAL, ACCESS POINTS, AND SHORELINE STABILITY (Env-Wt 313.03(c)(6))**

Describe how the structures have been designed to avoid and minimize the removal of vegetation, the number of access points through wetlands or over the bank, and activities that may have an adverse effect on shoreline stability.

Minimal removal of vegetation will be required because the area is already partially developed and existing access points are available via paved driveways. The bank of the shoreline will be restored and stabilized and vegetation will be re-established once the construction of the new pipe and headwall is complete. The proposed mitigation will increase vegetation in the project area.

| <b>PART II: FUNCTIONAL ASSESSMENT</b>   |  |
|---|--|
| <b>REQUIREMENTS</b>   | Ensure that project meets the requirements of Env-Wt 311.10 regarding functional assessment (Env-Wt 311.04(j); Env-Wt 311.10). |
| <b>FUNCTIONAL ASSESSMENT METHOD USED:</b>   | Coastal functional assessment provided as separate attachment.   |
| <b>NAME OF CERTIFIED WETLAND SCIENTIST (FOR NON-TIDAL PROJECTS) OR QUALIFIED COASTAL PROFESSIONAL (FOR TIDAL PROJECTS) WHO COMPLETED THE ASSESSMENT:</b>  | TOM SOKOLOSKI, NO. 127   |
| <b>DATE OF ASSESSMENT:</b>  | MARCH 30, 2021   |
| Check this box to confirm that the application includes a NARRATIVE ON FUNCTIONAL ASSESSMENT:   | <input checked="" type="checkbox"/>  |
| For minor or major projects requiring a standard permit without mitigation, the applicant shall submit a wetland evaluation report that includes completed checklists and information demonstrating the RELATIVE FUNCTIONS AND VALUES OF EACH WETLAND EVALUATED. Check this box to confirm that the application includes this information, if applicable: | <input type="checkbox"/>   |
| <p>Note: The Wetlands Functional Assessment worksheet can be used to compile the information needed to meet functional assessment requirements.</p>   |  |



**ATTACHMENT B**

**US Army Corps of Engineers Documents**

**Appendix B Checklist**

**USFWS IPAC**

**NHDHR Section 106 Review**







**US Army Corps  
of Engineers**®  
New England District

## Appendix B

### **New Hampshire General Permits (GPs) Required Information and Corps Secondary Impacts Checklist**

In order for the Corps of Engineers to properly evaluate your application, applicants must submit the following information along with the New Hampshire DES Wetlands Bureau application or permit notification forms. Some projects may require more information. For a more comprehensive checklist, go to <https://www.nae.usace.army.mil/Missions/Regulatory/> “Useful Documents, Forms and Publications” and then “Corps Application Form and Guidance.” Check with the Corps at (978) 318-8832 for project-specific requirements. For your convenience, this Appendix B is also attached to the State of New Hampshire DES Wetlands Bureau application and Permit by Notification forms.

#### **All Projects:**

- New Hampshire Department of Environmental Services (DES) Wetlands Permit Application.
- Request for Project Review Form by the New Hampshire Division of Historical Resources (DHR).  
<https://www.nh.gov/nhdhr/review/rpr.htm>.
- Photographs of wetland/waterway to be impacted.
- Purpose of the project.
- Legible, reproducible plans no larger than 11”x17” with bar scale. Provide locus map and plan views of the entire property.
- Typical cross-section views of all wetland and waterway fill areas and wetland replication areas.
- In navigable waters, show mean low water (MLW) and mean high water (MHW) elevations. Show the high tide line (HTL) elevations when fill is involved. In other waters, show ordinary high water (OHW) elevation.
- On each plan, show the following for the project:
  - Vertical datum and the NAVD 1988 equivalent with the vertical units as U.S. feet. In coastal waters this may be mean higher high water (MHHW), mean high water (MHW), mean low water (MLW), mean lower low water (MLLW) or other tidal datum with the vertical units as U.S. feet. MLLW and MHHW are preferred. Provide the correction factor detailing how the vertical datum (e.g., MLLW) was derived using the latest National Tidal Datum Epoch for that area, typically 1983-2001.
  - Horizontal state plane coordinates in U.S. survey feet based on the Traverse Mercator Grid system for the State of New Hampshire (Zone 2800) NAD 83.
  - Project limits with existing and proposed conditions.
  - Limits of any Federal Navigation Project in the vicinity of the project area and horizontal State Plane Coordinates in U.S. survey feet for the limits of the proposed work closest to the Federal Navigation Project;
  - Volume, type, and source of fill material to be discharged into waters and wetlands, including the area(s) (in square feet or acres) of fill in wetlands, below the OHW in inland waters and below the HTL in coastal waters.
  - Delineation of all waterways and wetlands on the project site,;
- Use Federal delineation methods and include Corps wetland delineation data sheets (GC 2).
- For activities involving discharges of dredged or fill material into waters of the U.S., include a statement describing how impacts to waters of the U.S. are to be avoided and minimized, and either a statement describing how impacts to waters of the U.S. are to be compensated for (or a conceptual or detailed mitigation plan) or a statement explaining why compensatory mitigation should not be required for the proposed impacts. Please contact the Corps for guidance.



**US Army Corps  
of Engineers**<sup>®</sup>  
New England District

**New Hampshire General Permits (GPs)  
Appendix B - Corps Secondary Impacts Checklist  
(for inland wetland/waterway fill projects in New Hampshire)**

1. Attach any explanations to this checklist. Lack of information could delay a Corps permit determination.
2. All references to “work” include all work associated with the project construction and operation. Work includes filling, clearing, flooding, draining, excavation, dozing, stumping, etc.
3. See GC 5, regarding single and complete projects.
4. Contact the Corps at (978) 318-8832 with any questions.

| <b>1. Impaired Waters</b>   | Yes                               | No |
|---|-----------------------------------|----|
| 1.1 Will any work occur within 1 mile upstream in the watershed of an impaired water? See <a href="http://des.nh.gov/organization/divisions/water/wmb/section401/impaired_waters.htm">http://des.nh.gov/organization/divisions/water/wmb/section401/impaired_waters.htm</a> to determine if there is an impaired water in the vicinity of your work area.*  | X                                 |    |
| <b>2. Wetlands</b>  | Yes                               | No |
| 2.1 Are there are streams, brooks, rivers, ponds, or lakes within 200 feet of any proposed work?  | X                                 |    |
| 2.2 Are there proposed impacts to SAS, special wetlands. Applicants may obtain information from the NH Department of Resources and Economic Development Natural Heritage Bureau (NHB) DataCheck Tool for information about resources located on the property at <a href="https://www2.des.state.nh.us/nhb_datacheck/">https://www2.des.state.nh.us/nhb_datacheck/</a> . The book <a href="#">Natural Community Systems of New Hampshire also contains specific information about the natural communities found in NH.</a>                         |                                   | X  |
| 2.3 If wetland crossings are proposed, are they adequately designed to maintain hydrology, sediment transport & wildlife passage?   | NA                                |    |
| 2.4 Would the project remove part or all of a riparian buffer? (Riparian buffers are lands adjacent to streams where vegetation is strongly influenced by the presence of water. They are often thin lines of vegetation containing native grasses, flowers, shrubs and/or trees that line the stream banks. They are also called vegetated buffer zones.)  |                                   | X  |
| 2.5 The overall project site is more than 40 acres?   |                                   | X  |
| 2.6 What is the area of the previously filled wetlands?   | 225 SF                            |    |
| 2.7 What is the area of the proposed fill in wetlands?  | 3,600 SF                          |    |
| 2.8 What is the % of previously and proposed fill in wetlands to the overall project site?  | 0.8% Previously<br>12.6% Proposed |    |
| <b>3. Wildlife</b>  | Yes                               | No |
| 3.1 Has the NHB & USFWS determined that there are known occurrences of rare species, exemplary natural communities, Federal and State threatened and endangered species and habitat, in the vicinity of the proposed project? (All projects require an NHB ID number & a USFWS IPAC determination.) NHB DataCheck Tool: <a href="https://www2.des.state.nh.us/nhb_datacheck/">https://www2.des.state.nh.us/nhb_datacheck/</a> USFWS IPAC website: <a href="https://ecos.fws.gov/ipac/location/index">https://ecos.fws.gov/ipac/location/index</a> |                                   | X  |

|  |     |    |
|--|-----|----|
| 3.2 Would work occur in any area identified as either “Highest Ranked Habitat in N.H.” or “Highest Ranked Habitat in Ecological Region”? (These areas are colored magenta and green, respectively, on NH Fish and Game’s map, “2010 Highest Ranked Wildlife Habitat by Ecological Condition.”) Map information can be found at:<br><ul style="list-style-type: none"> <li>• PDF: <a href="https://wildlife.state.nh.us/wildlife/wap-high-rank.html">https://wildlife.state.nh.us/wildlife/wap-high-rank.html</a>.</li> <li>• Data Mapper: <a href="http://www.granit.unh.edu">www.granit.unh.edu</a>.</li> <li>• GIS: <a href="http://www.granit.unh.edu/data/downloadfreedata/category/databycategory.html">www.granit.unh.edu/data/downloadfreedata/category/databycategory.html</a>.</li> </ul> |     | X  |
| 3.3 Would the project impact more than 20 acres of an undeveloped land block (upland, wetland/waterway) on the entire project site and/or on an adjoining property(s)?   |     | X  |
| 3.4 Does the project propose more than a 10-lot residential subdivision, or a commercial or industrial development?  |     | X  |
| 3.5 Are stream crossings designed in accordance with the GC 21?  | NA  |    |
| <b>4. Flooding/Floodplain Values</b>   | Yes | No |
| 4.1 Is the proposed project within the 100-year floodplain of an adjacent river or stream?   | X   |    |
| 4.2 If 4.1 is yes, will compensatory flood storage be provided if the project results in a loss of flood storage?  | NA  |    |
| <b>5. Historic/Archaeological Resources</b>  |     |    |
| For a minimum, minor or major impact project - a copy of the Request for Project Review (RPR) Form ( <a href="http://www.nh.gov/nhdhr/review">www.nh.gov/nhdhr/review</a> ) with your DES file number shall be sent to the NH Division of Historical Resources as required on Page 11 GC 8(d) of the GP document**   | X   |    |

\*Although this checklist utilizes state information, its submittal to the Corps is a Federal requirement.

\*\* If your project is not within Federal jurisdiction, coordination with NH DHR is not required under Federal law.

# IPaC resource list

This report is an automatically generated list of species and other resources such as critical habitat (collectively referred to as *trust resources*) under the U.S. Fish and Wildlife Service's (USFWS) jurisdiction that are known or expected to be on or near the project area referenced below. The list may also include trust resources that occur outside of the project area, but that could potentially be directly or indirectly affected by activities in the project area. However, determining the likelihood and extent of effects a project may have on trust resources typically requires gathering additional site-specific (e.g., vegetation/species surveys) and project-specific (e.g., magnitude and timing of proposed activities) information.

Below is a summary of the project information you provided and contact information for the USFWS office(s) with jurisdiction in the defined project area. Please read the introduction to each section that follows (Endangered Species, Migratory Birds, USFWS Facilities, and NWI Wetlands) for additional information applicable to the trust resources addressed in that section.

## Location

Rockingham County, New Hampshire



## Local office

New England Ecological Services Field Office

☎ (603) 223-2541

📠 (603) 223-0104

70 Commercial Street Suite 300

70 Commercial Street, Suite 300  
Concord, NH 03301-5094

NOT FOR CONSULTATION

# Endangered species

**This resource list is for informational purposes only and does not constitute an analysis of project level impacts.**

The primary information used to generate this list is the known or expected range of each species. Additional areas of influence (AOI) for species are also considered. An AOI includes areas outside of the species range if the species could be indirectly affected by activities in that area (e.g., placing a dam upstream of a fish population even if that fish does not occur at the dam site, may indirectly impact the species by reducing or eliminating water flow downstream). Because species can move, and site conditions can change, the species on this list are not guaranteed to be found on or near the project area. To fully determine any potential effects to species, additional site-specific and project-specific information is often required.

Section 7 of the Endangered Species Act **requires** Federal agencies to "request of the Secretary information whether any species which is listed or proposed to be listed may be present in the area of such proposed action" for any project that is conducted, permitted, funded, or licensed by any Federal agency. A letter from the local office and a species list which fulfills this requirement can **only** be obtained by requesting an official species list from either the Regulatory Review section in IPaC (see directions below) or from the local field office directly.

For project evaluations that require USFWS concurrence/review, please return to the IPaC website and request an official species list by doing the following:

1. Draw the project location and click CONTINUE.
2. Click DEFINE PROJECT.
3. Log in (if directed to do so).
4. Provide a name and description for your project.
5. Click REQUEST SPECIES LIST.

Listed species<sup>1</sup> and their critical habitats are managed by the [Ecological Services Program](#) of the U.S. Fish and Wildlife Service (USFWS) and the fisheries division of the National Oceanic and Atmospheric Administration (NOAA Fisheries<sup>2</sup>).

Species and critical habitats under the sole responsibility of NOAA Fisheries are **not** shown on this list. Please contact [NOAA Fisheries](#) for [species under their jurisdiction](#).

- 
1. Species listed under the [Endangered Species Act](#) are threatened or endangered; IPaC also shows species that are candidates, or proposed, for listing. See the [listing status page](#) for more information. IPaC only shows species that are regulated by USFWS (see FAQ).

2. [NOAA Fisheries](#), also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

The following species are potentially affected by activities in this location:

## Mammals

| NAME  | STATUS     |
|---|------------|
| Northern Long-eared Bat <i>Myotis septentrionalis</i><br>Wherever found<br>No critical habitat has been designated for this species.<br><a href="https://ecos.fws.gov/ecp/species/9045">https://ecos.fws.gov/ecp/species/9045</a> | Threatened |

## Critical habitats

Potential effects to critical habitat(s) in this location must be analyzed along with the endangered species themselves.

There are no critical habitats at this location.

## Migratory birds

Certain birds are protected under the Migratory Bird Treaty Act<sup>1</sup> and the Bald and Golden Eagle Protection Act<sup>2</sup>.

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats should follow appropriate regulations and consider implementing appropriate conservation measures, as described [below](#).

1. The [Migratory Birds Treaty Act](#) of 1918.
2. The [Bald and Golden Eagle Protection Act](#) of 1940.

Additional information can be found using the following links:

- Birds of Conservation Concern <https://www.fws.gov/program/migratory-birds/species>
- Measures for avoiding and minimizing impacts to birds  
<https://www.fws.gov/library/collections/avoiding-and-minimizing-incident-take-migratory-birds>
- Nationwide conservation measures for birds  
<https://www.fws.gov/sites/default/files/documents/nationwide-standard-conservation-measures.pdf>



The birds listed below are birds of particular concern either because they occur on the [USFWS Birds of Conservation Concern \(BCC\)](#) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how this list is generated, see the FAQ [below](#). This is not a list of every bird you may find in this location, nor a guarantee that every bird on this list will be found in your project area. To see exact locations of where birders and the general public have sighted birds in and around your project area, visit the [E-bird data mapping tool](#) (Tip: enter your location, desired date range and a species on your list). For projects that occur off the Atlantic Coast, additional maps and models detailing the relative occurrence and abundance of bird species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list, including how to properly interpret and use your migratory bird report, can be found [below](#).

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, click on the PROBABILITY OF PRESENCE SUMMARY at the top of your list to see when these birds are most likely to be present and breeding in your project area.

| NAME   | BREEDING SEASON         |
|--|-------------------------|
| <b>Bald Eagle</b> <i>Haliaeetus leucocephalus</i><br>This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. | Breeds Oct 15 to Aug 31 |
| <b>Black-billed Cuckoo</b> <i>Coccyzus erythrophthalmus</i><br>This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.<br><a href="https://ecos.fws.gov/ecp/species/9399">https://ecos.fws.gov/ecp/species/9399</a>         | Breeds May 15 to Oct 10 |
| <b>Blue-winged Warbler</b> <i>Vermivora pinus</i><br>This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA   | Breeds May 1 to Jun 30  |
| <b>Bobolink</b> <i>Dolichonyx oryzivorus</i><br>This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.   | Breeds May 20 to Jul 31 |
| <b>Chimney Swift</b> <i>Chaetura pelagica</i><br>This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.  | Breeds Mar 15 to Aug 25 |

**Lesser Yellowlegs** *Tringa flavipes*

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

<https://ecos.fws.gov/ecp/species/9679>

Breeds elsewhere

**Prairie Warbler** *Dendroica discolor*

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Breeds May 1 to Jul 31

**Purple Sandpiper** *Calidris maritima*

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Breeds elsewhere

**Red-headed Woodpecker** *Melanerpes erythrocephalus*

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Breeds May 10 to Sep 10

**Rusty Blackbird** *Euphagus carolinus*

This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA

Breeds elsewhere

**Short-billed Dowitcher** *Limnodromus griseus*

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

<https://ecos.fws.gov/ecp/species/9480>

Breeds elsewhere

**Willet** *Tringa semipalmata*

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Breeds Apr 20 to Aug 5

**Wood Thrush** *Hylocichla mustelina*

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Breeds May 10 to Aug 31

## Probability of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read and understand the FAQ "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

### Probability of Presence (■)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is  $0.25/0.25 = 1$ ; at week 20 it is  $0.05/0.25 = 0.2$ .
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

To see a bar's probability of presence score, simply hover your mouse cursor over the bar.

### Breeding Season (■)

Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

### Survey Effort (|)

Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

To see a bar's survey effort range, simply hover your mouse cursor over the bar.

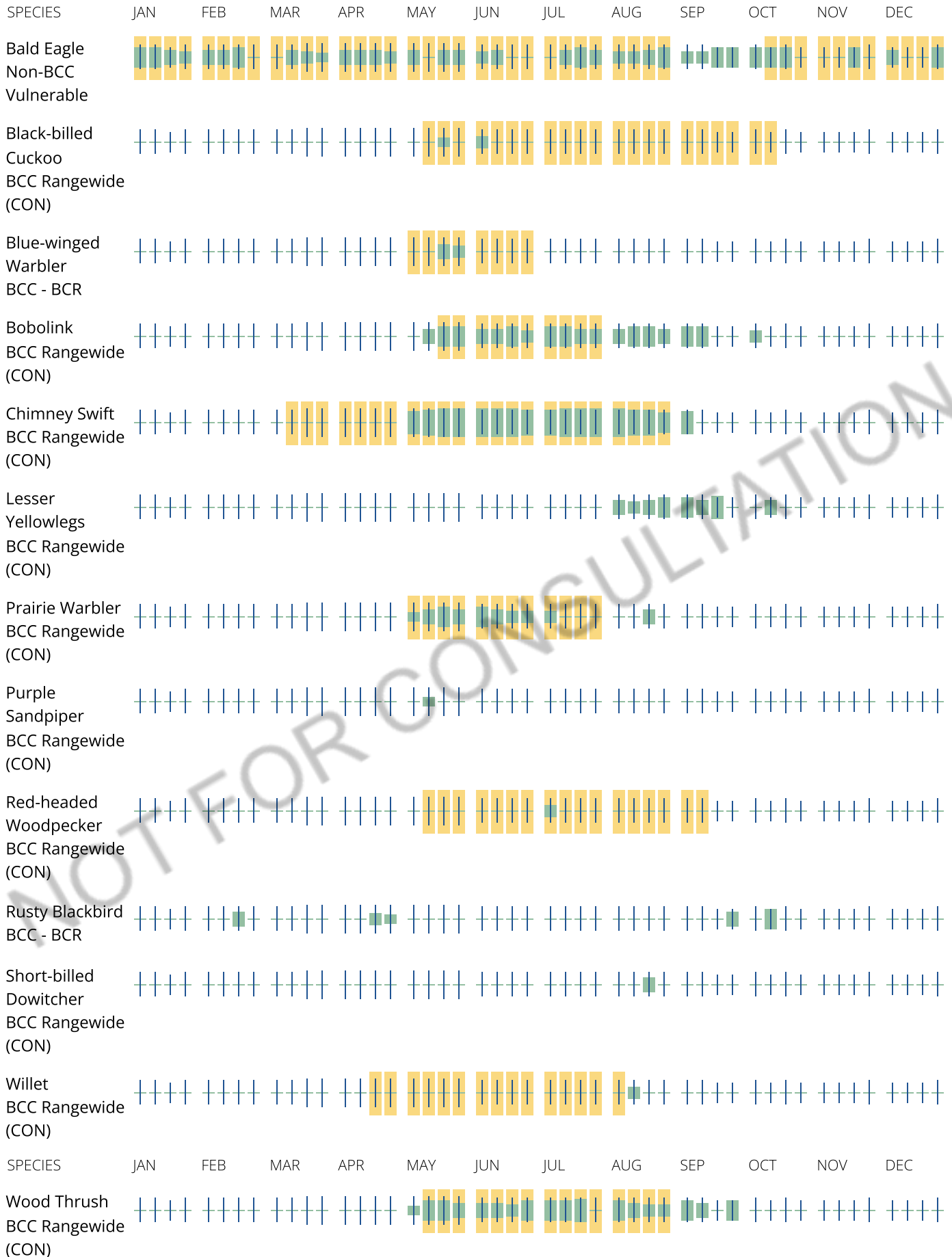
### No Data (—)

A week is marked as having no data if there were no survey events for that week.

### Survey Timeframe

Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.

■ probability of presence ■ breeding season | survey effort — no data



## **Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.**

[Nationwide Conservation Measures](#) describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. [Additional measures](#) or [permits](#) may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

## **What does IPaC use to generate the list of migratory birds that potentially occur in my specified location?**

The Migratory Bird Resource List is comprised of USFWS [Birds of Conservation Concern \(BCC\)](#) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the [Avian Knowledge Network \(AKN\)](#). The AKN data is based on a growing collection of [survey, banding, and citizen science datasets](#) and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle ([Eagle Act](#) requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the [Rapid Avian Information Locator \(RAIL\) Tool](#).

## **What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?**

The probability of presence graphs associated with your migratory bird list are based on data provided by the [Avian Knowledge Network \(AKN\)](#). This data is derived from a growing collection of [survey, banding, and citizen science datasets](#).

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

## **How do I know if a bird is breeding, wintering or migrating in my area?**

To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may query your location using the [RAIL Tool](#) and look at the range maps provided for birds in your area at the bottom of the profiles provided for each bird in your results. If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

## **What are the levels of concern for migratory birds?**

Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are [Birds of Conservation Concern](#) (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the [Eagle Act](#) requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

### **Details about birds that are potentially affected by offshore projects**

For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the [Northeast Ocean Data Portal](#). The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the [NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf](#) project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the [Diving Bird Study](#) and the [nanotag studies](#) or contact [Caleb Spiegel](#) or [Pam Loring](#).

### **What if I have eagles on my list?**

If your project has the potential to disturb or kill eagles, you may need to [obtain a permit](#) to avoid violating the Eagle Act should such impacts occur.

### **Proper Interpretation and Use of Your Migratory Bird Report**

The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ "What does IPaC use to generate the migratory birds potentially occurring in my specified location". Please be aware this report provides the "probability of presence" of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey effort (indicated by the black vertical bar) and for the existence of the "no data" indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to confirm presence, and helps guide you in knowing when to implement conservation measures to avoid or minimize potential impacts from your project activities, should presence be confirmed. To learn

more about conservation measures, visit the FAQ "Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds" at the bottom of your migratory bird trust resources page.

## Facilities

### National Wildlife Refuge lands

Any activity proposed on lands managed by the [National Wildlife Refuge](#) system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

There are no refuge lands at this location.

### Fish hatcheries

There are no fish hatcheries at this location.

### Wetlands in the National Wetlands Inventory (NWI)

Impacts to [NWI wetlands](#) and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local [U.S. Army Corps of Engineers District](#).

### Wetland information is not available at this time

This can happen when the National Wetlands Inventory (NWI) map service is unavailable, or for very large projects that intersect many wetland areas. Try again, or visit the [NWI map](#) to view wetlands at this location.

#### Data limitations

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

### **Data exclusions**

Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tubercid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

### **Data precautions**

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate Federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.



Please mail the completed form and required material to:

New Hampshire Division of Historical Resources  
State Historic Preservation Office  
Attention: Review & Compliance  
19 Pillsbury Street, Concord, NH 03301-3570

RECEIVED FEB 09 2023

2542.12

|               |           |
|---------------|-----------|
| DHR Use Only  |           |
| R&C #         | 14678     |
| Log In Date   | 2, 9, 23  |
| Response Date | 2, 16, 23 |
| Sent Date     | 2, 21, 23 |

## Request for Project Review by the New Hampshire Division of Historical Resources

- This is a new submittal  
 This is additional information relating to DHR Review & Compliance (R&C) #:

| GENERAL PROJECT INFORMATION   |   |
|---|---|
| Project Title   | Maplewood Avenue Outfall Improvements                     |
| Project Location  | 90 Maplewood Avenue                                       |
| City/Town   | Portsmouth  |
| Tax Map   | 125   |
| Lot #   | 19  |
| NH State Plane - Feet Geographic Coordinates:   | Easting 1225377   |
|   | Northing 211984   |
| <i>(See RPR Instructions and R&amp;C FAQs for guidance.)</i>  |   |
| Lead Federal Agency and Contact <i>(if applicable)</i><br><i>(Agency providing funds, licenses, or permits)</i> | Permit Type and Permit or Job Reference #                 |
| State Agency and Contact <i>(if applicable)</i>   | New Hampshire Department of Environmental Services        |
|   | Permit Type and Permit or Job Reference # Dredge and Fill |
| APPLICANT INFORMATION   |   |
| Applicant Name  | City of Portsmouth  |
| Mailing Address   | 680 Peverly Hill Road                                     |
| Phone Number  | 603.427.1530  |
| City  | Portsmouth  |
| State   | NH  |
| Zip   | 03801   |
| Email   | NA  |
| CONTACT PERSON TO RECEIVE RESPONSE  |   |
| Name/Company  | Zach Cronin   |
| Mailing Address   | 680 Peverly Hill Road                                     |
| Phone Number  | 603.610.7304  |
| City  | Portsmouth  |
| State   | NH  |
| Zip   | 03801   |
| Email   | NA  |

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FEB 27 2023  
UNDERWOOD ENGINEERING  
PORTSMOUTH, NH

***This form is updated periodically. Please download the current form at [www.nh.gov/nhdhr/review](http://www.nh.gov/nhdhr/review). Please refer to the Request for Project Review Instructions for direction on completing this form. Submit one copy of this project review form for each project for which review is requested. Please include a self-addressed stamped envelope. Project submissions will not be accepted via facsimile or e-mail.*** This form is required. Review request form must be complete for review to begin. Incomplete forms will be sent back to the applicant without comment. Please be aware that this form may only initiate consultation. For some projects, additional information will be needed to complete the Section 106 review. All items and supporting documentation submitted with a review request, including photographs and publications, will be retained by the DHR as part of its review records. Items to be kept confidential should be clearly identified. For questions regarding the DHR review process and the DHR's role in it, please visit our website at: [www.nh.gov/nhdhr/review](http://www.nh.gov/nhdhr/review) or contact the R&C Specialist at [marika.s.labash@dncr.nh.gov](mailto:marika.s.labash@dncr.nh.gov) or 603.271.3558.

PROJECTS C. NOT BE PROCESSED WITHOUT THE FOLLOWING INFORMATION

Project Boundaries and Description

- Attach the Project Mapping *using EMMIT or relevant portion of a 7.5' USGS Map.* (See RPR Instructions and R&C FAQs for guidance.)
- Attach a detailed narrative description of the proposed project.
- Attach a site plan. The site plan should include the project boundaries and areas of proposed excavation.
- Attach photos of the project area (overview of project location and area adjacent to project location, and specific areas of proposed impacts and disturbances.) (Informative photo captions are requested.)
- A DHR records search must be conducted to identify properties within or adjacent to the project area. Provide records search results via EMMIT or in **Table 1.** (Blank table forms are available on the DHR website.) Please note, using EMMIT Guest View for an RPR records search does not provide the necessary information needed for DHR review.  
EMMIT or in-house records search conducted on 10/6/2022.

Architecture

Are there any buildings, structures (bridges, walls, culverts, etc.) objects, districts or landscapes within the project area?  Yes  No  
If no, skip to Archaeology section. If yes, submit all of the following information:

Approximate age(s): 50 years

- Photographs of *each* resource or streetscape located within the project area, with captions, along with a mapped photo key. (Digital photographs are accepted. All photographs must be clear, crisp and focused.)
- If the project involves rehabilitation, demolition, additions, or alterations to existing buildings or structures, provide additional photographs showing detailed project work locations. (i.e. Detail photo of windows if window replacement is proposed.)

Archaeology

Does the proposed undertaking involve ground-disturbing activity?  Yes  No  
If yes, submit all of the following information:

- Description of current and previous land use and disturbances.
- Available information concerning known or suspected archaeological resources within the project area (such as cellar holes, wells, foundations, dams, etc.)

Please note that for many projects an architectural and/or archaeological survey or other additional information may be needed to complete the Section 106 process.

**DHR Comment/Finding Recommendation** *This Space for Division of Historical Resources Use Only*

- Insufficient information to initiate review.  Additional information is needed in order to complete review.
- No Potential to cause Effects  No Historic Properties Affected  No Adverse Effect  Adverse Effect

Comments: ARCHAEOLOGICAL MONITORING REQUIRED DURING TRENCHING ADJACENT TO OLD NORTH CEMETERY AND THROUGH INTERSECTION OF MAPLEWOOD AVE. + DEER ST. DUE TO PRESENCE OF PREVIOUSLY IDENTIFIED SITES. MONITORING ARCHAEOLOGIST TO HAVE EXPERIENCE IN RECOGNIZING 18TH-CENTURY BURIALS.

If plans change or resources are discovered in the course of this project, you must contact the Division of Historical Resources as required by federal law and regulation.

Authorized Signature: Nicki Miller, DSHPO

Date: 2/16/23

**ATTACHMENT C**

**COASTAL RESOURCES**

**Coastal Resource Worksheet**

**Coastal Resource Narrative**

**Tidal Shoreline Stabilization Worksheet**

**NOAA EFH Report**

**Pre-Application Meeting Minutes**





**COASTAL RESOURCE WORKSHEET**  
 Water Division/Land Resources Management  
 Wetlands Bureau



[Check the Status of your Application](#)

**RSA/Rule:** RSA 482-A/ Env-Wt 600

**APPLICANT LAST NAME, FIRST NAME, M.I.:** City of Portsmouth

This worksheet may be used to present the information required for projects in coastal areas, in addition to the information required for Lower-Scrutiny Approvals, Expedited Permits, and Standard Permits under Env-Wt 603.01.

Please refer to Env-Wt 605.03 for impacts requiring compensatory mitigation.

**SECTION 1 - REQUIRED INFORMATION (Env-Wt 603.02; Env-Wt 603.06; Env-Wt 603.09)**

The following information is required for projects in coastal areas.

Describe the purpose of the proposed project, including the overall goal of the project, the core project purpose consisting of a concise description of the facilities and work that could impact jurisdictional areas, and the intended project outcome. Specifically identify all natural resource assets in the area proposed to be impacted and include maps created through a data screening in accordance with Env-Wt 603.03 (refer to Section 2) and Env-Wt 603.04 (refer to Section 3) as attachments.

**The City of Portsmouth (City) is proposing sewer separation for downtown areas of Fleet Street and Congress Street. Preliminary engineering drainage calculations showed the downstream drainage system does not have adequate capacity to accommodate additional drainage flow resulting from the separation work, and improvements are required to accommodate additional capacity. Proposed improvements include constructing a new drainage interceptor along Maplewood Ave and upgrading the existing outfall at North Mill Pond.**

**Proposed improvements at the outfall include adding a parallel 48" diameter RCP pipe parallel to the existing 48" diameter RCP pipe, doubling the outfall's capacity. Stormwater treatment is proposed in the form of a 'Jellyfish' treatment unit. The existing headwall will be removed and replaced with a headwall which accommodates both pipes. Erosion has occurred over time around the existing headwall exposing the existing pipe behind the current headwall. The design proposes to back the headwall location up approximately 10' closer to the embankment to improve final grading and stabilization.**

**Onsite mitigation is planned adjacent to the outfall location. The City is proposing to restore a marsh which will also serve as a revetement to stabilize the shoreline embankment which borders the historic Union and North Cemeteries that is being undercut. Any additional loss of this embankment will threaten to destabilize grave sites.**

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For standard permit projects, provide:

- A Coastal Functional Assessment (CFA) report in accordance with Env-Wt 603.04 (refer to Section 3).
- A vulnerability assessment in accordance with Env-Wt 603.05 (refer to Section 4).

Explain all recommended methods and other considerations to protect the natural resource assets during and as a result of project construction in accordance with Env-Wt 311.07, Env-Wt 313, and Env-Wt 603.04.

**The project impact area will be limited to the tidal embankment at North Mill Pond. Drainage improvements will include stormwater treatment to decrease the amount of nutrient pollutants discharged into North Mill Pond. Protective measures including temporary and permanent erosion control measures are included to minimize any potential impacts that may occur.**

**In accordance with Env-Wt 311.07, the project does not propose a water access structure or require access through wetlands to reach a buildable lot. Impacts to jurisdictional areas or their functions and values have been minimized by the proposed project design and alternative designs or technologies would not further limit any impacts.**

**In accordance with Env-Wt 313, all procedures and criteria for the submission of an application for a standard permit will be satisfied.**

**In accordance with Env-Wt 603.04, a CFA report is included.**

Provide a narrative showing how the project meets the standard conditions in Env-Wt 307 and the approval criteria in Env-Wt 313.01.

**BMPs will be used as described throughout the application package. Applicable sections of Env-Wt regarding prime wetlands, endangered species, shoreline structures, invasive species, fisheries, dredging, and filling are addressed elsewhere as required. All work will be done within jurisdictional waters of the State and City easements.**

**This project meets all approval conditions listed in 313.01. Avoidance and minimization is detailed in the attached narrative. Project-specific criteria and compensatory mitigation are addressed throughout the application package. A Functional Assessment is included. This project will not infringe on any property rights or affect the value and enjoyment of abutting property owners.**

Provide a project design narrative that includes the following:

- A discussion of how the proposed project:
  - Uses best management practices and standard conditions in Env-Wt 307;
  - Meets all avoidance and minimization requirements in Env-Wt 311.07 and Env-Wt 313.03;
  - Meets approval criteria in Env-Wt 313.01;
  - Meets evaluation criteria in Env-Wt 313.01(c);
  - Meets CFA requirements in Env-Wt 603.04; and
  - Considers sea-level rise and potential flooding evaluated pursuant to Env-Wt 603.05;
- A construction sequence, erosion/siltation control methods to be used, and a dewatering plan; and
- A discussion of how the completed project will be maintained and managed.

**A CWS will create a 5-year monitoring and maintenance plan for the mitigation area, which will be submitted to the NHDES for approval. The outfall will be maintained by the City of Portsmouth.**

- Provide design plans that meet the requirements of Env-Wt 603.07 (refer to Section 5);
  - Provide water depth supporting information required by Env-Wt 603.08 (refer to Section 6); and
  - For any major project that proposes to construct a structure in tidal waters/wetlands or to extend an existing structure seaward, provide a statement from the Pease Development Authority Division of Ports and Harbors (DP&H) chief harbormaster, or designee, for the subject location relative to the proposed structure's impact on navigation. If the proposed structure might impede existing public passage along the subject shoreline on foot or by non-motorized watercraft, the applicant shall explain how the impediments have been minimized to the greatest extent practicable.
- The project will not extend any structures seaward beyond where they exist. Public passage will be improved as any existing piping to remain which is currently exposed will be buried below grade. This will allow for easier passage of pedestrians and non-motorized watercraft along the shoreline.**

**SECTION 2 - DATA SCREENING (Env-Wt 603.03, in addition to Env-Wt 306.05)**

Please use the Wetland Permit Planning Tool, or any other database or source, to indicate the presence of:

- Existing salt marsh and salt marsh migration pathways;
- Eelgrass beds;
- Documented shellfish sites;
- Projected sea-level rise; and
- 100-year floodplain.

Conduct data screening as described to identify documented essential fish habitat, and tides and currents that may be impacted by the proposed project, by using the following links:

- [National Oceanic and Atmospheric Administration \(NOAA\) Tides & Currents](#); and
- [NOAA Essential Fish Habitat Mapper](#).
- Verify or correct the information collected from the data screenings by conducting an on-site assessment of the subject property in accordance with Env-Wt 406 and Env-Wt 603.04.

**SECTION 3 - COASTAL FUNCTIONAL ASSESSMENT/ AVOIDANCE AND MINIMIZATION (Env-Wt 603.04; Env-Wt 605.01; Env-Wt 605.02; Env-Wt 605.03)**

Projects in coastal areas shall:

- Not impair the navigation, recreation, or commerce of the general public; and
- Minimize alterations in prevailing currents.

An applicant for a permit for work in or adjacent to tidal waters/wetlands or the tidal buffer zone shall demonstrate that the following have been avoided or minimized as required by Env-Wt 313.04:

- Adverse impacts to beach or tidal flat sediment replenishment;
- Adverse impacts to the movement of sediments along a shore;
- Adverse impacts on a tidal wetland's ability to dissipate wave energy and storm surge; and
- Adverse impacts of project runoff on salinity levels in tidal environments.

For standard permit applications submitted for minor or major projects:

- Attach a CFA based on the data screening information and on-site evaluation required by Env-Wt 603.03. The CFA for tidal wetlands or tidal waters shall be:
  - Performed by a qualified coastal professional; and
  - Completed using one of the following methods:
    - a. The US Army Corps of Engineers (USACE) Highway Methodology Workbook, dated 1993, together with the USACE New England District *Highway Methodology Workbook Supplement*, dated 1999; or
    - b. An alternative scientifically-supported method with cited reference and the reasons for the alternative method substantiated.



For any project that would impact tidal wetlands, tidal waters, or associated sand dunes, the applicant shall:

- Use the results of the CFA to select the location of the proposed project having the least impact to tidal wetlands, tidal waters, or associated sand dunes;
- Design the proposed project to have the least impact to tidal wetlands, tidal waters, or associated sand dunes;
- Where impact to wetland and other coastal resource functions is unavoidable, limit the project impacts to the least valuable functions, avoiding and minimizing impact to the highest and most valuable functions; and
- Include on-site minimization measures and construction management practices to protect coastal resource areas.

Projects in coastal areas shall use results of this CFA to:

- Minimize adverse impacts to finfish, shellfish, crustacean, and wildlife;
- Minimize disturbances to groundwater and surface water flow;
- Avoid impacts that could adversely affect fish habitat, wildlife habitat, or both; and
- Avoid impacts that might cause erosion to shoreline properties.

**SECTION 4 - VULNERABILITY ASSESSMENT (Env-Wt 603.05)**

Refer to the New Hampshire Coastal Flood Risk Summary Part 1: Science and New Hampshire Coastal Flood Risk Summary Part II: Guidance for Using Scientific Projections or other best available science to:

Determine the time period over which the project is designed to serve.

The design life of the new drainage outfall pipe and headwall is 50 years to the year 2080.

Identify the project's relative risk tolerance to flooding and potential damage or loss likely to result from flooding to buildings, infrastructure, salt marshes, sand dunes and other valuable coastal resource areas.

Per the report written by Sean Sweeney of Headwaters Consulting, LLC included in this application package, the drainage ourfall will have a high risk tolerance to flooding.

Reference the projected sea-level rise (SLR) scenario that most closely matches the end of the project design life and the project's tolerance to risk or loss.

Per Step 3 Table A from NHCFR STAP (2020), the projected SLR with high risk tolerance to the year 2080 is 2.3 relative to sea levels in the year 2000.

Identify areas of the proposed project site subject to flooding from SLR.

SLR raises the expected flood elevation by 2.3 feet relative to sea levels in the year 2000. The entirety of the proposed wetlands disturbance area is below this level. Please note Tideflex check valves will be installed on the outfall pipe to prevent tidal surcharge into the drainage system.

Identify areas currently located within the 100-year floodplain and subject to coastal flood risk.

The flood elevation in this area is 8.0. The proposed mitigation area is within the 100-year floodplain.

Describe how the project design will consider and address the selected SLR scenario within the project design life, including in the design plans.

The salt marsh design incorporates different kinds of plantings within three planting zones - low marsh (below elev. 3.6 MHW), high marsh (between elev. 3.6 and 4.0 MHW and MHHW), and tidal buffer (above elev. 4.0 MHHW). As the sea level rises over time, the makeup of the types of vegetation is expected to adapt and spread out to meet their requirements in the new water levels.

Where there are conflicts between the project's purpose and the vulnerability assessment results, schedule a pre-application meeting with the department to evaluate design alternatives, engineering approaches, and use of the best available science.

Pre-application meeting date held: **April 2, 2024**

**SECTION 5 - DESIGN PLANS (Env-Wt 603.07, in addition to Env-Wt 311)**

Submit design plans for the project in both plan and elevation views that clearly depict and identify all required elements.

The plan view shall depict the following:

- The engineering scale used, which shall be no larger than one inch equals 50 feet;
- The location of tidal datum lines depicted as lines with the associated elevation noted, based on North American Vertical Datum of 1988 (NAVD 88), derived from [https://tidesandcurrents.noaa.gov/datum\\_options.html](https://tidesandcurrents.noaa.gov/datum_options.html), as described in Section 6.
- An imaginary extension of property boundary lines into the waterbody and a 20-foot setback from those property line extensions;
- The location of all special aquatic sites at or within 100 feet of the subject property;
- Existing bank contours;
- The name and license number, if applicable, of each individual responsible for the plan, including:
  - a. The agent for tidal docking structures who determined elevations represented on plans; and
  - b. The qualified coastal professional who completed the CFA report and located the identified resources on the plan;
- The location and dimensions of all existing and proposed structures and landscape features on the property;
- Tidal datum(s) with associated elevations noted, based on NAVD 88; and
- Location of all special aquatic sites within 100-feet of the property.

The elevation view shall depict the following:

- The nature and slope of the shoreline;
- The location and dimensions of all proposed structures, including permanent piers, pilings, float stop structures, ramps, floats, and dolphins; and
- Water depths depicted as a line with associated elevation at highest observable tide, mean high tide, and mean low tide, and the date and tide height when the depths were measured. Refer to Section 6 for more instructions regarding water depth supporting information.

See specific design and plan requirements for certain types of coastal projects:

- Overwater structures (Env-Wt 606).
- Tidal shoreline stabilization (Env-Wt 609).
- Dredging activities (Env-Wt 607).
- Protected tidal zone (Env-Wt 610).
- Tidal beach maintenance (Env-Wt 608).
- Sand Dunes (Env-Wt 611).

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**SECTION 6 - WATER DEPTH SUPPORTING INFORMATION REQUIRED (Env-Wt 603.08)**

Using current predicted NOAA tidal datum for the location, and tying field measurements to NAVD 88, field observations of at least three tide events, including at least one minus tide event, shall be located to document the range of the tide in the proposed location showing the following levels:

- Mean lower low water;
- Mean low water;
- Mean high water;
- Mean tide level;
- Mean higher high water;
- Highest observable tide line; and
- Predicted sea-level rise as identified in the vulnerability assessment in Env-Wt 603.05.

The following data shall be presented in the application project narrative to support how water depths were determined:

- The date, time of day, and weather conditions when water depths were recorded; and
- The name and license number of the licensed land surveyor who conducted the field measurements.

For tidal stream crossing projects, provide:

- Water depth information to show how the tier 4 stream crossing is designed to meet Env-Wt 904.07(c) and (d).

For repair, rehabilitation or replacement of tier 4 stream crossings:

- Demonstrate how the requirements of Env-Wt 904.09 are met.

**SECTION 7 - GENERAL CRITERIA FOR TIDAL BEACHES, TIDAL SHORELINE, AND SAND DUNES (Env-Wt 604.01)**

Any person proposing a project in or on a tidal beach, tidal shoreline, or sand dune, or any combination thereof, shall evaluate the proposed project based on:

- The standard conditions in Env-Wt 307;
- The avoidance and minimization requirements in Env-Wt 311.07 and Env-Wt 313.03;
- The approval criteria in Env-Wt 313.01;
- The evaluation criteria in Env-Wt 313.05;
- The project specific criteria in Env-Wt 600;
- The CFA required by Env-Wt 603.04; and
- The vulnerability assessment required by Env-Wt 603.05.

New permanent impacts to sand dunes that provide coastal storm surge protection for protected species or habitat shall not be allowed except:

- To protect public safety; and
- Only if constructed by a state agency, coastal resiliency project, or for a federal homeland security project.

Projects in or on a tidal beach, tidal shoreline, or sand dune shall support integrated shoreline management that:

- Optimizes the natural function of the shoreline, including protection or restoration of habitat, water quality, and self-sustaining stability to flooding and storm surge; and
- Protects upland infrastructure from coastal hazards with a preference for living shorelines over hardened shoreline practices.

**SECTION 8 - GENERAL CRITERIA FOR TIDAL BUFFER ZONES (Env-Wt 604.02)**

The 100-foot statutory limit on the extent of the tidal buffer zone shall be measured horizontally. Any person proposing a project in or on an undeveloped tidal buffer zone shall evaluate the proposed project based on:

- The standard conditions in Env-Wt 307;
- The avoidance and minimization requirements in Env-Wt 311.07 and Env-Wt 313.03;
- The approval criteria in Env-Wt 313.01;
- The evaluation criteria in Env-Wt 313.05;
- The project specific criteria in Env-Wt 600;
- The CFA required by Env-Wt 603.04; and
- The vulnerability assessment required by Env-Wt 603.05.

Projects in or on a tidal buffer zone shall preserve the self-sustaining ability of the buffer area to:

- Provide habitat values;
- Protect tidal environments from potential sources of pollution;
- Provide stability of the coastal shoreline; and
- Maintain existing buffers intact where the lot has disturbed area defined under RSA 483-B:4, IV.

**SECTION 9 - GENERAL CRITERIA FOR TIDAL WATERS/WETLANDS (Env-Wt 604.03)**

Except as allowed under Env-Wt 606, permanent new impacts to tidal wetlands shall be allowed only to protect public safety or homeland security. Evaluation of impacts to tidal wetlands and tidal waters shall be based on:

- The standard conditions in Env-Wt 307;
- The avoidance and minimization requirements in Env-Wt 311.07 and Env-Wt 313.03;
- The approval criteria in Env-Wt 313.01;
- The evaluation criteria in Env-Wt 313.05;
- The project specific criteria in Env-Wt 600;
- The CFA required by Env-Wt 603.04; and
- The vulnerability assessment required by Env-Wt 603.05.

Projects in tidal surface waters or tidal wetlands shall:

- Optimize the natural function of the tidal wetland, including protection or restoration of habitat, water quality, and self-sustaining stability to storm surge;
- Be designed with a preference for living shorelines over hardened stabilization practices; and
- Be limited to public infrastructure or restoration projects that are in the interest of the general public, including a road, a bridge, energy infrastructure, or a project that addresses predicted sea-level rise and coastal flood risk.

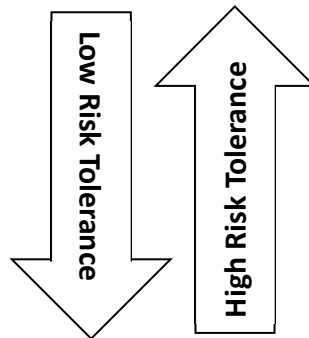
**SECTION 10 – GUIDANCE**

Your application must follow the New Hampshire Coastal Risk and Hazards Commission’s Guiding Principles or other best available science. Below are some of these guidance principles:

- Incorporate science-based coastal flood risk projections into planning;
- Apply risk tolerance\* to assessment, planning, design, and construction;
- Protect natural resources and public access;
- Create a bold vision, start immediately, and respond incrementally and opportunistically as projected coastal flood risks increase over time; and
- Consider the full suite of actions including effectiveness and consequences of actions.

\*Risk tolerance is a project’s willingness to accept a higher or lower probability of flooding impacts. The diagram below gives examples of project with lower and higher risk tolerance:

Critical infrastructures, historic sites, essential ecosystems, and high value assets typically have lower risk tolerance, and thus should be planned, designed, and constructed using higher coastal flood risk projections.



Sheds, pathways, and small docks typically have higher risk tolerance and thus may be planned, designed, and constructed using less protective coastal flood risk projections.

**City of Portsmouth**  
**MAPLEWOOD AVENUE DRAINAGE IMPROVEMENTS**  
**Coastal Project Narrative**

**Project Summary:**

The City of Portsmouth (City) is proposing sewer separation for downtown areas of Fleet Street and Congress Street. Preliminary engineering drainage calculations showed the downstream drainage system does not have adequate capacity to accommodate additional drainage flow resulting from the separation work, and improvements are required to accommodate additional capacity. Proposed improvements include constructing a new drainage interceptor along Maplewood Ave and upgrading the existing outfall at North Mill Pond.

Proposed improvements at the outfall include adding a 48" diameter RCP pipe parallel to the existing 48" diameter RCP pipe, doubling the outfall's capacity. Stormwater treatment is proposed in the form of a 'Jellyfish' treatment unit. The existing headwall will be removed and replaced with a headwall which accommodates both pipes. Erosion has occurred over time around the existing headwall exposing the existing pipe behind the current headwall. The design proposes to back the headwall location up approximately 10' closer to the embankment to improve final grading and stabilization.

Onsite mitigation is planned adjacent to the outfall location. The City is proposing to restore a marsh which will also serve as a revetement to stabilize the shoreline embankment which borders the historic Union and North Cemeteries that is being undercut. Any additional loss of this embankment will threaten to destabilize grave sites.

**Avoidance and Minimization:**

Avoidance and minimization is detailed in a separate narrative included in this application package.

Impacts will be minimized by using construction management practices and BMPs that will be employed as required to protect aquatic resource functions. Proposed practices include use of silt boom, silt fences, hay bales, and other measures. Work is required to be completed in accordance with the Stormwater Management and Erosion and Sediment Control Handbook for Urban and Developing Areas in New Hampshire, by the NHDES as well as the latest edition of the New Hampshire Stormwater Manual. Contractors will also be required to prepare, execute, and monitor a Stormwater Pollution Prevention Plan as part of the contract documents.

### Construction Sequence:

A separate work sequence narrative is included as part of the application package.

- Impacts to water quality will be minimized by requiring the contractor to install stormwater BMPs prior to work in accordance with the Stormwater Management and Erosion and Sediment Control Handbook for Urban and Developing Areas in New Hampshire, by the NHDES, the latest edition of the New Hampshire Stormwater Manual, and the approved SWPPP. Work will be done in conformance with specification section 02540 (Temporary Erosion Control) of the project specifications and the Erosion Control detail sheets. Silt booms will also be installed in accordance with the project plans in the vicinity of the work.
- Following installation of erosion and sedimentation controls, the contractor will proceed with the work.
- Planting and seeding of vegetation will occur immediately following final grading of disturbed areas.
- Upon completion of construction and stabilization of the site, the erosion control measures will be removed.
- No work will be allowed outside of the limits of work shown on the design plans.

### Dewatering Plan:

It is anticipated the contractor will complete all pipe and headwall installations during low tide and low flow conditions, and permanent flow diversions and engineered dewatering systems are not anticipated. Any trench dewatering that occurs during installation will be discharged to appropriate silt bags or haybale detention ponds.

### Post-Construction Management:

Following planting of vegetation, the marsh area shall be routinely monitored for erosion and vegetation establishment. Weather conditions will also be monitored so that vegetation is to be watered as required during times of drought. Monitoring will also be in place to ensure that geese and other waterfowl are not negatively impacting the newly planted areas. If waterfowl impacts are observed, additional deterrents shall be put in place until vegetation is established.

Long term observation and maintenance will be conducted for 5 years by a qualified professional as required by NHDES to ensure long term success of the mitigated area. A Monitoring Plan will be developed by the qualified professional and submitted to the NHDES for approval.



### Data Screening:

No salt marshes, eelgrass beds, or shellfish sites will be impacted by installation of the new drainage outfall and headwall. A salt marsh will be created as part of the project.

The project is in the floodplain and subject to sea-level rise.

The NHB #NHB24-0476 data check resulted in reports of the American Eel which is listed as a “special concern”. Consultation with NHF&G resulted in adding notes provided by the NHF&G regarding the eel and a flyer to the plans.

Tide and current screening was performed. A tide datum survey was completed by Doucet Survey, as detailed below.

NOAA screening yielded no habitats of particular concern and no salmon habitats. An EFH list is included in this application. Please note we do not anticipate any impacts to fish species, as the work will mainly be done out of the water and the work to remove the protruding outfall pipe section and headwall will be done during low tide.

Several on-site visits have been conducted by Underwood Engineers, the NHDES, and the City of Portsmouth to confirm the parameters noted above.

### Coastal Functional Assessment:

A CFA is included as part of the permit application package.

### Vulnerability Assessment:

A VA was performed by Headwaters Consulting, LLC as part of an earlier version of the project in conjunction with the Maplewood Avenue Bridge Rehabilitation project, which is located approximately 600’ from the project site. The report is included in this package, titled “Information Required under Env-Wt 903.05(f), Env-Wt 904.07(d), and Env-Wt 603.05”, dated August 23, 2023.

The drainage outfall is intended to be submerged, so it will have a high tolerance for flood risk and a low sensitivity to inundation. Tideflex check valves are proposed on the outfall to prevent tides from surcharging into the drainage system.

### Water Levels:

A tidal survey was conducted by Doucet Survey over 3 days in May and June of 2022. High and low water elevations were surveyed on all 3 dates. A comparison with the tide station at Seavey Island was used to calculate the tide datums, as listed in Table 2 in the report by Sean Sweeney, P.E. of Headwaters Consulting included in this application package.

The tide datums are depicted in plan view and cross-sections on drawings P1 and P5.

### Shoreline Stabilization:

The mitigation proposed is living shoreline with a short stone slope (NHDOT class C stone fill) along the sill as a toe to protect against erosion. Natural rocks and stones found in the area will be used where possible. The living shoreline will be fully exposed at low tide and mean tide. Please note some boulders will also be placed to break up sheet ice in the winter.

Stabilization of the shoreline will also be improved by cutting back the existing outfall pipe and adding a new headwall to both pipes. The area behind the existing headwall has eroded over time, so the area will be protected by the headwall itself. A small area of Class B stone will be placed in front of the new headwall to stabilize the sill at the outlet.



**TIDAL SHORELINE STABILIZATION  
PROJECT-SPECIFIC WORKSHEET  
FOR STANDARD APPLICATION**

Water Division/Land Resources Management  
Wetlands Bureau

[Check the Status of your Application](#)



**RSA/Rule:** RSA 482-A/ Env-Wt 609

This worksheet summarizes the criteria and requirements for a Standard Permit for "Tidal Shoreline Stabilization" projects in tidal areas as outlined in Chapter Env-Wt 600. In addition to the project-specific criteria and requirements on this worksheet, all Standard Applications must meet the criteria and requirements listed in the [Standard Dredge and Fill Wetlands Permit Application Form \(NHDES-W-06-012\)](#) and the [Coastal Resource Worksheet \(NHDES-W-06-079\)](#).

**SECTION 1 - APPLICATION REQUIREMENTS (Env-Wt 609.02)**

Applications for tidal shoreline stabilization projects shall demonstrate that:

- The technique or combinations of techniques is based on best available scientific and engineering practices.
- The proposed technique or combination of techniques addresses:
  - Results of the avoidance and minimization narrative required in Env-Wt 311.07, the avoidance, minimization and mitigation demonstration required in Env-Wt 313.03 and Env-Wt 313.04, the coastal functional assessment (CFA) required in Env-Wt 603.04, and the project design narrative required in Env-Wt 603.06,
  - Any causes of erosion that can be identified,
  - The degree or extent of erosion,
  - Relative exposure based on shoreline geometry, shore orientation, intensity of boat traffic, influence of adjacent structures, storm surge, and extreme precipitation events,
  - Potential sea-level rise and vulnerability assessment under Env-Wt 603.05,
  - Potential marsh migration as a result of sea-level rise and
  - The design requirements of Env-Wt 514.04.

An application for a tidal shoreline stabilization shall include the following information:

- Tidal shoreline stabilization shall be accomplished using living shoreline techniques, per Env-Wt 609.04(b), unless the applicant demonstrates that a living shoreline is not practicable.

Applicants proposing to install new rip-rap shall include the following information with the application:

- Evidence of erosion that cannot be stabilized solely with a soft stabilization design.
- A description of anticipated turbulence, flows, restricted space, fetch or similar factors that render vegetative and diversion methods physically impractical.
- An assessment of the potential for the proposed rip-rap to erode the shoreline of neighboring properties, based on an examination of the shoreline and modeling based on tides, average wave height and force, and the energy absorption of deflection or the proposed rip-rap.
- Specification of minimum and maximum stone sizes, existing contours and final proposed contours, the volume of rip-rap to be used, the minimum and maximum rip-rap thickness, and the type and thickness of bedding for the stone.
- Cross-section and plan views of the proposed installation.
- The relationship of the project to fixed points of reference, abutting properties, and features of the natural shoreline.

[lrn@des.nh.gov](mailto:lrn@des.nh.gov) or (603) 271-2147

NHDES Wetlands Bureau, 29 Hazen Drive, PO BOX 95, Concord, NH 03302-0095

[www.des.nh.gov](http://www.des.nh.gov)

**SECTION 2 - APPROVAL CRITERIA (Env-Wt 607.07; Env-Wt 607.08; Env-Wt 609.01; Env-Wt 609.09)**

Applications for tidal shoreland stabilization projects shall:

- Maintain or enhance the natural process functions of the shoreline as the critical transition zone between the intertidal zone and upland tidal buffer zone/sand dune regimes.
- Provide wildlife habitat while providing protection against coastal hazards.
- Be compatible with the existing natural land cover and its functions.
- Address the known causes of erosion.
- Avoid adverse impacts to near shore ecosystem processes, habitats, and adjacent shoreline.

The department shall not approve any tidal shoreline stabilization plan that proposes to install new rip-rap unless the applicant demonstrates that:

- Anticipated turbulence, flows, restricted space, fetch or similar factors render soft stabilization methods physically impractical, and
- Natural areas or naturalized soft shoreline stabilization on neighboring properties will not be damaged by the placement of the proposed rip-rap, or
- Rip-rap is a component used as a sill to stabilize the toe, but is not the primary or dominant component of a living shoreline stabilization design.

The department shall not approve any tidal shoreline stabilization plan that proposes to install a wall unless:

- The wall is required to protect public infrastructure in situations where softer stabilization technique is shown to be impracticable.

**SECTION 3 - DESIGN & CONSTRUCTION REQUIREMENTS (Env-Wt 609.05; Env-Wt 609.06)**

Living shoreline design plans shall:

- Be prepared and stamped by a professional engineer and reviewed relative to delineations of wetlands and stamped by a certified wetland scientist in accordance with the "Guidance for Considering the Use of Living Shorelines" (National Oceanic and Atmospheric Administration, 2015).
- Be prepared to show that the project will:
  - Use native vegetation, sand fill, and limited stone or wood as specified in Env-Wt 609.06 to provide shoreline stabilization and protection,
  - Mimic the natural landscape and leave natural vegetation intact to the greatest extent practicable,
  - If practicable, be based on the location of the highest observable tide line, water turbulence and soil conditions, add vegetation to existing sand beaches or dune or construct vegetated sand dunes,
  - Design the sill to the lowest elevation possible that still ensure stabilization of the toe of the living shoreline,
  - Maintain the shoreline's ability to absorb and mitigate storm impacts and adapt to the landward progression of the sea,
  - Minimize or prevent wave reflection toward abutting properties,
  - If space and soil conditions allow, cut back unstable banks to a flatter slope, seed and replant with native, non-invasive trees and shrubs, and
  - Provide habitat for wildlife and aquatic species.
- Large wood debris and natural rock that is comparable to the natural-occurring rock found in the vicinity of the project may be incorporated into a soft tidal shoreline stabilization design as matrix material for a bio-engineering bank stabilization technique.

Living shoreline techniques shall be required if the project is to replace an existing stabilization structure that:

- Has not functioned as required by Env-Wt 609.0, or
- Is not an existing legal structure.

[irm@des.nh.gov](mailto:irm@des.nh.gov) or (603) 271-2147

NHDES Wetlands Bureau, 29 Hazen Drive, PO BOX 95, Concord, NH 03302-0095

[www.des.nh.gov](http://www.des.nh.gov)

**SECTION 4 - MAINTENANCE & REPAIR (Env-Wt 609.03; Env-Wt 609.08)**

Applications for repair or rehabilitation of existing tidal shoreland stabilization structures shall include an analysis by the engineer or qualified coastal professional to rate the conditions of the existing structure and the purpose for the repair based on the following:

- The degree of damage or extent of deterioration, as applicable, such as missing components, cracking, or weeping with erosion.
- Whether opportunities exist to use soft bank stabilization components or a combination of soft and hard components.
- The ability of the structure to withstand coastal flood risk in accordance with the vulnerability assessment required by Env-Wt 603.05.

**SECTION 5 - PROJECT CLASSIFICATION (Env-Wt 609.10; Env-Wt 609.11)**

Refer to Env-Wt 609.10 and Env-Wt 609.11 for project classification.

## EFH Mapper Report

### EFH Data Notice

Essential Fish Habitat (EFH) is defined by textual descriptions contained in the fishery management plans developed by the regional fishery management councils. In most cases mapping data can not fully represent the complexity of the habitats that make up EFH. This report should be used for general interest queries only and should not be interpreted as a definitive evaluation of EFH at this location. A location-specific evaluation of EFH for any official purposes must be performed by a regional expert. Please refer to the following links for the appropriate regional resources.

[Greater Atlantic Regional Office](#)  
[Atlantic Highly Migratory Species Management Division](#)

### Query Results









Degrees, Minutes, Seconds: Latitude = 43° 4' 45" N, Longitude = 71° 14' 4" W  
 Decimal Degrees: Latitude = 43.079, Longitude = -70.766



The query location intersects with spatial data representing EFH and/or HAPCs for the following species/management units.

### \*\*\* WARNING \*\*\*

Please note under "Life Stage(s) Found at Location" the category "ALL" indicates that all life stages of that species share the same map and are designated at the queried location.

### EFH

| Link  | Data Caveats  | Species/ Management Unit | Lifestage(s) Found at Location | Management Council | FMP  |
|---|---|--------------------------|--------------------------------|--------------------|--|
|  |  | Atlantic Butterfish      | Adult                          | Mid-Atlantic       | Atlantic Mackerel, Squid,& Butterfish Amendment 11 |
|  |  | Atlantic Cod             | Adult, Eggs, Larvae            | New England        | Amendment 14 to the Northeast Multispecies FMP     |
|  |  | Atlantic Herring         | Adult, Juvenile, Larvae        | New England        | Amendment 3 to the Atlantic Herring FMP            |
|  |  | Atlantic Mackerel        | Eggs, Juvenile,                | Mid-Atlantic       | Atlantic Mackerel, Squid,& Butterfish              |

| Link  | Data Caveats  | Species/<br>Management Unit | Lifestage(s)<br>Found at Location | Management Council | FMP  |
|---|---|-----------------------------|-----------------------------------|--------------------|--|
|   |   |                             | Larvae                            |                    | Amendment 11                                   |
|    |    | Atlantic Sea Scallop        | ALL                               | New England        | Amendment 14 to the Atlantic Sea Scallop FMP   |
|    |    | Atlantic Wolffish           | ALL                               | New England        | Amendment 14 to the Northeast Multispecies FMP |
|    |    | Bluefish                    | Adult, Juvenile                   | Mid-Atlantic       | Bluefish                                       |
|    |    | Little Skate                | Adult, Juvenile                   | New England        | Amendment 2 to the Northeast Skate Complex FMP |
|    |    | Pollock                     | Eggs, Juvenile, Larvae            | New England        | Amendment 14 to the Northeast Multispecies FMP |
|  |  | Red Hake                    | Adult, Eggs/Larvae/ Juvenile      | New England        | Amendment 14 to the Northeast Multispecies FMP |
|  |  | Smooth Skate                | Juvenile                          | New England        | Amendment 2 to the Northeast Skate Complex FMP |
|  |  | Thorny Skate                | Juvenile                          | New England        | Amendment 2 to the Northeast Skate Complex FMP |
|  |  | White Hake                  | Adult, Eggs, Juvenile             | New England        | Amendment 14 to the Northeast Multispecies FMP |
|  |  | Windowpane Flounder         | Adult, Eggs, Juvenile, Larvae     | New England        | Amendment 14 to the Northeast Multispecies FMP |
|  |  | Winter Flounder             | Eggs, Juvenile, Larvae/Adult      | New England        | Amendment 14 to the Northeast Multispecies FMP |
|  |  | Winter Skate                | Juvenile                          | New England        | Amendment 2 to the Northeast Skate             |

| Link | Data Caveats | Species/ Management Unit | Lifestage(s) Found at Location | Management Council | FMP         |
|------|--------------|--------------------------|--------------------------------|--------------------|-------------|
|      |              |                          |                                |                    | Complex FMP |

### Pacific Salmon EFH

No Pacific Salmon Essential Fish Habitat (EFH) were identified at the report location.

### Atlantic Salmon

No Atlantic Salmon were identified at the report location.

### HAPCs

No Habitat Areas of Particular Concern (HAPC) were identified at the report location.

### EFH Areas Protected from Fishing

No EFH Areas Protected from Fishing (EFHA) were identified at the report location.

**Spatial data does not currently exist for all the managed species in this area. The following is a list of species or management units for which there is no spatial data. \*\*For links to all EFH text descriptions see the complete data inventory: [open data inventory -->](#)**

**All EFH species have been mapped for the Greater Atlantic region,**

**Atlantic Highly Migratory Species EFH,**

Bigeye Sand Tiger Shark,

Bigeye Sixgill Shark,

Caribbean Sharpnose Shark,

Galapagos Shark,

Narrowtooth Shark,

Sevengill Shark,

Sixgill Shark,

Smooth Hammerhead Shark,

Smalltail Shark





**MAPLEWOOD AVENUE DRAINAGE IMPROVEMENTS  
PORTSMOUTH, NEW HAMPSHIRE**

**WETLANDS PRE-APPLICATION MEETING**  
**- NOTES -**

April 2, 2024 at 10:30 A.M. (Virtual Via Teams)

**ATTENDEES**

|                      |  |
|----------------------|--|
| Underwood Engineers: | Dan Rochette, Allison Rees, Jake Stoddard              |
| City of Portsmouth:  | Dave Desfosses, Zach Cronin                            |
| NHDES:               | Eben Lewis, Kristin Duclos, Emily Nichols, Seta Detzel |
| Army Corp:           | Lindsey Lefebvre                                       |
| EPA:                 | Jean Brochi  |

**INTRODUCTIONS**

**Project Background**

- Preliminary Engineering started 3 years ago for separation work in the Fleet Street Area of Downtown
- Separation is driven by EPA consent decree
- Runoff calculations determined downstream drainage system is undersized to accommodate additional drainage flows
- Downstream upgrades are required including improvements to the existing outfall
- The outfall improvements previously included with the pre-application meeting last spring where it was presented alongside the Maplewood Culvert/Arch Rehabilitation.
  - ARM Fund Payment at that time
  - Scope of project has changed to incorporate embankment revetement alongside the cemetery

**Outfall Improvements**

- Upgrade the existing outfall location to not impact another location along the pond.
  - The existing outfall area has also been previously developed urban area and has been subject to stabilization efforts adjacent to the paved lot
- Add a 48” diameter pipe parallel to the existing 48” outfall pipe
- Construct new headwall located within the embankment.
  - The existing location has been subject to erosion and protruding into the pond
- Stormwater treatment elements.
- Eliminate direct surface runoff into the pond and direct surface runoff from paved lot into stormwater treatment unit.
- Compensatory mitigation proposed
  - Will also serve as revetement to the embankment adjacent to the cemetery

### Proposed Mitigation

- Complete marsh restoration immediately adjacent to the outfall location
  - 2,950 SF of marsh proposed
  - 650 SF of tidal buffer proposed
  - Other existing marsh areas in the vicinity, restores an asset previously existing
  - Doubles as revetement for the cemetery
  - Other marsh restoration efforts have been successful along the pond
  - At the request of NHDES, marsh design developed with the aid of Tom Ballestero from UNH.
- Multiple alternatives reviewed
  - Stone sill armoring
  - Coir log armoring
  - Tree log armored mud flat with coir log armored marsh
- Stone sill armoring was selected as the best alternative
  - Stone armored sill will better protect the marsh long term...coir logs degrade after a few years
  - Incorporating mudflat habitat added too much complexity...keep it simple
  - Provided the best options for maximizing marsh space with in the area selected and ability to provide some additional tidal buffer area.
  - Wetlands bureau was included in alternatives review
- Additional considerations
  - Protection from Canada Geese
  - Maintenance and monitoring plan

### QUESTIONS AND ANSWERS

**Q: What level of federal involvement (Army Corp, NOAA) kicks in with impacts below the HOTL?**

**A:** Lindsey noted the following:

- Essential fish habitat and endangered species need to be checked (i.e., sturgeon)
- May need formal consultation
- Level of consultation will be determined once the Army Corp receives the submittal package from the NHDES
- She will be the direct contact for now, but may change once consultation starts

**Q: The following concerns and questions were brought up regarding site protection:**

- Concerned about long-term protection, this is critical
- Riparian rights – property of state
- Looking for assurance of restrictions to future docks, etc.
- Possible deed restrictions or conservation easements?

- Possibly tie this project in w/ City's ARM restoration on the other side of the pond?

**A:** The following responses were provided:

- The mitigation improvements are below the HOTL and are in jurisdictional waters of the State, and not on City property which the City can place restrictions on.
- The impact area related to the mitigation is surrounded by City Property that is a registered Historic Cemetery. A change in land use for the Cemetery will never be permitted and no additional development is possible. Further, the drain pipe associated with the outfall improvements will be within a utility easement which will prevent development to within 20' of the property line. It is UE and City position that this area is protected and no additional protection is required.

**Q: Are there Greenway trails in the area?**

**A:** No, they're on the other side of the pond, however, the cemetery is open to the public for walking along the shoreline.

**Q: The following questions were asked regarding the cemetery:**

- Anything done to protect burials?
- Were 50 & 100-year storms considered during design?
- Adaptive management plan in case of failure to protect burial sites?

**A:** The existing erosion that undercut the bank below the cemetery was made worse by runoff from the adjacent lot. This project will neutralize the source by eliminating the surface runoff and directing it into the drain pipe.

**Q: Impact Area – new impact vs existing outfall stabilization.**

**A:** A table of impact areas is provided on the plans. The permanent impact area shown on the table is inclusive of the impact resulting from the mitigation. The ratio of mitigation impact area (3,700 sf) to outfall impact area (500 sf) is approximately 7:1. Table 800-1 of Env-Wt 803.08 requires a 2:1 ratio for restoration of tidal wetlands.

**Q: The following concerns and questions were brought up regarding the monitoring plan:**

- A minimum of 5 years of monitoring is required.
- Has an entity been tagged for the monitoring yet?
- The entity performing the work should have experience in coastal areas.

**A:** We are aware a monitoring plan is required. However, a plan has not yet been prepared, and no entity has been identified at this point.

**Q: Are there any limiting factors to the size of the mitigation area? Will the trees at the back edge of the area remain?**

**A:** An area of protruding rocks was pointed out in the photos that serves as a natural edge of restoration. Marsh extending beyond this point would be backed by a stone retaining wall and not be backed by a natural barrier. Existing trees are proposed to remain, although lower branches and select brush may be thinned to provide more sunlight to the area, per a

recommendation from Tom Ballestero. It was noted prior, that the size of the restoration area meets the ratio requirements for mitigation.

**Q: Has the potential for backwater in the outfall been addressed?**

A: Tideflex Check Valves will be installed at the outfall.

**Q: Will invasive species be addressed? It is noted there may be phragmites in the area.**

A: Yes, handling and removal of invasive species will be addressed in the specifications. Several types of invasive species have been documented in the area and along the outfall route. The intent will be to minimize impacts to areas with invasive species and leave them undisturbed.

**Q: When is application submittal anticipated?**

A: The goal is early May. It was noted a minimum of 30 days is required for submittal after a pre-application meeting.

**Other**

It was noted the meeting notes should be included in the application package.

**ATTACHMENT D**

**PROJECT MAPPING**

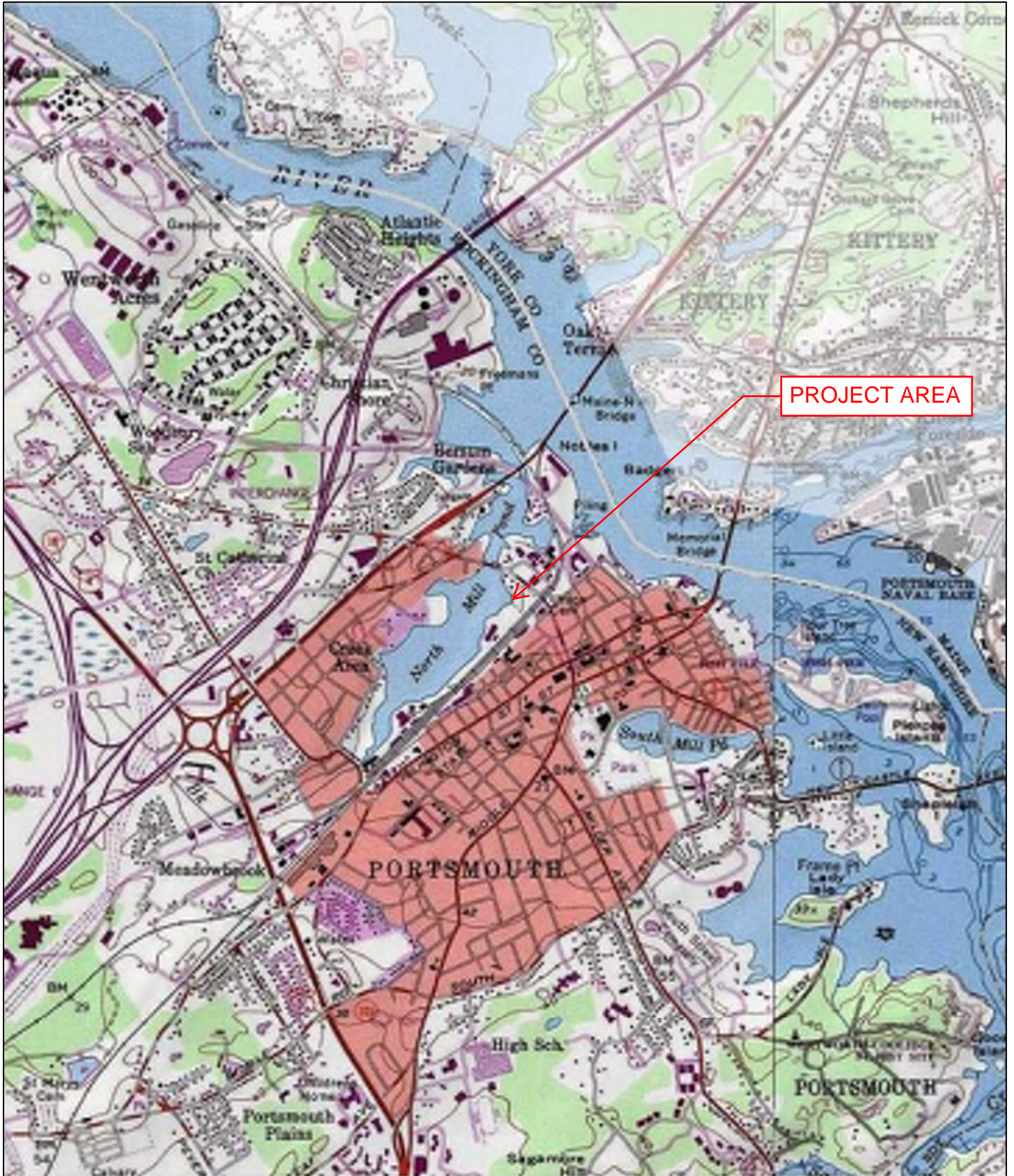
**USGS Figure**

**Aerial Plan**

**WPPT Plan**

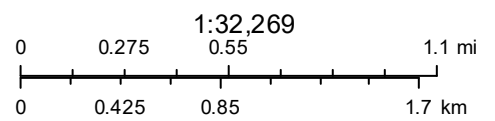


# Maplewood Ave Drainage Improvements



4/18/2024


USA Topo Maps







Not To Scale

|                 |  |   |      |
|-----------------|--|---|------|
| DATE<br>2-23-24 | <br><b>UNDERWOOD</b><br>engineers<br>25 Vaughan Mall, Portsmouth, N.H. 03801<br>Tel. 603-436-6192 Fax. 603-431-4733 | <b>Aerial of Project Area</b>   | FIG. |
| PROJECT<br>2542 |  | Outfall Improvements and Marsh Restoration<br>Portsmouth, New Hampshire | 2.1  |

# WPPT Print Out North Mill Pond Outfall Improvements



## Legend

- Dock Registrations
- NH Parcels
- Additional Lines
- City/Town
- Designated Rivers with a
  - Ammonoosuc
  - Ashuelot
  - Cocheco
  - Cold
  - Connecticut
  - Contoocook
  - Exeter
  - Isinglass
  - Lamprey
  - Little
  - Mascoma
  - Merrimack-Lower
  - Merrimack-Upper
  - Middle Branch Piscataquog
  - North
  - North Branch Contoocook

Map Scale

1: 6,494



© NH GRANIT, www.granit.unh.edu

Map Generated: 2/22/2024

## Notes

## Attachment 2.2

WPPT Property Map  
with PRA

# **ATTACHMENT E**

## **Avoidance and Minimization Worksheet**





AVOIDANCE AND MINIMIZATION  
WRITTEN NARRATIVE  
Water Division/Land Resources Management  
Wetlands Bureau  
[Check the Status of your Application](#)



**RSA/ Rule:** RSA 482-A/ Env-Wt 311.04(j); Env-Wt 311.07; Env-Wt 313.01(a)(1)b; Env-Wt 313.01(c)

**APPLICANT'S NAME:** City of Portsmouth

**TOWN NAME:** Portsmouth, NH

An applicant for a standard permit shall submit with the permit application a written narrative that explains how all impacts to functions and values of all jurisdictional areas have been avoided and minimized to the maximum extent practicable. This attachment can be used to guide the narrative (attach additional pages if needed). Alternatively, the applicant may attach a completed [Avoidance and Minimization Checklist \(NHDES-W-06-050\)](#) to the permit application.

**SECTION 1 - WATER ACCESS STRUCTURES (Env-Wt 311.07(b)(1))**

Is the primary purpose of the proposed project to construct a water access structure?

No

**SECTION 2 - BUILDABLE LOT (Env-Wt 311.07(b)(1))**

Does the proposed project require access through wetlands to reach a buildable lot or portion thereof?

No

**SECTION 3 - AVAILABLE PROPERTY (Env-Wt 311.07(b)(2))\***

For any project that proposes permanent impacts of more than one acre, or that proposes permanent impacts to a PRA, or both, are any other properties reasonably available to the applicant, whether already owned or controlled by the applicant or not, that could be used to achieve the project's purpose without altering the functions and values of any jurisdictional area, in particular wetlands, streams, and PRAs?

*\*Except as provided in any project-specific criteria and except for NH Department of Transportation projects that qualify for a categorical exclusion under the National Environmental Policy Act.*

The location selected for outfall improvements is the location of an existing outfall. Using other areas along North Mill pond would require impacts to a new area of shoreline. The area adjacent to the outfall is also previously developed as a paved lot and an old warehouse building. The Embankment stabilization along the cemetery could not occur by making improvements towards the shore as there are burial sites located in close proximity to the top of slope. Therefor any necessary grading or slope stabilization efforts would need to be completed on the seaward side of the embankment. The proposed marsh restoration will serve two functions; 1. provide compensatory mitigation for impacts associated to the outfall, and 2. to provide revetement for the undercut embankment adjacent to the cemetery.

**SECTION 4 - ALTERNATIVES (Env-Wt 311.07(b)(3))**

Could alternative designs or techniques, such as different layouts, different construction sequencing, or alternative technologies be used to avoid impacts to jurisdictional areas or their functions and values as described in the [Wetlands Best Management Practice Techniques For Avoidance and Minimization?](#)

No alternate location was considered for the outfall improvements as adding a parallel pipe to the existing outfall was the simplest way to increase capacity. The existing location already had select land rights/easements in place for existing infrastructure. Upgrading the existing pipe to provide a single pipe with additional capacity was not an option due to physical constraints with depths and conflicts around other underground utilities. An alternate outfall location for a second pipe while maintaining the existing outfall location would have added an additional outfall location to the pond which would result in additional impacts to natural resources. Also any potential alternate locations to outlet the second pipe would have resulted in longer length of pipe to reach negatively impacting pipe hydraulics as the outlet would have been further below high tide lines than it currently is.

The marsh restoration location was selected as it is directly adjacent to the outfall work. Three separate alternatives were reviewed with NHDES Wetlands bureau and the proposed alternative (marsh with stone armored sill) was selected as the preferred. Other alternatives included reducing the marsh size to reduce the sill height and using timber reinforcement to create tiers with stabilized mudflats and marsh within the same footprint. The alternative selected better meets intent of maximising the marsh restoration.

The work will also include some grading adjacent to the proposed marsh to eliminate surface runoff from the paved parking lot adjacent to the project area and redirect runoff to a stormwater treatment unit prior to being discharged from the upgraded outfall. The upgraded outfall will also include its own stormwater treatment unit to help maintain water quality in receiving water bodies.

**SECTION 5 - CONFORMANCE WITH Env-Wt 311.10(c) (Env-Wt 311.07(b)(4))\*\***

How does the project conform to Env-Wt 311.10(c)?

*\*\*Except for projects solely limited to construction or modification of non-tidal shoreline structures only need to complete relevant sections of Attachment A.*

Compensatory mitigation is proposed in the form of the marsh restorations shown on the plan. Approximately 3,600 SF of marsh restoration is proposed to provide compensation for approximately 550 SF of permanent impacts resulting from the outfall work.

# **ATTACHMENT F**

## **Functional Assessment**





# TES Environmental Consultants, LLC

March 30, 2021

Ref: TES JN 19-0168

Mr. William Doucet, President  
Doucet Survey, Inc.  
2 Commerce Drive, Suite 202  
Bedford, NH 03110

Re: Environmental Services (Wetland Description and Functions and Values Assessment)  
Maplewood Avenue Over North Mill Pond, Portsmouth, New Hampshire  
NHDOT Bridge No. 231/103

Dear Mr. Doucet:

TES Environmental Consultants, L.L.C. (TES) has prepared this report to document the physical and biological characteristics of the wetlands and surrounding lands in the vicinity of the proposed replacement of the existing culvert at Maplewood Avenue Over North Mill Pond in Portsmouth, New Hampshire, and to evaluate the functions and values associated with those wetlands. These observations are provided in support of the Survey Scope of Services related to the proposed project.

An on-site investigation was performed by TES on February 28, 2020 to delineate the boundaries of wetlands in the vicinity of the culvert (Figure 1) and to observe the characteristics of the wetlands and the upland portion of the surroundings. The wetland delineation was performed according to the standards of the Corps of Engineers Wetland Delineation Manual and the Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region, Version 2.0, January 2012, US Army Corps of Engineers. All wetlands in the survey area consist of coastal resources, therefore the limits of jurisdictional wetlands were identified as the highest observable tide line (HOTL) as defined at Env-Wt 602.23. The observations made during this field effort were during the mid-incoming tide, and together with the following published information, form the basis for this wetland functional assessment:

- USGS Portsmouth, NH-ME Quadrangle, 7.5 minute series topographic map
- Aerial photographs from Google Earth and other sources
- USDA-NRCS Soil Survey of Rockingham County, New Hampshire (via Web Soil Survey)
- National Wetlands Inventory map
- The New Hampshire Department of Environmental Services (NHDES) Wetlands Permit Planning Tool (WPPT)
- NH Natural Heritage Program Datacheck Program
- US Army Corps of Engineers The Highway Methodology Workbook – Supplement

## **Site Characterization**

**Uplands.** The upland areas in the vicinity of this survey area are primarily in urban residential (to the west) and commercial/industrial use to the east (Figure 2). Essentially no undeveloped land exists in the vicinity of the site, although North Cemetery lies approximately 500 feet to the southeast. Trees exist

# TES Environmental Consultants, LLC

only in yards and small roadside spaces, with boxelder (*Acer negundo*) and weeping willow (*Salix babylonica*) predominant, and choke cherry (*Prunus virginiana*), black locust (*Robinia pseudoacacia*), and staghorn sumac (*Rhus typhina*) present as shrub species. Two invasive shrub species are present within the project site: glossy buckthorn (*Frangula alnus*) and multiflora rose (*Rosa multiflora*). Two invasive vines are also present – Oriental bittersweet (*Celastrus orbiculatus*), and black swallowwort (*Cynanchum louiseae*). Herbaceous species present in the upland areas include turf grasses and Canada goldenrod (*Solidago canadensis*).

Upland soils in the vicinity of the survey area are shown in the Soil Survey of Rockingham County as being Urban Land (699) to the east of the culvert, and Urban Land-Canton complex (799) to the west. Canton fine sandy loam is a sandy soil formed in loose glacial till deposits. Urban Land components are developed lands, most likely having soils similar to Canton.

**Wetlands.** On February 28, 2020 a TES wetland scientist delineated and flagged the boundaries of the HOTL within the project survey area with numbered pink and black striped flags for location by ground survey and depiction on site plans. The principal jurisdictional wetland feature within the survey area consists of North Mill Pond (Figures 3 and 4) which is identified as Estuarine Water on the WPPT, with small, limited fringe areas of Irregularly Flooded (Tidal) Marsh and Tidal Flats in the vicinity of the project area. The project site lies approximately 1,500 feet south of the Piscataqua River at the Sarah Mildred Long Bridge on US Route 1 Bypass. Tidal Flats predominate landward from Maplewood Avenue, and Estuarine Water occupies most of the seaward portion of North Mill Pond.

Under the U.S. Fish and Wildlife Service's Classification of Wetlands and Deepwater Habitats of the United States (Cowardin et al., 1979), the Tidal Flats would be classified as Estuarine, Intertidal, Unconsolidated Shore, Mud, Regularly Flooded (E2US3N), and the Estuarine Water portions would be classified as Estuarine, Subtidal, Unconsolidated Bottom, Subtidal (E1UBL). The latter areas have a cobble bottom in the vicinity of the culvert, where tidal currents are strongest, and mud further away. Riprap is present along both sides of the Maplewood Avenue causeway, and rockweed (*Ascophyllum nodosum*) grows on the riprap and other rocky surfaces (Figure 5) in the project vicinity. Salt marsh cordgrass (*Spartina alterniflora*) grows in unconsolidated material (Figure 6) in the intertidal zone in only narrow strips in scattered areas near the project site. No eelgrass beds, shellfish beds, or oyster restoration beds are located near the project area.

No fish were observed within North Mill Pond, although various species such as winter flounder (*Pseudopleuronectes americanus*), juvenile (snapper) bluefish (*Pomatomus saltatrix*), and baitfish such as killifish (*Fundulus* spp.) and common mummichog (*Fundulus heteroclitus*) may be expected to occur seasonally. Various wading birds, shore birds, and waterfowl may also be expected to utilize North Mill Pond and its tidal flats seasonally.

**Vernal Pool.** No vernal pools were observed within the vicinity of the Maplewood Avenue Over North Mill Pond survey area, applying the following definition and methodologies: New Hampshire Department of Environmental Service definition of vernal pool at Env-Wt 101.106; delineation methods at Env-Wt 301.01(f); and guidelines for identifying and describing vernal pools given in "Identification and Documentation of Vernal Pools in New Hampshire" published by the New Hampshire Fish and Game Department. It is possible that vernal pool habitat is present in the forested floodplain wetlands

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further away from the survey corridor, although the depth of floodwaters during the field survey precluded observations in those areas.

**Invasive Plant Species.** The lands within the survey area for this project were investigated for the potential presence of invasive plants identified in the New Hampshire Department of Transportation (NHDOT) Best Management Practices for Roadside Invasive Plants. Four invasive plant species were observed in the survey area: Oriental bittersweet (*Celastrus orbiculatus*), glossy buckthorn (*Frangula alnus*), multiflora rose (*Rosa multiflora*), and black swallowwort (*Cynanchum louiseae*). Oriental bittersweet, glossy buckthorn, and multiflora rose are common in the uplands in the northwest quadrant of the survey area, and black swallowwort is present all along the north side of Maplewood Avenue. The extensive nature of the colonization of each of these invasive plants, along with the location of many of them on adjacent private property and along the shoreline extending well away from the project site, lead to a recommendation of no attempts to control these invasive species. Soil and plant material removed from this site, however, should not be re-used on site or on other sites, but rather should be disposed of in accordance with the New Hampshire Department of Transportation's Best Management Practices for Roadside Invasive Plants (2008).

## Wetland Functional Assessment Methodology

Wetland functions and values, and their significance were evaluated using the US Army Corps Highway Methodology guidelines. The following is a list of the 14 wetland functions and values with a brief description of each.

1. **Groundwater Recharge** should relate to the potential for the wetland to contribute water to an aquifer (often combined with the following).
2. **Groundwater Discharge** should relate to the potential for the wetland to serve as an area where ground water can be discharged to the surface.
3. **Floodflow Alteration:** This function considers the effectiveness of the wetland in reducing flood damage by attenuation of floodwaters for prolonged periods following precipitation events.
4. **Fish and Shellfish Habitat:** This function considers the effectiveness of seasonal or permanent water bodies associated with the wetland in question for fish and shell fish habitat.
5. **Sediment/Toxicant/Pathogen Retention:** This function reduces or prevents degradation of water quality. It relates to the effectiveness of the wetland as a trap for sediments, toxicants or pathogens.
6. **Nutrient Removal/Retention/Transformation:** This function relates to the effectiveness of the wetland to prevent adverse effects of excess nutrients entering aquifers or surface waters such as ponds, lakes, streams, rivers or estuaries.
7. **Production Export:** This function relates to the effectiveness of the wetland to produce food or usable products for humans or other living organisms.
8. **Sediment/Shoreline Stabilization:** This function relates to the effectiveness of a wetland to stabilize stream banks and shorelines against erosion.
9. **Wildlife Habitat:** This function considers the effectiveness of the wetland to provide habitat for various types and populations of animals typically associated with wetlands and the wetland edge. Both resident and or migrating species must be considered.
10. **Recreation:** This value considers the effectiveness of the wetland and associated watercourses to provide recreational opportunities such as canoeing, boating, fishing, hunting and other active or

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passive recreational activities. Consumptive opportunities consume or diminish the plants, animals or other resources that are intrinsic to the wetland, whereas non-consumptive opportunities do not.

11. **Educational/Scientific Value:** This value considers the effectiveness of the wetland as a site for an "outdoor classroom" or as a location for scientific study or research.
12. **Uniqueness/Heritage:** This value relates to the effectiveness of the wetland or its associated water bodies to produce certain special values. Special values may include such things as archeological sites, unusual aesthetic quality, historical events, or unique plants, animals, or geological features.
13. **Visual Quality/Aesthetics:** This value relates to the visual and aesthetic qualities of the wetland.
14. **Threatened or Endangered Species Habitat:** This value relates to the effectiveness of the wetland or associated water bodies to support threatened or endangered species.

## Wetland Functions and Values in the Survey Area

The functions and values of the wetland resources in the survey area are associated with North Mill Pond and contiguous wetlands landward and seaward from the site.

Of the 14 recognized potential functions and values of wetlands, 8 are considered to be present at some level at the location of this project, of which 4 rise to principal or significant levels within this wetland resource:

- sediment/toxicant retention,
- nutrient removal/transformation,
- sediment/shoreline stabilization, and
- visual quality/aesthetics.

## Principal Functions and Values.

Sediment/toxicant retention potential is present at a principal level within the North Mill Pond wetland system due in large part to the low gradient of Pond bottom and extensive mud flats. The slow water flow present in most of the Pond (except at the Maplewood Avenue culvert) during incoming and outgoing tides, along with the Pond sediments, provide potential for settling of sediment and toxicants, as well as binding of toxicants to Pond sediment. Potential sources of sediment and toxicants are present within the Pond watershed.

Nutrient removal/transformation is also considered to be present at a principal level at this location. This function generally follows sediment/toxicant retention, as both require a wetland having a low gradient and slow flowing water. The North Mill Pond does generally lack sufficient vegetation to slow water flow, and to provide significant uptake of excessive nutrients, however. Potential sources of excess nutrients are present within the Pond watershed.

Sediment/shoreline stabilization is a function clearly provided to some degree by the wetlands along the banks of North Mill Pond, although mechanical stabilization including riprap and retaining walls are prominent in the vicinity of the Maplewood Avenue causeway. Stable bank soils contribute to reduced sediment entering downgradient channels with silt, maintaining their ability to convey flows and boat traffic.

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Visual quality/aesthetics is a value considered to be present at a significant level at this location due to the presence of expansive surface waters, and a public road elevated above the water offering an open vista. This affords the public opportunities to view the setting while travelling along Maplewood Avenue, the primary public viewing location.

**Functions and Values Present at Moderate Levels.** Four potential functions and values of wetlands are considered to be present at moderate but not principal levels at this location:

- fish and shellfish habitat,
- production export,
- wildlife habitat, and
- recreation.

Fish and shellfish habitat is considered to be present, or potentially present, at moderate levels within North Mill Pond due to the presence of permanent surface water connected to the Piscataqua River. Some marine or estuarine fish species may inhabit the Pond seasonally at some point in their life cycle, although the minimal submerged and emergent vegetation in the Pond limits potential food and cover. The existing Maplewood Avenue culvert is sufficiently wide to allow fish passage. No fish or shellfish were noted during the field investigation, but some examples of fish that may occur seasonally include winter flounder (*Pseudopleuronectes americanus*), juvenile (snapper) bluefish (*Pomatomus saltatrix*), and baitfish such as killifish (*Fundulus* spp.) and common mummichog (*Fundulus heteroclitus*). The sole tributary to North Mill Pond is Hodgson Brook, and no significant fresh surface waters exist along that drainageway, limiting potential for anadromous or catadromous fish usage.

Production export consists of the transport of vegetation or its decomposing material from a wetland to connected wetlands or surface waters. High potential for wetlands to perform production export is typically exemplified by high levels of vegetative production within a wetland coupled with a broad pathway for that production to be conveyed from that wetland to another wetland or water body. There is minimal vegetative growth with North Mill Pond or in wetlands along its shores, and therefore little export of vegetation occurs here, although a limited amount occurs from the small fringe marsh vegetation (primarily *Spartina alterniflora*) and submerged vegetation such as rockweed (*Ascophyllum nodosum*).

Wildlife habitat is a function related to all of the physical and biological elements of a wetland complex and its surrounding landscapes. The setting of North Mill Pond and associated wetlands within a highly-developed area corridor detracts greatly from its overall habitat potential. However, the significant open water (especially at high tide) provides potential resting areas for migrating waterfowl, and shorebirds and wading birds may find limited foraging habitat along the shore and on exposed mud flats. For the purposes of wetland function and values assessments, the function of wildlife habitat focuses on habitat for wildlife dependent on wetlands for part or all of their life cycles.

Recreation potential related to the wetland resources present at this location relate primarily to potential active recreation (fishing, canoe/kayak use) related to North Mill Pond, and passive recreation potentially provided by viewing the open vista or possibly birding from Maplewood Avenue, which has sidewalks along both sides. The primary limiting factor for both active and passive recreation in this location is the general lack of public access. Metered parallel parking is present off the eastern end of

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the survey corridor, although little visual interest is present for passive public recreation. The existing culvert appears to provide sufficient width and overhead clearance for the passage of small craft such as canoes or kayaks, although during peak tidal flow the current may be too strong to paddle against, and at high tide the overhead clearance may be insufficient for passage.

**Functions and Values Absent or Present at Negligible Levels.** Five potential functions and values of wetlands are considered to be absent or present at negligible levels at this location:

- groundwater recharge and discharge,
- floodflow alteration
- educational/scientific value,
- uniqueness/heritage value, and
- endangered species habitat.

Groundwater recharge and discharge are generally considered insignificant functions in Estuarine environments such as North Mill Pond. Coastal areas may have brackish groundwater, recharged by coastal surface waters. Fresh groundwater from inland areas “pushes” against this brackish groundwater, and the brackish front may push inland during periods of little rainfall, or seaward during periods of heavier rainfall. Over time, rising sea levels may increase saltwater intrusion into coastal aquifers that were previously exclusively or mostly freshwater, rendering that groundwater unpotable at least until freshwater recharge pushes out the salt intrusion. These occurrences are not so much related to the functions of the wetlands as they are to fluctuations, seasonal and long-term, in weather and climate variations.

Floodflow alteration can be considered a significant function in coastal wetlands such as where extensive salt marshes or dunes provide buffers to storm surges. The narrow and discontinuous marsh fringes along North Mill Pond provide negligible protection against storm surges, and constructed barriers such as riprap banks and retaining walls are the principal features providing such protection in the vicinity of Maplewood Avenue.

Potential for educational/scientific value associated with North Mill Pond at this site is limited by the minimal controlled public access to the Pond and adjacent wetlands. A sidewalk along both sides of Maplewood Avenue permits visual access, but physical access is obstructed by retaining walls, steep slopes, and adjacent private property. In general, the potential for limited use of the site as an “outdoor classroom” is present, and the educational opportunity provided by the view of the Pond and adjacent developed land is intriguing, but this value is deemed negligible due to access issues including limited parking and safety issues related to vehicular traffic.

Uniqueness/heritage value was determined to be negligible for this location. Although the area was developed during early colonial times, no historic or archaeological interests associated with the Pond or adjacent wetlands were observed at this location.

Endangered species habitat is a potential value of wetlands. A New Hampshire Natural Heritage Bureau preliminary online datacheck for this location was performed to assess the potential for the presence of threatened or endangered species in the vicinity. This preliminary datacheck resulted in a finding of no

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known occurrences of threatened or endangered species or exemplary natural communities in the vicinity of the project. Such datachecks consist of reviews of all known occurrences of such species or communities within one mile of a proposed project, and is subject to change over time as new occurrences are recorded. A complete review of this matter will be required during the New Hampshire wetland permitting process for this project, although it is considered unlikely that the proposed culvert replacement would be found to have an adverse impact on any such sensitive species or habitats.

In general, the proposed project to replace the culvert at Maplewood Avenue over North Mill Pond would not be expected to cause any degradation of the functions and values associated with the Pond and the adjacent wetlands. Continued unrestricted passage of flows, sediment, and movement of fish and wildlife through the area will continue as under the present conditions. With the implementation of best management construction practices, the project would avoid potential construction-phase impacts related to sedimentation and erosion.

Please feel free to contact me with any questions or comments regarding this report.

Sincerely,



Thomas E. Sokoloski  
New Hampshire Certified Wetland Scientist #127



# Wetland Function-Value Evaluation Form

Total area of wetland <sup>+/-</sup> Access Human made? No Is wetland part of a wildlife corridor? No or a "habitat island"? No  
 Adjacent land use Residential, Commercial, Industrial Distance to nearest roadway or other development 0 feet  
 Dominant wetland systems present Estuarine Contiguous undeveloped buffer zone present No  
 Is the wetland a separate hydraulic system? No If not, where does the wetland lie in the drainage basin? Tidal  
 How many tributaries contribute to the wetland? 1 Wildlife & vegetation diversity/abundance (see attached list)  
(Hodgson Brook)

Wetland I.D. North Mill Pond  
 Latitude 43.0797 Longitude 70.7655  
 Prepared by: JES Date 3/27/2021  
 Wetland Impact:  
 Type TBD Area TBD

Evaluation based on:  
 Office  Field   
 Corps manual wetland delineation completed? Y  N  (OTH)

| Function/Value                   | Occurrence<br>Y N                   | Rationale<br>(Reference #)* | Principal<br>Function(s)/Value(s)   | Comments   |
|----------------------------------|-------------------------------------|-----------------------------|-------------------------------------|--|
| Groundwater Recharge/Discharge   | <input checked="" type="checkbox"/> |                             |                                     | Absent - tidal resource.                                     |
| Floodflow Alteration             | <input checked="" type="checkbox"/> |                             |                                     | North Mill Pond has limited flood storage/desynchronization. |
| Fish and Shellfish Habitat       | <input checked="" type="checkbox"/> | 1,4                         |                                     | Limited known potential; no shellfish beds (WPPD)            |
| Sediment/Toxicant Retention      | <input checked="" type="checkbox"/> | 1,2,3,4,8,9                 | <input checked="" type="checkbox"/> | Opportunity present; sediments provide toxicant retention.   |
| Nutrient Removal                 | <input checked="" type="checkbox"/> | 1,2,3,4,6,7                 | <input checked="" type="checkbox"/> | Sediment binding potential; minimal vegetative uptake        |
| Production Export                | <input checked="" type="checkbox"/> |                             |                                     | Limited vegetative production present in Pond overall        |
| Sediment/Shoreline Stabilization | <input checked="" type="checkbox"/> | 1,2,3,10,11                 | <input checked="" type="checkbox"/> | Much of shoreline at road stabilized by riprap, walls.       |
| Wildlife Habitat                 | <input checked="" type="checkbox"/> | 6,12,18                     |                                     | Modest habitat due to minimal vegetation and development.    |
| Recreation                       | <input checked="" type="checkbox"/> | 7,9                         |                                     | Limited accessibility and interest in Pond itself            |
| Educational Scientific Value     | <input checked="" type="checkbox"/> |                             |                                     | Generally inaccessible to public; high disturbance           |
| Uniqueness/Heritage              | <input checked="" type="checkbox"/> | 1,3,13,14,17                |                                     | No observed unique/significant historic features.            |
| Visual Quality/Aesthetics        | <input checked="" type="checkbox"/> | 2,6,12                      | <input checked="" type="checkbox"/> | Open water, mud flats, viewshed from road.                   |
| Endangered Species Habitat       | <input checked="" type="checkbox"/> |                             |                                     | Preliminary NH NHB data check - negative results.            |
| Other                            |                                     |                             |                                     |  |

\* Refer to back up list of numbered considerations.



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FIGURE 1

Arch Culvert at Maplewood Avenue Over North Mill Pond, Portsmouth, View Southwest of Seaward Side of Culvert from Shoreline (2/28/2020)



FIGURE 2

Residential and Commercial/Industrial Development on East Side of Project Site, View East from Western Shoreline of North Mill Pond (2/28/2020)

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FIGURE 3  
North Mill Pond, Landward Side, View Southeast from West Side of Culvert  
in Maplewood Road, Mid-Incoming Tide (2/28/2020)



FIGURE 4  
North Mill Pond, Seaward Side, View North from East Side of Culvert in  
Maplewood Road, Mid-Incoming Tide (2/28/2020)

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FIGURE 5

Rockweed Growing on Stones and Riprap in the Subtidal and Lower Intertidal Areas Near the Maplewood Avenue Culvert Site (2/28/2020)



FIGURE 6

Remnants of Salt Marsh Cordgrass Growing within the Intertidal Zone Near the Maplewood Avenue Culvert Site (2/28/2020)

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**ATTACHMENT G**

**Wetland Permit Support Report, including  
Vulnerability Assessment**



**Information Required under Env-Wt 903.05(f),  
Env-Wt 904.07(d), and Env-Wt 603.05**

for

**Maplewood Avenue over North Mill Pond Bridge  
Rehabilitation Project**

and

**North Mill Pond Drainage Outfall Project**

Portsmouth, New Hampshire



Prepared For:

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August 23, 2023



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## APPENDICES

APPENDIX 1 – SUPPORTING DOCUMENTATION FOR HYDRAULIC MODELS

APPENDIX 2 – BRIDGE REHABILITATION PROJECT HYDROLOGY STUDY REPORT

APPENDIX 3 – DRAINAGE OUTFALL PROJECT PRE-PROJECT HYDROLOGY CALCULATIONS

APPENDIX 4 – DRAINAGE OUTFALL PROJECT POST-PROJECT HYDROLOGY CALCULATIONS



## **A. Introduction**

This report describes the hydrologic and hydraulic analyses completed to support a NHDES Wetlands Permit application for the Maplewood Avenue over North Mill Pond Bridge Rehabilitation Project and the North Mill Pond Drainage Outfall Project in Portsmouth, NH. More specifically, this report includes the information required under sections Env-Wt 903.05(f), Env-Wt 904.07(d), and Env-Wt 603.05 of the NHDES administrative rules.

## **B. Env-Wt 903.05(f)**

Env-Wt 903.05(f) requires “a narrative explanation of the effect of the crossing on the tidal hydrograph, and the corresponding effect on the upstream and downstream tidal resource.” Since the drainage outfall project does not include a tidal waterway crossing, only the effects of the bridge rehabilitation project on tidal conditions have been evaluated.

Two-dimensional (2D) unsteady flow models which simulate existing (i.e., pre-project) conditions and proposed (i.e., post-project) conditions with the geopolymer liner applied and portions of the existing above-grade concrete footings removed have been developed to evaluate the effect of the proposed bridge rehabilitation work on the tidal hydrograph and North Mill Pond. The models were created using the U.S. Army Corps of Engineers HEC-RAS program (version 6.3). To understand the effects of the proposed bridge rehabilitation work across a range of tidal conditions, pre- and post-project models were developed using two different tide stage hydrographs – one simulating a tide stage crest equal to mean higher-high water (MHHW) and one simulating a tide stage trough equal to mean lower-low water (MLLW). Comparisons between the pre- and post-project models were used to identify changes to maximum and minimum water levels and timing of the high and low tides caused by the rehabilitation work. The following sections describe the development of these models and the analysis results.

### **B.1. Hydraulic Model Geometry – All Models**

The hydraulic models cover an area from a point on Hodgson Brook (a.k.a. Hodgdon Brook) about 1,200 feet southwest (upstream) from Bartlett Street to a point in North Mill Pond approximately 500 feet north of Maplewood Avenue. Model geometry was developed from a combination of field survey data and publicly-available LiDAR data (Coastal New Hampshire - 2014 data set). With the exception of the area in the vicinity of the bridge, the same geometry was used in all of the models.

The LiDAR data does not include below-water ground elevations (i.e., bathymetry), geometry of the corrugated metal arch bridge at Maplewood Avenue, or geometry of the box culvert at Bartlett Street; therefore, this information was field surveyed. Bathymetry of North Mill Pond within the study area was surveyed by Doucet Survey, LLC in late 2019 and early 2020. The Doucet survey also included topography along about 800 feet of Maplewood Avenue, portions of the shoreline north and south of the road, and other above-water areas in the project vicinity. However, it did not include detailed geometry of the existing bridge, bathymetry at the bridge inlet or outlet, geometry of the box culvert at Bartlett Street, or channel bottom elevations at the box culvert inlet or outlet; therefore, this information was field surveyed by Headwaters Consulting, LLC in September 2020. All field survey data was collected relative to NH State Plane coordinates and NAVD88 elevations, which are the same coordinate system and elevation datum the LiDAR data is referenced to (though the LiDAR

data was converted from metric to U.S. customary units). This allowed the field survey data to be merged with the LiDAR data to produce a comprehensive digital elevation model (DEM) of the study area. Figure 1 shows the hydraulic study area DEM with the Doucet field survey area outlined in red and the Headwaters field survey areas outlined in blue. Terrain information in all other areas was generated from LiDAR data.

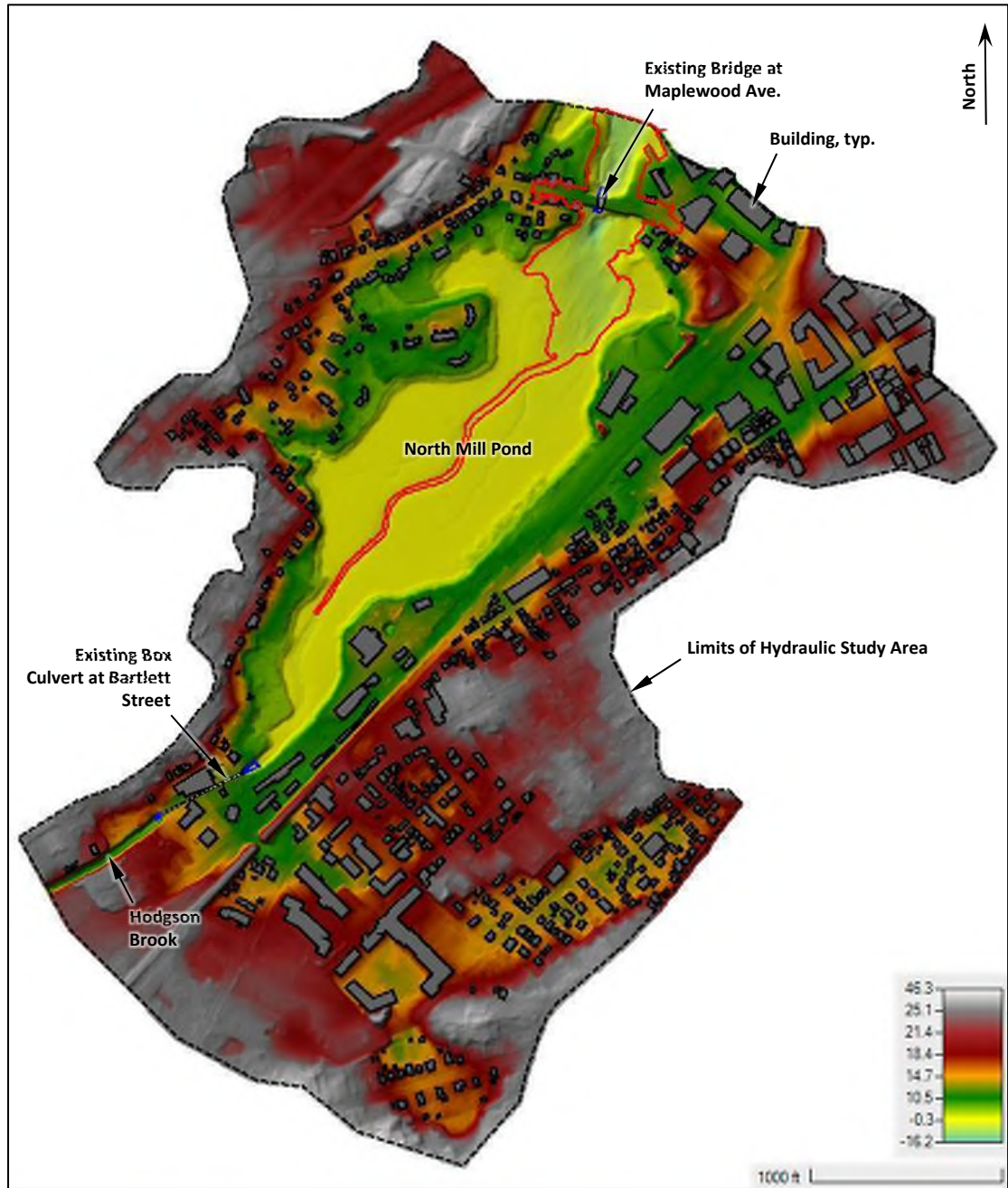
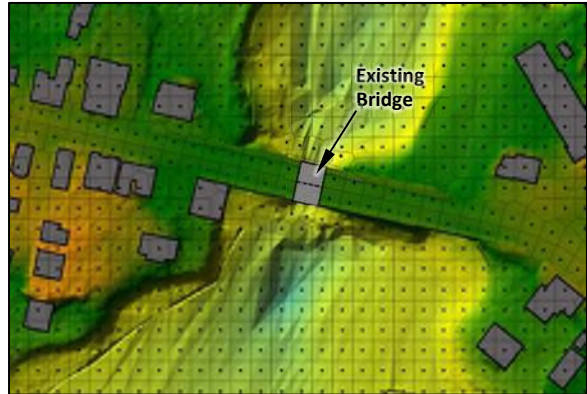


Figure 1 – Existing conditions digital elevation model (DEM) of the hydraulic study area showing areas field surveyed by Doucet Survey, LLC outlined in red and areas field surveyed by Headwaters Consulting, LLC outlined in blue

As shown in Figure 1, there are many buildings within the hydraulic study area. The building footprints were provided by the City of Portsmouth in GIS format and were uniformly assigned

an elevation value of 30 feet in the DEM so that they would be recognized as flow obstructions in the model.

A 2D computational mesh with a 25-foot x 25-foot cell size was overlaid on the DEM. Breaklines were defined along the tops of embankments and other elevated features which obstruct the flow (e.g., Maplewood Avenue) to prevent the model from calculating flow over them before they are actually overtopped. Figure 2 shows the computational mesh layout in the vicinity of Maplewood Avenue for the pre-project hydraulic models.



*Figure 2 – Computational mesh in the vicinity of Maplewood Avenue used in the pre-project hydraulic models*

## **B.2. Pre-Project Bridge Geometry**

Figure 3 shows a photo of the existing bridge inlet and Figures 4 and 5 show cross-sections at the existing bridge inlet and outlet. [Note that although there is bi-directional flow through the bridge, for the purposes of this study the bridge inlet is on the south side of Maplewood Avenue and the bridge outlet is on the north side of the road.] Geometries of the metal arch, concrete footings, and channel bottom are based on field survey data collected by Headwaters Consulting, LLC collected in September 2020. The roadway embankment geometries were determined from the Doucet Survey, LLC survey information.

A 24-inch diameter sanitary sewer main passes through the bridge opening about 15 feet south of the bridge outlet (see Figures 3 and 6). The size, location, and elevation of the sewer main were estimated from a 2009 plan by Haight Engineering, PLLC<sup>1</sup> and superimposed on the existing bridge outlet section (Figure 5).

---

<sup>1</sup> Existing Profile Plan, Maplewood Ave Culvert Replacement & North Mill Pond Restoration, Portsmouth, NH, prepared by Haight Engineering, PLLC, Sheet C-4, date: 12-30-2009



Figure 3 – View north at the existing bridge inlet (09-23-20)

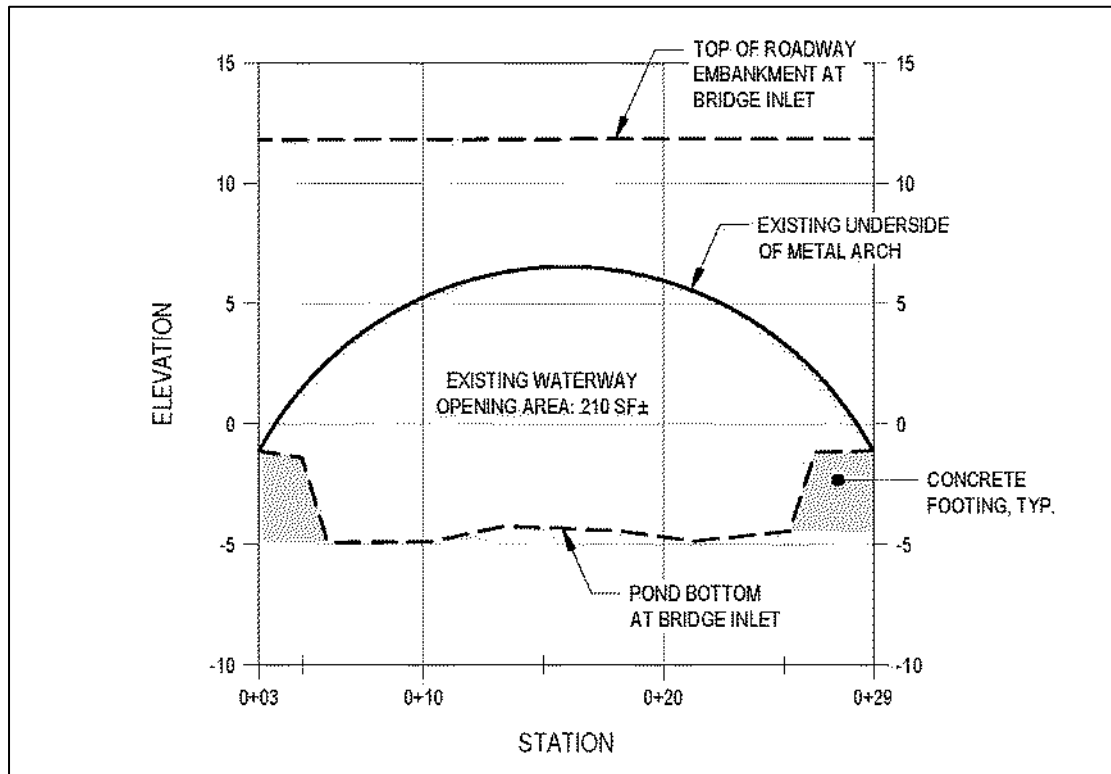


Figure 4 – Existing bridge inlet cross-section

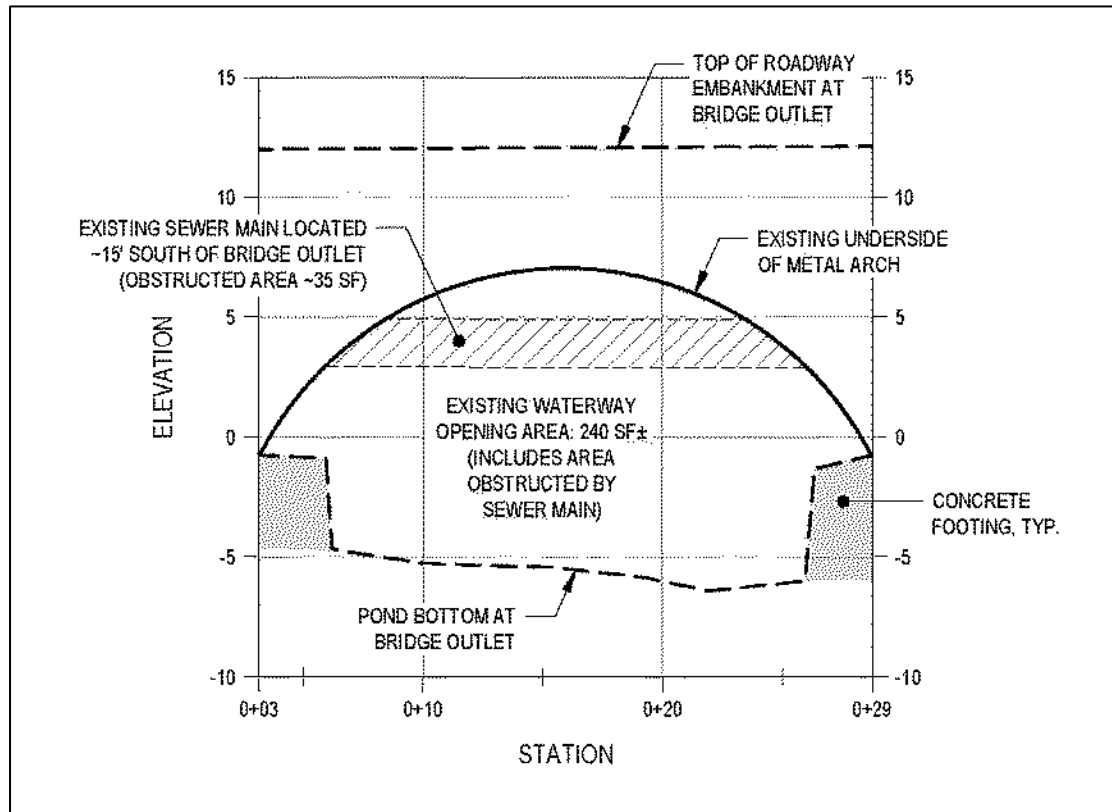


Figure 5 – Existing bridge outlet cross-section

Since the HEC-RAS bridge hydraulics routine computes flow through the bridge only at the inlet and outlet, the true effect of the sewer main cannot be modelled directly. Therefore, in an attempt to estimate its impact, the waterway opening at the bridge outlet was reduced by an area equal to the area obstructed by the sewer main, which is shown to be approximately 35 square feet on the 2009 Haight Engineering plan. Figure 7 shows the bridge outlet section as coded in the pre-project models to account for the sewer main. The waterway opening area at the bridge outlet is approximately 240 square feet when the sewer main obstruction is disregarded. The modeled waterway opening area at the bridge outlet is about 205 square feet.



Figure 6 – View north within the existing bridge opening showing the sewer main (09-23-20)

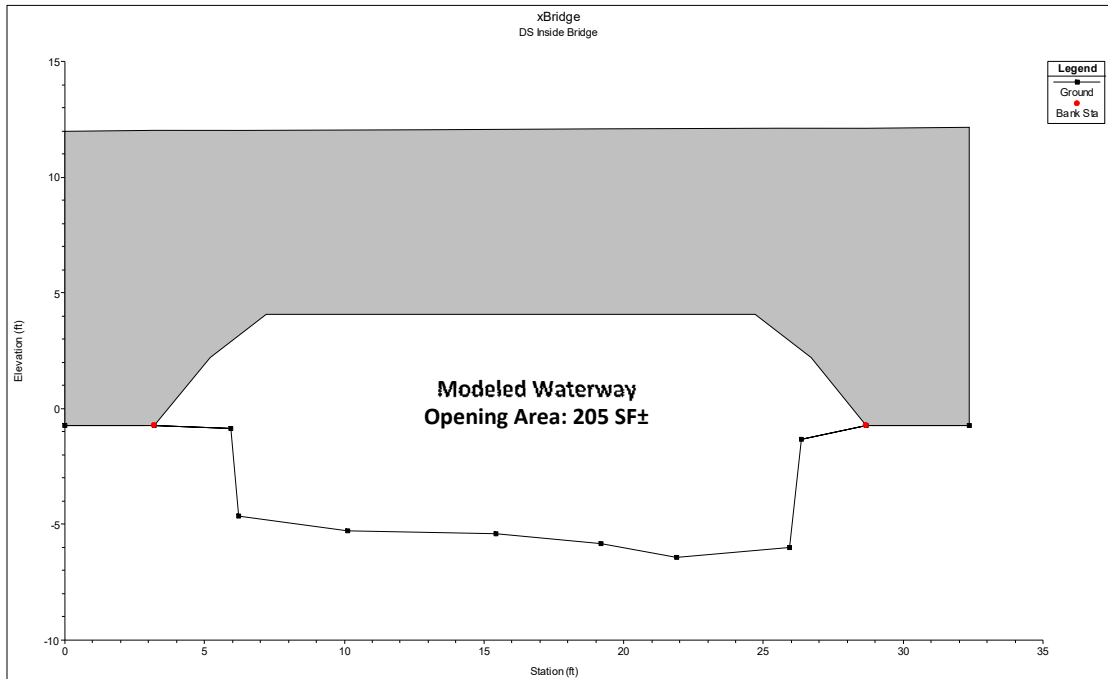


Figure 7 – Existing bridge outlet cross-section as modeled to account for sewer main obstruction

**B.3. Post-Project Bridge Geometry**

Figure 8 shows a cross-section of the bridge inlet as modeled with the geopolymer liner applied and portions of the concrete footings removed. The existing waterway opening area at the inlet is approximately 210 square feet (see Figure 4). The geopolymer liner would occupy approximately 11 square feet and the concrete footing removal would add about 11 square feet, resulting in no change to the overall waterway opening area at the inlet.

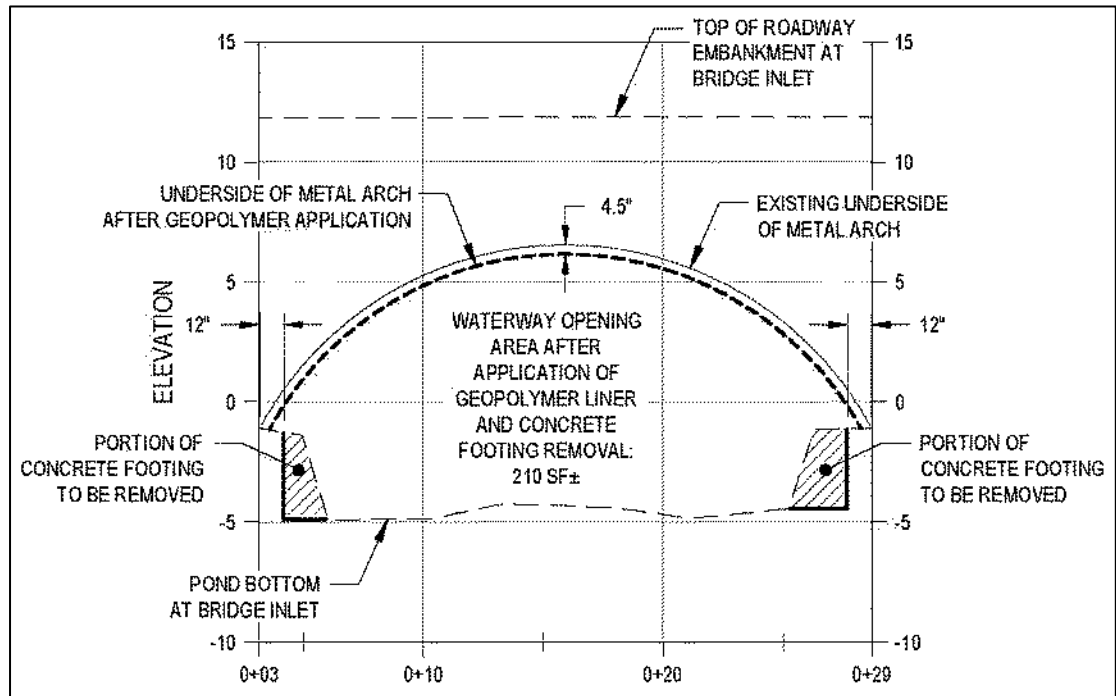


Figure 8 – Post-project bridge inlet cross-section

The waterway opening at the bridge outlet was reduced by an area equal to the sum of the areas obstructed by the geopolymer liner and sanitary sewer main (45 sf) less the area added by removing portions of the concrete footings (15 sf). Figure 9 shows the bridge outlet section defined in the hydraulic models to account for these obstructions and additions which increase the modeled waterway opening area at the bridge outlet from 205 square feet (see Figure 7) to about 210 square feet.

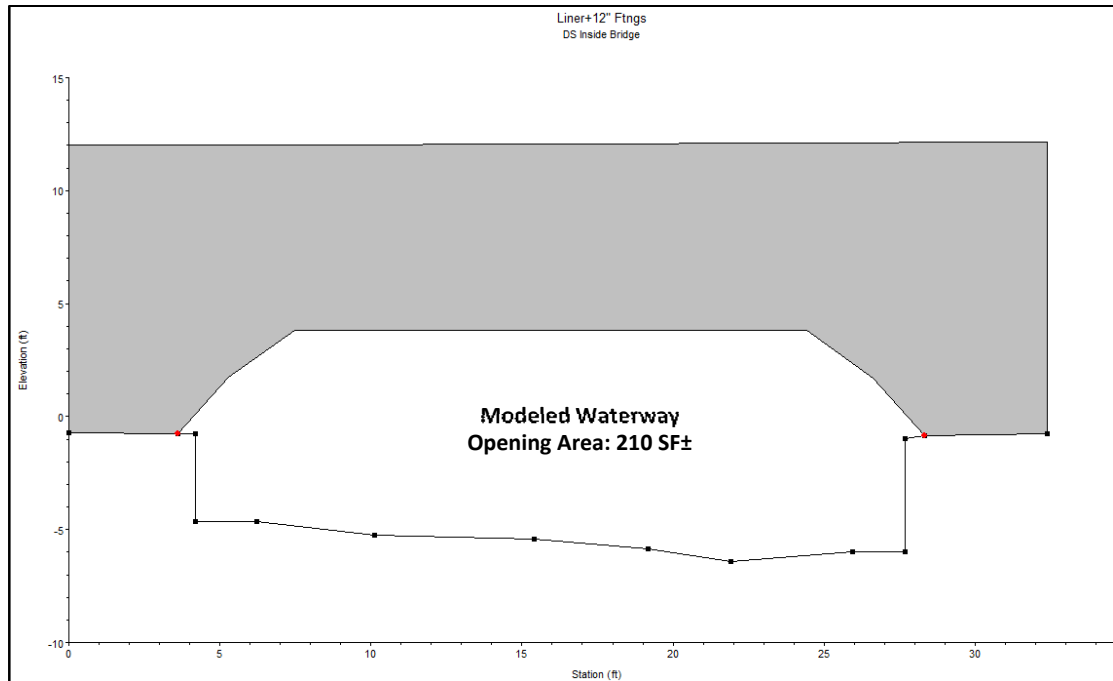


Figure 9 – Post-project bridge outlet cross-section as modeled to account for the areas obstructed by the geopolymer liner and sewer main and the area added by removing portions of the concrete footings

Details for the geopolymer liner at the interface of the metal arch and concrete footings are still being developed and as a result there may be some minor differences between the final proposed waterway opening geometries and those shown in Figures 8 and 9; however, if these result in a diminution of the modeled opening areas, additional concrete footing removal will be incorporated into the details such that the final proposed waterway opening geometries will have the same cross-sectional areas as the modeled waterway openings and the results of these analyses will still be valid.

#### B.4. Roughness

2017 aerial photography and the “Impervious Surfaces in the Coastal Watershed of NH and Maine, High Resolution – 2015” and “Land Use 2015 - Southeastern New Hampshire” GIS layers downloaded from NHGRANIT were used to map land cover in the hydraulic study area via the creation of GIS land cover polygons. Manning’s n surface roughness coefficients were then assigned to each land cover type for use in the hydraulic modeling. Figure 10 shows the land cover mapping and Table 1 lists the roughness coefficients assigned to the land cover classifications. A full-size copy of the land cover map is included in Appendix 1.

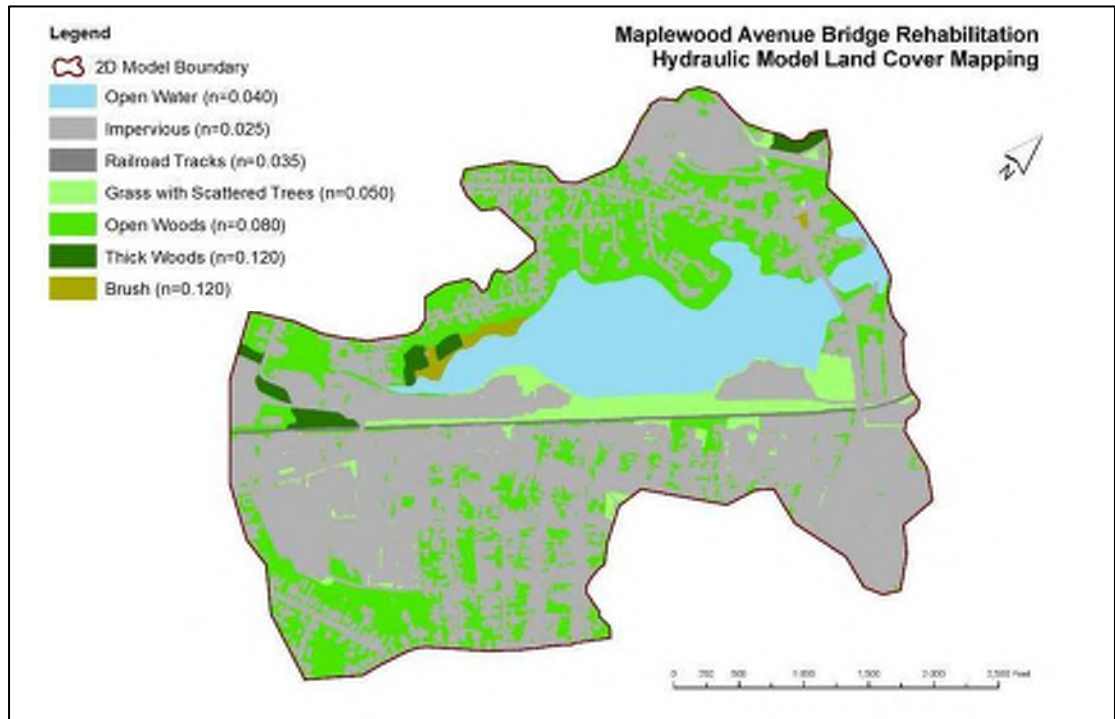


Figure 10 – Land cover mapping

Table 1 – Manning’s n roughness coefficients

| Land Cover Classification  | Manning’s n Roughness Coefficient |
|----------------------------|-----------------------------------|
| Open Water                 | 0.040                             |
| Impervious Surface         | 0.025                             |
| Railroad Tracks            | 0.035                             |
| Grass with Scattered Trees | 0.050                             |
| Open Woods                 | 0.080                             |
| Thick Woods                | 0.120                             |
| Brush                      | 0.120                             |

Figure 11 shows the hydraulic study area (i.e., 2D model boundary) overlaid on the 2017 aerial photography.



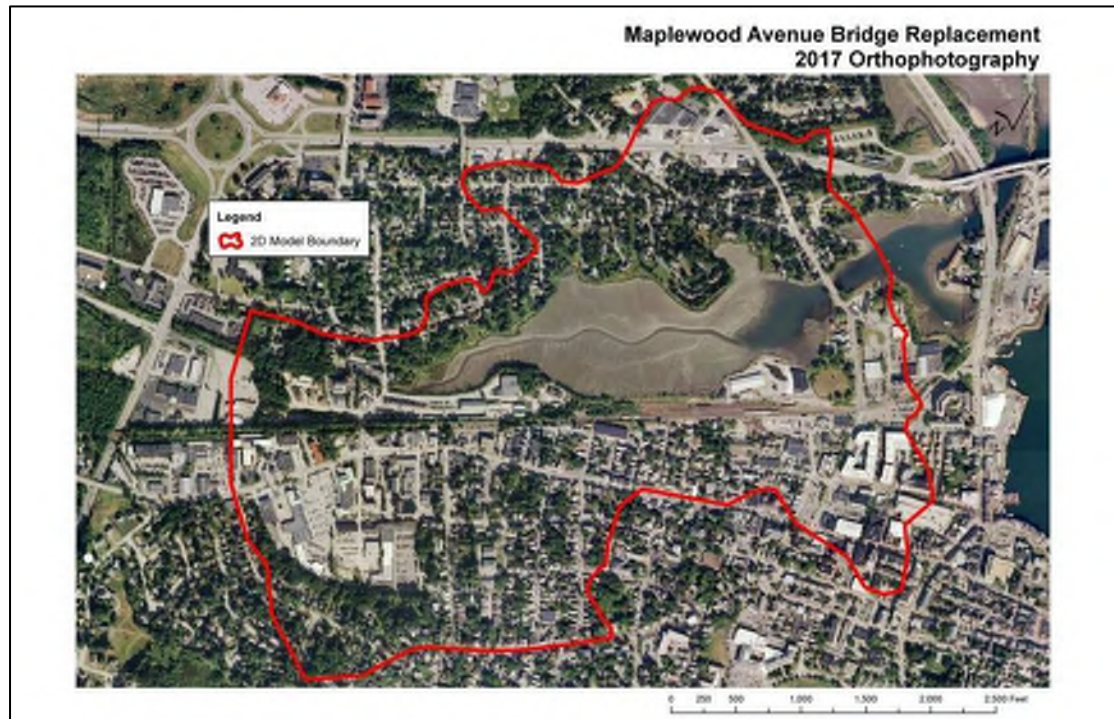


Figure 11 – Hydraulic study area boundary overlaid on 2017 aerial photography

### **B.5. Boundary Conditions**

External boundary conditions were defined at the upstream (south) and downstream (north) limits of the hydraulic study area in each model. These include flow hydrographs at the upstream end of the study area, which represent freshwater inflow to North Mill Pond, and stage hydrographs at the downstream end of the study area to simulate tide fluctuations.

Since Env-Wt 903.05(f) only requires an assessment of project's impact on the tidal hydrograph, the freshwater inflow hydrograph only reflects base flow conditions for Hodgson Brook, which are estimated to be a constant discharge of 2 cfs, which is the approximate flow that is equaled or exceeded 60% of the time predicted by the flow duration regression equations in the web-based USGS StreamStats program<sup>2</sup> (see Appendix 1).

Data from the NOAA Seavey Island tide station (#8419870) were used to develop stage hydrographs for the downstream boundary. The tide station is located at the Portsmouth Naval Shipyard about 1.2 miles due east of the bridge and has operated intermittently between 1926 and present with a cumulative record of approximately 58 years.

Doucet Survey, LLC completed a tidal study in May and June 2022 to relate tide stages on the north side of Maplewood Avenue (i.e., the ocean side) to tide stages measured at the Seavey Island tide station. This involved surveying high and low water elevations at the bridge on three separate occasions, comparing these to the high and low water elevations measured at the tide station, and using the data to calculate tide datums on the north side of the bridge.

<sup>2</sup> Flynn, R.H. and Tasker, G.D., 2002, Development of Regression Equations to Estimate Flow Durations and Low-Flow-Frequency Statistics in New Hampshire Streams: U.S. Geological Survey Scientific Investigations Report 02-4298, 66 p. (<http://pubs.water.usgs.gov/wrir02-4298>)

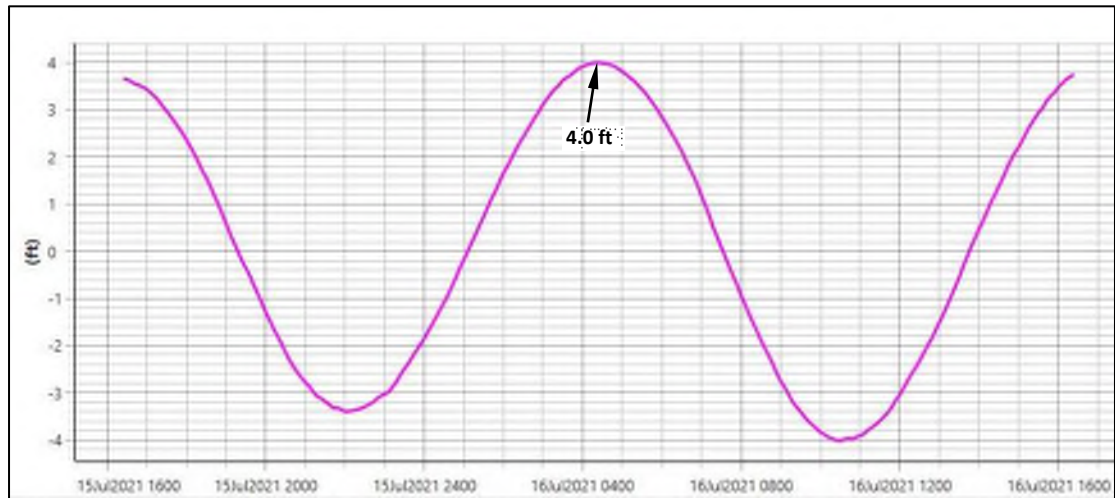
Table 2 summarizes the calculated tidal datums. A summary table from the Doucet tidal study is also included in Appendix 1.

*Table 2 – Tide Datums from Doucet Survey Tidal Study*

| Datum  | Description                           | Maplewood Ave. Bridge (North Side) | Seavey Island Tide Station (#8419870) |
|--------|---------------------------------------|------------------------------------|---------------------------------------|
| HAT    | Highest Astronomical Tide             | 5.6 ft                             | 5.87 ft                               |
| MHHW   | Mean Higher-High Water                | 4.0 ft                             | 4.18 ft                               |
| MHW    | Mean High Water                       | 3.6 ft                             | 3.76 ft                               |
| MTL    | Mean Tide Level                       | -0.3 ft                            | -0.32 ft                              |
| MLW    | Mean Low Water                        | -4.2 ft                            | -4.39 ft                              |
| MLLW   | Mean Lower-Low Water                  | -4.5 ft                            | -4.71 ft                              |
| NAVD88 | North American Vertical Datum of 1988 | 0.0 ft                             | 0.00 ft                               |

Tide stage hydrographs used for the downstream boundaries were estimated using water levels measured at the Seavey Island station during tide cycles with crests and troughs equal to MHHW and MLLW, respectively. These occurred most recently at 4:24 AM on July 16, 2021 (higher-high water 4.18 ft) and 6:48 PM on October 26, 2022 (lower-low water -4.71 ft).

Six-minute water level data for 24-hour periods centered on the MHHW and MLLW measurements at the tide station were downloaded from the NOAA website. Per the Doucet tidal study, MHHW on the north side of the bridge is approximately 4.3% lower than MHHW at the tide station and MLLW on the north side of the bridge is approximately 4.5% higher than MLLW at the tide station. The water levels measured at the tide station were lowered and raised by these percentages to generate tide stage hydrographs simulating MHHW and MLLW on the north side of the bridge which were used as the downstream boundaries in the models. Figures 12 and 13 show the tide stage hydrographs simulating MHHW and MLLW at the downstream model boundary.



*Figure 12 – Tide stage hydrograph simulating MHHW at the downstream model boundary*

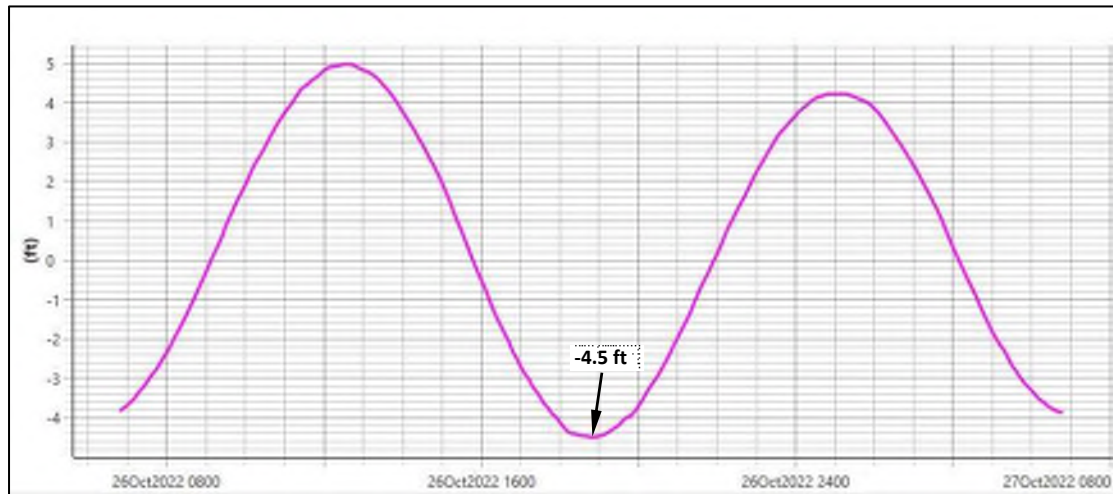


Figure 13 – Tide stage hydrograph simulating MLLW at the downstream model boundary

### **B.6. Additional Modeling Parameters**

All models were run with the full momentum SWE-ELM equation set (i.e., Shallow Water Equations, Eulerian-Lagrangian Method) which is appropriate for tidally-influenced conditions as it is capable of modeling the propagation of dynamic tide cycle waves.

The HEC-RAS program was allowed to adjust the computational time step as needed to produce stable model runs with Courant numbers of about one or less to ensure that flow was not propagating through more than one cell at each time step.

Bridge hydraulics were calculated with the energy-based standard step method for low flow conditions (i.e., open channel flow where the water surface is below the highest point of the bridge low chord) and pressure flow (orifice equations) for high flow conditions when the bridge is submerged. The energy-based method was selected as the low flow computational method because there are no piers and this method accounts for friction losses, changes in geometry through the bridge, and losses due to flow transitions and turbulence. Contraction and expansion coefficients of 0.3 and 0.5, respectively, were used in the energy head loss equation. The pressure flow method was used as the high flow computational method because the bridge deck and roadway are significant flow obstructions which create backwater and result in the bridge opening acting like a pressurized orifice when it is submerged.

### **B.7. Analysis Results – MHHW**

Both the pre- and post-project MHHW models indicate that the peak stage in North Mill Pond south of the bridge is only slightly lower (<0.01 ft) than on the north side of the bridge. Figure 14 shows the inundation area at the MHHW tide stage crest and the centroid of the portion of North Mill Pond south of Maplewood Avenue, which has been selected as a representative location for comparing the pre- and post-project MHHW tidal hydrographs.

Figure 15 shows the pre- and post-project MHHW tide stage hydrographs calculated at the centroid. The analysis shows little change to the tide crest and more substantial changes to the tide trough, which is discussed in Section B.8. Figure 16 shows a zoomed in view of the pre- and post-project stage hydrographs at the tide crest so that the minor changes at the upper end of the tide range projected to result from the bridge rehabilitation project can be seen. As compared to pre-project conditions, the analysis shows no change to the MHHW high water level or duration of the tide crest and that the time to reach the peak stage would be delayed by 1 minute.



Figure 14 – Inundation area at the MHHW tide stage crest and centroid of the portion of North Mill Pond south of Maplewood Avenue

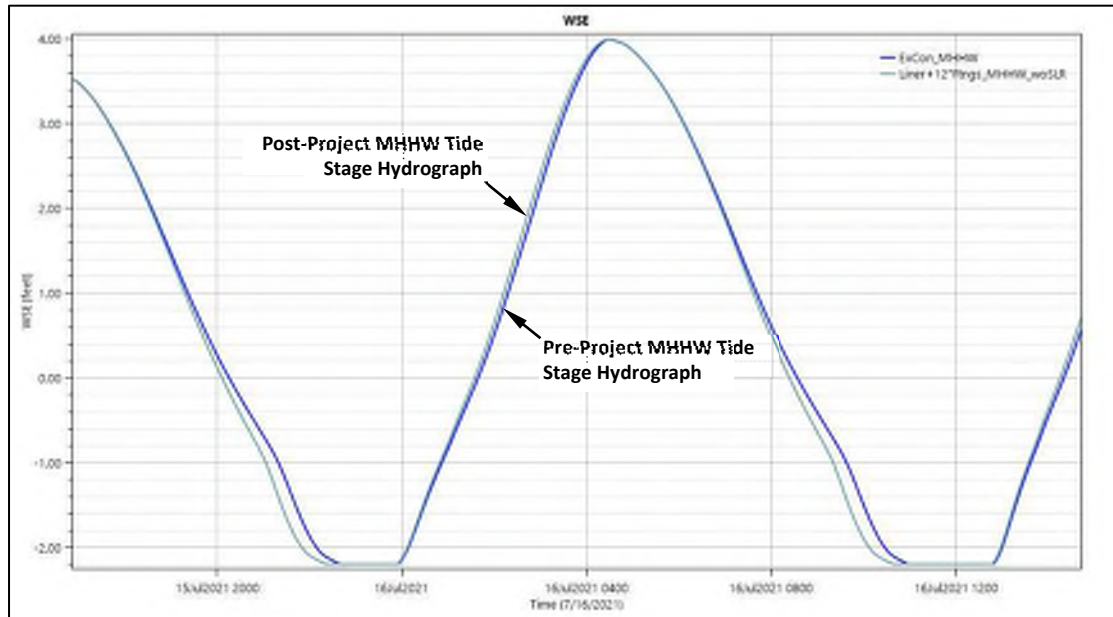


Figure 15 – Pre- and post-project MHHW tide stage hydrographs calculated at the centroid of the portion of North Mill Pond south of Maplewood Avenue

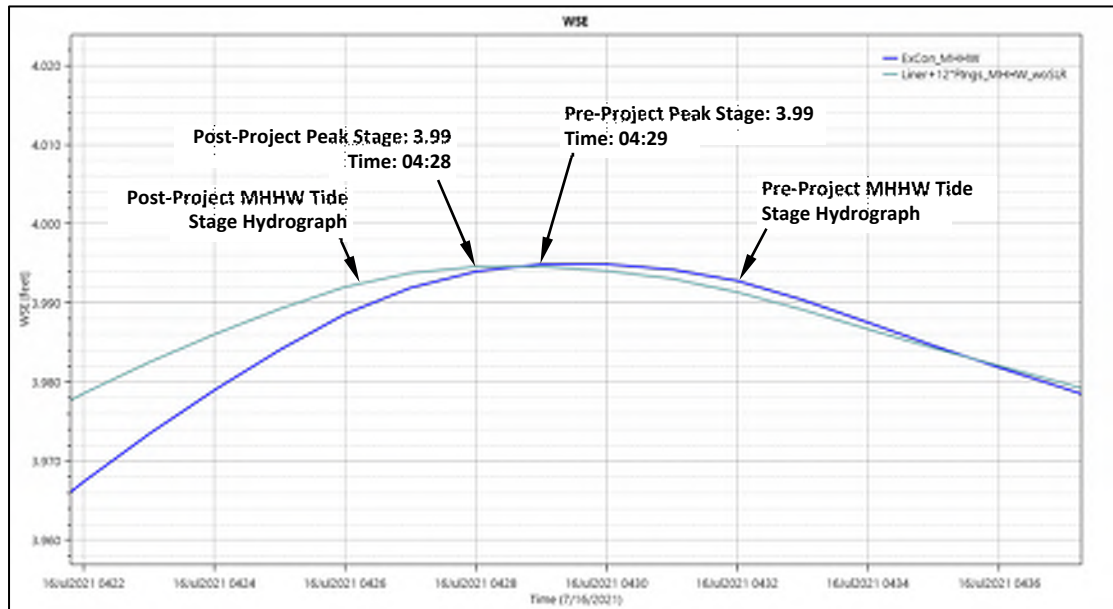


Figure 16 – Crest of the pre- and post-project MHHW tide stage hydrographs calculated at the centroid of the portion of North Mill Pond south of Maplewood Avenue for MHHW

**B.8. Analysis Results – MLLW**

The pre- and post-project MLLW models indicate that: (1) the project would lower the low water level in the portion of North Mill Pond south of the bridge by 0.10 feet and (2) the lowest stages in North Mill Pond south of the bridge for pre- and post-project conditions are about 1.2 and 1.1 feet higher, respectively, than the lowest water level on the north side of the bridge. Figure 17 shows the pre- and post-project inundation areas at the MLLW tide stage trough in the vicinity of Maplewood Avenue. Blue shading represents the post-project inundation area at MLLW and yellow shading along the periphery of the blue shading indicates the additional areas inundated at MLLW under pre-project conditions. The pre-project MLLW inundation area of the main waterbody south of Maplewood Avenue (i.e., not including isolated areas of ponded water remaining after the tide recedes) is approximately 264,300 square feet (6.067 acres) and the post-project MLLW inundation area of south of the road is about 256,400 square feet (5.886 acres). This is a reduction of approximately 7,900 square feet (0.181 acres) or about 3.0%. Note that at the time steps depicted in



Figure 17 – Inundated areas at the MLLW tide stage trough with blue shading representing the post-project inundation area and yellow shading indicating the additional areas inundated under pre-project conditions

Figure 17, the water level south of Maplewood Avenue has just reached its lowest level, whereas the tide has been rising on the north side of the road for nearly 1½ hours.

The differences between the water levels on either side of Maplewood Avenue are due to two significant factors: (1) the flow restriction created by the crossing which prevents the pond on the south side of the road from draining as fast as the tide recedes on the north side and (2) what appears to be bedrock grade control on the pond bottom just upstream from the bridge (see Figure 18). The lowest elevation of the grade control was measured at about elevation -3.5 feet (NAVD88). The portion of the pond south of the grade control cannot drain below this elevation even when the water level on the north side of Maplewood Avenue is significantly lower.



Figure 18 – View south from Maplewood Avenue at the grade control feature just upstream from the bridge inlet (09-23-20)

Figure 19 shows the pre- and post-project MLLW tide stage hydrographs calculated at a point about 250 feet south of the bridge inlet where the water depth at MLLW is about four feet and Figure 20 shows a detailed view of the hydrographs at the tide cycle trough representing MLLW. The analysis shows that the project would lower the low water level at the tide stage trough by 0.10 feet and reduce the time to reach the low water level by 3 minutes.

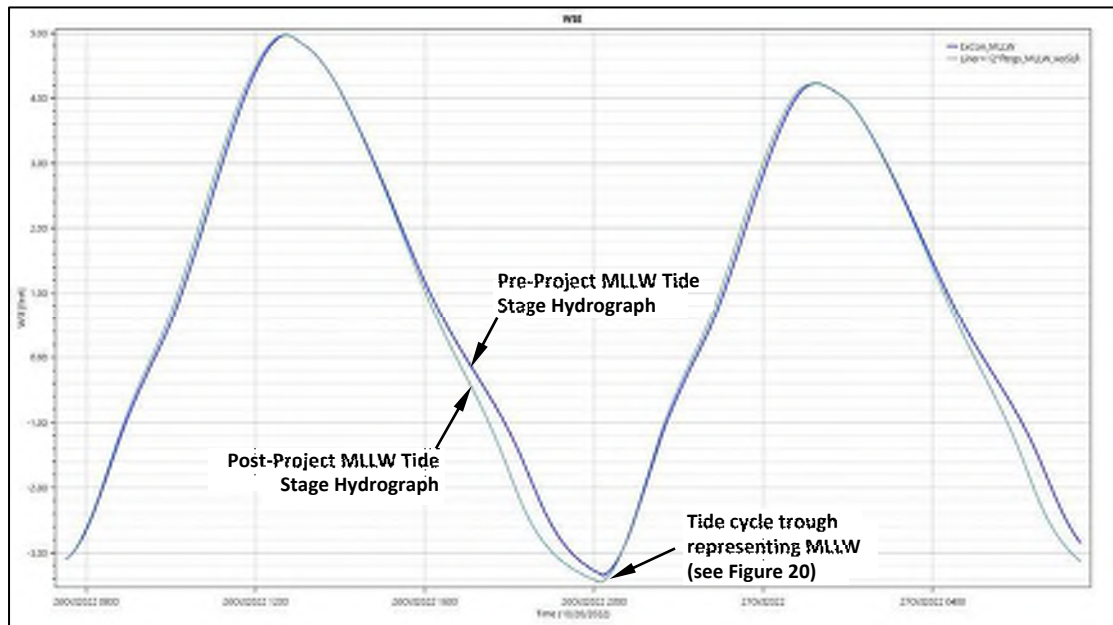


Figure 19 – Pre- and post-project MLLW tide stage hydrographs calculated in North Mill Pond south of Maplewood Avenue

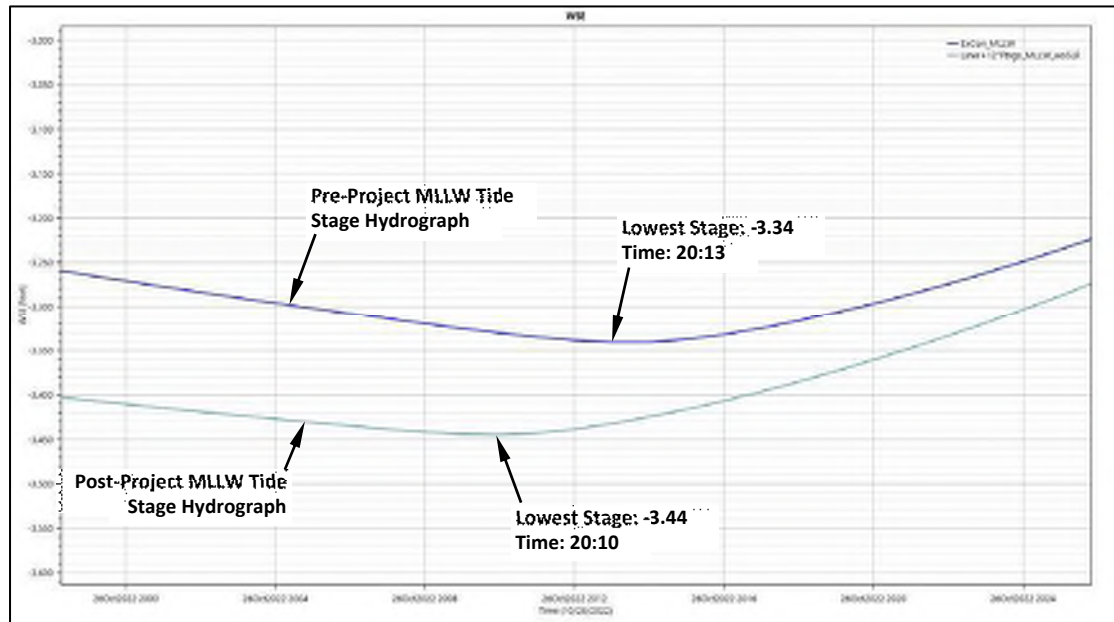


Figure 20 – Troughs of the pre- and post-project MLLW tide stage hydrographs calculated in the portion of North Mill Pond south of Maplewood Avenue

The lower water level, and faster time to reach that level, are explained by the proposed changes to the waterway opening. As compared to the pre-project bridge opening, the post-project opening will be smaller at the top due to the geopolymer liner, but larger at the bottom due to the footing removal. As a result, the bridge will have greater capacity when water levels are low and the portion of the pond on the south side of the road will drain faster as the tide cycle trough approaches. The faster drain time is important as it allows the water level south of the road to reach a lower stage before the water level on the north side of the road rises and the flow reverses.

### **B.9. Tidal Resource Impact**

Because the bridge only restricts flow into and out of the portion of North Mill Pond on the south side of Maplewood Avenue, the project will not affect the tidal hydrograph in the portion of North Mill Pond on the north side of Maplewood Avenue.

Concerning the portion of North Mill Pond south of Maplewood Avenue, the project will not alter the MHHW high water level and changes to the MLLW low water level, inundation area, and water depths are not considered significant enough to adversely affect the tidal resource, particularly in light of the natural water level variability this area experiences due to astronomical tides and local wind and weather patterns.

### **C. Env-Wt 904.07(d)**

Env-Wt 904.07(d) requires that “new, repaired, rehabilitated, or replaced tier 4 stream crossing shall be designed: (1) Based on a hydraulic analysis that accounts for daily fluctuating tides, bidirectional flows, tidal inundation, and coastal storm surge; (2) To prevent creating a restriction on tidal flows; and (3) To account for tidal channel morphology and potential impacts due to sea-level rise.”

The four HEC-RAS 2D flow models described in Section B simulate pre- and post-project conditions under normal astronomical tide conditions (MHHW and MLLW) without sea-level rise (SLR). Twelve additional HEC-RAS 2D flow models were created to analyze the effects of the proposed bridge rehabilitation work under various storm and SLR scenarios. These include:

- MHHW and MLLW with SLR under pre- and post-project conditions;
- 50- and 100-year storms without SLR under pre- and post-project conditions; and
- 50- and 100-year storms with SLR under pre- and post-project conditions.

These models account for fluctuating tides, bidirectional flow, tidal inundation, storm surge, and SLR as required by Env-Wt 904.07(d). All of these models use the same geometry data (including pre- and post-project bridge geometries), roughness, and additional modeling parameters described in Section B. However, each model uses different boundary conditions to simulate the various tide cycle, storm surge, freshwater inflow, and SLR conditions.

The recommended SLR estimate published in Step 3 Table A of NHCFR STAP (2020)<sup>3</sup> for a project with a high tolerance for flood risk and a year 2040 timeframe, which is the timeframe that most closely matches that of the bridge rehabilitation project design life, is 1.0 ft (see Figure 21). For the models which account for SLR, this estimate was used to adjust the present-day tide stage hydrographs to simulate sea-level conditions at the end of the rehabilitated bridge service life. Additional information concerning the projects’ flood risk tolerance and timeframe can be found in Section D.3.

**STEP 3 TABLE A. RECOMMENDED DECADAL RSLR ESTIMATES (IN FEET ABOVE 2000 LEVELS) BASED ON RCP 4.5, PROJECT TIMEFRAME, AND TOLERANCE FOR FLOOD RISK.**

| TIMEFRAME | HIGH<br>TOLERANCE FOR FLOOD RISK   | MEDIUM<br>TOLERANCE FOR FLOOD RISK | LOW<br>TOLERANCE FOR FLOOD RISK | VERY LOW<br>TOLERANCE FOR FLOOD RISK   |
|-----------|--|------------------------------------|---------------------------------|--|
|           | Plan for the following RSLR estimate (ft)*<br>compared to sea level in the year 2000 |                                    |                                 |  |
|           | Lower magnitude,<br>Higher probability   | ←————→                             |                                 | Higher magnitude,<br>Lower probability |
| 2030      | 0.7  | 0.9                                | 1.0                             | 1.1                                    |
| 2040      | 1.0  | 1.2                                | 1.5                             | 1.6                                    |
| 2050      | 1.3  | 1.6                                | 2.0                             | 2.3                                    |
| 2060      | 1.6  | 2.1                                | 2.6                             | 3.0                                    |
| 2070      | 2.0  | 2.5                                | 3.3                             | 3.7                                    |
| 2080      | 2.3  | 3.0                                | 3.9                             | 4.5                                    |
| 2090      | 2.6  | 3.4                                | 4.6                             | 5.3                                    |
| 2100      | 2.9  | 3.8                                | 5.3                             | 6.2                                    |
| 2110      | 3.3  | 4.4                                | 6.1                             | 7.3                                    |
| 2120      | 3.6  | 4.9                                | 7.0                             | 8.3                                    |
| 2130      | 3.9  | 5.4                                | 7.9                             | 9.3                                    |
| 2140      | 4.3  | 5.9                                | 8.9                             | 10.5                                   |
| 2150      | 4.6  | 6.4                                | 9.9                             | 11.7                                   |

Figure 21 – Step 3 Table A from NHCFR STAP (2020)

<sup>3</sup> NH Coastal Flood Risk Science and Technical Advisory Panel (2020). New Hampshire Coastal Flood Risk Summary, Part II: Guidance for Using Scientific Projections. Report published by the University of New Hampshire, Durham, NH.



The 50- and 100-year storm models assume that a tidal storm surge and a freshwater flood on Hodgson Brook occur simultaneously. These are believed to be conservative, but realistic, scenarios as coastal weather systems which generate storm surge also have the potential to produce extreme rainfall. In each storm model the recurrence interval of the tidal storm surge and the freshwater flood are assumed to be equal. For example, the 50-year storm models assume that a 50-year tidal storm surge and a 50-year freshwater flood occur simultaneously. Furthermore, in these models the tide stage hydrographs and the freshwater inflow hydrographs are assumed to peak concurrently so as to simulate near worst-case scenarios wherein the peak inland runoff enters North Mill Pond at the same time the storm tide reaches its maximum level.

Independent hydrology studies to estimate the rate and volume of rainfall runoff into North Mill Pond from various storms have been completed for the bridge rehabilitation project and the drainage outfall project. The hydrology study for the bridge rehabilitation project was performed by Headwaters Consulting and produced estimates of the 50- and 100-year rainfall runoff hydrographs for the entire watershed of North Mill Pond upstream from the bridge which encompasses the watershed of the drainage outfall. The hydrologic analysis for the drainage outfall project was done by Underwood Engineers and included only the watershed of the drainage outfall. For both studies the SCS unit hydrograph method was used with the HydroCAD computer program to estimate the freshwater inflow hydrographs. A complete copy of the Headwaters Consulting hydrology study is included in Appendix 2. Output from the HydroCAD models prepared by Underwood Engineers can be found in Appendices 3 and 4.

The watershed area of the drainage outfall at North Mill Pond (37 acres) represents about 1.4% of the overall watershed area of the pond at Maplewood Avenue (2,628 acres). The drainage outfall project proposes improvements to the stormwater collection system which would increase its maximum flow capacity, but it will not expand the watershed area, add impervious surfaces, or otherwise increase the overall stormwater runoff volume, except that it is designed to accommodate future separation of existing roof drains that are currently connected to the sanitary sewer system but have been incorporated into the outfall's drainage calculations. The pre- and post-project HydroCAD models for the drainage outfall project show no change to the watershed area, runoff curve numbers (CN), or total runoff volume (see Appendices 3 and 4). [Note that the HydroCAD outputs show a minor difference between the pre- and post-project total runoff volumes; however, this is because the two models used different time spans. The pre- and post-project runoff volumes would be identical if the same time span had been used.]

A comparison between the results of the bridge rehabilitation and drainage outfall hydrology studies shows that under both pre- and post-project conditions: (1) peak runoff at the bridge occurs about 7.3 hours after peak runoff from the drainage outfall enters the pond and (2) nearly the entire runoff volume from the drainage outfall watershed enters North Mill Pond by the time peak runoff from the overall watershed occurs. This is due to the small size of the drainage outfall watershed, the absence of any significant floodwater storage areas, and its close proximity to the pond. By contrast, runoff from the hydraulically most distant point of the overall watershed, located at the Portsmouth International Airport, must travel approximately 4.4 miles to the bridge.

Therefore, because the drainage outfall project is not expected to significantly increase the total runoff volume or alter the timing of runoff to North Mill Pond, it is not projected to change the peak flows, runoff volumes, or flow hydrographs calculated for the entire watershed draining to the bridge. Consequently, the same 50- and 100-year flow hydrographs calculated under the

bridge rehabilitation project hydrology study (see Appendix 2) have been used in both the pre- and post-project HEC-RAS 2D flow models which simulate storm conditions.

Detailed descriptions of the boundary conditions used in the models and the analysis results are provided in the following sections.

### C.1. Pre- and Post-Project MHHW Models without SLR

These are the same models described in Section B which use the pre- and post-project bridge geometries and the MHHW tidal hydrograph. Additional results from these models are presented in this section to meet the requirements of Env-Wt 904.07(d)(2) relative to tidal flow restriction.

Figures 22 and 23 show the MHHW stage and flow hydrographs at the bridge calculated for pre- and post-project conditions, respectively. The headwater stage is the water level at the bridge inlet on the south side of Maplewood Avenue and the tailwater stage is the water level at the bridge outlet on the north side of the road. Note that when the headwater stage is greater than the tailwater stage flow is from south to north and the flow values are positive. When the tailwater stage is higher than the headwater stage flow is from north to south and the flow values are negative.

The maximum flow through the bridge from south to north during the MHHW tide cycle is 721 cfs for pre-project conditions and 762 cfs for post-project conditions, an increase of 41 cfs, or approximately 5.7%. The maximum flow through the bridge from north to south during the MHHW tide cycle is 960 cfs for pre-project conditions and 946 cfs for post-project conditions, a reduction of 14 cfs, or approximately 1.5%.

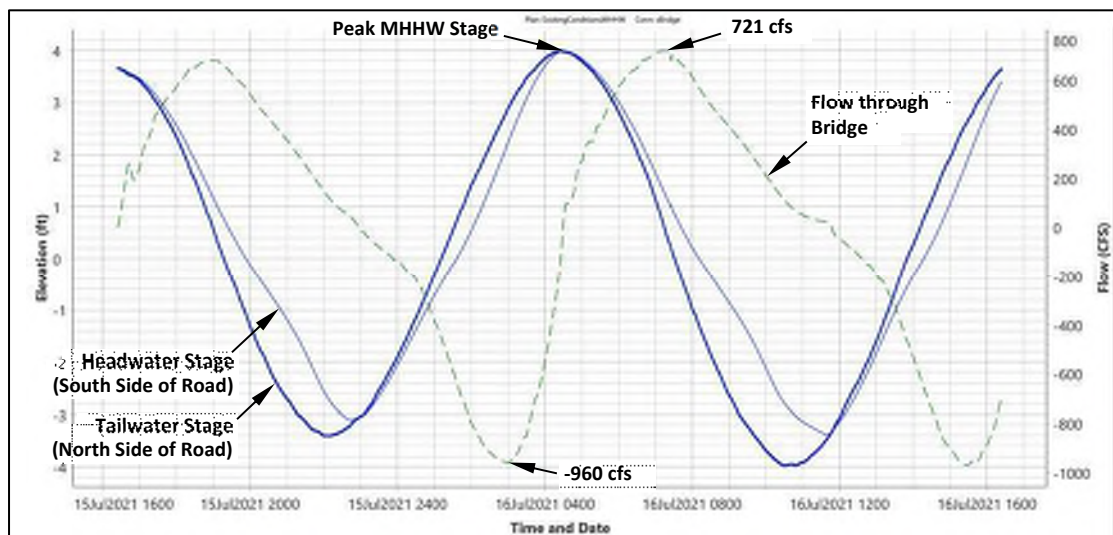


Figure 22 – Pre-project stage and flow hydrographs calculated at the bridge for MHHW without SLR

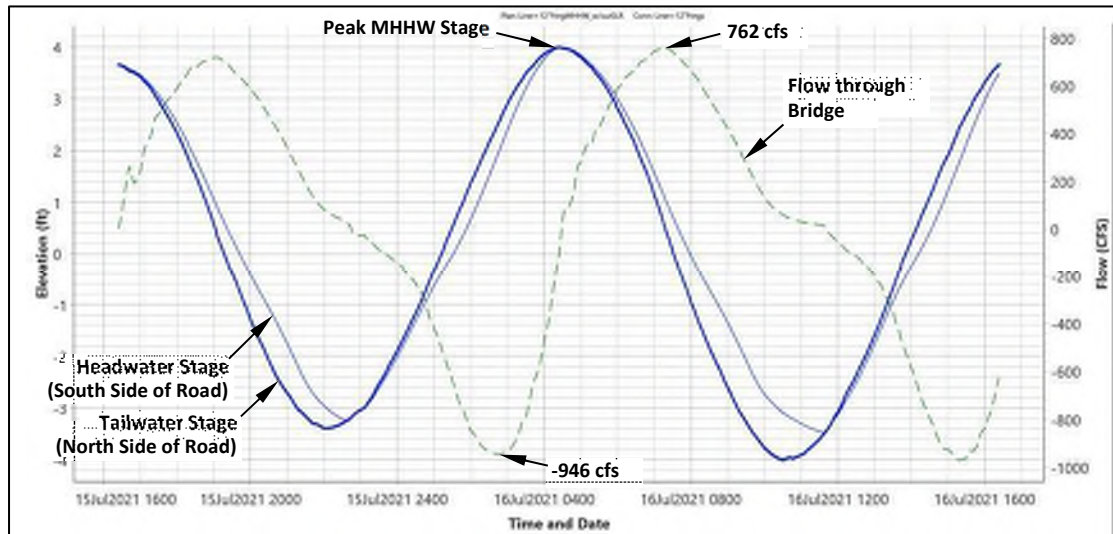


Figure 23 – Post-project stage and flow hydrographs calculated at the bridge for MHHW without SLR

The proposed bridge rehabilitation would result in increased peak flow through the bridge from south to north for the MHHW event, indicating that the project will not restrict tidal flows during the outgoing tide and would in fact reduce the existing flow restriction. The small reduction in peak flows from north to south is explained by the faster rate that the portion of the pond south of Maplewood Avenue would fill during the incoming tide (see Figure 15) which decreases the water level differential on either side of the bridge and reduces the maximum flow rate through it. This also indicates that the project will not restrict tidal flows, even though this decreased differential results in a slightly lower peak flow.

### C.2. Pre- and Post-Project MLLW Models without SLR

These are the same models described in Section B which use the pre- and post-project bridge geometries and the MLLW tidal hydrograph. Additional results from these models are presented in this section to meet the requirements of Env-Wt 904.07(d)(2) relative to tidal flow restriction.

Figures 24 and 25 show the MLLW stage and flow hydrographs at the bridge calculated for pre- and post-project conditions, respectively. The maximum flow through the bridge from south to north during the MLLW tide cycle is 858 cfs for pre-project conditions and 895 cfs for post-project conditions, an increase of 37 cfs, or approximately 4.3%. The maximum flow through the bridge from north to south during the MLLW tide cycle is 1,092 cfs for pre-project conditions and 1,097 cfs for post-project conditions, an increase of 5 cfs, or approximately 0.5%.

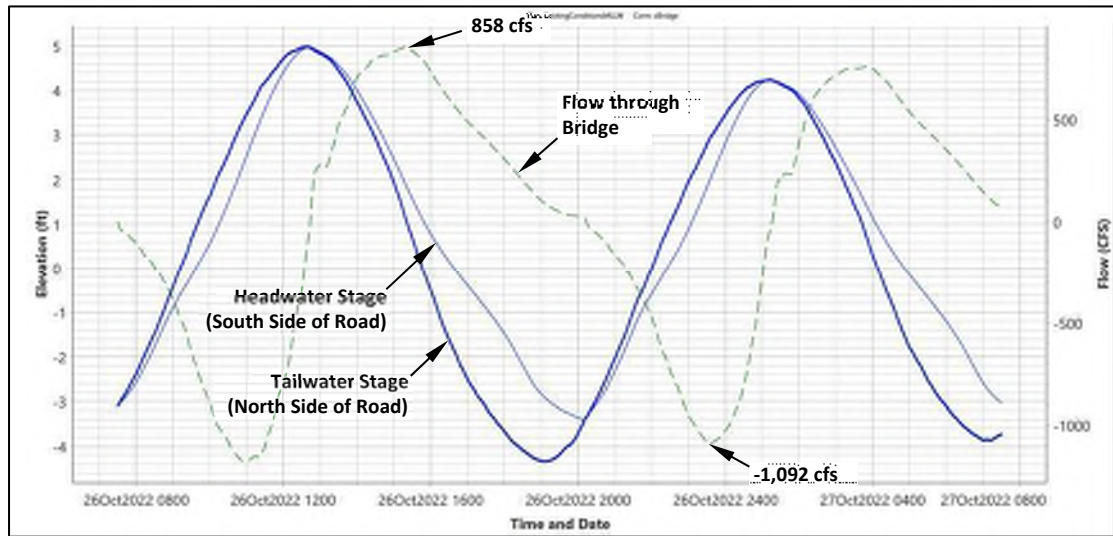


Figure 24 – Pre-project stage and flow hydrographs calculated at the bridge for MLLW without SLR

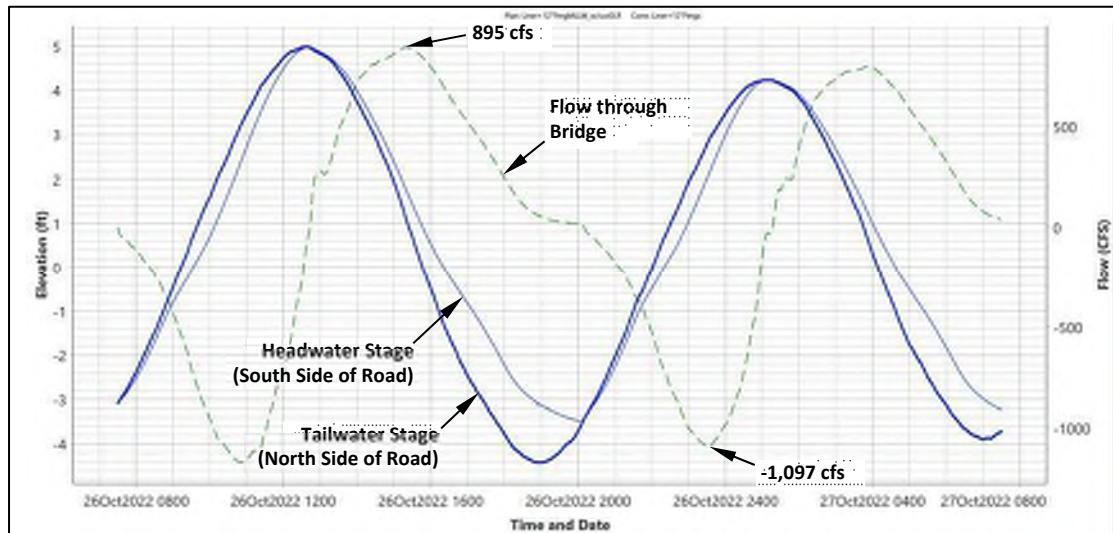


Figure 25 – Post-project stage and flow hydrographs calculated at the bridge for MLLW without SLR

The proposed bridge rehabilitation would increase flow rates through the bridge in both directions during the MLLW event; therefore, the project will not restrict tidal flows for this event under present-day sea-level conditions and would in fact reduce the existing flow restriction.

### C.3. Pre- and Post-Project MHHW Models with SLR

The water level at each time step of the present-day MHHW tide stage hydrograph shown in Figure 12 was raised by 1.0 ft to develop an estimate of the MHHW tide stage hydrograph with SLR during the bridge rehabilitation project design life. This results in a MHHW stage of 5.0 ft (NAVD88) on the north side of the bridge. The estimated MHHW tide stage hydrograph with SLR shown in Figure 26 was used as the downstream boundary in the models. The same flow hydrograph used in the MHHW model without SLR, which assumes a constant base flow of 2 cfs in Hodgson Brook, was used as the upstream boundary in the models.

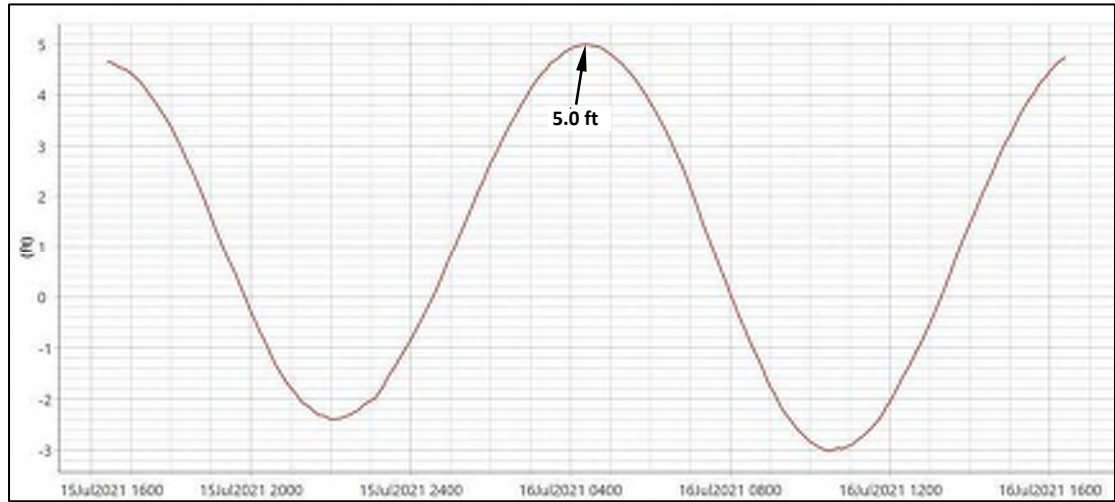


Figure 26 – Tide stage hydrograph simulating MHHW with 1.0' SLR at the downstream model boundary

Both the pre- and post-project MHHW models with SLR indicate that the peak stage in North Mill Pond south of the bridge would be only slightly lower (~0.01 ft) than on the north side of the bridge. Figure 27 shows the inundation area at the MHHW tide stage crest with 1.0 ft SLR for both pre- and post-project conditions.



Figure 27 – Inundation area at the MHHW tide stage crest with 1.0 ft SLR for both pre- and post-project conditions

Figure 28 shows the pre- and post-project MHHW tide stage hydrographs with 1.0 ft SLR calculated at the centroid of the portion of North Mill Pond south of Maplewood Avenue. The analysis shows very little difference in maximum water levels or the timing of the tide stage crest between pre- and post-project conditions. Consequently, the pre- and post-project stage hydrographs near the tide stage crest shown in Figure 28 cannot be distinguished from each other. Therefore, Figure 29 shows a zoomed in view of the hydrographs at the crest stage representing MHHW with 1.0 ft SLR so that the minor changes to the tidal hydrograph resulting from the project can be seen. As compared to pre-project conditions, the analysis shows that the peak stage would increase by less than 0.002 ft and the time to reach the peak stage would be reduced by 1 minute.

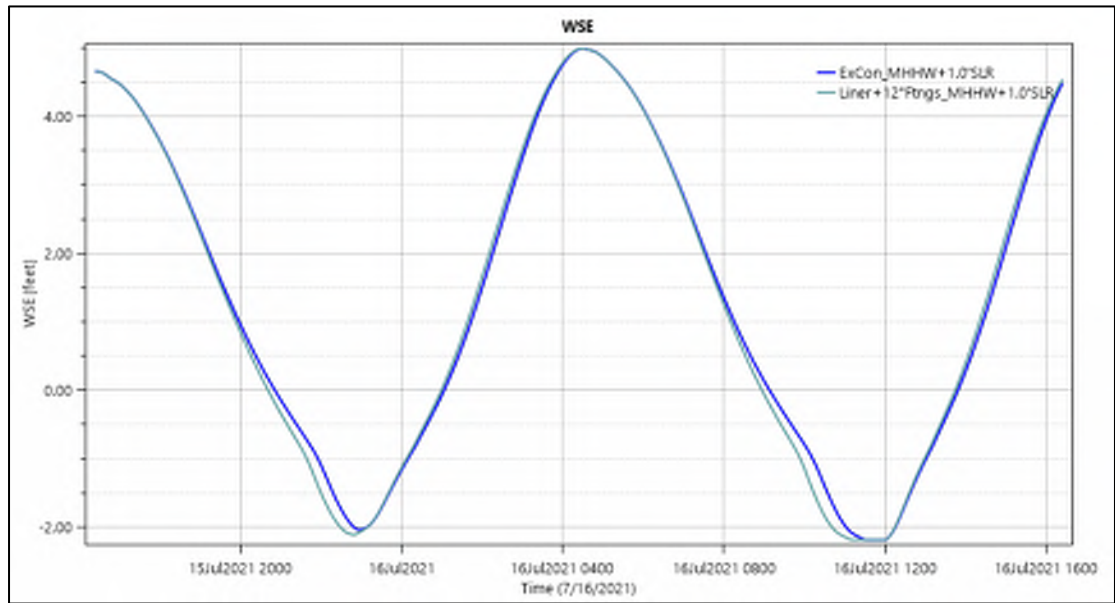


Figure 28 – Pre- and post-project MHHW tide stage hydrographs with 1.0 ft SLR calculated at the centroid of the portion of North Mill Pond south of Maplewood Avenue

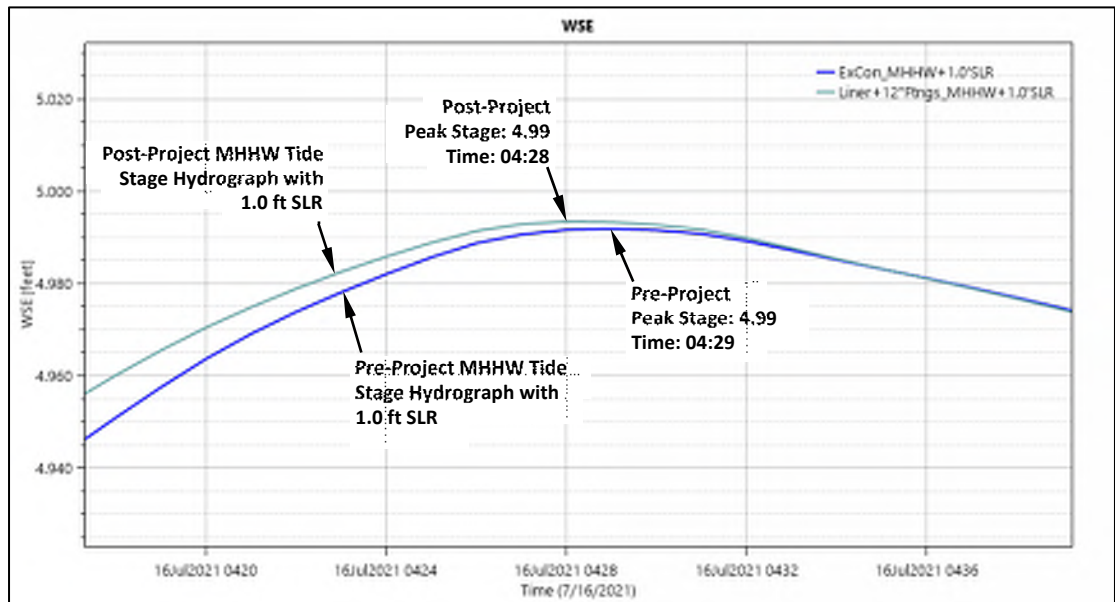


Figure 29 – Crest of the pre- and post-project MHHW tide stage hydrographs with 1.0 ft SLR calculated at the centroid of the portion of North Mill Pond south of Maplewood Avenue for MHHW

Figures 30 and 31 show the MHHW stage and flow hydrographs at the bridge calculated for pre- and post-project conditions with 1.0 ft SLR, respectively. The maximum flow through the bridge from south to north during the MHHW tide cycle with 1.0 ft SLR is 833 cfs for pre-project conditions and 865 cfs for post-project conditions, an increase of 32 cfs, or approximately 3.8%. The maximum flow through the bridge from north to south during the MHHW tide cycle with 1.0 ft SLR is 1,043 cfs for pre-project conditions and 1,035 cfs for post-project conditions, a reduction of 8 cfs, or approximately 0.8%.

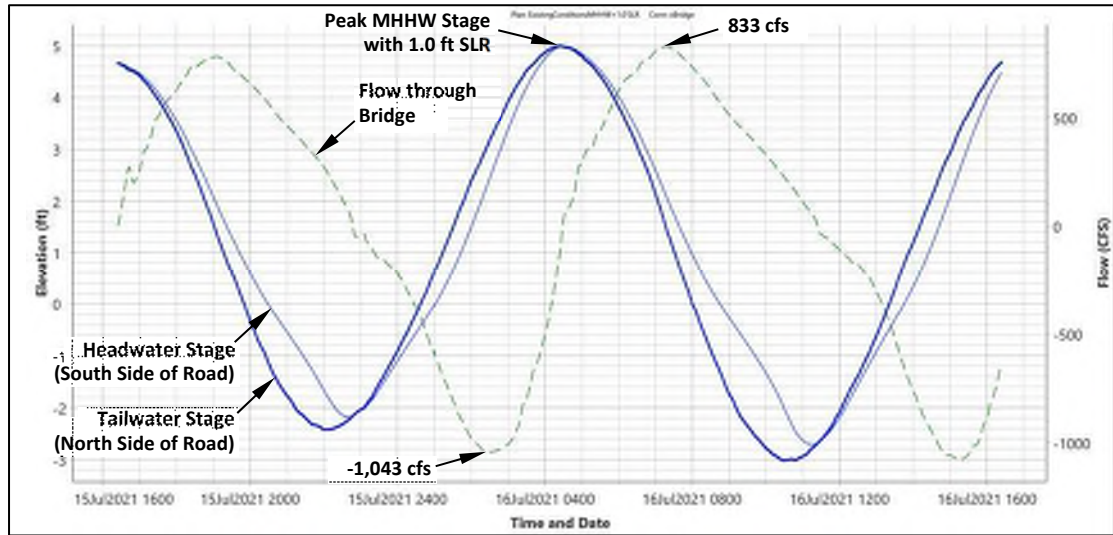


Figure 30 – Pre-project stage and flow hydrographs calculated at the bridge for MHHW with 1.0 ft SLR

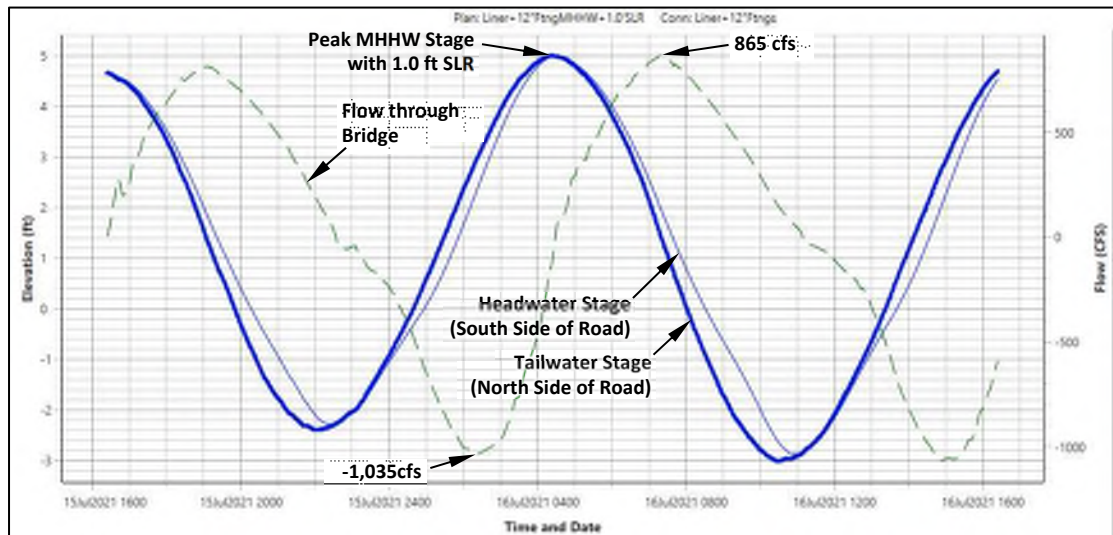


Figure 31 – Post-project stage and flow hydrographs calculated at the bridge for MHHW with 1.0 ft SLR

The models show that the proposed bridge rehabilitation would increase the peak flow rate through the bridge from south to north for the MHHW event with 1.0 ft SLR and therefore would not restrict tidal flows during the outgoing tide, but rather would reduce the existing flow restriction. The small reduction in the peak flow from north to south is due to the faster rate that the pond south of Maplewood Avenue would fill during the flood tide (see Figure 28) which increases the tailwater elevation and reduces the maximum flow rate through the bridge. This is another indication that the project will not restrict tidal flows, even though the faster fill rate and decreased tailwater result in a slightly lower peak flow during the incoming tide.

#### C.4. Pre- and Post-Project MLLW Models with SLR

The water level at each time step of the present-day MLLW tide stage hydrograph shown in Figure 13 was raised by 1.0 ft to develop an estimate of the MLLW tide stage hydrograph with

SLR during the bridge rehabilitation project design life (see Figure 32). This results in a MLLW stage of -3.5 feet (NAVD88) on the north side of the bridge. The estimated MLLW tide stage hydrograph with SLR shown in Figure 32 was used as the downstream boundary in the models. The same flow hydrograph used in the MLLW model without SLR, which assumes a constant base flow of 2 cfs in Hodgson Brook, was used as the upstream boundary in the models.

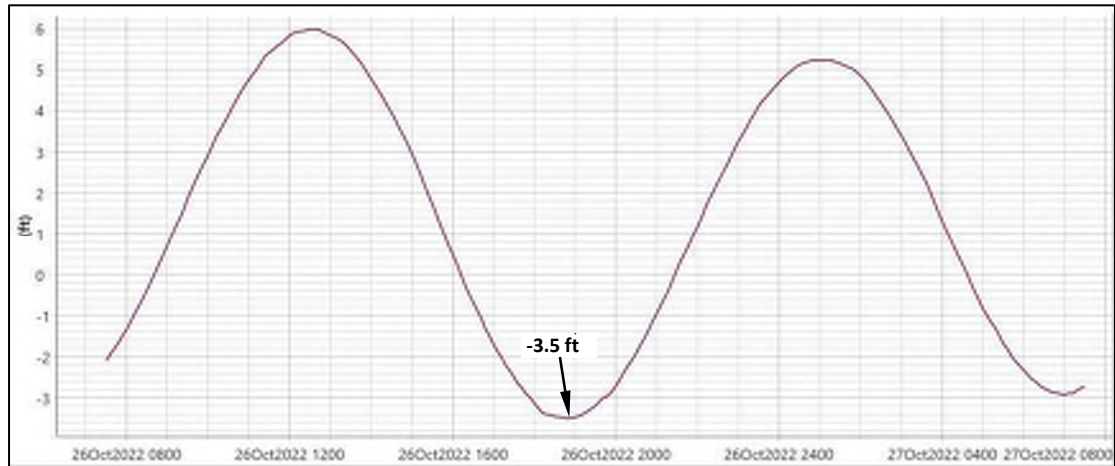


Figure 32 – Tide stage hydrograph simulating MLLW with 1.0' SLR at the downstream model boundary

The pre- and post-project MLLW models with 1.0 ft SLR indicate that the project would lower the low water level in the portion of North Mill Pond south of the bridge by 0.20 feet and reduce the difference between the low water levels on either side of the bridge from 0.65 feet to 0.45 feet. Figure 33 shows the pre- and post-project inundation areas at the MLLW tide stage trough with 1.0 ft SLR in the vicinity of Maplewood Avenue. Blue shading represents the post-project inundation area at MLLW with 1.0 ft SLR and yellow shading along the periphery of the blue shading indicates the additional areas inundated at MLLW with 1.0 ft SLR under pre-project conditions. The pre-project inundation area of the waterbody south of Maplewood Avenue is approximately 307,300 square feet (7.055 acres) and the post-project inundation area of south of the road is about 285,400 square feet (6.552 acres). This is a reduction of approximately 21,900 square feet (0.503 acres) or about 7.1%.



Figure 33 – Inundated areas at the MLLW tide stage trough with 1.0 ft SLR. Blue shading represents the post-project inundation area and yellow shading indicates the additional areas inundated under pre-project conditions

Figure 34 shows the pre- and post-project MLLW tide stage hydrographs with 1.0 ft SLR calculated at point about 250 feet south of the bridge inlet where the water depth at MLLW is approximately 4.5 feet under pre-project conditions and Figure 35 shows a detailed view of the hydrographs at the tide cycle through representing MLLW with 1.0 ft SLR. As compared



to pre-project conditions, the analysis shows that the lowest stage would decrease by 0.20 feet and the time to reach the minimum stage would be reduced by 16 minutes.

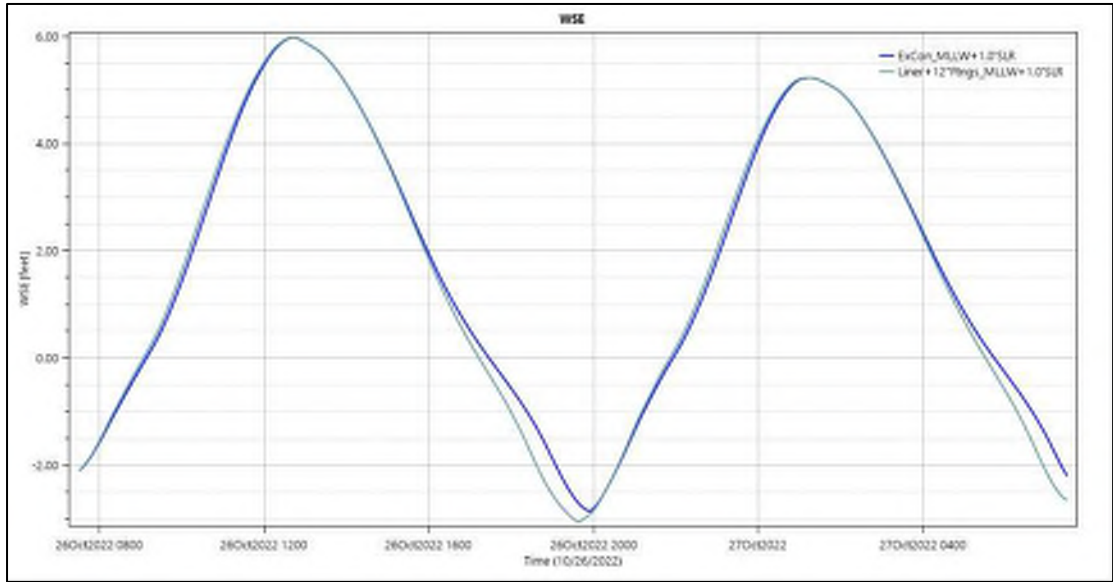


Figure 34 – Pre- and post-project MLLW tide stage hydrographs with 1.0 ft SLR calculated in North Mill Pond south of Maplewood Avenue

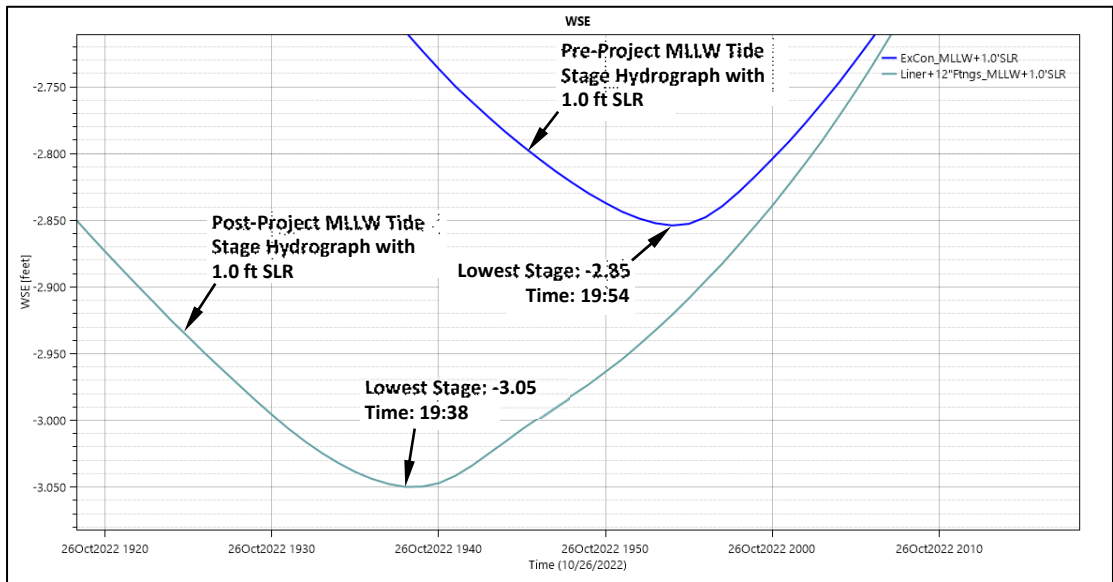


Figure 35 – Troughs of the pre- and post-project MLLW tide stage hydrographs with 1.0 ft SLR calculated in the portion of North Mill Pond south of Maplewood Avenue

The lower MLLW stage and reduced time to reach that stage are due to the proposed waterway opening modifications which would increase the rate that the portion of the pond south of the bridge drains during the ebb tide, allowing the water level south of the road to reach a lower stage before the flow reverses.

Figures 36 and 37 show the MLLW stage and flow hydrographs at the bridge calculated for pre- and post-project conditions with 1.0 ft SLR, respectively. The maximum flow through the bridge from south to north during the MLLW tide cycle with 1.0 ft SLR is 977 cfs for pre-project

conditions and 1,010 cfs for post-project conditions, an increase of 33 cfs, or approximately 3.4%. The maximum flow through the bridge from north to south during the MLLW tide cycle with 1.0 ft SLR is 1,216 cfs for pre-project conditions and 1,195 cfs for post-project conditions, a reduction of 21 cfs, or approximately 1.7%.

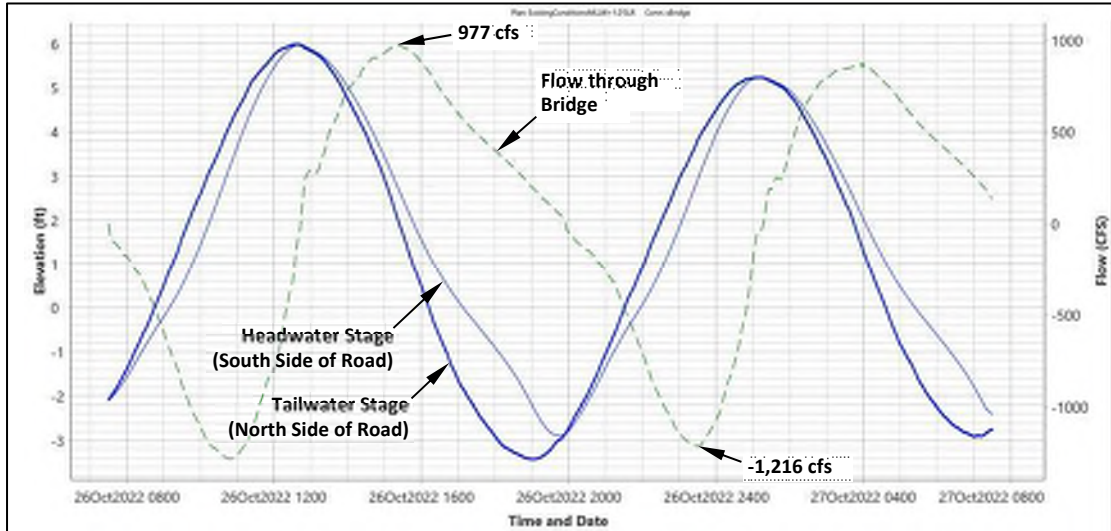


Figure 36 – Pre-project stage and flow hydrographs calculated at the bridge for MLLW with 1.0 ft SLR

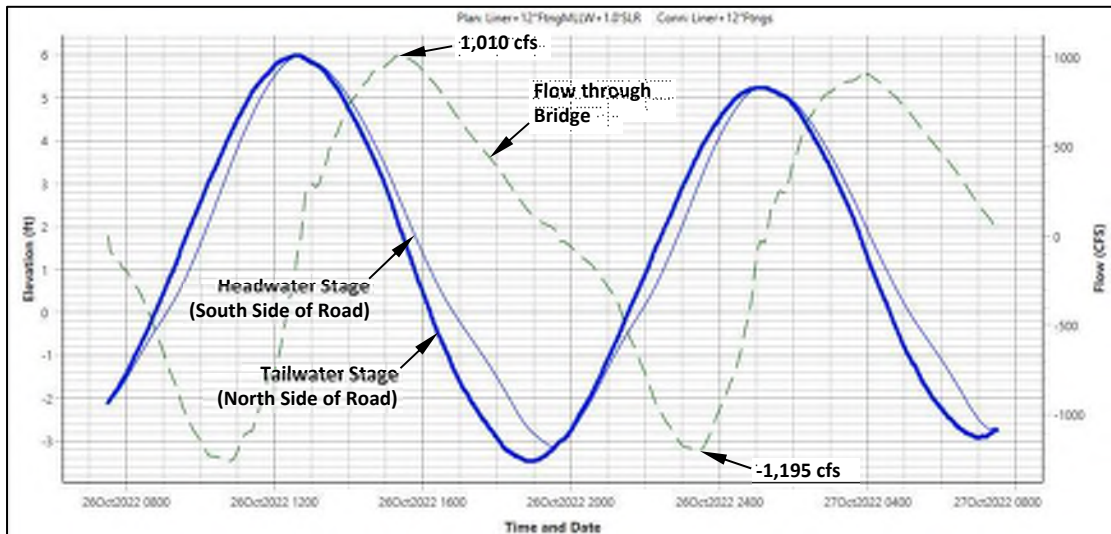


Figure 37 – Post-project stage and flow hydrographs calculated at the bridge for MLLW with 1.0 ft SLR

The models indicate that the proposed bridge rehabilitation would increase the peak flow rate through the bridge from south to north for the MLLW event with 1.0 ft SLR and therefore would not restrict tidal flows, but in fact would reduce the existing flow restriction during the ebb tide. The decreased peak flow rate from north to south during the flood tide also indicates that the project would reduce the existing flow restriction as this decrease is due to the faster rate that the pond south of Maplewood Avenue would fill (see Figure 34) which increases the tailwater elevation and reduces the maximum flow rate through the bridge.

### C.5. Boundary Conditions for 50- and 100-year Storm Models

The 50- and 100-year rainfall runoff hydrographs from the Headwaters Consulting hydrology study were used as the upstream boundaries in the pre- and post-project 50- and 100-year storm models both with and without SLR. These are shown in Figures 38 and 39.

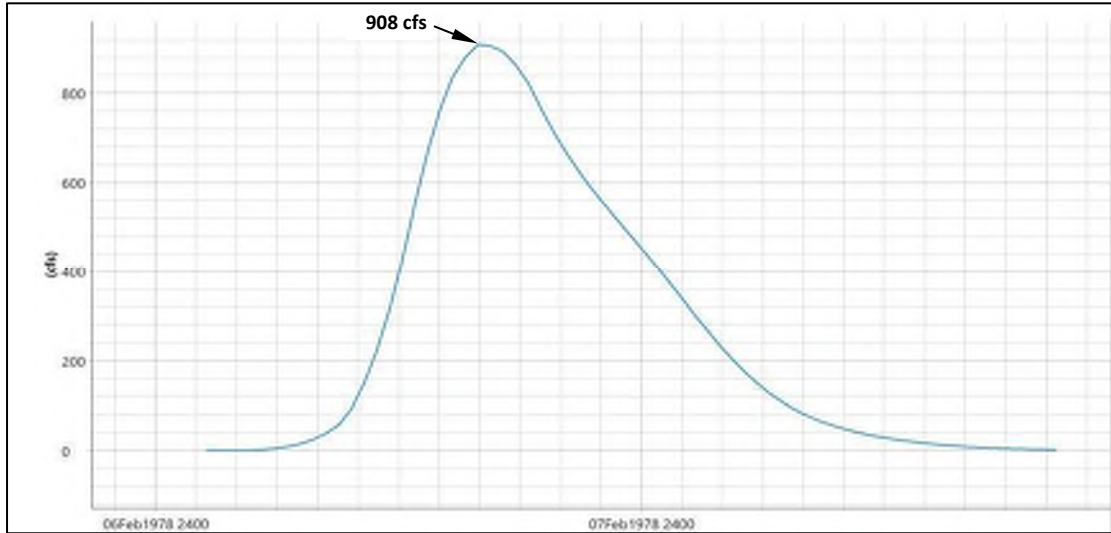


Figure 38 – 50-year rainfall runoff hydrograph used as the upstream boundary in the pre- and post-project 50-year storm models with and without SLR

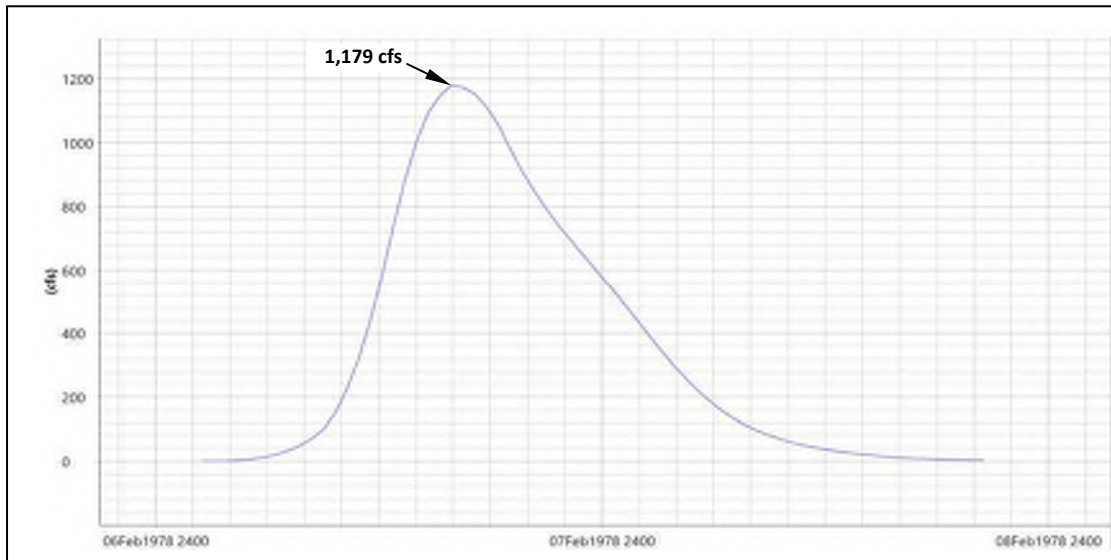


Figure 39 – 100-year rainfall runoff hydrograph used as the upstream boundary in the pre- and post-project 100-year storm models with and without SLR

Stage hydrographs representing the 50- and 100-year tidal storm surge events were used as the downstream boundaries in the storm models. These were developed from water levels measured at the NOAA Seavey Island tide station and the high water level exceedance probability curve published by NOAA for the tide gage (see Figure 40).

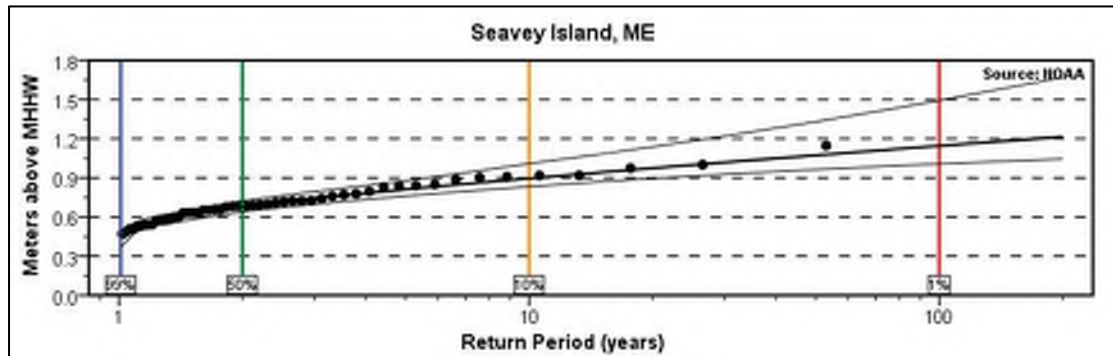


Figure 40 – High water annual exceedance probability curve for the Seavey Island tide station

The exceedance probability curve predicts the 100-year high water level is about 1.14 meters (3.74 ft) above mean higher high water (MHHW) and the 50-year high water level is approximately 1.07 meters (3.51 ft) above MHHW. Datum information for the tide station dated August 8, 2016 lists MHHW at the gage for the tidal epoch ending in 2001 as 4.22 ft above the North American Vertical Datum of 1988 (NAVD88). Adjusting the exceedance probability water level estimates to fixed elevations relative to NAVD88 results in the following peak tidal storm surge water levels.

Table 3 – Peak tidal storm surge water levels predicted at NOAA station 8419870 (Seavey Island, ME)

| Recurrence Interval (years) | Peak Storm Surge Water Level (ft, NAVD88) |
|-----------------------------|---|
| 50                          | 7.73                                      |
| 100                         | 7.96                                      |

Section 3.2 of NHCRHC STAP (2014)<sup>4</sup> suggests that present recurrence intervals of New Hampshire tidal storm surges be based upon the preliminary FEMA Flood Insurance Rate Maps (FIRMs) for coastal NH. The preliminary FIRM covering the project area (#33015C0259F), dated April 9, 2014, shows the Base Flood Elevation (BFE) at elevation 8 ft (NAVD88) (see Figure 41). The effective FIRM, dated January 29, 2021, also shows the BFE at elevation 8 ft. The BFE, which corresponds to the 1% annual chance, or 100-year, flood level, is only 0.04 ft higher than the 100-year peak tidal storm surge water level predicted from the exceedance probability curve for the Seavey Island tide gage.



Figure 41 – Preliminary FIRM #33015C0259F

In keeping with the recommendations of NHCRHC STAP (2014), a 100-year peak tidal storm surge elevation of 8.00 ft was used in the pre- and post-project 100-year storm models without SLR. NHCRHC STAP (2014) does not provide guidance relative to 50-year tidal storm

<sup>4</sup> Sea-level Rise, Storm Surges, and Extreme Precipitation in Coastal New Hampshire: Analysis of Past and Projected Future Trends. 2014. New Hampshire Coastal Risk and Hazards Commission Science and Technical Advisory Panel (NHCRHC STAP). <http://www.nhcrhc.org/wp-content/uploads/2014-STAP-final-report.pdf>.

surge water levels and none are published on the FEMA FIRM or in the FEMA Flood Insurance Study (FIS) for Rockingham County. Therefore, the 50-year peak tidal storm surge water level predicted by the exceedance probability curve for the Seavey Island tide gage (7.73 ft) was used in the pre- and post-project 50-year storm models without SLR.

The 50- and 100-year tidal storm surge stage hydrographs used for the downstream boundaries in the pre- and post-project storm models without SLR were estimated using water levels measured during the highest tidal storm surge cycle recorded at the Seavey Island gage. This occurred on February 7, 1978 with a peak elevation of 8.06 ft (NAVD88) (see Figure 42), which is 0.33 ft above the estimated 50-year peak tidal storm surge water level and 0.06 ft above the estimated 100-year peak water level.

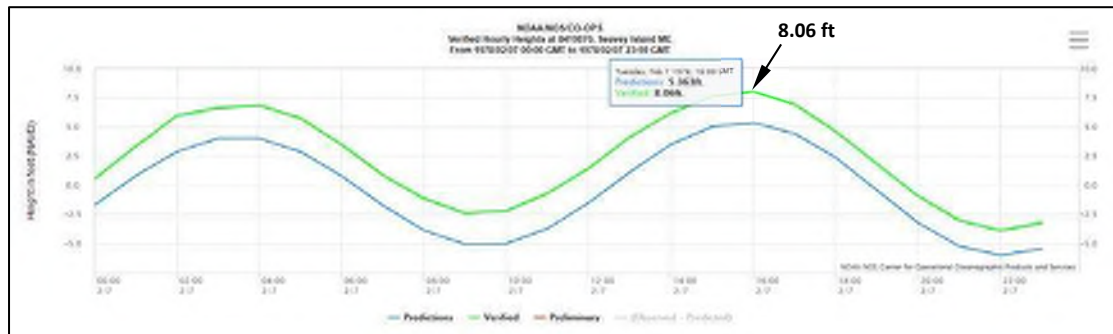


Figure 42 – Stage hydrograph showing water levels measured at the Seavey Island, ME tide gage on February 7, 1978. The green line represents measured water levels and the blue line represents predicted water levels.

Hourly water level data for February 6 through February 8, 1978 were downloaded from the NOAA website. The estimated 50- and 100-year peak tidal storm surge water levels are approximately 95.9% and 99.3% of the peak water level recorded at the gage on February 7, 1978, respectively. The measured water levels were multiplied by these percentages to generate the estimated 50- and 100-year tidal storm surge stage hydrographs used as the downstream boundaries in the storm models without SLR.

The 50- and 100-year freshwater inflow hydrographs have a duration of 42 hours with the peak flow occurring at hour 13.5 of the runoff events. The estimated storm surge stage hydrographs were generated so as to have the same 42-hour duration with peak water levels also occurring at hour 13.5. This results in the freshwater inflow hydrographs and the tidal storm surge stage hydrographs peaking concurrently so as to simulate near worst-case scenarios wherein the peak freshwater runoff enters North Mill Pond at the same time the storm tide reaches its maximum level. Figures 43 and 44 show the estimated 50- and 100-year tidal storm surge stage hydrographs used as the downstream boundaries in the storm models without SLR.

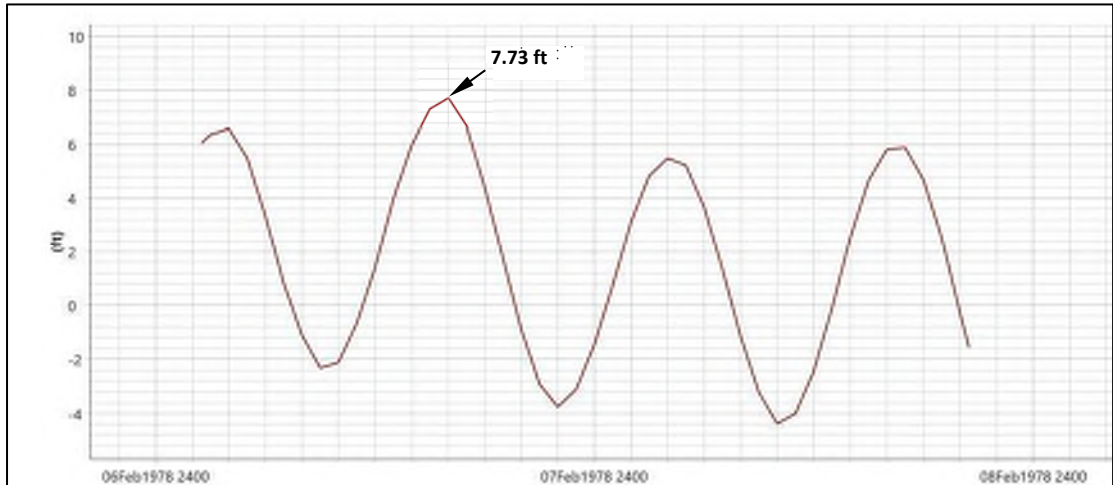


Figure 43 – Estimated 50-year tidal storm surge stage hydrograph used as the downstream boundary in the 50-year storm models without SLR

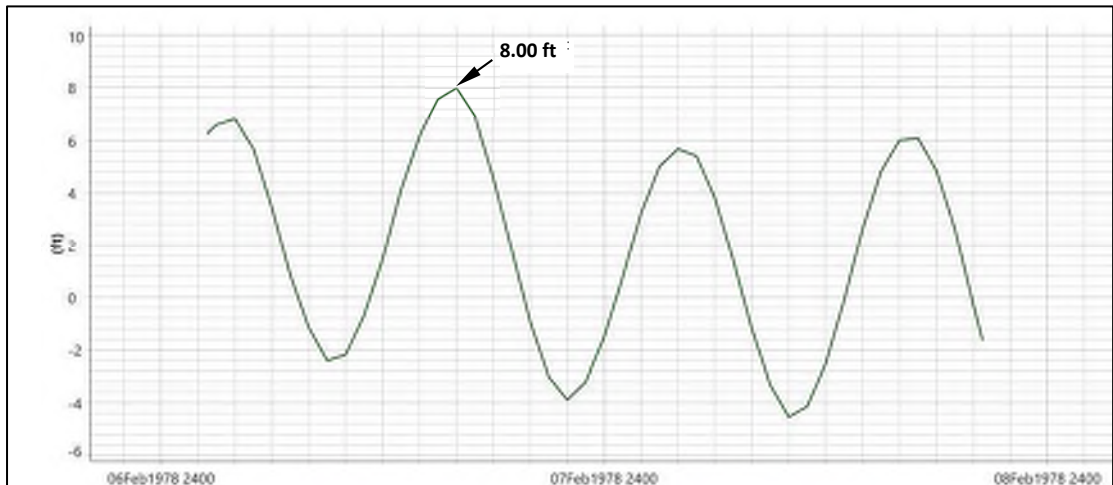


Figure 44 – Estimated 100-year tidal storm surge stage hydrograph used as the downstream boundary in the 100-year storm models without SLR

The 50- and 100-year tidal storm surge stage hydrographs used in the storm models with SLR were developed by adding 1.0 ft to the water level at each time step of the storm surge stage hydrographs used in the storm models without SLR. This results in peak water levels of 8.73 ft for the 50-year storm surge event and 9.00 ft for the 100-year storm surge event. The tidal storm surge stage hydrographs used as the downstream boundaries in the 50- and 100-year storm models with SLR are shown in Figures 45 and 46.

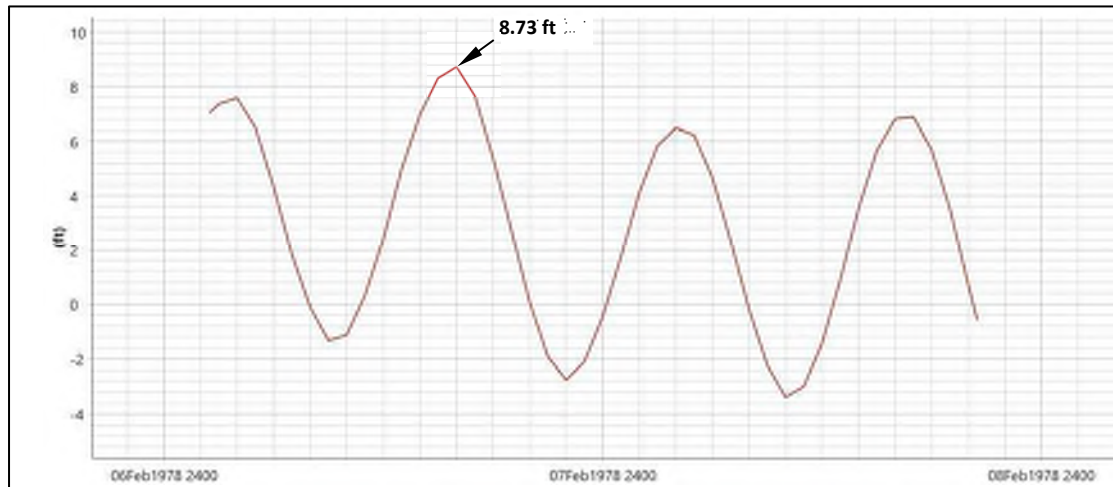


Figure 45 – Estimated 50-year tidal storm surge stage hydrograph used as the downstream boundary in the 50-year storm models with SLR

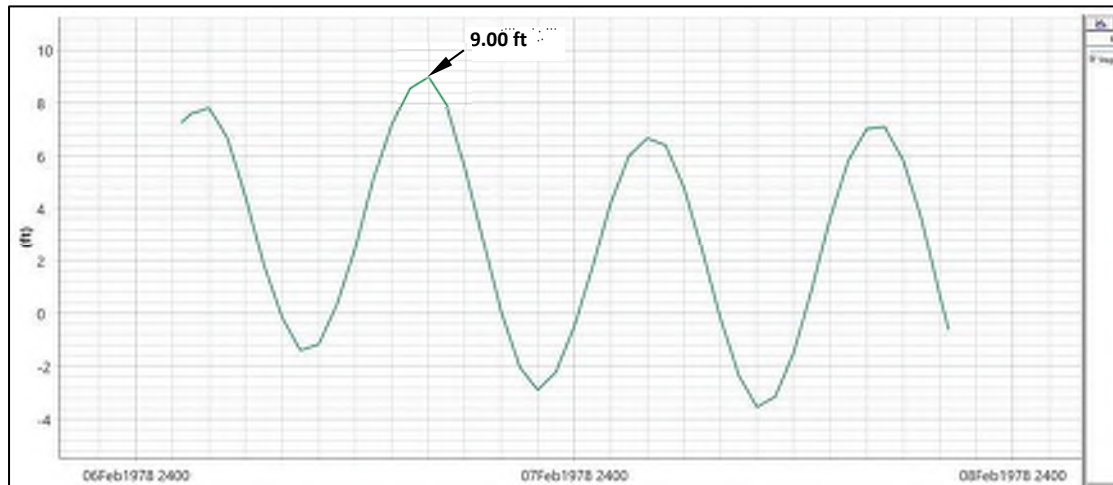


Figure 46 – Estimated 100-year tidal storm surge stage hydrograph used as the downstream boundary in the 100-year storm models with SLR

#### C.6. Pre- and Post-Project 50-year Storm Models without SLR

The pre-project 50-year storm model without SLR simulates the existing bridge geometry (see Section B.2.), runoff to North Mill Pond from the 50-year rainfall event (see Figure 38), and 50-year tidal storm surge unadjusted for SLR (see Figure 43).

The post-project 50-year storm model without SLR simulates the proposed bridge geometry after application of the geopolymer liner and removal of portions of the concrete footings (see Section B.3.), runoff to North Mill Pond from the 50-year rainfall event (see Figure 38), and 50-year tidal storm surge unadjusted for SLR (see Figure 43).

Table 4 summarizes the peak water levels in the portion of North Mill Pond south of Maplewood Avenue calculated with the pre- and post-project 50-year storm models without SLR. Note that maximum water levels at the south end of the pond below the outlet of the Bartlett Street culvert are slightly higher than in the majority of the pond. Similarly, maximum water levels at the bridge inlet are slightly lower than in the majority of the pond. The peak

water levels listed in Table 4, and in subsequent tables which report maximum water levels, have been calculated at the centroid of the portion of North Mill Pond on the south side of Maplewood Avenue and represent the peak water levels in the majority of the waterbody on the south side of the road.

*Table 4 – Peak water levels in the portion of North Mill Pond on the south side of Maplewood Avenue calculated with the pre- and post-project 50-year storm models without SLR*

| <b>Model</b>                                 | <b>Peak Water Level in the portion of North Mill Pond on the South Side of Maplewood Avenue*<br/>(ft, NAVD88)</b> |
|--|---|
| Pre-Project 50-year Storm Model without SLR  | 7.96  |
| Post-Project 50-year Storm Model without SLR | 7.95  |

*\*calculated at the centroid of the waterbody on the south side of Maplewood Ave. (N 211315, E 1224317)*

As shown in Table 4, the maximum water level at the centroid would decrease by 0.01 ft for a storm event which includes a 50-year tidal storm surge and a 50-year freshwater flood occurring simultaneously under present-day sea-level conditions.

Figure 47 shows the inundation area when the calculated water levels are at their maximum. The area shaded light blue represents the post-project inundation area. The pink area along the periphery of the light blue shading, which due to the small water level decrease is unnoticeable at the scale shown in Figure 47, represents the additional area inundated under pre-project conditions. Because the peak water level would decrease, the projects will not exacerbate flooding on properties along the shoreline of North Mill Pond under this storm scenario.



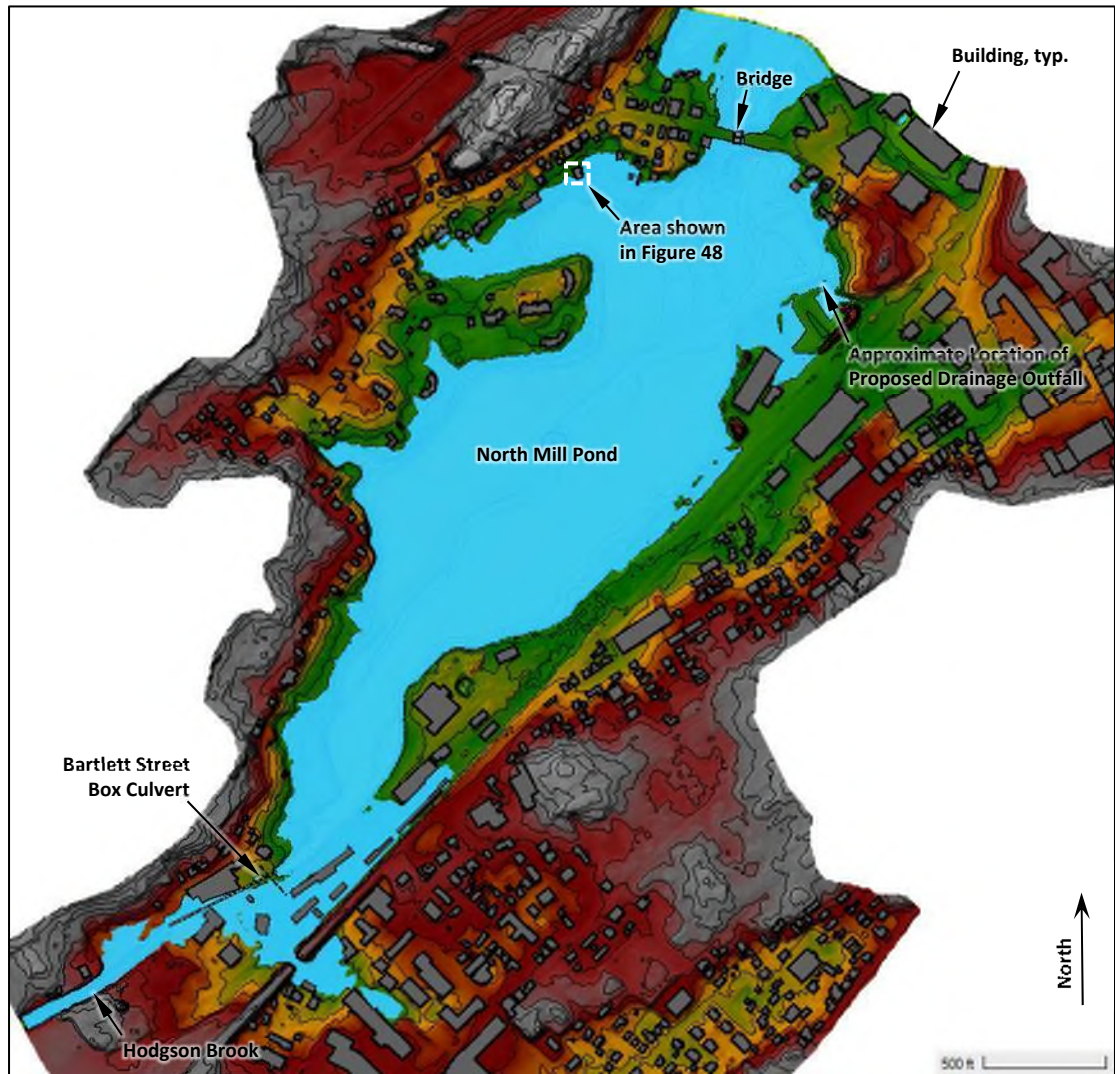


Figure 47 – Inundated areas calculated with the pre- and post-project 50-year storm models without SLR.

In order to visualize the magnitude of the reduced inundation in a typical area along the shoreline of North Mill Pond, Figure 48 shows a detailed view of an area southwest from the bridge.



*Figure 48 – Detail view of a portion of the shoreline southwest from the bridge showing the inundated areas at the peak water levels calculated with the pre- and post-project 50-year storm models without SLR. The area shaded blue represents the post-project inundation area. The pink area along the periphery of the blue-shaded area represents the additional area flooded under pre-project conditions.*

Figures 49 and 50 show the stage and flow hydrographs at the bridge calculated with the pre- and post-project 50-year storm models without SLR. Note that the maximum stage at the bridge inlet at the crest of each tide cycle is more or less equal to the water level at the bridge outlet except at the coincident peak of the freshwater inflow and tidal storm surge when the stage at the inlet is higher due to the freshwater inflow. Also note that due to the flow constriction created by the bridge and the grade control just south of the bridge inlet, low water levels in North Mill Pond south of the road at the trough of each tide cycle are higher than, and lag behind, low water levels at the bridge outlet with the greatest differences occurring at the tide cycle trough immediately after the coincident inflow and storm surge peaks. These same characteristics are also apparent on the stage hydrographs calculated with the other storm models.

The maximum flow through the bridge is 1,874 cfs for pre-project conditions and 1,907 cfs for post-project conditions. Both occur from south to north about two hours after the coincident inflow and storm surge peaks. Table 5 summarizes the peak flows through the bridge calculated with the pre- and post-project 50-year storm models without SLR.

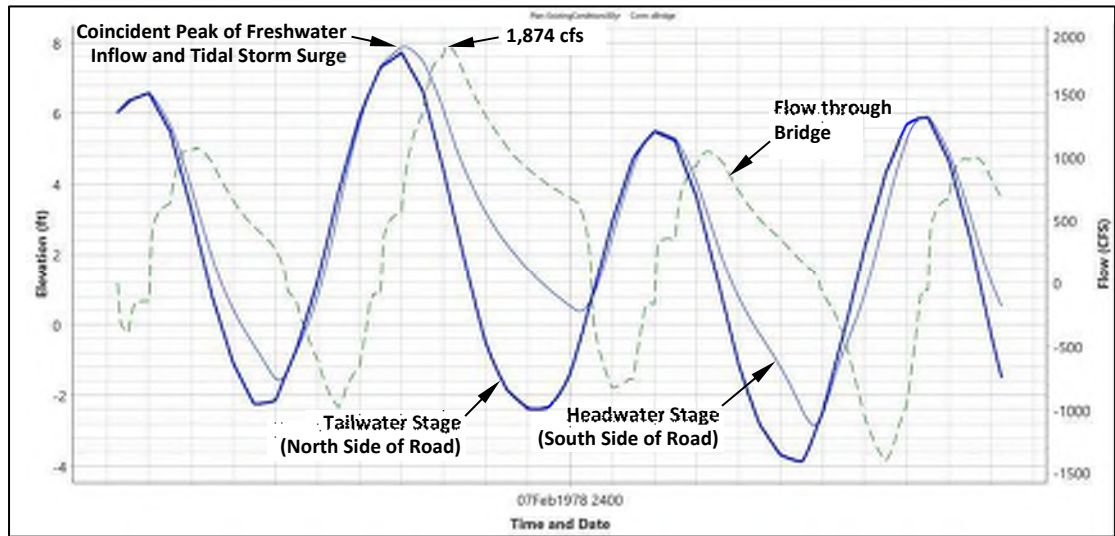


Figure 49 – Stage and flow hydrographs at the bridge calculated with the pre-project 50-year storm model without SLR

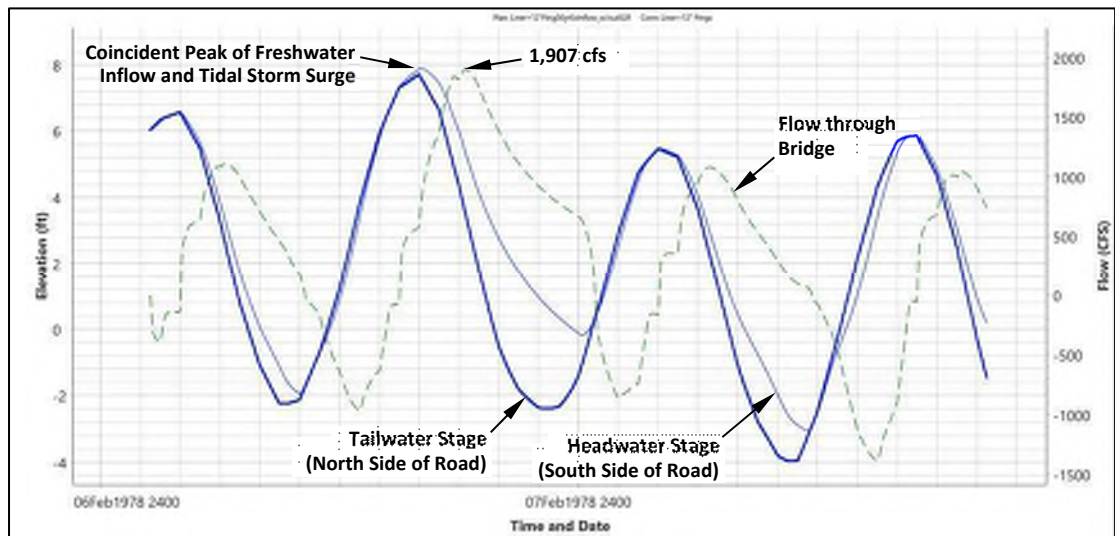


Figure 50 – Stage and flow hydrographs at the bridge calculated with the post-project 50-year storm model without SLR

Table 5 – Peak flows through the bridge calculated with the pre- and post-project 50-year storm models without SLR

| Model  | Peak Flow through Bridge (cfs) |
|--|--------------------------------|
| Pre-Project 50-year Storm Model without SLR  | 1,874                          |
| Post-Project 50-year Storm Model without SLR | 1,907                          |

As shown in Table 5, due to the proposed waterway opening modifications, the maximum flow through the bridge would increase by 33 cfs for a storm event which includes a 50-year tidal storm surge and a 50-year freshwater flood occurring simultaneously under present-day sea-level conditions. This is an increase of approximately 1.8% and indicates that the bridge rehabilitation project will not restrict tidal flows as required by Env-Wt 904.07(d)(2).

**C.7. Pre- and Post-Project 100-year Storm Models without SLR**

The pre-project 100-year storm model without SLR includes the existing bridge geometry (see Section B.2.), runoff to North Mill Pond from the 100-year rainstorm (see Figure 39), and 100-year tidal storm surge unadjusted for SLR (see Figure 44).

The post-project 100-year storm model without SLR includes the proposed bridge geometry with the geopolymer liner applied and portions of the existing concrete footings removed (see Section B.3.), runoff to North Mill Pond from the 100-year rainstorm (see Figure 39), and 100-year tidal storm surge unadjusted for SLR (see Figure 44).

Table 6 lists the peak water levels calculated at the centroid of the portion of North Mill Pond south of Maplewood Avenue with the pre- and post-project 100-year storm models without SLR.

*Table 6 – Peak water levels in the portion of North Mill Pond on the south side of Maplewood Avenue calculated with the pre- and post-project 100-year storm models without SLR*

| <b>Model</b>                                  | <b>Peak Water Level in the portion of North Mill Pond on the South Side of Maplewood Avenue* (ft, NAVD88)</b> |
|---|---|
| Pre-Project 100-year Storm Model without SLR  | 8.41  |
| Post-Project 100-year Storm Model without SLR | 8.40  |

*\*calculated at the centroid of the waterbody on the south side of Maplewood Ave. (N 211315, E 1224317)*

The model results indicate that the maximum water level in the portion of North Mill Pond south of Maplewood Avenue would decrease by 0.01 ft for a storm which includes simultaneous 100-year tidal storm surge and 100-year freshwater flood events under current sea-level conditions.

Figures 51 and 52 show the pre- and post-project inundation areas associated with the calculated peak water levels listed in Table 6. Light blue shading indicates the post-project inundation area. Pink shading along the edge of the light blue-shaded area indicates the additional area flooded under pre-project conditions. Both the maximum water level and inundated area would decrease; therefore, the projects will not increase flooding on properties along the shoreline of North Mill Pond during the 100-year storm.

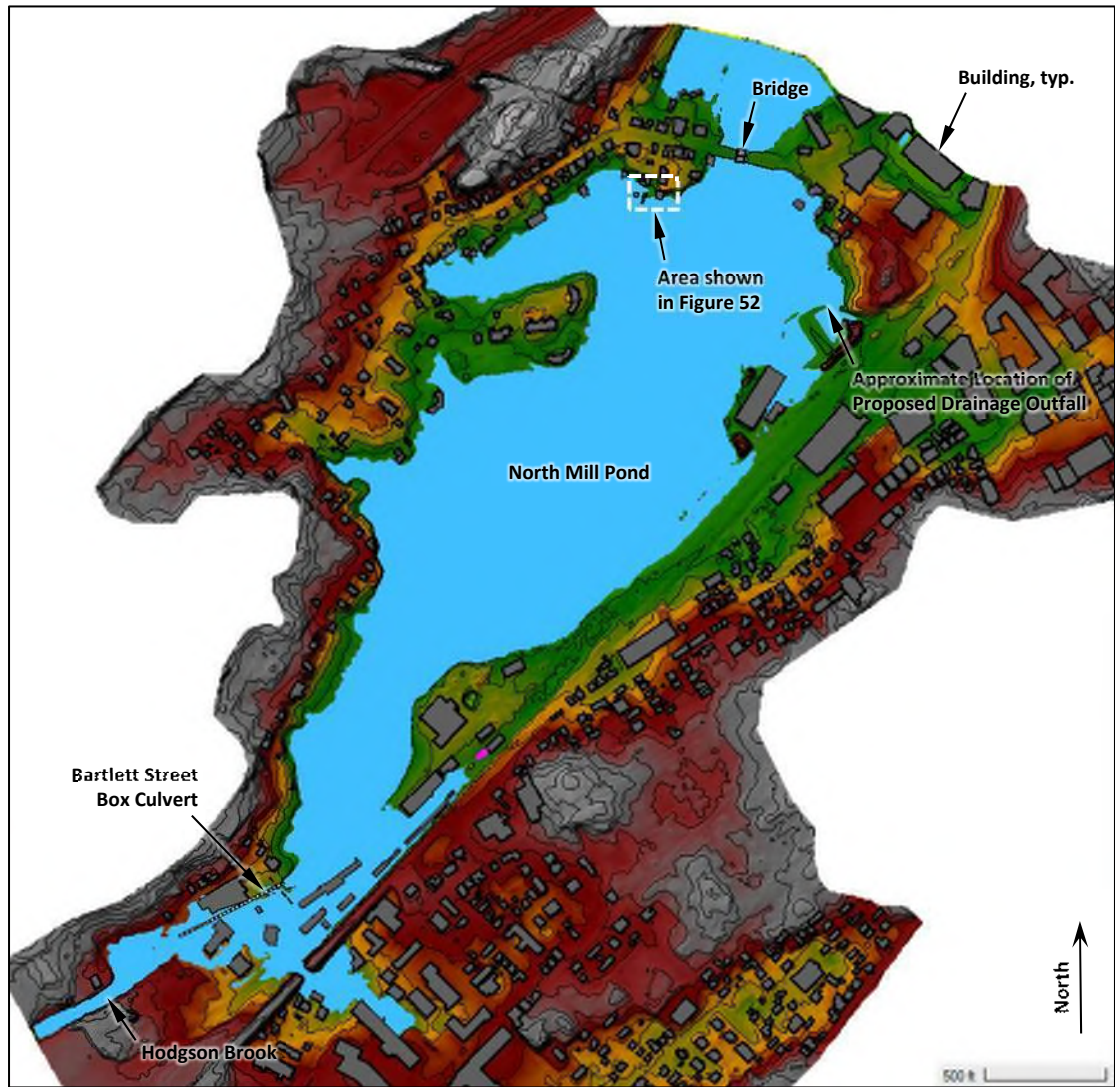


Figure 51 – Inundated areas calculated with the pre- and post-project 100-year storm models without SLR.

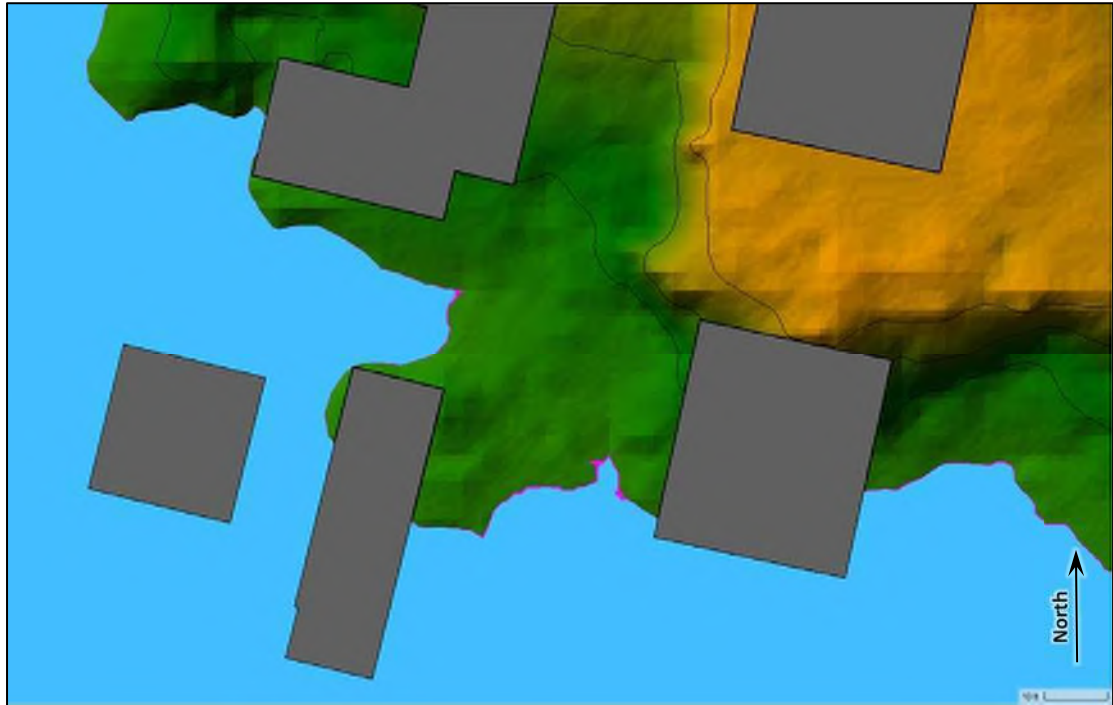


Figure 52 – Detail view of a portion of the North Mill Pond shoreline southwest from the bridge showing the inundated areas calculated with the pre- and post-project 100-year storm models without SLR. The area shaded blue represents the post-project inundation area. The pink area along the periphery of the blue-shaded area represents the additional area flooded under pre-project conditions.

Figures 53 and 54 show the stage and flow hydrographs at the bridge calculated with the pre- and post-project 100-year storm models without SLR and Table 7 summarizes the peak flows through the bridge, which are 2,129 cfs for pre-project conditions and 2,164 cfs for post-project conditions. Both occur from south to north about two hours after the coincident inflow and storm surge peaks.

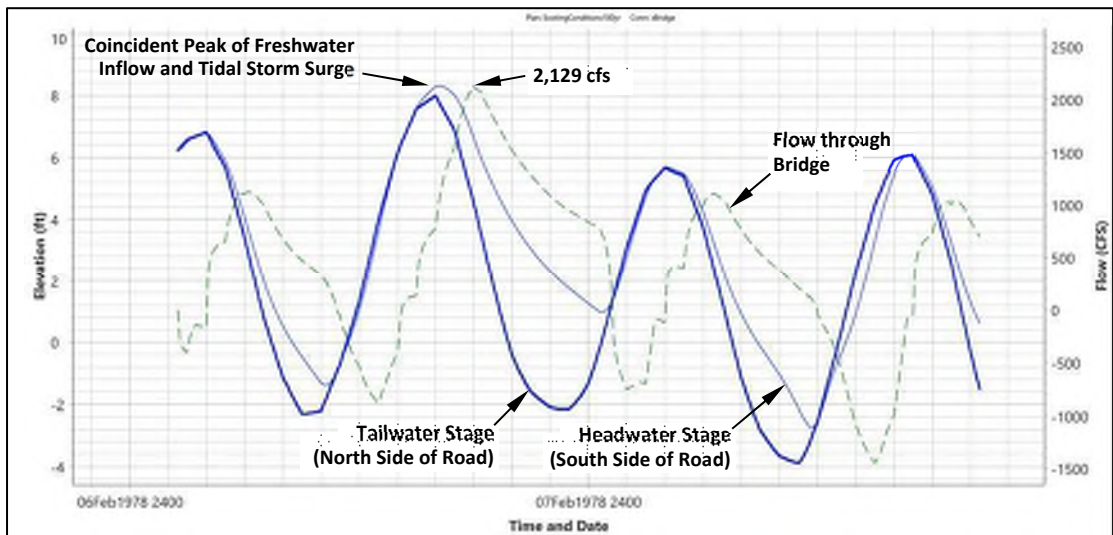


Figure 53 – Stage and flow hydrographs at the bridge calculated with the pre-project 100-year storm model without SLR

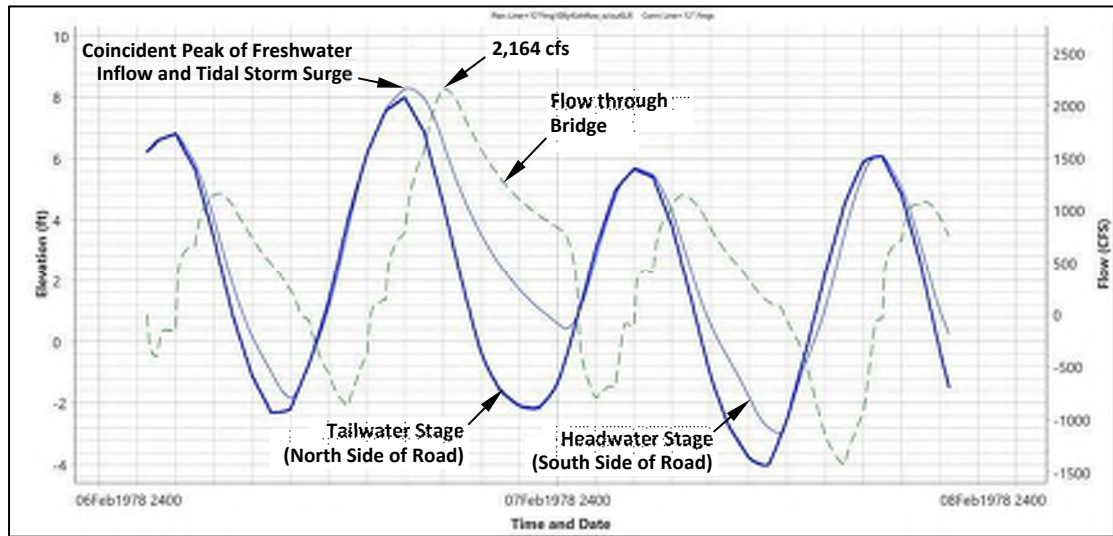


Figure 54 – Stage and flow hydrographs at the bridge calculated with the post-project 100-year storm model without SLR

Table 7 – Peak flows through the bridge calculated with the pre- and post-project 100-year storm models without SLR

| Model   | Peak Flow through Bridge (cfs) |
|---|--------------------------------|
| Pre-Project 100-year Storm Model without SLR  | 2,129                          |
| Post-Project 100-year Storm Model without SLR | 2,164                          |

As shown in Table 7, for a storm event which includes a 100-year tidal storm surge and a 100-year freshwater flood occurring simultaneously under present-day sea-level conditions, the calculated peak flow through the bridge would increase by 35 cfs, or approximately 1.6%. The increased peak flow rate indicates that the proposed modifications to the bridge waterway opening will not restrict flows in accordance with Env-Wt 904.07(d)(2).

### C.8. Pre- and Post-Project 50-year Storm Models with SLR

The pre-project 50-year storm model with SLR simulates the existing bridge geometry (see Section B.2.), runoff to North Mill Pond from the 50-year rainfall event (see Figure 38), and 50-year tidal storm surge adjusted for 1.0 ft SLR projected to occur during the bridge rehabilitation project design life (see Figure 45).

The post-project 50-year storm model with SLR simulates the proposed bridge geometry after the geopolymer liner has been applied (see Section B.3.), runoff to North Mill Pond from the 50-year rainfall event (see Figure 38), and 50-year tidal storm surge adjusted for 1.0 ft SLR (see Figure 45).

Table 8 summarizes the peak water levels in North Mill Pond south of Maplewood Avenue calculated with the pre- and post-project 50-year storm models with 1.0 ft SLR.

*Table 8 – Peak water levels in the portion of North Mill Pond on the south side of Maplewood Avenue calculated with the pre- and post-project 50-year storm models with 1.0 ft SLR*

| <b>Model</b>                              | <b>Peak Water Level in the portion of North Mill Pond on the South Side of Maplewood Avenue*<br/>(ft, NAVD88)</b> |
|---|---|
| Pre-Project 50-year Storm Model with SLR  | 8.95  |
| Post-Project 50-year Storm Model with SLR | 8.94  |

*\*calculated at the centroid of the waterbody on the south side of Maplewood Ave. (N 211315, E 1224317)*

As shown in Table 8, with 1.0 ft of sea-level rise, the maximum water level in the portion of North Mill Pond south of Maplewood Avenue would decrease by 0.01 ft for a storm event which includes a 50-year tidal storm surge and a 50-year freshwater flood occurring simultaneously. This is the same decrease calculated for the 50-year storm event without SLR, which suggests that in regards to peak water levels, the projects would have more or less the same effect under both present-day sea-levels and those projected at the end of the bridge rehabilitation design life.

Figures 55 and 56 show the inundated areas at the peak water levels calculated with the pre- and post-project 50-year storm models with 1.0 ft SLR. Areas flooded under a scenario with the proposed bridge geometry and 1.0 ft SLR are shaded light blue. Pink shading along the limits of the light blue shading represents the additional areas which would be flooded with the existing bridge opening and 1.0 ft SLR. The models show that both the peak water level and inundation area would decrease; therefore, the projects will not increase flooding on properties along the shoreline of North Mill Pond under this scenario.



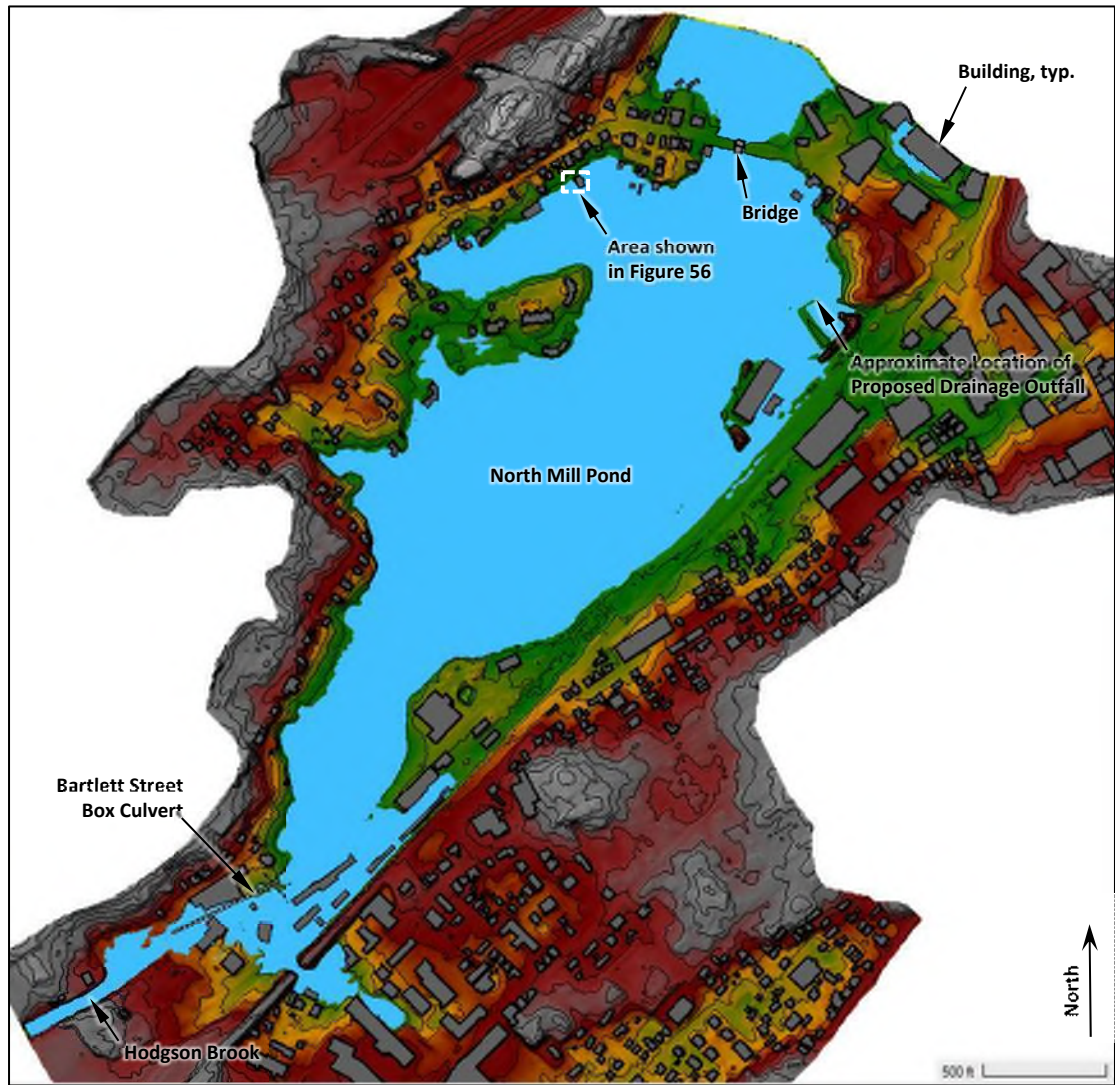


Figure 55 – Inundated areas calculated with the pre- and post-project 50-year storm models with 1.0 ft SLR



Figure 56 – Detail view of a portion of the shoreline southwest from the bridge showing the inundated areas at the peak water levels calculated with the pre- and post-project 50-year storm models with 1.0 ft SLR. The area shaded blue represents the post-project inundation area. The pink area along the periphery of the blue-shaded area represents the additional area flooded under pre-project conditions.

Figures 57 and 58 show the stage and flow hydrographs calculated at the bridge with the pre- and post-project 50-year storm models with 1.0 ft SLR. Maximum flows through the bridge are 2,016 cfs for pre-project conditions and 2,102 cfs for post-project conditions, both of which occur from south to north about two hours after the coincident freshwater inflow and tidal storm surge peaks. This is an increase of about 4.3% and indicates that the proposed waterway opening modifications would not restrict flows under a scenario which includes simultaneous 50-year tidal storm surge and 50-year freshwater flood events with 1.0 ft SLR.

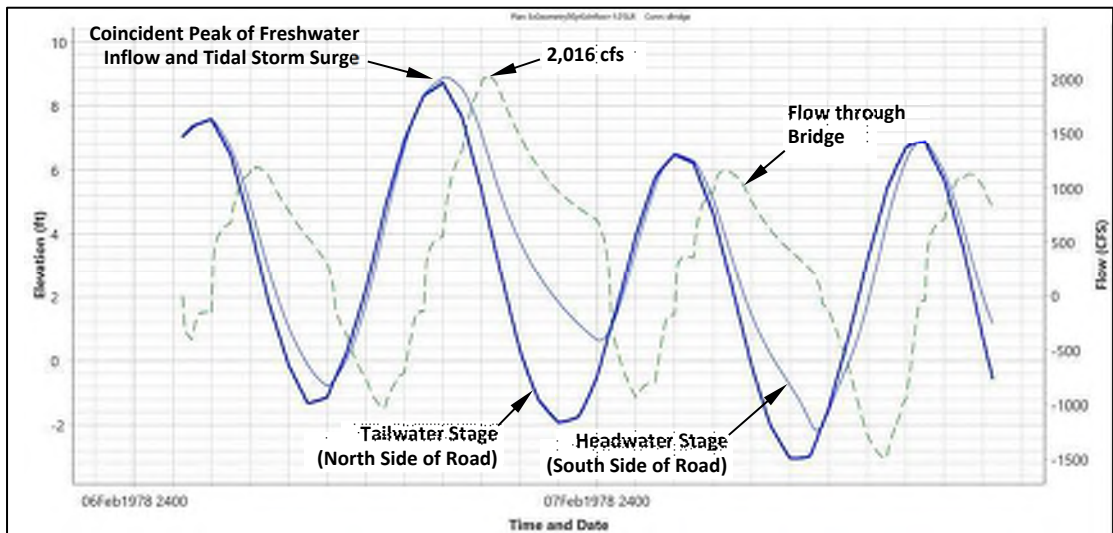


Figure 57 – Stage and flow hydrographs calculated at the bridge with the pre-project 50-year storm model with 1.0 ft SLR

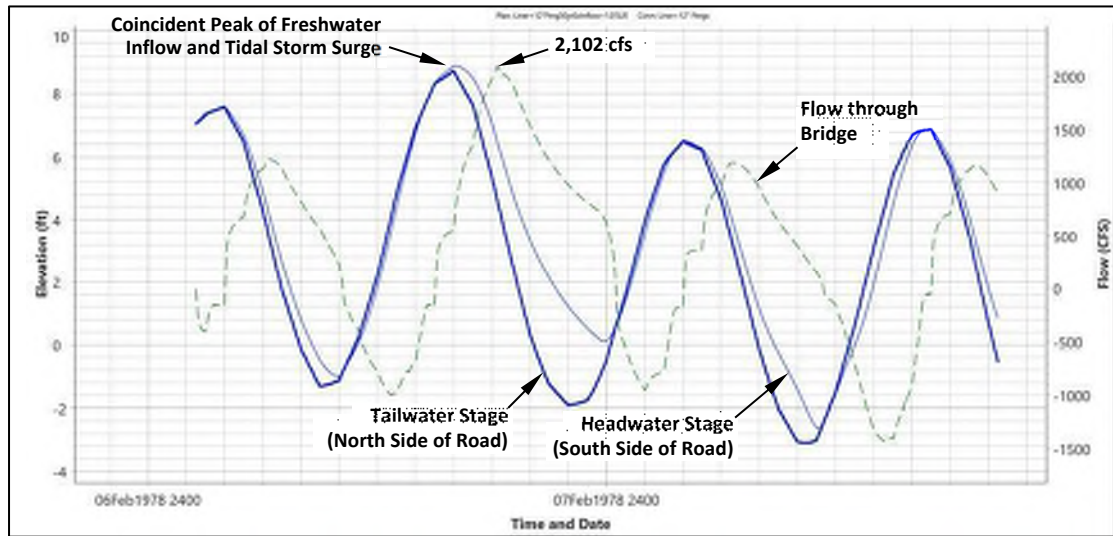


Figure 58 – Stage and flow hydrographs calculated at the bridge with the post-project 50-year storm model with 1.0 ft SLR

Table 9 – Peak flows through the bridge calculated with the pre- and post-project 50-year storm models with 1.0 ft SLR

| Model                                     | Peak Flow through Bridge (cfs) |
|---|--------------------------------|
| Pre-Project 50-year Storm Model with SLR  | 2,016                          |
| Post-Project 50-year Storm Model with SLR | 2,102                          |

### C.9. Pre- and Post-Project 100-year Storm Models with SLR

The pre-project 100-year storm model with SLR simulates a scenario which includes the existing bridge geometry (see Section B.2.), runoff to North Mill Pond from the 100-year rainfall event (see Figure 39), and 100-year tidal storm surge adjusted for 1.0 ft SLR projected to occur during the bridge rehabilitation project design life (see Figure 46).

The post-project 100-year storm model with SLR simulates a scenario which includes the proposed bridge geometry after the geopolymer liner has been applied and portions of the existing concrete footings have been removed (see Section B.3.), runoff to North Mill Pond from the 100-year rainfall event (see Figure 39), and 50-year tidal storm surge adjusted for 1.0 ft SLR (see Figure 46).

Table 10 lists the peak water levels calculated in the portion of North Mill Pond south of Maplewood Avenue with the pre- and post-project 100-year storm models with 1.0 ft SLR.

Table 10 – Peak water levels in the portion of North Mill Pond on the south side of Maplewood Avenue calculated with the pre- and post-project 100-year storm models with 1.0 ft SLR

| Model                                      | Peak Water Level in the portion of North Mill Pond on the South Side of Maplewood Avenue* (ft, NAVD88) |
|--|--|
| Pre-Project 100-year Storm Model with SLR  | 9.40   |
| Post-Project 100-year Storm Model with SLR | 9.39   |

\*calculated at the centroid of the waterbody on the south side of Maplewood Ave. (N 211315, E 1224317)

As indicated in Table 10, the model results show that the maximum water level in the portion of North Mill Pond south of Maplewood Avenue would decrease by 0.01 ft for a storm which includes simultaneous 100-year tidal storm surge and 100-year freshwater flood events under conditions with 1.0 ft of sea-level rise. This is the same decrease calculated for the 100-year storm event without SLR, suggesting that with respect to maximum water levels, the proposed waterway opening modifications would have about the same effect under both present-day sea-levels and elevated sea-levels predicted during the bridge rehabilitation design life.

Figures 59 and 60 show the inundation areas when water levels calculated with the pre- and post-project 100-year storm models with 1.0 ft SLR are at their maximum elevation. Areas shaded light blue are inundated under post-project conditions with 1.0 ft SLR. Pink shading along the edge of the post-project inundation area (see Figure 60) represents the additional area which would be flooded under pre-project conditions with 1.0 ft SLR. The peak water level and inundation area would both decrease; therefore, the projects will not exacerbate flooding on properties along the shoreline of North Mill Pond under this storm and SLR scenario.

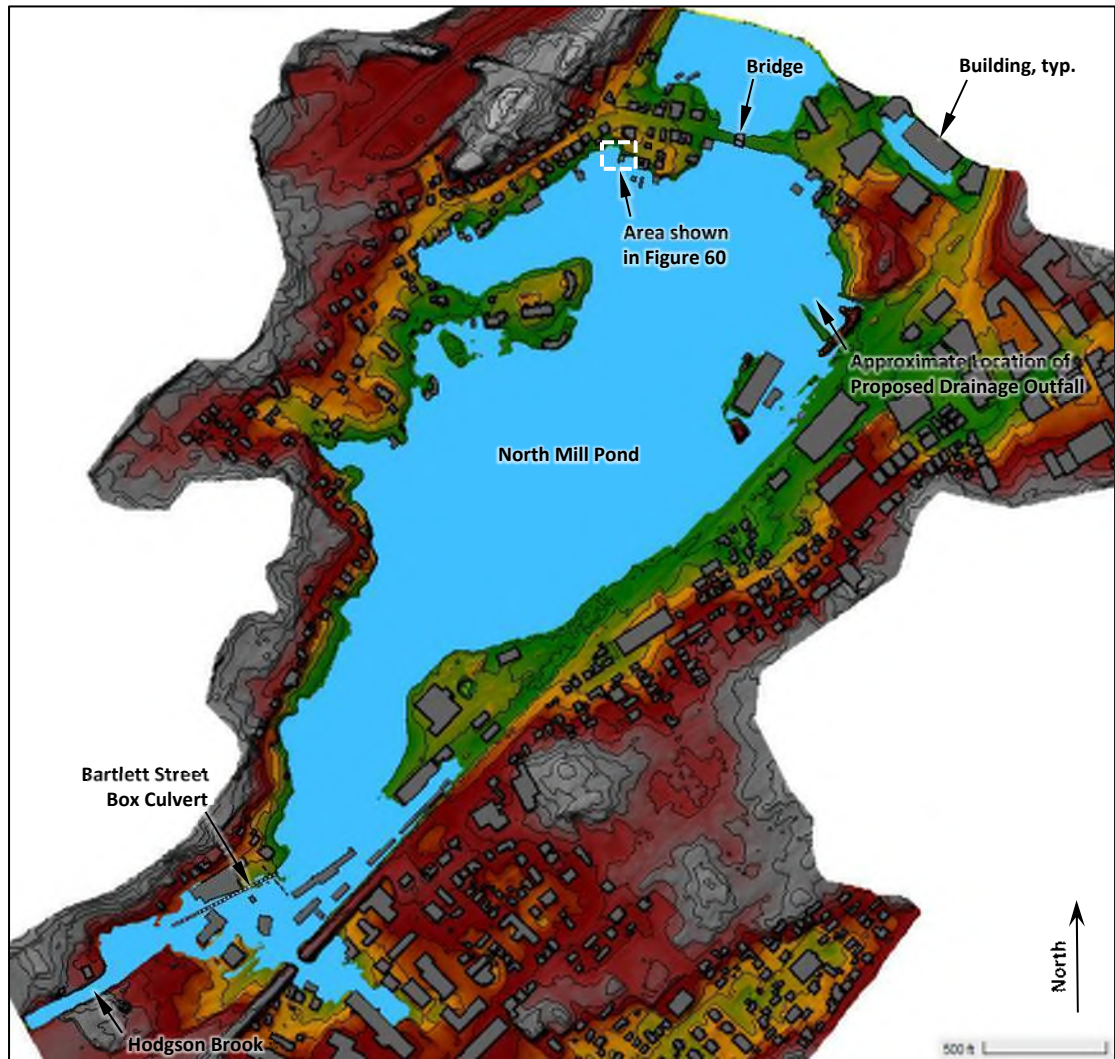


Figure 59 – Inundation areas calculated with the pre- and post-project 100-year storm models with 1.0 ft SLR

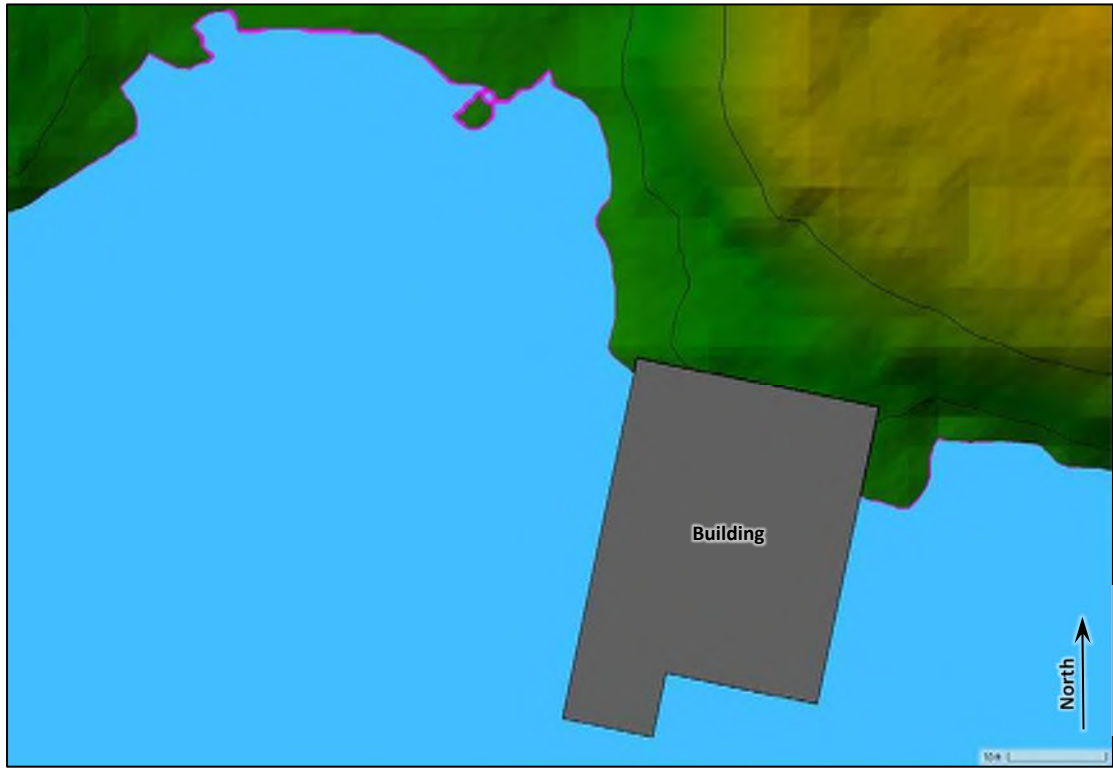


Figure 60 – Detail view of an area along the shore of North Mill Pond southwest from the bridge showing the inundated areas calculated with the pre- and post-project 100-year storm models with 1.0 ft SLR. The area shaded blue represents the post-project inundation area. The pink area along the periphery of the blue-shaded area represents the additional area flooded under pre-project conditions.

Figures 61 and 62 show the stage and flow hydrographs at the bridge calculated with the pre- and post-project 100-year storm models with 1.0 ft SLR. Maximum flows through the bridge are 2,209 cfs for pre-project conditions with 1.0 ft SLR and 2,250 cfs for post-project conditions with 1.0 ft SLR. Peak flows under both scenarios are from south to north and occur about two hours after the coincident freshwater inflow and tidal storm surge peaks.

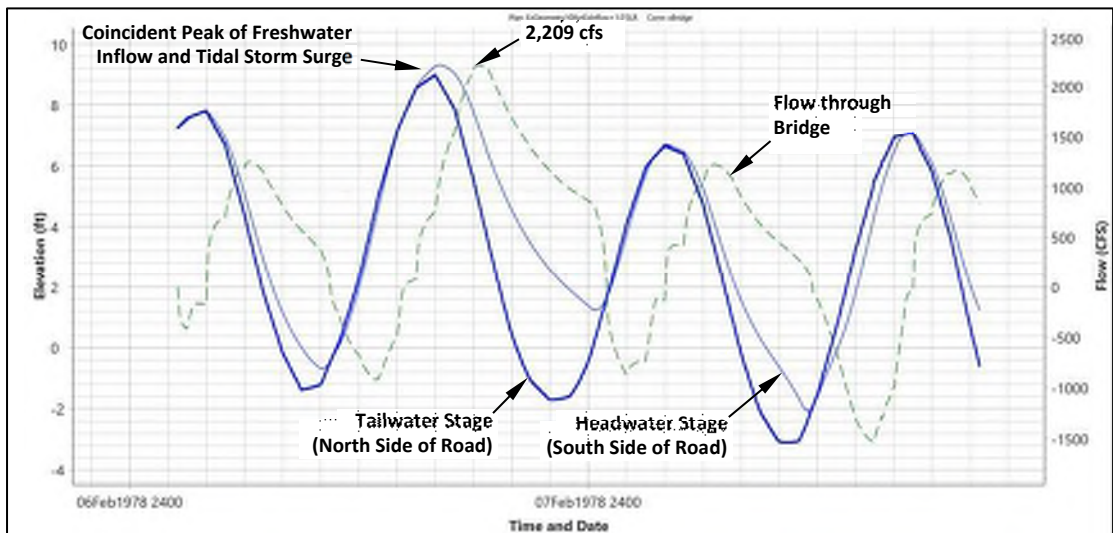


Figure 61 – Stage and flow hydrographs calculated at the bridge with the pre-project 100-year storm model with 1.0 ft SLR

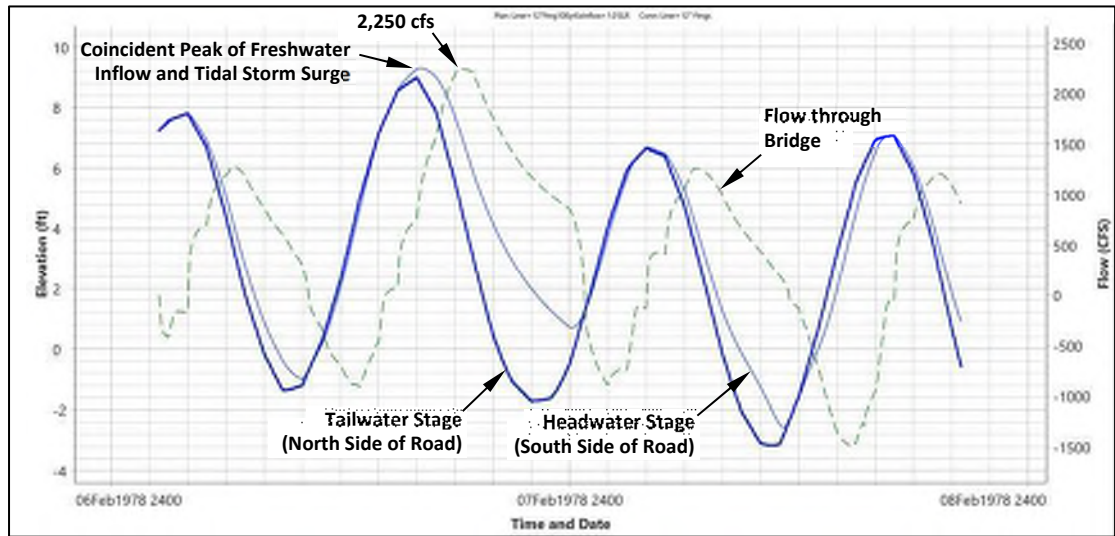


Figure 62 – Stage and flow hydrographs calculated at the bridge with the post-project 100-year storm model with 1.0 ft SLR

Table 11 – Peak flows through the bridge calculated with the pre- and post-project 100-year storm models with 1.0 ft SLR

| Model                                      | Peak Flow through Bridge (cfs) |
|--|--------------------------------|
| Pre-Project 100-year Storm Model with SLR  | 2,209                          |
| Post-Project 100-year Storm Model with SLR | 2,250                          |

The models indicate the maximum flow through the bridge would increase by 41 cfs for a storm event which includes a 100-year tidal storm surge and a 100-year freshwater flood occurring simultaneously under conditions with 1.0 ft SLR. This is an increase of approximately 1.9% and indicates that the proposed modifications to the bridge waterway opening will not restrict flows under this storm and SLR scenario.

#### D. Env-Wt 603.05 Vulnerability Assessment

Results of the hydraulic analyses completed under Sections B and C have been used to complete a vulnerability assessment per Env-Wt 603.05.

##### D.1. Env-Wt 603.05(a)

The bridge rehabilitation project is intended to be a temporary repair which will maintain the functionality of the crossing until the structure can be completely replaced. It is expected to be in service for 10 to 20 years. Construction is anticipated to occur in the fall of 2023; therefore, the rehabilitated bridge is projected to be in service from 2023 to sometime between 2033 and 2043.

##### D.2. Env-Wt 603.05(b)

The corrugated metal arch bridge is a hydraulic structure that has been, and continues to be, frequently submerged since its construction in 1976. Granite block headwalls surround the metal arch at both ends of the structure and bedrock, boulders, and cobble line the pond

bottom at the crossing (see Figures 3 and 18). Therefore, there is little risk for erosion of the roadway embankment or degradation of the pond bottom. Furthermore, because the surface of Maplewood Avenue is about 3 ft higher than the FEMA BFE, there is little risk of the roadway being overtopped during the project design life. The only damage potential is corrosion of the metal arch from regular saltwater exposure, which the geopolymer liner is intended to mitigate. Due to these characteristics, the rehabilitated bridge will have a low sensitivity to inundation and therefore a high tolerance for flood risk per the Step 2 Table (Framework for Determining Project Tolerance for Flood Risk) in NHCFR STAP (2020). Similarly, the drainage outfall is intended to be frequently submerged and will be constructed of erosion and corrosion resistant materials. Consequently, it too has a low sensitivity to inundation and a high tolerance for flood risks.

Although the bridge rehabilitation and drainage outfall projects themselves have a low sensitivity to inundation and a high tolerance for flood risks, the existing residential and commercial properties near the pond have a high sensitivity to inundation and low tolerance for flood risks. As described in Section C, detailed hydraulic analyses have been performed to assess the impact on these properties. These analyses found that the projects will not increase flood levels or flood inundation under any of the modeled storm scenarios, either with or without SLR, and will therefore not increase the flood risks to these properties.

The “SLAMM 2022 – Initial Conditions” layer in the NH Coastal Viewer shows narrow bands of existing salt marsh along most of the west shoreline of North Mill Pond south of Maplewood Avenue and about half of the east shoreline (see Figure 63). These salt marshes were also observed in the field (see Figure 64). Salt marsh migration is driven primarily by changes to ordinary water levels rather than changes to infrequent, storm-induced water levels. Therefore, the results of the hydraulic models which simulate MHHW and MLLW under pre- and post-project conditions with and without SLR are useful for evaluating the likely effect of the projects on these salt marshes. As described in Sections B.7., B.8., C.3., and C.4., the proposed projects will not significantly alter water levels during typical astronomical tide cycles, either with or without SLR. Therefore, the projects are not expected to adversely impact the salt marshes in North Mill Pond. There are no sand dunes or other known valuable coastal resources in the area which could be affected by the projects.

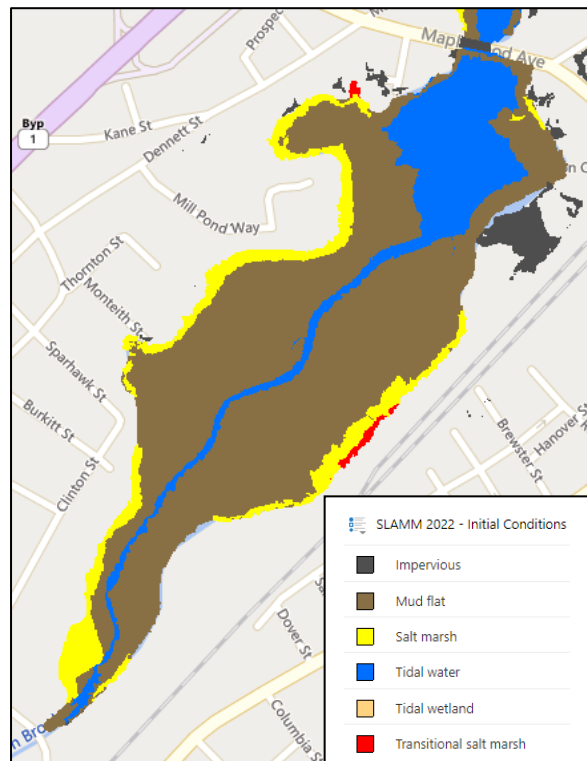


Figure 63 – SLAMM 2022 Initial Conditions layer showing existing salt marshes and other tidal resources in the portion of North Mill Pond south of Maplewood Avenue





Figure 64 – View north from the south end of North Mill Pond showing salt marshes along the shoreline (09-23-20)

**D.3. Env-Wt 603.05(c)**

NHCFR STAP (2019)<sup>5</sup> states in Section 4.5 (Relative Sea-Level Rise Projections): “For the purposes of this summary report, the preferred RSLR projections for coastal New Hampshire from 2000 to 2050 are based on K14 for the RCP 4.5 scenario (Table 4.2; Figure 4.5).” A copy of Table 4.2 from NHCFR STAP (2019) is shown as Figure 65 below. Per this table, as compared to sea-levels in the year 2000, there is a 67% probability that sea-levels will be between 0.3 and 0.7 ft higher in the year 2030 and between 0.5 and 1.3 ft higher in 2050.

**Table 4.2.** Projected local sea-level rise (in feet) estimates above 2000 levels for NH based on K14 and the Seavey Island tide-gauge.

| Year | RCP       | Central Estimate                      | Likely Range                    | 1-in-20 Chance                       | 1-in-100 Chance                      | 1-in-200 Chance                        | 1-in-1000 Chance                       |
|------|-----------|---------------------------------------|---------------------------------|--------------------------------------|--------------------------------------|--|--|
|      |           | 50% probability SLR meets or exceeds: | 67% probability SLR is between: | 5% probability SLR meets or exceeds: | 1% probability SLR meets or exceeds: | 0.5% probability SLR meets or exceeds: | 0.1% probability SLR meets or exceeds: |
| 2030 | RCP 4.5*  | 0.5                                   | 0.3 - 0.7                       | 0.9                                  | 1.0                                  | 1.1                                    | 1.3                                    |
| 2050 | RCP 4.5*  | <b>0.9</b>                            | <b>0.5 - 1.3</b>                | <b>1.6</b>                           | <b>2.0</b>                           | <b>2.3</b>                             | 2.9                                    |
| 2100 | RCP 2.6   | 1.4                                   | 0.6 - 2.5                       | 3.4                                  | 5.0                                  | 5.8                                    | 8.6                                    |
| 2100 | RCP 4.5   | <b>1.9</b>                            | <b>1.0 - 2.9</b>                | <b>3.8</b>                           | <b>5.3</b>                           | <b>6.2</b>                             | 8.7                                    |
| 2100 | RCP 6.0   | 2.0                                   | 0.9 - 3.3                       | 4.3                                  | 5.8                                  | 6.8                                    | 9.4                                    |
| 2100 | RCP 8.5   | 2.6                                   | 1.5 - 3.8                       | 4.9                                  | 6.5                                  | 7.5                                    | 10.0                                   |
| 2150 | RCP 2.6   | 2.0                                   | 0.9 - 3.4                       | 5.1                                  | 8.6                                  | 10.7                                   | 17.0                                   |
| 2150 | RCP 4.5   | <b>2.7</b>                            | <b>1.2 - 4.6</b>                | <b>6.4</b>                           | <b>9.9</b>                           | <b>11.7</b>                            | 18.1                                   |
| 2150 | RCP 6.0** | N/A                                   | N/A                             | N/A                                  | N/A                                  | N/A                                    | N/A                                    |
| 2150 | RCP 8.5   | 4.0                                   | 2.6 - 5.8                       | 7.6                                  | 11.4                                 | 13.4                                   | 19.9                                   |

Figure 65 – Table 4.2 from NHCFR STAP (2019)

<sup>5</sup> Wake, C., Knott, J., Lippmann, T., Stampono, M., Ballesterio, T., Bjerklie, D., Burakowski, E., Glidden, S., Hosseini-Shakib, I., Jacobs, J. (2019). *New Hampshire Coastal Flood Risk Summary – Part I: Science*. Prepared for the New Hampshire Coastal Flood Risk Science and Technical Advisory Panel. Report published by the University of New Hampshire, Durham, NH.

Step 3 Table A from NHCFR STAP (2020) lists recommended SLR estimates based on project design life and flood risk tolerance (see Figure 21). As described in Section D.1, the rehabilitated bridge is anticipated to be in service until sometime between 2033 and 2043. This most closely matches the year 2040 timeframe in Step 3 Table A. As described in Section D.2., the rehabilitated bridge will have a high tolerance for flood risk. Per Step 3 Table A, the recommended SLR estimate for a project with a 2040 timeframe and a high tolerance for flood risk is 1.0 ft relative to sea-levels in the year 2000. The hydraulic models described in Sections B and C which do not account for SLR use tide stage hydrographs simulating MHHW, MLLW, and tidal storm surge which are relative to the the tidal datum based on the 1983-2001 National Tidal Datum Epoch. Water levels at each time step of these stage hydrographs were raised by 1.0 ft to develop estimates of the MHHW, MLLW, and storm surge tide stage hydrographs which account for projected SLR during the bridge rehabilitation project design life. These SLR-adjusted tide stage hydrographs were used in the hydraulic models which account for SLR.

#### **D.4. Env-Wt 603.05(d) and (e)**

The area shaded light blue in Figure 66 represents the portion of the hydraulic study area which is currently within the 100-year floodplain. This is the area at and below the FEMA BFE, which is 8.0 ft (NAVD88). Pink shading indicates the additional areas which would be subject to flooding as a result of the projected SLR at the end of the project design life assuming the BFE is raised by 1.0 ft to elevation 9.0 ft.

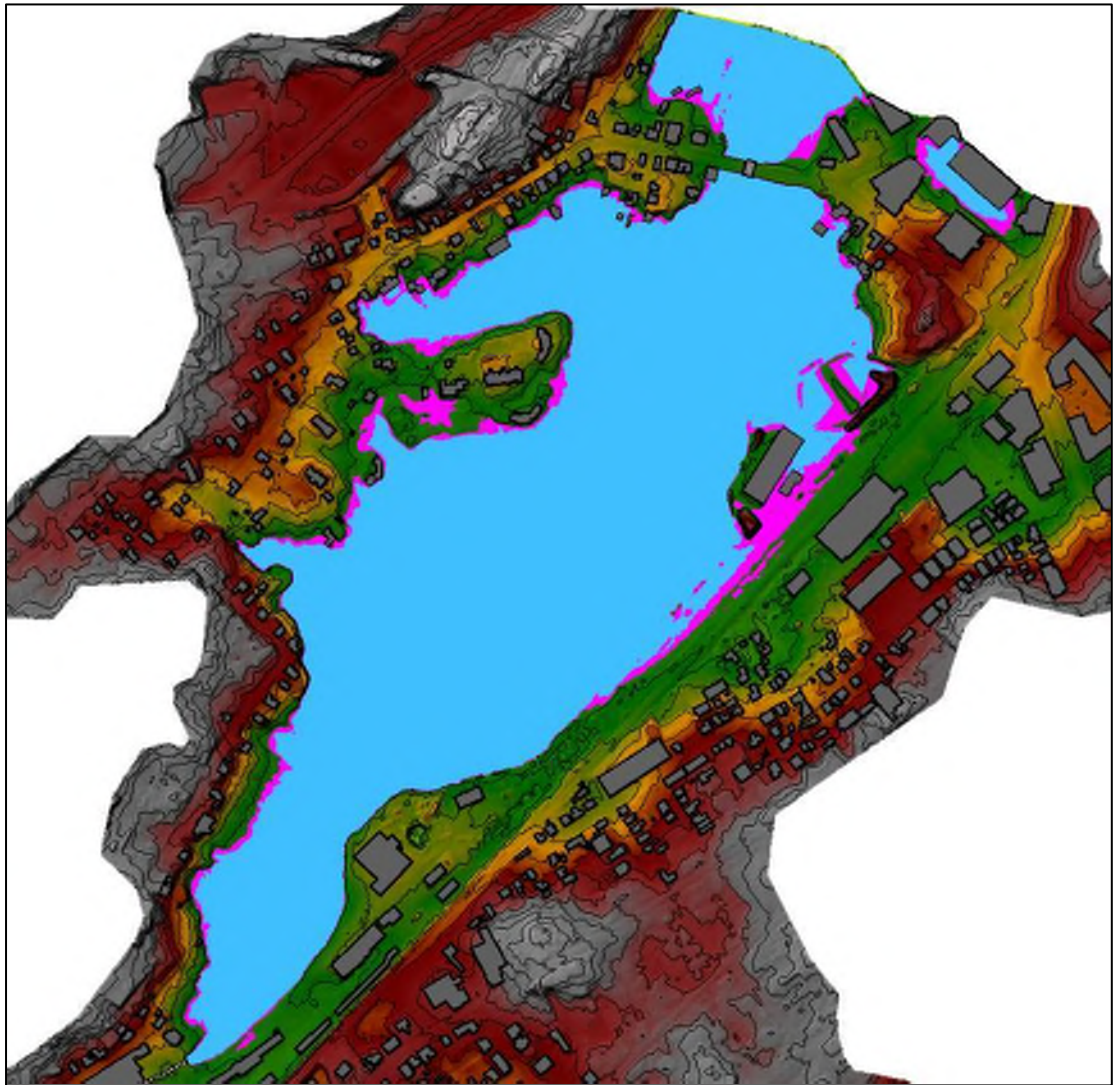


Figure 66 – Existing 100-year floodplain (blue shading, BFE 8.0 ft) and additional area subject to flooding with 1.0 ft SLR (pink shading, BFE 9.0 ft)

**D.5. Env-Wt 603.05(f)**

Since the bridge and outfall are intended to be submerged and Maplewood Avenue at the crossing would still be about 2 ft higher than the FEMA BFE increased by 1.0 ft to account for SLR (i.e., reasonably safe from flooding), no special design features are needed to accommodate SLR within the project design life. However, as described in Section C, SLR has been considered in the project design by evaluating the combined effects of the projects on flood levels, inundation extents, and bridge discharge capacities under scenarios where sea-levels have risen 1.0 ft.

**D.6. Env-Wt 603.05(g)**

There are no conflicts between the purpose of the projects and the vulnerability assessment results.











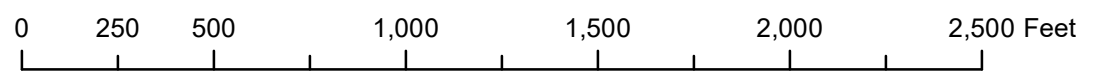
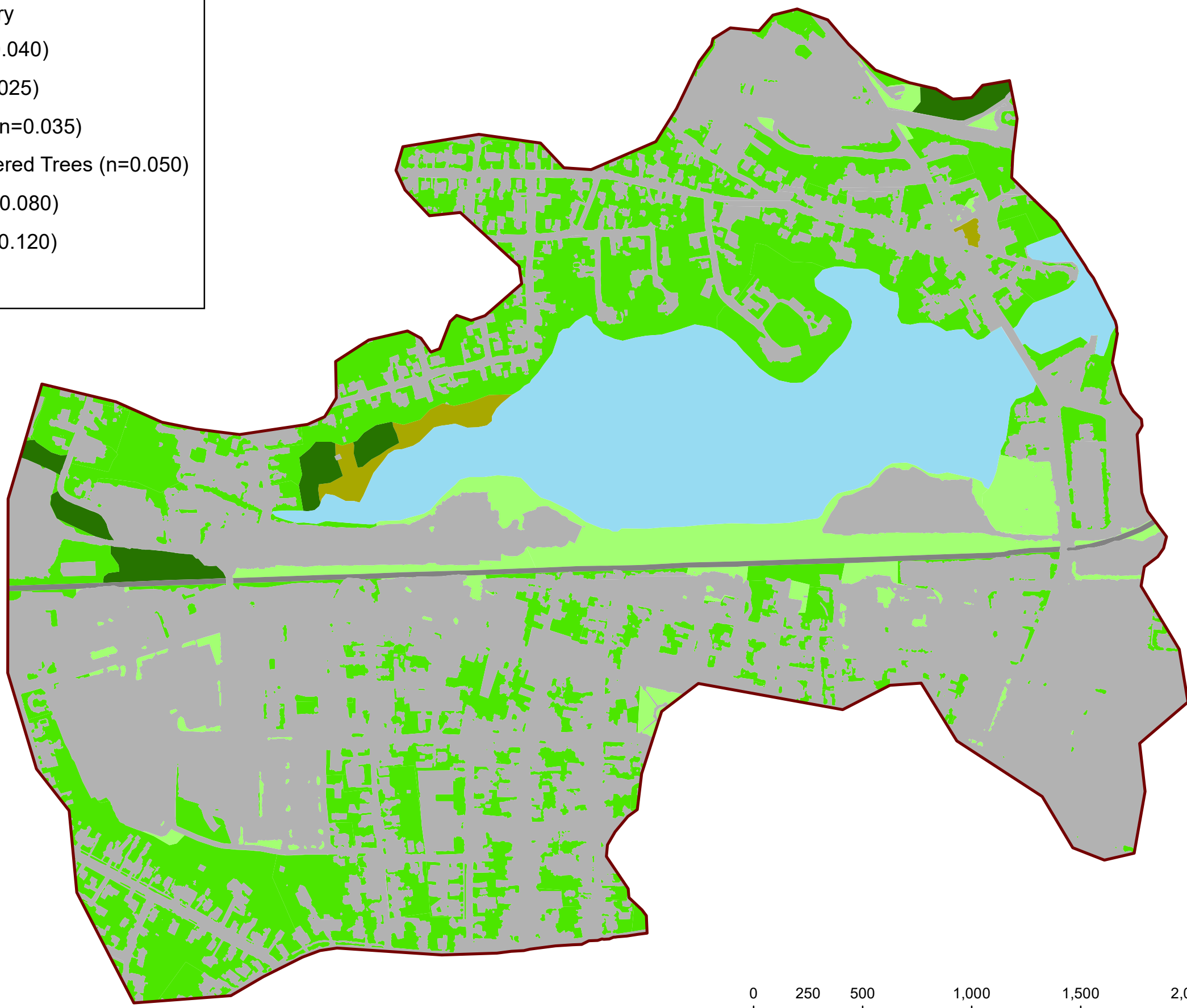
**APPENDIX 1**  
**SUPPORTING DOCUMENTATION FOR**  
**HYDRAULIC MODELS**



# Maplewood Avenue Bridge Replacement Hydraulic Model Land Cover Mapping

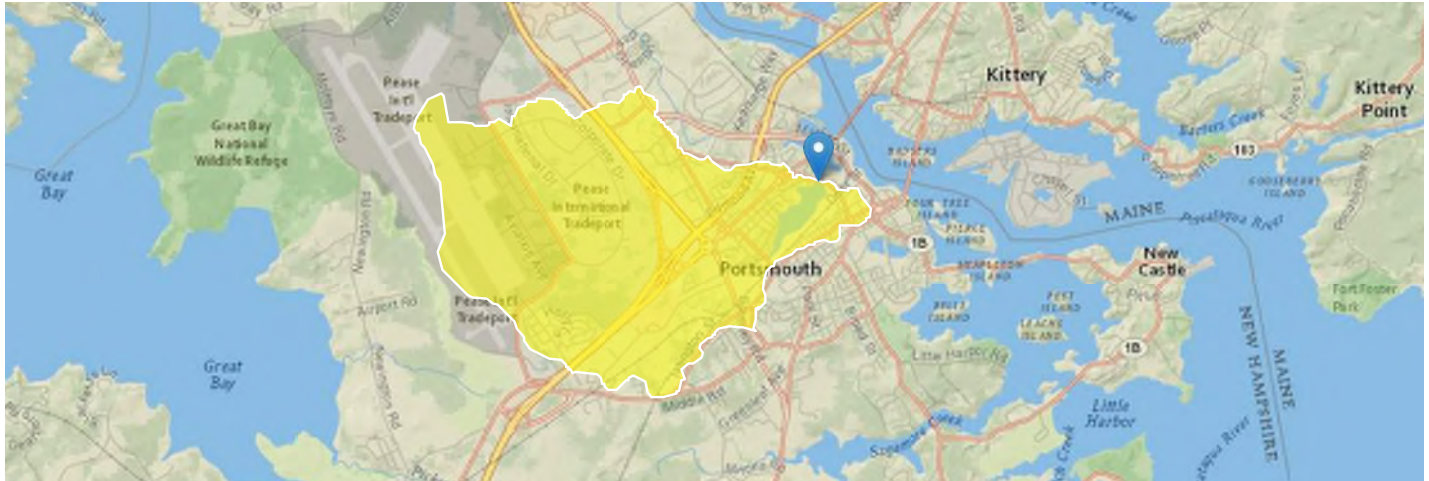
**Legend**

-  2D Model Boundary
-  Open Water (n=0.040)
-  Impervious (n=0.025)
-  Railroad Tracks (n=0.035)
-  Grass with Scattered Trees (n=0.050)
-  Open Woods (n=0.080)
-  Thick Woods (n=0.120)
-  Brush (n=0.120)



## StreamStats Report - North Mill Pond at Maplewood Ave.

Region ID: NH  
 Workspace ID: NH20221003123325873000  
 Clicked Point (Latitude, Longitude): 43.07969, -70.76530  
 Time: 2022-10-03 08:33:51 -0400



Collapse All

### Basin Characteristics

| Parameter Code | Parameter Description   | Value   | Unit         |
|----------------|---|---------|--------------|
| APRAVPRE       | Mean April Precipitation  | 4.429   | inches       |
| BSLDDEM30M     | Mean basin slope computed from 30 m DEM   | 1.47    | percent      |
| CONIF          | Percentage of land surface covered by coniferous forest   | 6.3785  | percent      |
| CSL10_85       | Change in elevation divided by length between points 10 and 85 percent of distance along main channel to basin divide - main channel method not known | 19      | feet per mi  |
| DRNAREA        | Area that drains to a point on a stream   | 4.16    | square miles |
| ELEVMAX        | Maximum basin elevation   | 101.072 | feet         |
| MIXFOR         | Percentage of land area covered by mixed deciduous and coniferous forest  | 2.2681  | percent      |
| PREBC0103      | Mean annual precipitation of basin centroid for January 1 to March 15 winter period   | 9.25    | inches       |
| PREG_03_05     | Mean precipitation at gaging station location for March 16 to May 31 spring period  | 9.6     | inches       |
| PREG_06_10     | Mean precipitation at gaging station location for June to October summer period   | 17.2    | inches       |
| TEMP           | Mean Annual Temperature   | 46.223  | degrees F    |
| TEMP_06_10     | Basinwide average temperature for June to October summer period   | 62.036  | degrees F    |
| WETLAND        | Percentage of Wetlands  | 7.3067  | percent      |

### Peak-Flow Statistics

Peak-Flow Statistics Parameters [Peak Flow Statewide SIR2008 5206]

| Parameter Code | Parameter Name                | Value  | Units        | Min Limit | Max Limit |
|----------------|-------------------------------|--------|--------------|-----------|-----------|
| DRNAREA        | Drainage Area                 | 4.16   | square miles | 0.7       | 1290      |
| APRAVPRE       | Mean April Precipitation      | 4.429  | inches       | 2.79      | 6.23      |
| WETLAND        | Percent Wetlands              | 7.3067 | percent      | 0         | 21.8      |
| CSL10_85       | Stream Slope 10 and 85 Method | 19     | feet per mi  | 5.43      | 543       |

Peak-Flow Statistics Flow Report [Peak Flow Statewide SIR2008 5206]



PII: Prediction Interval-Lower, Plu: Prediction Interval-Upper, ASEp: Average Standard Error of Prediction, SE: Standard Error (other -- see report)

| Statistic             | Value | Unit               | PII  | Plu  | ASEp | Equiv. Yrs. |
|-----------------------|-------|--------------------|------|------|------|-------------|
| 50-percent AEP flood  | 115   | ft <sup>3</sup> /s | 69.6 | 190  | 30.1 | 3.2         |
| 20-percent AEP flood  | 196   | ft <sup>3</sup> /s | 117  | 329  | 31.1 | 4.7         |
| 10-percent AEP flood  | 266   | ft <sup>3</sup> /s | 155  | 455  | 32.3 | 6.2         |
| 4-percent AEP flood   | 363   | ft <sup>3</sup> /s | 204  | 644  | 34.3 | 8           |
| 2-percent AEP flood   | 445   | ft <sup>3</sup> /s | 243  | 815  | 36.4 | 9           |
| 1-percent AEP flood   | 546   | ft <sup>3</sup> /s | 287  | 1040 | 38.6 | 9.8         |
| 0.2-percent AEP flood | 799   | ft <sup>3</sup> /s | 386  | 1650 | 44.1 | 11          |

*Peak-Flow Statistics Citations*

**Olson, S.A., 2009, Estimation of flood discharges at selected recurrence intervals for streams in New Hampshire: U.S. Geological Survey Scientific Investigations Report 2008-5206, 57 p. (<http://pubs.usgs.gov/sir/2008/5206/>)**

## ➤ Flow-Duration Statistics

### Flow-Duration Statistics Parameters [Low Flow Statewide]

| Parameter Code | Parameter Name                | Value  | Units        | Min Limit | Max Limit |
|----------------|-------------------------------|--------|--------------|-----------|-----------|
| DRNAREA        | Drainage Area                 | 4.16   | square miles | 3.26      | 689       |
| PREG_06_10     | Jun to Oct Gage Precipitation | 17.2   | inches       | 16.5      | 23.1      |
| TEMP           | Mean Annual Temperature       | 46.223 | degrees F    | 36        | 48.7      |

### Flow-Duration Statistics Flow Report [Low Flow Statewide]

PII: Prediction Interval-Lower, Plu: Prediction Interval-Upper, ASEp: Average Standard Error of Prediction, SE: Standard Error (other -- see report)

| Statistic           | Value  | Unit               | PII    | Plu   | SE   | ASEp |
|---------------------|--------|--------------------|--------|-------|------|------|
| 60 Percent Duration | 1.94   | ft <sup>3</sup> /s | 1.41   | 2.6   | 18   | 18   |
| 70 Percent Duration | 1.21   | ft <sup>3</sup> /s | 0.84   | 1.68  | 20.6 | 20.6 |
| 80 Percent Duration | 0.64   | ft <sup>3</sup> /s | 0.388  | 0.991 | 28   | 28   |
| 90 Percent Duration | 0.289  | ft <sup>3</sup> /s | 0.147  | 0.509 | 37.5 | 37.5 |
| 95 Percent Duration | 0.164  | ft <sup>3</sup> /s | 0.0741 | 0.313 | 44.1 | 44.1 |
| 98 Percent Duration | 0.0948 | ft <sup>3</sup> /s | 0.0356 | 0.203 | 54.3 | 54.3 |

*Flow-Duration Statistics Citations*

**Flynn, R.H. and Tasker, G.D., 2002, Development of Regression Equations to Estimate Flow Durations and Low-Flow-Frequency Statistics in New Hampshire Streams: U.S. Geological Survey Scientific Investigations Report 02-4298, 66 p. (<http://pubs.water.usgs.gov/wrir02-4298>)**

## ➤ Seasonal Flow Statistics

### Seasonal Flow Statistics Parameters [Low Flow Statewide]

| Parameter Code | Parameter Name                   | Value   | Units        | Min Limit | Max Limit |
|----------------|----------------------------------|---------|--------------|-----------|-----------|
| DRNAREA        | Drainage Area                    | 4.16    | square miles | 3.26      | 689       |
| CONIF          | Percent Coniferous Forest        | 6.3785  | percent      | 3.07      | 56.2      |
| PREBC0103      | Jan to Mar Basin Centroid Precip | 9.25    | inches       | 5.79      | 15.1      |
| BSLDEM30M      | Mean Basin Slope from 30m DEM    | 1.47    | percent      | 3.19      | 38.1      |
| MIXFOR         | Percent Mixed Forest             | 2.2681  | percent      | 6.21      | 46.1      |
| PREG_03_05     | Mar to May Gage Precipitation    | 9.6     | inches       | 6.83      | 11.5      |
| TEMP           | Mean Annual Temperature          | 46.223  | degrees F    | 36        | 48.7      |
| TEMP_06_10     | Jun to Oct Mean Basinwide Temp   | 62.036  | degrees F    | 52.9      | 64.4      |
| PREG_06_10     | Jun to Oct Gage Precipitation    | 17.2    | inches       | 16.5      | 23.1      |
| ELEVMAX        | Maximum Basin Elevation          | 101.072 | feet         | 260       | 6290      |

### Seasonal Flow Statistics Disclaimers [Low Flow Statewide]

One or more of the parameters is outside the suggested range. Estimates were extrapolated with unknown errors.

## Seasonal Flow Statistics Flow Report [Low Flow Statewide]

| Statistic                           | Value  | Unit               |
|-------------------------------------|--------|--------------------|
| Jan to Mar15 60 Percent Flow        | 4.67   | ft <sup>3</sup> /s |
| Jan to Mar15 70 Percent Flow        | 3.99   | ft <sup>3</sup> /s |
| Jan to Mar15 80 Percent Flow        | 3.25   | ft <sup>3</sup> /s |
| Jan to Mar15 90 Percent Flow        | 2.3    | ft <sup>3</sup> /s |
| Jan to Mar15 95 Percent Flow        | 1.77   | ft <sup>3</sup> /s |
| Jan to Mar15 98 Percent Flow        | 1.32   | ft <sup>3</sup> /s |
| Jan to Mar15 7 Day 2 Year Low Flow  | 2.95   | ft <sup>3</sup> /s |
| Jan to Mar15 7 Day 10 Year Low Flow | 1.63   | ft <sup>3</sup> /s |
| Mar16 to May 60 Percent Flow        | 4.82   | ft <sup>3</sup> /s |
| Mar16 to May 70 Percent Flow        | 4.02   | ft <sup>3</sup> /s |
| Mar16 to May 80 Percent Flow        | 4.18   | ft <sup>3</sup> /s |
| Mar16 to May 90 Percent Flow        | 3.76   | ft <sup>3</sup> /s |
| Mar16 to May 95 Percent Flow        | 3.4    | ft <sup>3</sup> /s |
| Mar16 to May 98 Percent Flow        | 2.92   | ft <sup>3</sup> /s |
| Mar16 to May 7 Day 2 Year Low Flow  | 3.39   | ft <sup>3</sup> /s |
| Mar16 to May 7 Day 10 Year Low Flow | 1.87   | ft <sup>3</sup> /s |
| Jun to Oct 60 Percent Flow          | 0.536  | ft <sup>3</sup> /s |
| Jun to Oct 70 Percent Flow          | 0.381  | ft <sup>3</sup> /s |
| Jun to Oct 80 Percent Flow          | 0.225  | ft <sup>3</sup> /s |
| Jun to Oct 90 Percent Flow          | 0.134  | ft <sup>3</sup> /s |
| Jun to Oct 95 Percent Flow          | 0.0875 | ft <sup>3</sup> /s |
| Jun to Oct 98 Percent Flow          | 0.0703 | ft <sup>3</sup> /s |
| Jun to Oct 7 Day 2 Year Low Flow    | 0.157  | ft <sup>3</sup> /s |
| Jun to Oct 7 Day 10 Year Low Flow   | 0.0492 | ft <sup>3</sup> /s |
| Nov to Dec 60 Percent Flow          | 2.14   | ft <sup>3</sup> /s |
| Nov to Dec 70 Percent Flow          | 1.37   | ft <sup>3</sup> /s |
| Nov to Dec 80 Percent Flow          | 0.814  | ft <sup>3</sup> /s |
| Nov to Dec 90 Percent Flow          | 0.42   | ft <sup>3</sup> /s |
| Nov to Dec 95 Percent Flow          | 0.227  | ft <sup>3</sup> /s |
| Nov to Dec 98 Percent Flow          | 0.107  | ft <sup>3</sup> /s |
| Oct to Nov 7 Day 2 Year Low Flow    | 0.848  | ft <sup>3</sup> /s |
| Oct to Nov 7 Day 10 Year Low Flow   | 0.182  | ft <sup>3</sup> /s |

## Seasonal Flow Statistics Citations

Flynn, R.H. and Tasker, G.D.,2002, Development of Regression Equations to Estimate Flow Durations and Low-Flow-Frequency Statistics in New Hampshire Streams: U.S.Geological Survey Scientific Investigations Report 02-4298, 66 p. (<http://pubs.water.usgs.gov/wrir02-4298>)

### ➤ Low-Flow Statistics

## Low-Flow Statistics Parameters [Low Flow Statewide]

| Parameter Code | Parameter Name                | Value  | Units        | Min Limit | Max Limit |
|----------------|-------------------------------|--------|--------------|-----------|-----------|
| DRNAREA        | Drainage Area                 | 4.16   | square miles | 3.26      | 689       |
| TEMP           | Mean Annual Temperature       | 46.223 | degrees F    | 36        | 48.7      |
| PREG_06_10     | Jun to Oct Gage Precipitation | 17.2   | inches       | 16.5      | 23.1      |

## Low-Flow Statistics Flow Report [Low Flow Statewide]

PII: Prediction Interval-Lower, PIu: Prediction Interval-Upper, ASEp: Average Standard Error of Prediction, SE: Standard Error (other -- see report)

| Statistic              | Value  | Unit               | PII    | PIu   | SE   | ASEp |
|------------------------|--------|--------------------|--------|-------|------|------|
| 7 Day 2 Year Low Flow  | 0.154  | ft <sup>3</sup> /s | 0.0553 | 0.327 | 55.7 | 55.7 |
| 7 Day 10 Year Low Flow | 0.0477 | ft <sup>3</sup> /s | 0.0111 | 0.125 | 79.4 | 79.4 |

*Low-Flow Statistics Citations*

**Flynn, R.H. and Tasker, G.D., 2002, Development of Regression Equations to Estimate Flow Durations and Low-Flow-Frequency Statistics in New Hampshire Streams: U.S. Geological Survey Scientific Investigations Report 02-4298, 66 p. (<http://pubs.water.usgs.gov/wrir02-4298>)**

USGS Data Disclaimer: Unless otherwise stated, all data, metadata and related materials are considered to satisfy the quality standards relative to the purpose for which the data were collected. Although these data and associated metadata have been reviewed for accuracy and completeness and approved for release by the U.S. Geological Survey (USGS), no warranty expressed or implied is made regarding the display or utility of the data for other purposes, nor on all computer systems, nor shall the act of distribution constitute any such warranty.

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USGS Product Names Disclaimer: Any use of trade, firm, or product names is for descriptive purposes only and does not imply endorsement by the U.S. Government.

Application Version: 4.10.1

StreamStats Services Version: 1.2.22

NSS Services Version: 2.2.1

**MAPLEWOOD AVE BRIDGE IN PORTSMOUTH, NH TIDAL STUDY (DOUCET SURVEY, LLC (DS~6032)) JUNE 16, 2022**

| KNOWN DATA AT SEAVEY ISLAND, ME STATION 8419870 (CONTROL STATION: 8418150 PORTLAND, ME) EPOCH 1983-2001 (STATUS ACCEPTED DEC. 6, 2021) |        |   |
|--|--------|---|
| 5.87'  | HAT    | HIGHEST ASTRONOMICAL TIDE - REFERENCE LINE - HOTL |
| 4.18'  | MHHW   | MEAN HIGHER-HIGH WATER                            |
| 3.76'  | MHW    | MEAN HIGH WATER                                   |
| -0.32'   | MTL    | MEAN TIDE LEVEL                                   |
| -0.25'   | MSL    | MEAN SEA LEVEL                                    |
| -0.26'   | DTL    | MEAN DIURNAL TIDE LEVEL                           |
| -4.39'   | MLW    | MEAN LOW WATER                                    |
| -4.71'   | MLLW   | MEAN-LOWER-LOW WATER                              |
| 0.00'  | NAVD88 | NORTH AMERICAN VERTICAL DATUM OF 1988             |
| -6.98'   | STND   | STATION DATUM                                     |
| 8.89'  | GT     | GREAT DIURNAL RANGE                               |
| 8.16'  | MN     | MEAN RANGE OF TIDE                                |
| 0.42'  | DHQ    | MEAN DIURNAL HIGH WATER INEQUALITY                |
| 0.31'  | DLQ    | MEAN DIURNAL LOW WATER INEQUALITY                 |

| PRELIMINARY DATA AT CONTROL STATION, SEAVEY ISLAND, ME STATION 8419870 (DATUM NAVD88) |   |
|---|---|
| DATE: 2022-05-27  |   |
| 3.65'   | HIGH WATER AT 10:12 (GMT TIMEZONE: 14:12) |
| DATE: 2022-06-02  |   |
| 3.26'   | HIGH WATER AT 14:18 (GMT TIMEZONE: 18:18) |
| DATE: 2022-06-07  |   |
| -3.56'  | LOW WATER AT 11:48 (GMT TIMEZONE: 15:48)  |

| SITE DATA AT SUBORDINATE STATION BY NORTHEASTERLY (OCEAN-SIDE) OF MAPLEWOOD BRIDGE, PORTSMOUTH, NH |   |
|--|---|
| DATE: 2022-05-27   |   |
| 3.51'  | HIGH WATER AT 10:48 (GMT TIMEZONE: 14:48) |
| DATE: 2022-06-02   |   |
| 3.14'  | HIGH WATER AT 14:40 (GMT TIMEZONE: 18:40) |
| DATE: 2022-06-07   |   |
| -3.36'   | LOW WATER AT 11:52 (GMT TIMEZONE: 15:52)  |

| FINAL TIDAL STUDY INFORMATION |                      |               |
|-------------------------------|----------------------|---------------|
|                               | MAPLEWOOD AVE BRIDGE | SEAVEY ISLAND |
|                               | ELEV.                | ELEV.         |
| HAT                           | 5.6'                 | 5.87'         |
| MHHW                          | 4.0'                 | 4.18'         |
| MHW                           | 3.6'                 | 3.76'         |
| MTL                           | -0.3'                | -0.32'        |
| MLW                           | -4.2'                | -4.39'        |
| MLLW                          | -4.5'                | -4.71'        |
| NAVD88                        | 0.0'                 | 0.00'         |

**APPENDIX 2**  
**BRIDGE REHABILITATION PROJECT**  
**HYDROLOGY STUDY REPORT**



February 1, 2021

Jillian A. Semprini, P.E.  
Hoyle, Tanner & Associates, Inc.  
Pease International Tradeport  
100 International Drive, Suite 360  
Portsmouth, NH 03801  
(603) 431-2520, ext 28  
[jsemprini@hoyletanner.com](mailto:jsemprini@hoyletanner.com)

Subject: **Maplewood Avenue over North Mill Pond Hydrologic Analysis  
Portsmouth, NH**

Jillian:

This letter describes the hydrologic analysis we have completed for the Maplewood Avenue over North Mill Pond bridge replacement project in Portsmouth. Methods and results of the hydrology study are described below and supporting plans and calculations are attached.

#### **A. Overview**

Our approach to the hydrologic analysis was based on the requirements and recommendations included in the following documents:

- *Bridge Design Manual, Chapter 2, Bridge Selection*. January 2015 – v 2.0 (Revised August 2018). NH Department of Transportation (NHDOT); and
- *Sea-level Rise, Storm Surges, and Extreme Precipitation in Coastal New Hampshire: Analysis of Past and Projected Future Trends*. 2014. New Hampshire Coastal Risk and Hazards Commission Science and Technical Advisory Panel (NHCRHC STAP). <http://www.nhcrhc.org/wp-content/uploads/2014-STAP-final-report.pdf>.

Maplewood Avenue is classified as a Tier 5 highway (i.e. local road). Per the NHDOT Bridge Design Manual, the design flood for calculating freeboard to the superstructure of bridges on local roads is the 50-year event and the design flood for substructure scour analysis is the 100-year event.

The SCS unit hydrograph method was used with the HydroCAD computer program to estimate runoff hydrographs resulting from the 50-, and 100-year, 24-hour rainfalls. This method, which is an approved hydrologic analysis method listed in the Bridge Design Manual, uses the SCS unit hydrograph (representing the runoff resulting from 1 inch of excess precipitation), synthetic rainfall distribution curve (specifying the distribution of rainfall throughout the storm duration), and the following variables:

- Watershed Area;
- Rainfall depth;
- Runoff Curve Number (measure of the land's capacity to retain precipitation, based on soil and land cover characteristics); and
- Time of Concentration (time required for runoff to travel from the most hydraulically distant point of a watershed to its outlet).

## **B. Watershed Delineation**

The main tributary to North Mill Pond is Hodgson Brook, which enters the southwest end of the pond at the outlet of a stone masonry box culvert beneath Bartlett Street. North Mill Pond also receives runoff from areas immediately north and south of the pond which drain directly to it, rather than to Hodgson Brook.

The following data was used to delineate the area draining to North Mill Pond at Maplewood Avenue:

- Digital elevation model (DEM) generated from 2011 LiDAR data downloaded from NHGRANIT (note that the 2011 LiDAR data is the most recent dataset which covers the entire watershed – more recent data only covers a portion of the watershed);
- Stormwater infrastructure GIS data (storm drains and drainage structures) provided by James McCarty, GIS Manager for the City of Portsmouth;
- 1-foot resolution color orthophotography captured in 2017 and 6-inch resolution color orthophotography captured in 2010; and
- Google Maps Street View.

The watershed includes a significant amount of commercial, industrial, and residential development which has altered the natural drainage patterns. Due to these alterations, the stormwater infrastructure GIS data provided by the City was invaluable in determining the current drainage pathways and watershed boundary. However, this data does not include all of the closed drainage pipes and structures nor does it contain other drainage information such as roof drain connections and parking garage stormwater infrastructure. Where the stormwater infrastructure GIS data was incomplete, the LiDAR DEM, orthophotography, and Google Maps Street View were used to estimate flow pathways and delineate the watershed boundary.

The area draining to North Mill Pond at Maplewood Avenue was determined to be 2,628 acres (4.11 square miles). The watershed boundary is shown on the attached Watershed Relief Map and Drainage Plan.



### C. Rainfall

In accordance with the recommendations in NHDRHC STAP (2014), rainfall depths and distributions at the watershed centroid were obtained from the Northeast Regional Climate Center (NRCC) using their “Extreme Precipitation” web tool (<http://precip.eas.cornell.edu>). Table 1 summarizes the rainfall depths for the analyzed storms and Figure 1 shows the rainfall distribution curves for these events.

Table 1 – NRCC Rainfall Data

| Storm Frequency | 24-hour Rainfall Depth |
|-----------------|------------------------|
| 50-year         | 7.39”                  |
| 100-year        | 8.86”                  |

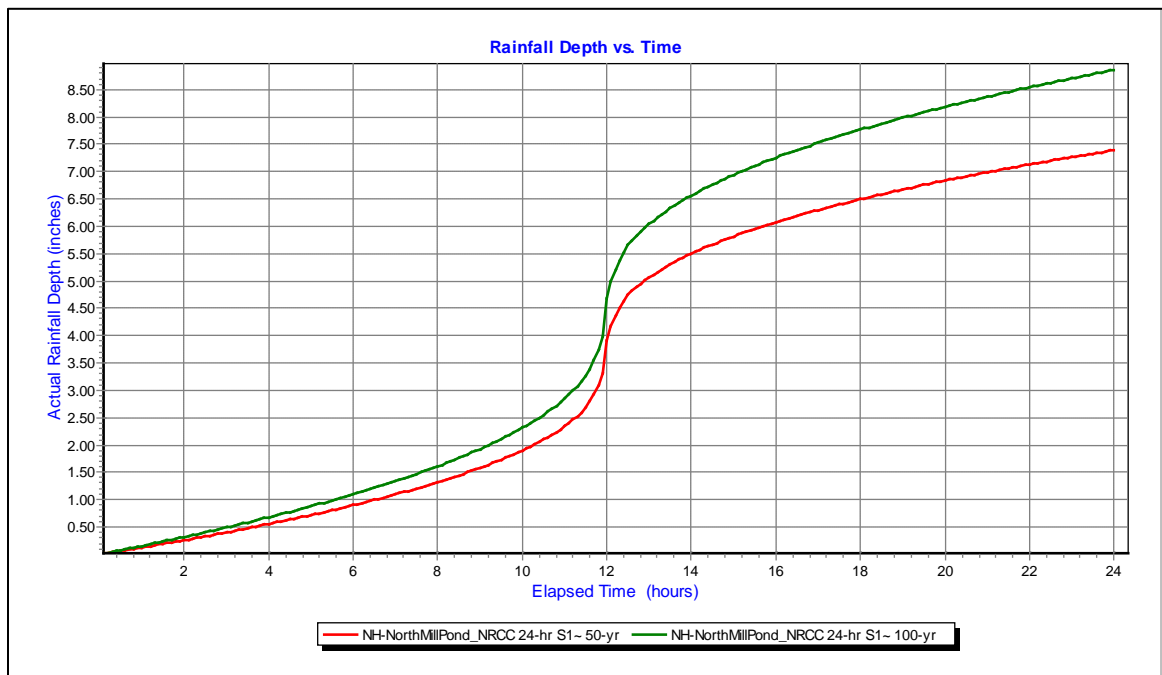


Figure 1 – Rainfall Distribution Curves for 50- and 100-year Storms

### D. Runoff Curve Number

The composite runoff curve number (CN) for the watershed was estimated using the following data sources:

- “Impervious Surfaces in the Coastal Watershed of NH and Maine, High Resolution – 2015” GIS layer downloaded from NHGRANIT;
- “Land Use 2015 - Southeastern New Hampshire” GIS layer downloaded from NHGRANIT;
- 1-foot resolution color orthophotography captured in 2017; and

- digital NRCS soil mapping.

The Land Use polygons were clipped to remove those portions covered by the Impervious layer. The remaining portions of the Land Use polygons were then assigned one of the land cover types and conditions listed in Table 2-2 of the SCS Technical Release 55 (TR-55) publication by inspecting the ground cover of these polygons shown on 2017 orthophotography. For example, the orthophotography shows that the Land Use “Electric, gas, and other utilities” polygons, which generally cover utility right-of-ways, support predominantly brush and tall herbaceous vegetation over more than 75 percent of the ground surface, which most closely matches the “Brush, Good” cover type and condition in the TR-55 manual. The attached “North Mill Pond Watershed Land Cover” table summarizes the correlations between the Land Use layers and TR-55 cover types.

Once the land cover mapping was completed for the entire watershed, it was combined with NRCS soil mapping to create soil-land cover polygons for each combination of hydrologic soil group (HSG) and land cover (e.g. Brush, Good, HSG B). Each soil-land cover combination was then assigned a CN from Table 2-2 of the TR-55 manual. The attached “North Mill Pond Watershed Soil – Land Cover Map” shows the soil-land cover polygons and the attached “North Mill Pond Watershed Soil - Land Cover Polygons” table summarizes the areas and CNs for each soil-land cover combination.

This cumulative area of each soil-land cover combination was determined and used to calculate the area-weighted composite CN for the entire watershed. This value was determined to be 73, which suggests a relatively high runoff potential due to the extent of development in the watershed, approximately 36% of which was determined to be covered by impervious surfaces.

#### **E. Time of Concentration**

The time of concentration ( $T_c$ ) – the time for runoff to travel from the hydraulically most distant point of the watershed to the bridge – was estimated using the velocity method. The flow path from the uppermost point of the watershed to the bridge was identified using the DEM and storm drain GIS data and has a total length of 23,320 feet (see attached Drainage Plan). Twenty-six discreet flow segments were delineated – one sheet flow segment and one shallow concentrated flow segment at the upper end of the watershed followed by alternating pipe and channel flow segments as the drainage path crosses multiple roadways on its way to North Mill Pond.

A terrain profile was cut along the flow path and used to identify the start and end of each channel and pipe segment, the invert elevations at these break points, and the length and slope of each segment. The storm drain GIS data included culvert diameter and material attribute information for a few of the pipe runs; however, most of these features did not include this data. For these pipe segments the pipe diameter and material were estimated. A typical cross-section was cut across each channel flow segment and the ground profile from the DEM was used to determine channel geometry for use in calculating travel time. Geometry was measured at an estimated maximum bankfull depth of one foot. The 2017 orthophotography was used to identify land cover along the channel flow segments from which Manning’s roughness coefficients were estimated. Most channel segments have brush or forest cover and were

assigned a roughness coefficient of 0.10. The numerous roadway embankments along the flow path likely have restricted outlets which provide floodwater storage and act to increase Tc and lag time between the start of the runoff event and its peak. Although the analysis did not directly account for the storage effects of these manmade basins, the assignment of relatively high roughness coefficients to the channel flow segments does, to some extent, account for these effects.

The total Tc for the watershed was calculated at 564 minutes (9.4 hours). The attached "North Mill Pond Watershed Time of Concentration" table summarizes the data for each flow segment.

#### F. Rainfall Runoff Simulation

The hydrologic model yielded the following peak discharges at the Maplewood Avenue Bridge.

Table 2 – Peak Discharge Estimates at Maplewood Avenue

| Storm Frequency | Peak Discharge (cfs) |
|-----------------|----------------------|
| 50-year         | 908                  |
| 100-year        | 1,179                |

Output from the HydroCAD model is attached.

I can be reached at (603) 616-6850 or via email at [sean@headwatershydrology.com](mailto:sean@headwatershydrology.com) if you have any questions.

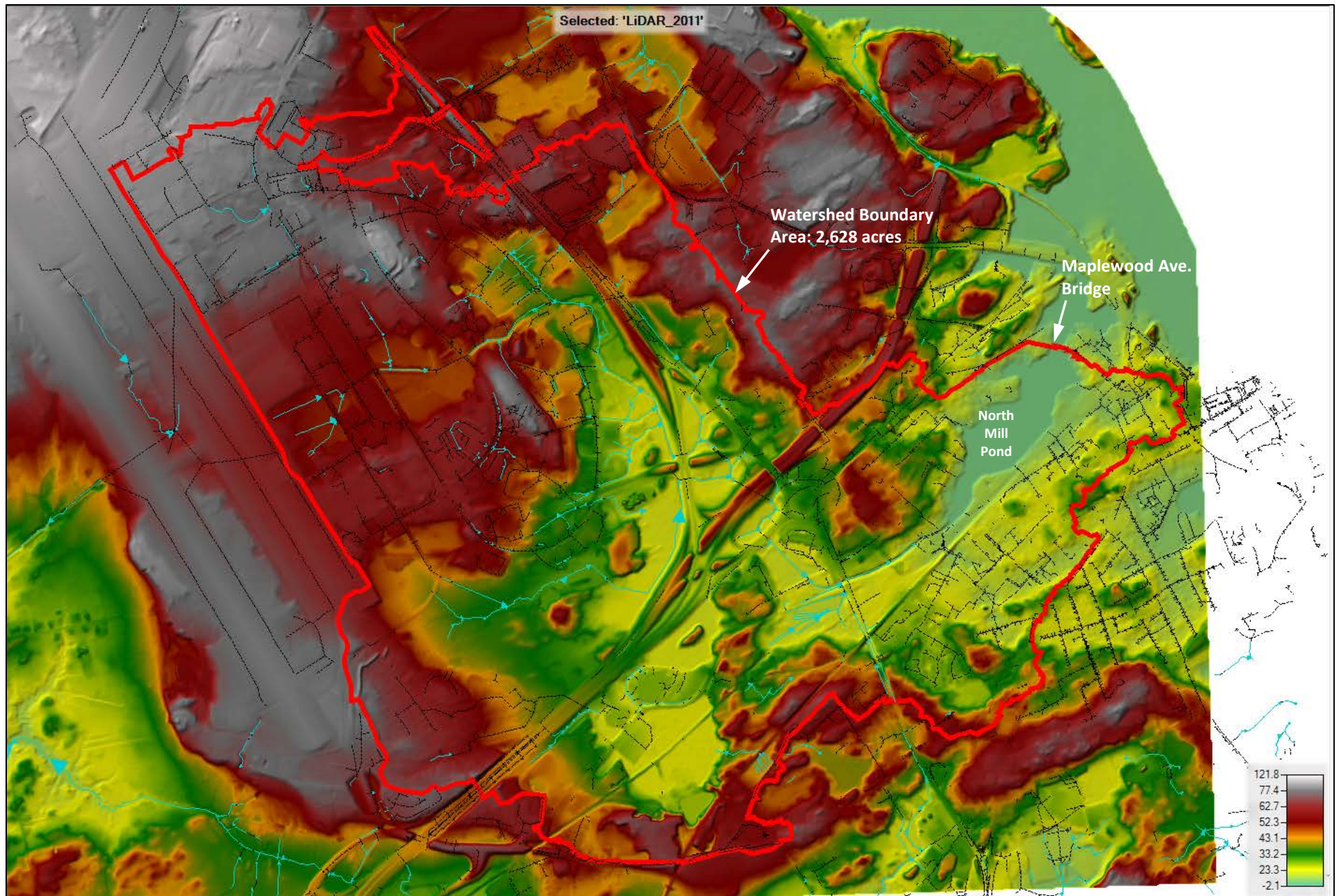
Respectfully submitted,



Sean P. Sweeney, P.E., CWS  
Manager  
Headwaters Consulting, LLC

Attachments:      Watershed Relief Map  
                         Drainage Plan  
                         NRCC Precipitation Estimates  
                         Land Cover Table  
                         Soil – Land Cover Map  
                         Soil – Land Cover Polygons Table  
                         Time of Concentration Table  
                         HydroCAD Report

# Maplewood Avenue over North Mill Pond Watershed Relief Map





**HEADWATERS**  
Consulting, LLC  
P.O. Box 744 Littleton, NH 03561 (603) 616-6850

**HOYLE, TANNER & ASSOCIATES, INC.**  
MAPLEWOOD AVE. OVER NORTH MILL POND BRIDGE REPLACEMENT  
PORTSMOUTH, NH  
**DRAINAGE PLAN**

| NO. | REVISION | DATE |
|-----|----------|------|
|     |          |      |
|     |          |      |
|     |          |      |

|                |           |
|----------------|-----------|
| DATE:          | FEB. 2021 |
| PROJECT #:     | 1920      |
| ENGINEERED BY: | ---       |
| DRAWN BY:      | SPS       |

DATE OF PRINT: 02/01/21

C:\Users\sp5\OneDrive\Documents\1920 - HT - Maplewood Ave. Drainage\Map\1920Headwaters.dwg, 2/1/2021 1:38:14 PM

# Extreme Precipitation Tables

## Northeast Regional Climate Center

Data represents point estimates calculated from partial duration series. All precipitation amounts are displayed in inches.

|                  |                                 |
|------------------|---------------------------------|
| <b>Smoothing</b> | No                              |
| <b>State</b>     | New Hampshire                   |
| <b>Location</b>  |                                 |
| <b>Longitude</b> | 70.792 degrees West             |
| <b>Latitude</b>  | 43.074 degrees North            |
| <b>Elevation</b> | 0 feet                          |
| <b>Date/Time</b> | Mon, 01 Feb 2021 08:12:03 -0500 |

### Extreme Precipitation Estimates

|              | 5min | 10min | 15min | 30min | 60min | 120min |              | 1hr  | 2hr  | 3hr  | 6hr  | 12hr | 24hr  | 48hr  |              | 1day  | 2day  | 4day  | 7day  | 10day |              |
|--------------|------|-------|-------|-------|-------|--------|--------------|------|------|------|------|------|-------|-------|--------------|-------|-------|-------|-------|-------|--------------|
| <b>1yr</b>   | 0.26 | 0.40  | 0.49  | 0.66  | 0.82  | 1.00   | <b>1yr</b>   | 0.70 | 0.98 | 1.14 | 1.58 | 2.02 | 2.66  | 2.92  | <b>1yr</b>   | 2.35  | 2.81  | 3.22  | 3.94  | 4.55  | <b>1yr</b>   |
| <b>2yr</b>   | 0.32 | 0.50  | 0.61  | 0.83  | 1.02  | 1.21   | <b>2yr</b>   | 0.88 | 1.18 | 1.40 | 1.86 | 2.41 | 3.21  | 3.57  | <b>2yr</b>   | 2.84  | 3.43  | 3.93  | 4.68  | 5.32  | <b>2yr</b>   |
| <b>5yr</b>   | 0.37 | 0.57  | 0.71  | 0.98  | 1.24  | 1.50   | <b>5yr</b>   | 1.07 | 1.46 | 1.73 | 2.32 | 2.96 | 4.07  | 4.57  | <b>5yr</b>   | 3.60  | 4.40  | 5.04  | 5.93  | 6.70  | <b>5yr</b>   |
| <b>10yr</b>  | 0.42 | 0.65  | 0.80  | 1.12  | 1.44  | 1.76   | <b>10yr</b>  | 1.25 | 1.72 | 2.04 | 2.73 | 3.47 | 4.87  | 5.53  | <b>10yr</b>  | 4.31  | 5.32  | 6.08  | 7.10  | 7.98  | <b>10yr</b>  |
| <b>25yr</b>  | 0.50 | 0.75  | 0.94  | 1.34  | 1.76  | 2.18   | <b>25yr</b>  | 1.52 | 2.13 | 2.53 | 3.39 | 4.27 | 6.17  | 7.10  | <b>25yr</b>  | 5.46  | 6.83  | 7.79  | 9.02  | 10.06 | <b>25yr</b>  |
| <b>50yr</b>  | 0.56 | 0.85  | 1.06  | 1.53  | 2.06  | 2.57   | <b>50yr</b>  | 1.78 | 2.51 | 2.98 | 3.99 | 5.01 | 7.39  | 8.58  | <b>50yr</b>  | 6.54  | 8.25  | 9.41  | 10.81 | 11.99 | <b>50yr</b>  |
| <b>100yr</b> | 0.64 | 0.97  | 1.21  | 1.75  | 2.40  | 3.03   | <b>100yr</b> | 2.07 | 2.96 | 3.51 | 4.71 | 5.88 | 8.86  | 10.38 | <b>100yr</b> | 7.84  | 9.98  | 11.36 | 12.96 | 14.29 | <b>100yr</b> |
| <b>200yr</b> | 0.73 | 1.09  | 1.38  | 2.01  | 2.80  | 3.57   | <b>200yr</b> | 2.41 | 3.49 | 4.13 | 5.56 | 6.89 | 10.62 | 12.55 | <b>200yr</b> | 9.40  | 12.07 | 13.72 | 15.54 | 17.05 | <b>200yr</b> |
| <b>500yr</b> | 0.87 | 1.29  | 1.66  | 2.42  | 3.44  | 4.45   | <b>500yr</b> | 2.97 | 4.35 | 5.14 | 6.92 | 8.52 | 13.50 | 16.15 | <b>500yr</b> | 11.95 | 15.53 | 17.62 | 19.78 | 21.54 | <b>500yr</b> |

### Lower Confidence Limits

|              | 5min | 10min | 15min | 30min | 60min | 120min |              | 1hr  | 2hr  | 3hr  | 6hr  | 12hr | 24hr | 48hr  |              | 1day | 2day  | 4day  | 7day  | 10day |              |
|--------------|------|-------|-------|-------|-------|--------|--------------|------|------|------|------|------|------|-------|--------------|------|-------|-------|-------|-------|--------------|
| <b>1yr</b>   | 0.23 | 0.36  | 0.44  | 0.59  | 0.73  | 0.89   | <b>1yr</b>   | 0.63 | 0.87 | 0.92 | 1.32 | 1.66 | 2.22 | 2.52  | <b>1yr</b>   | 1.97 | 2.42  | 2.85  | 3.15  | 3.88  | <b>1yr</b>   |
| <b>2yr</b>   | 0.31 | 0.49  | 0.60  | 0.81  | 1.00  | 1.19   | <b>2yr</b>   | 0.86 | 1.16 | 1.37 | 1.82 | 2.34 | 3.05 | 3.46  | <b>2yr</b>   | 2.70 | 3.32  | 3.82  | 4.55  | 5.07  | <b>2yr</b>   |
| <b>5yr</b>   | 0.35 | 0.54  | 0.67  | 0.92  | 1.17  | 1.40   | <b>5yr</b>   | 1.01 | 1.37 | 1.61 | 2.12 | 2.74 | 3.79 | 4.20  | <b>5yr</b>   | 3.36 | 4.04  | 4.72  | 5.54  | 6.25  | <b>5yr</b>   |
| <b>10yr</b>  | 0.39 | 0.59  | 0.73  | 1.03  | 1.32  | 1.60   | <b>10yr</b>  | 1.14 | 1.56 | 1.81 | 2.40 | 3.07 | 4.38 | 4.89  | <b>10yr</b>  | 3.88 | 4.70  | 5.46  | 6.43  | 7.22  | <b>10yr</b>  |
| <b>25yr</b>  | 0.44 | 0.67  | 0.83  | 1.19  | 1.56  | 1.90   | <b>25yr</b>  | 1.35 | 1.86 | 2.10 | 2.77 | 3.55 | 4.69 | 5.93  | <b>25yr</b>  | 4.15 | 5.71  | 6.68  | 7.83  | 8.72  | <b>25yr</b>  |
| <b>50yr</b>  | 0.48 | 0.73  | 0.91  | 1.31  | 1.77  | 2.17   | <b>50yr</b>  | 1.53 | 2.12 | 2.35 | 3.09 | 3.96 | 5.30 | 6.86  | <b>50yr</b>  | 4.69 | 6.60  | 7.78  | 9.10  | 10.07 | <b>50yr</b>  |
| <b>100yr</b> | 0.54 | 0.81  | 1.02  | 1.47  | 2.01  | 2.47   | <b>100yr</b> | 1.74 | 2.42 | 2.63 | 3.44 | 4.39 | 5.95 | 7.94  | <b>100yr</b> | 5.26 | 7.63  | 9.07  | 10.58 | 11.62 | <b>100yr</b> |
| <b>200yr</b> | 0.59 | 0.89  | 1.13  | 1.64  | 2.29  | 2.82   | <b>200yr</b> | 1.97 | 2.76 | 2.94 | 3.82 | 4.85 | 6.65 | 9.18  | <b>200yr</b> | 5.89 | 8.83  | 10.56 | 12.32 | 13.44 | <b>200yr</b> |
| <b>500yr</b> | 0.69 | 1.03  | 1.32  | 1.92  | 2.73  | 3.37   | <b>500yr</b> | 2.35 | 3.30 | 3.41 | 4.37 | 5.54 | 7.73 | 11.12 | <b>500yr</b> | 6.84 | 10.69 | 12.92 | 15.09 | 16.27 | <b>500yr</b> |

### Upper Confidence Limits

|              | 5min | 10min | 15min | 30min | 60min | 120min |              | 1hr  | 2hr  | 3hr  | 6hr  | 12hr  | 24hr  | 48hr  |              | 1day  | 2day  | 4day  | 7day  | 10day |              |
|--------------|------|-------|-------|-------|-------|--------|--------------|------|------|------|------|-------|-------|-------|--------------|-------|-------|-------|-------|-------|--------------|
| <b>1yr</b>   | 0.28 | 0.44  | 0.54  | 0.72  | 0.89  | 1.08   | <b>1yr</b>   | 0.77 | 1.06 | 1.26 | 1.75 | 2.21  | 3.00  | 3.14  | <b>1yr</b>   | 2.65  | 3.02  | 3.58  | 4.38  | 5.05  | <b>1yr</b>   |
| <b>2yr</b>   | 0.33 | 0.52  | 0.64  | 0.86  | 1.06  | 1.26   | <b>2yr</b>   | 0.92 | 1.24 | 1.48 | 1.96 | 2.51  | 3.43  | 3.69  | <b>2yr</b>   | 3.04  | 3.55  | 4.07  | 4.83  | 5.64  | <b>2yr</b>   |
| <b>5yr</b>   | 0.40 | 0.61  | 0.76  | 1.05  | 1.33  | 1.61   | <b>5yr</b>   | 1.15 | 1.58 | 1.88 | 2.53 | 3.24  | 4.34  | 4.94  | <b>5yr</b>   | 3.84  | 4.75  | 5.37  | 6.35  | 7.13  | <b>5yr</b>   |
| <b>10yr</b>  | 0.47 | 0.72  | 0.89  | 1.24  | 1.60  | 1.97   | <b>10yr</b>  | 1.38 | 1.92 | 2.27 | 3.10 | 3.93  | 5.34  | 6.17  | <b>10yr</b>  | 4.72  | 5.93  | 6.77  | 7.81  | 8.72  | <b>10yr</b>  |
| <b>25yr</b>  | 0.57 | 0.87  | 1.08  | 1.54  | 2.03  | 2.55   | <b>25yr</b>  | 1.75 | 2.50 | 2.94 | 4.05 | 5.11  | 7.81  | 8.28  | <b>25yr</b>  | 6.92  | 7.96  | 9.05  | 10.28 | 11.36 | <b>25yr</b>  |
| <b>50yr</b>  | 0.66 | 1.01  | 1.26  | 1.81  | 2.44  | 3.10   | <b>50yr</b>  | 2.10 | 3.03 | 3.58 | 4.97 | 6.25  | 9.79  | 10.37 | <b>50yr</b>  | 8.66  | 9.97  | 11.29 | 12.65 | 13.90 | <b>50yr</b>  |
| <b>100yr</b> | 0.78 | 1.18  | 1.48  | 2.13  | 2.93  | 3.77   | <b>100yr</b> | 2.53 | 3.69 | 4.34 | 6.11 | 7.67  | 12.25 | 12.97 | <b>100yr</b> | 10.85 | 12.48 | 14.08 | 15.59 | 17.01 | <b>100yr</b> |
| <b>200yr</b> | 0.91 | 1.37  | 1.74  | 2.52  | 3.51  | 4.60   | <b>200yr</b> | 3.03 | 4.50 | 5.30 | 7.52 | 9.40  | 15.38 | 16.26 | <b>200yr</b> | 13.61 | 15.63 | 17.58 | 19.21 | 20.82 | <b>200yr</b> |
| <b>500yr</b> | 1.13 | 1.68  | 2.16  | 3.14  | 4.46  | 5.96   | <b>500yr</b> | 3.85 | 5.83 | 6.87 | 9.93 | 12.33 | 20.80 | 21.91 | <b>500yr</b> | 18.41 | 21.07 | 23.59 | 25.31 | 27.22 | <b>500yr</b> |

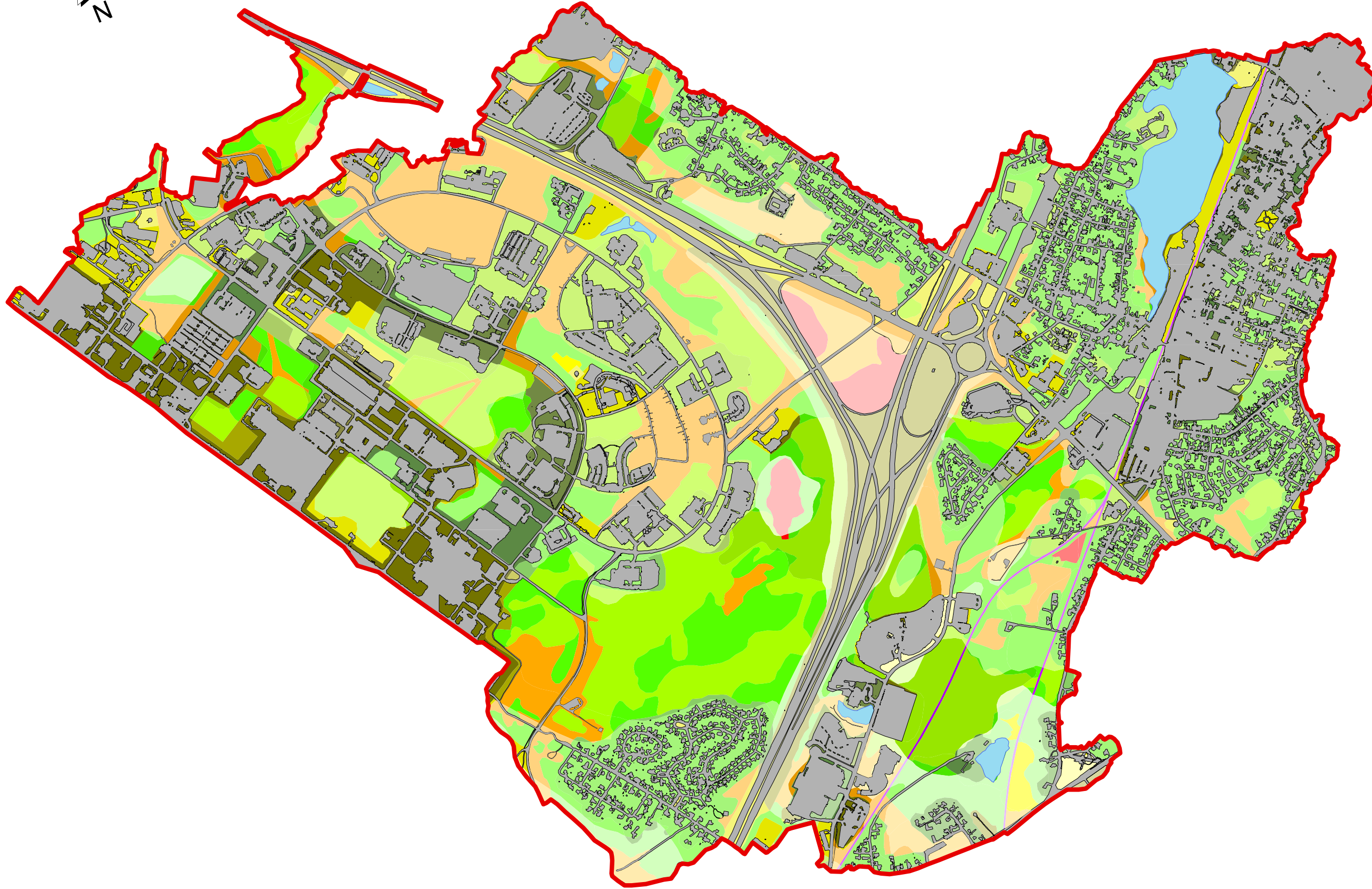
## North Mill Pond Watershed Land Cover

categories from NHGRANIT "Land Use 2015 - Southeastern New Hampshire" layer

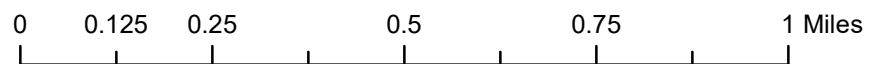
Note: Impervious areas have been removed from Land Use Category polygons such that the Cover Type applies to the land cover of the remaining polygons outside of impervious areas as estimated from 2017 orthophotography.

| <u>NHGRANIT Land Use Category</u>                   | <u>Cover Type</u> | <u>Condition</u> |
|---|-------------------|------------------|
| Brush or transitional between open & forested       | Brush             | Good             |
| Electric, gas, and other utilities                  | Brush             | Good             |
| Limited & controlled highway right-of-way           | Impervious        | n/a              |
| Park & ride lot                                     | Impervious        | n/a              |
| Road right-of-way                                   | Impervious        | n/a              |
| Agricultural land                                   | Meadow            | Good             |
| Water   | Open Water        | n/a              |
| Rail transportation                                 | Railroad Tracks   | n/a              |
| Forest land   | Woods             | Good             |
| Other transportation, communications, and utilities | Woods             | Good             |
| Auxilliary transportation                           | Woods/Grass 10/90 | Good             |
| Cemetaries  | Woods/Grass 10/90 | Good             |
| Communication                                       | Woods/Grass 10/90 | Good             |
| Disturbed land                                      | Woods/Grass 10/90 | Fair             |
| Other commercial, services, and institutional       | Woods/Grass 10/90 | Good             |
| Water and wastewater utilities                      | Woods/Grass 10/90 | Good             |
| Air transportation                                  | Woods/Grass 25/75 | Good             |
| Commercial wholesale                                | Woods/Grass 25/75 | Good             |
| Government  | Woods/Grass 25/75 | Good             |
| Institutional                                       | Woods/Grass 25/75 | Good             |
| Lodging   | Woods/Grass 25/75 | Good             |
| Multi-family (4 or more stories)                    | Woods/Grass 25/75 | Good             |
| Other commercial complexes                          | Woods/Grass 25/75 | Good             |
| Outdoor recreation                                  | Woods/Grass 25/75 | Good             |
| Parking structure/lot                               | Woods/Grass 25/75 | Good             |
| Commercial retail                                   | Woods/Grass 40/60 | Good             |
| Educational   | Woods/Grass 40/60 | Good             |
| Multi-family (1-3 stories)                          | Woods/Grass 40/60 | Good             |
| Office park   | Woods/Grass 40/60 | Good             |
| Other agricultural land                             | Woods/Grass 40/60 | Good             |
| Other industrial complexes                          | Woods/Grass 40/60 | Good             |
| Services  | Woods/Grass 40/60 | Good             |
| Indoor cultural/ public assembly                    | Woods/Grass 50/50 | Good             |
| Industrial  | Woods/Grass 50/50 | Good             |
| Other residential                                   | Woods/Grass 50/50 | Good             |
| Single family/duplex                                | Woods/Grass 50/50 | Good             |
| Vacant land   | Woods/Grass 50/50 | Good             |
| Wetlands  | Woods/Grass 75/25 | Good             |

# North Mill Pond Watershed Soil - Land Cover Map



- Legend**
- WatershedBoundary
  - Brush\_Good\_A
  - Brush\_Good\_B
  - Brush\_Good\_C
  - Brush\_Good\_D
  - Impervious
  - Meadow\_Good\_A
  - Meadow\_Good\_B
  - Meadow\_Good\_D
  - OpenWater
  - RxR\_Good\_A
  - RxR\_Good\_B
  - RxR\_Good\_C
  - RxR\_Good\_D
  - Woods\_Good\_A
  - Woods\_Good\_B
  - Woods\_Good\_C
  - Woods\_Good\_D
  - Woods-Grass\_75-25\_Good\_A
  - Woods-Grass\_75-25\_Good\_B
  - Woods-Grass\_75-25\_Good\_C
  - Woods-Grass\_75-25\_Good\_D
  - Woods-Grass\_50-50\_Good\_A
  - Woods-Grass\_50-50\_Good\_B
  - Woods-Grass\_50-50\_Good\_C
  - Woods-Grass\_50-50\_Good\_D
  - Woods-Grass\_40-60\_Good\_A
  - Woods-Grass\_40-60\_Good\_B
  - Woods-Grass\_40-60\_Good\_C
  - Woods-Grass\_40-60\_Good\_D
  - Woods-Grass\_25-75\_Good\_A
  - Woods-Grass\_25-75\_Good\_B
  - Woods-Grass\_25-75\_Good\_C
  - Woods-Grass\_25-75\_Good\_D
  - Woods-Grass\_10-90\_Fair\_A
  - Woods-Grass\_10-90\_Fair\_B
  - Woods-Grass\_10-90\_Good\_A
  - Woods-Grass\_10-90\_Good\_B
  - Woods-Grass\_10-90\_Good\_C
  - Woods-Grass\_10-90\_Good\_D





**North Mill Pond Watershed Soil-Land Cover Polygons**

| Land Cover        | Hydrologic |     |           | CN  |
|-------------------|------------|-----|-----------|-----|
|                   | Condition  | HSG | Area (AC) |     |
| Brush             | Good       | A   | 58.81     | 30  |
| Brush             | Good       | B   | 179.13    | 48  |
| Brush             | Good       | C   | 32.85     | 65  |
| Brush             | Good       | D   | 20.82     | 73  |
| Impervious        | n/a        |     | 930.36    | 98  |
| Impervious2       | n/a        |     | 5.67      | 98  |
| Meadow            | Good       | A   | 23.27     | 30  |
| Meadow            | Good       | B   | 1.73      | 58  |
| Meadow            | Good       | C   | 0.00      | 71  |
| Meadow            | Good       | D   | 0.12      | 78  |
| Open Water        | n/a        |     | 54.48     | 100 |
| RxR               | Good       | A   | 1.28      | 76  |
| RxR               | Good       | B   | 5.93      | 85  |
| RxR               | Good       | C   | 0.20      | 89  |
| RxR               | Good       | D   | 1.60      | 91  |
| Woods             | Good       | A   | 60.28     | 30  |
| Woods             | Good       | B   | 120.30    | 55  |
| Woods             | Good       | C   | 80.53     | 70  |
| Woods             | Good       | D   | 17.09     | 77  |
| Woods-Grass 10-90 | Fair       | A   | 5.94      | 48  |
| Woods-Grass 10-90 | Fair       | B   | 1.08      | 68  |
| Woods-Grass 10-90 | Fair       | C   | 0.00      | 78  |
| Woods-Grass 10-90 | Fair       | D   | 0.00      | 84  |
| Woods-Grass 10-90 | Good       | A   | 69.10     | 38  |
| Woods-Grass 10-90 | Good       | B   | 33.81     | 60  |
| Woods-Grass 10-90 | Good       | C   | 2.13      | 74  |
| Woods-Grass 10-90 | Good       | D   | 3.07      | 80  |
| Woods-Grass 25-75 | Good       | A   | 5.89      | 36  |
| Woods-Grass 25-75 | Good       | B   | 55.58     | 60  |
| Woods-Grass 25-75 | Good       | C   | 10.22     | 73  |
| Woods-Grass 25-75 | Good       | D   | 70.08     | 79  |
| Woods-Grass 40-60 | Good       | A   | 5.06      | 33  |
| Woods-Grass 40-60 | Good       | B   | 120.91    | 59  |
| Woods-Grass 40-60 | Good       | C   | 7.04      | 72  |
| Woods-Grass 40-60 | Good       | D   | 38.94     | 79  |
| Woods-Grass 50-50 | Good       | A   | 16.68     | 32  |
| Woods-Grass 50-50 | Good       | B   | 250.09    | 58  |
| Woods-Grass 50-50 | Good       | C   | 7.28      | 72  |
| Woods-Grass 50-50 | Good       | D   | 24.38     | 79  |
| Woods-Grass 75-25 | Good       | A   | 16.01     | 30  |
| Woods-Grass 75-25 | Good       | B   | 94.23     | 57  |
| Woods-Grass 75-25 | Good       | C   | 120.21    | 71  |
| Woods-Grass 75-25 | Good       | D   | 76.21     | 78  |

2628.4

| Surface Description | Curve Number - Good Condition |     |     |     |
|---------------------|-------------------------------|-----|-----|-----|
|                     | A                             | B   | C   | D   |
| Open Water          | 100                           | 100 | 100 | 100 |
| Impervious          | 98                            | 98  | 98  | 98  |
| Railroad Tracks     | 76                            | 85  | 89  | 91  |
| Grass               | 39                            | 61  | 74  | 80  |
| Meadow              | 30                            | 58  | 71  | 78  |
| Brush               | 30                            | 48  | 65  | 73  |
| Woods/Grass 10/90   | 38                            | 60  | 74  | 80  |
| Woods/Grass 25/75   | 36                            | 60  | 73  | 79  |
| Woods/Grass 40/60   | 33                            | 59  | 72  | 79  |
| Woods/Grass 50/50   | 32                            | 58  | 72  | 79  |
| Woods/Grass 60/40   | 31                            | 57  | 72  | 78  |
| Woods/Grass 75/25   | 30                            | 57  | 71  | 78  |
| Woods               | 30                            | 55  | 70  | 77  |

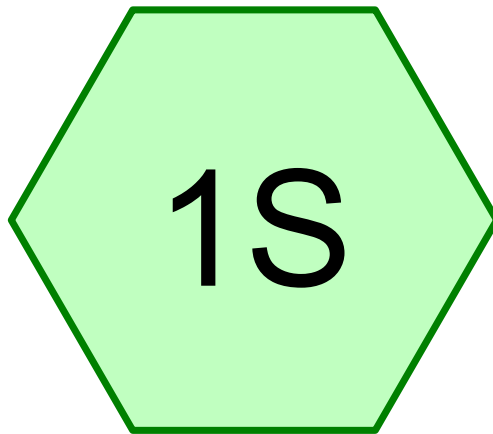
Note: CN values are for "good" hydrologic condition (>75% ground cover)

| Surface Description | Curve Number - Fair Condition |     |     |     |
|---------------------|-------------------------------|-----|-----|-----|
|                     | A                             | B   | C   | D   |
| Open Water          | 100                           | 100 | 100 | 100 |
| Impervious          | 98                            | 98  | 98  | 98  |
| Railroad Tracks     | 76                            | 85  | 89  | 91  |
| Grass               | 49                            | 69  | 79  | 84  |
| Meadow              | 30                            | 58  | 71  | 78  |
| Brush               | 35                            | 56  | 70  | 77  |
| Woods/Grass 10/90   | 48                            | 68  | 78  | 84  |
| Woods/Grass 25/75   | 46                            | 67  | 78  | 83  |
| Woods/Grass 40/60   | 44                            | 65  | 77  | 82  |
| Woods/Grass 50/50   | 43                            | 65  | 76  | 82  |
| Woods/Grass 60/40   | 41                            | 64  | 75  | 81  |
| Woods/Grass 75/25   | 39                            | 62  | 75  | 80  |
| Woods               | 36                            | 60  | 73  | 79  |

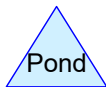
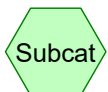
Note: CN values are for "fair" hydrologic condition (50-75% ground cover)

North Mill Pond Watershed Time of Concentration

| Flow Path Segment | Type    | Start Sta | Inv In | End Sta | Inv Out | Dia      | A   | P   | Length | Slope   | Surface       | Notes  |
|-------------------|---------|-----------|--------|---------|---------|----------|-----|-----|--------|---------|---------------|--|
| 1                 | sheet   | 0         | 97.28  | 73      | 96.31   | -        | -   | -   | 73     | 0.01329 | Pavement      |  |
| 2                 | shallow | 73        | 96.31  | 478     | 92.55   | -        | -   | -   | 405    | 0.00928 | Grass         |  |
| 3                 | pipe    | 478       | 88.55  | 2389    | 81.02   | 15       | -   | -   | 1911   | 0.00394 | RCP           | pipe size & material estimated and inv in estimated at 4' below ground elevation at grate  |
| 4                 | channel | 2389      | 81.02  | 3584    | 75.09   | -        | 41  | 74  | 1195   | 0.00496 | Forest        | A & P measured at typical section at max depth of 1' (estimated bankfull stage)  |
| 5                 | pipe    | 3584      | 75.09  | 3991    | 71.71   | 26       | -   | -   | 407    | 0.00831 | RCP           | pipe slope estimated as average slope between inlet segment 5 and outlet segment 7   |
| 6                 | pipe    | 3991      | 71.71  | 5936    | 55.54   | 36       | -   | -   | 1945   | 0.00831 | RCP           | pipe slope estimated as average slope between inlet segment 5 and outlet segment 7   |
| 7                 | pipe    | 5936      | 55.54  | 7933    | 38.95   | 48       | -   | -   | 1997   | 0.00831 | RCP           | pipe slope estimated as average slope between inlet segment 5 and outlet segment 7   |
| 8                 | channel | 7933      | 38.95  | 8243    | 37.04   | -        | 57  | 123 | 310    | 0.00616 | Brush         | A & P measured at typical section at max depth of 0.87' (elev. Difference between thalwet & height of land in right overbank)  |
| 9                 | pipe    | 8243      | 37.04  | 8344    | 37.00   | 60       | -   | -   | 101    | 0.00040 | RCP           | pipe size & material estimated   |
| 10                | channel | 8344      | 37.00  | 9090    | 34.40   | -        | 148 | 210 | 746    | 0.00349 | Brush         | A & P measured at typical section at max depth of 1' (estimated bankfull stage)  |
| 11                | pipe    | 9090      | 34.40  | 9189    | 33.76   | 60       | -   | -   | 99     | 0.00646 | RCP           | pipe size & material estimated   |
| 12                | channel | 9189      | 33.76  | 13125   | 19.25   | -        | 15  | 27  | 3936   | 0.00369 | Brush/Forest  | A & P measured at typical section at max depth of 1' (estimated bankfull stage)  |
| 13                | pipe    | 13125     | 19.25  | 13346   | 18.58   | 72       | -   | -   | 221    | 0.00303 | RCP           | pipe size & material estimated   |
| 14                | channel | 13346     | 18.58  | 13858   | 18.14   | -        | 17  | 26  | 512    | 0.00086 | Brush/Forest  | A & P measured at typical section at max depth of 1' (estimated bankfull stage)  |
| 15                | pipe    | 13858     | 18.14  | 14194   | 17.39   | 72       | -   | -   | 336    | 0.00223 | RCP           | pipe size & material estimated   |
| 16                | channel | 14194     | 17.39  | 14550   | 17.04   | -        | 18  | 29  | 356    | 0.00098 | Brush/Forest  | A & P measured at typical section at max depth of 1' (estimated bankfull stage)  |
| 17                | pipe    | 14550     | 17.04  | 15234   | 16.40   | 96       | -   | -   | 684    | 0.00094 | CMP           | pipe size & material estimated   |
| 18                | channel | 15234     | 16.40  | 15909   | 15.47   | -        | 17  | 26  | 675    | 0.00138 | Brush/Forest  | A & P measured at typical section at max depth of 1' (estimated bankfull stage)  |
| 19                | pipe    | 15909     | 15.47  | 16084   | 15.41   | 96       | -   | -   | 175    | 0.00034 | CMP           | pipe size & material estimated   |
| 20                | channel | 16084     | 15.41  | 16960   | 15.35   | -        | 21  | 32  | 876    | 0.00007 | Brush/Forest  | A & P measured at typical section at max depth of 1' (estimated bankfull stage)  |
| 21                | pipe    | 16960     | 15.35  | 17041   | 15.32   | 96       | -   | -   | 81     | 0.00037 | CMP           | pipe size & material estimated   |
| 22                | channel | 17041     | 15.32  | 17622   | 15.31   | -        | 13  | 22  | 581    | 0.00002 | Forest        | A & P measured at typical section at max depth of 1' (estimated bankfull stage)  |
| 23                | pipe    | 17622     | 15.31  | 17712   | 13.54   | 96       | -   | -   | 90     | 0.01967 | CMP           | pipe size & material estimated   |
| 24                | channel | 17712     | 13.54  | 18977   | 5.58    | -        | 16  | 23  | 1265   | 0.00629 | Forest        | A & P measured at typical section at max depth of 1' (estimated bankfull stage)  |
| 25                | pipe    | 18977     | 5.58   | 19479   | 3.54    | 72Hx144W | -   | -   | 502    | 0.00406 | Concrete Box  | pipe size & material from field measurements   |
| 26                | channel | 19479     | 1.05   | 23320   | -3.40   | -        | 32  | 34  | 3841   | 0.00116 | Cobble/Gravel | channel inverts from field measurments, channel geometry estimated from aerial photography and are based on a channel bottom width of 30', 2:1 side slopes, and flow depth of 1' |



# North Mill Pond Watershed



## Routing Diagram for NorthMillPond

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# NorthMillPond

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## Rainfall Events Listing (selected events)

| Event# | Event Name | Storm Type                     | Curve  | Mode    | Duration (hours) | B/B | Depth (inches) | AMC |
|--------|------------|--------------------------------|--------|---------|------------------|-----|----------------|-----|
| 1      | 50-yr      | NH-NorthMillPond_NRCC 24-hr S1 | 50-yr  | Default | 24.00            | 1   | 7.39           | 2   |
| 2      | 100-yr     | NH-NorthMillPond_NRCC 24-hr S1 | 100-yr | Default | 24.00            | 1   | 8.86           | 2   |

## NorthMillPond

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### Area Listing (selected nodes)

| Area<br>(acres) | CN        | Description<br>(subcatchment-numbers) |
|-----------------|-----------|---------------------------------------|
| 1               | 76        | Ballasted RxR Tracks, HSG A (1S)      |
| 6               | 85        | Ballasted RxR Tracks, HSG B (1S)      |
| 0               | 89        | Ballasted RxR Tracks, HSG C (1S)      |
| 2               | 91        | Ballasted RxR Tracks, HSG D (1S)      |
| 59              | 30        | Brush, Good, HSG A (1S)               |
| 179             | 48        | Brush, Good, HSG B (1S)               |
| 33              | 65        | Brush, Good, HSG C (1S)               |
| 21              | 73        | Brush, Good, HSG D (1S)               |
| 936             | 98        | Impervious (1S)                       |
| 23              | 30        | Meadow, non-grazed, HSG A (1S)        |
| 2               | 58        | Meadow, non-grazed, HSG B (1S)        |
| 0               | 78        | Meadow, non-grazed, HSG D (1S)        |
| 54              | 100       | Open Water (1S)                       |
| 60              | 30        | Woods, Good, HSG A (1S)               |
| 120             | 55        | Woods, Good, HSG B (1S)               |
| 80              | 70        | Woods, Good, HSG C (1S)               |
| 17              | 77        | Woods, Good, HSG D (1S)               |
| 6               | 48        | Woods/grass 10/90, Fair, HSG A (1S)   |
| 1               | 68        | Woods/grass 10/90, Fair, HSG B (1S)   |
| 69              | 38        | Woods/grass 10/90, Good, HSG A (1S)   |
| 34              | 60        | Woods/grass 10/90, Good, HSG B (1S)   |
| 2               | 74        | Woods/grass 10/90, Good, HSG C (1S)   |
| 3               | 80        | Woods/grass 10/90, Good, HSG D (1S)   |
| 6               | 36        | Woods/grass 25/75, Good, HSG A (1S)   |
| 56              | 60        | Woods/grass 25/75, Good, HSG B (1S)   |
| 10              | 73        | Woods/grass 25/75, Good, HSG C (1S)   |
| 70              | 79        | Woods/grass 25/75, Good, HSG D (1S)   |
| 5               | 33        | Woods/grass 40/60, Good, HSG A (1S)   |
| 121             | 59        | Woods/grass 40/60, Good, HSG B (1S)   |
| 7               | 72        | Woods/grass 40/60, Good, HSG C (1S)   |
| 39              | 79        | Woods/grass 40/60, Good, HSG D (1S)   |
| 17              | 32        | Woods/grass 50/50, Good, HSG A (1S)   |
| 250             | 58        | Woods/grass 50/50, Good, HSG B (1S)   |
| 7               | 72        | Woods/grass 50/50, Good, HSG C (1S)   |
| 24              | 79        | Woods/grass 50/50, Good, HSG D (1S)   |
| 16              | 30        | Woods/grass 75/25, Good, HSG A (1S)   |
| 94              | 57        | Woods/grass 75/25, Good, HSG B (1S)   |
| 120             | 71        | Woods/grass 75/25, Good, HSG C (1S)   |
| 76              | 78        | Woods/grass 75/25, Good, HSG D (1S)   |
| <b>2,628</b>    | <b>73</b> | <b>TOTAL AREA</b>                     |

## NorthMillPond

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### Soil Listing (selected nodes)

| Area<br>(acres) | Soil<br>Group | Subcatchment<br>Numbers |
|-----------------|---------------|-------------------------|
| 262             | HSG A         | 1S                      |
| 863             | HSG B         | 1S                      |
| 260             | HSG C         | 1S                      |
| 252             | HSG D         | 1S                      |
| 991             | Other         | 1S                      |
| <b>2,628</b>    |               | <b>TOTAL AREA</b>       |

## NorthMillPond

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### Ground Covers (selected nodes)

| HSG-A<br>(acres) | HSG-B<br>(acres) | HSG-C<br>(acres) | HSG-D<br>(acres) | Other<br>(acres) | Total<br>(acres) | Ground<br>Cover         | Subcatchment<br>Numbers |
|------------------|------------------|------------------|------------------|------------------|------------------|-------------------------|-------------------------|
| 1                | 6                | 0                | 2                | 0                | 9                | Ballasted RxR Tracks    | 1S                      |
| 59               | 179              | 33               | 21               | 0                | 292              | Brush, Good             | 1S                      |
| 0                | 0                | 0                | 0                | 936              | 936              | Impervious              | 1S                      |
| 23               | 2                | 0                | 0                | 0                | 25               | Meadow, non-grazed      | 1S                      |
| 0                | 0                | 0                | 0                | 54               | 54               | Open Water              | 1S                      |
| 60               | 120              | 80               | 17               | 0                | 278              | Woods, Good             | 1S                      |
| 6                | 1                | 0                | 0                | 0                | 7                | Woods/grass 10/90, Fair | 1S                      |
| 69               | 34               | 2                | 3                | 0                | 108              | Woods/grass 10/90, Good | 1S                      |
| 6                | 56               | 10               | 70               | 0                | 142              | Woods/grass 25/75, Good | 1S                      |
| 5                | 121              | 7                | 39               | 0                | 172              | Woods/grass 40/60, Good | 1S                      |
| 17               | 250              | 7                | 24               | 0                | 299              | Woods/grass 50/50, Good | 1S                      |
| 16               | 94               | 120              | 76               | 0                | 307              | Woods/grass 75/25, Good | 1S                      |
| <b>262</b>       | <b>863</b>       | <b>260</b>       | <b>252</b>       | <b>991</b>       | <b>2,628</b>     | <b>TOTAL AREA</b>       |                         |

# NorthMillPond

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## Pipe Listing (selected nodes)

| Line# | Node Number | In-Invert (feet) | Out-Invert (feet) | Length (feet) | Slope (ft/ft) | n     | Width (inches) | Diam/Height (inches) | Inside-Fill (inches) |
|-------|-------------|------------------|-------------------|---------------|---------------|-------|----------------|----------------------|----------------------|
| 1     | 1S          | 0.00             | 0.00              | 1,911.0       | 0.0039        | 0.015 | 0.0            | 15.0                 | 0.0                  |
| 2     | 1S          | 0.00             | 0.00              | 407.0         | 0.0083        | 0.015 | 0.0            | 26.0                 | 0.0                  |
| 3     | 1S          | 0.00             | 0.00              | 1,945.0       | 0.0083        | 0.015 | 0.0            | 36.0                 | 0.0                  |
| 4     | 1S          | 0.00             | 0.00              | 1,997.0       | 0.0083        | 0.015 | 0.0            | 48.0                 | 0.0                  |
| 5     | 1S          | 0.00             | 0.00              | 101.0         | 0.0004        | 0.015 | 0.0            | 60.0                 | 0.0                  |
| 6     | 1S          | 0.00             | 0.00              | 99.0          | 0.0065        | 0.015 | 0.0            | 60.0                 | 0.0                  |
| 7     | 1S          | 0.00             | 0.00              | 221.0         | 0.0030        | 0.015 | 0.0            | 72.0                 | 0.0                  |
| 8     | 1S          | 0.00             | 0.00              | 336.0         | 0.0022        | 0.015 | 0.0            | 72.0                 | 0.0                  |
| 9     | 1S          | 0.00             | 0.00              | 684.0         | 0.0009        | 0.025 | 0.0            | 96.0                 | 0.0                  |
| 10    | 1S          | 0.00             | 0.00              | 175.0         | 0.0003        | 0.025 | 0.0            | 96.0                 | 0.0                  |
| 11    | 1S          | 0.00             | 0.00              | 81.0          | 0.0004        | 0.025 | 0.0            | 96.0                 | 0.0                  |
| 12    | 1S          | 0.00             | 0.00              | 90.0          | 0.0197        | 0.025 | 0.0            | 96.0                 | 0.0                  |
| 13    | 1S          | 0.00             | 0.00              | 502.0         | 0.0041        | 0.015 | 144.0          | 72.0                 | 0.0                  |



**Summary for Subcatchment 1S: North Mill Pond Watershed**

Runoff = 908 cfs @ 19.47 hrs, Volume= 936 af, Depth> 4.27"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 6.00-48.00 hrs, dt= 0.05 hrs  
 NH-NorthMillPond\_NRCC 24-hr S1 50-yr Rainfall=7.39"

| Area (ac) | CN  | Description                    |
|-----------|-----|--------------------------------|
| 59        | 30  | Brush, Good, HSG A             |
| 179       | 48  | Brush, Good, HSG B             |
| 33        | 65  | Brush, Good, HSG C             |
| 21        | 73  | Brush, Good, HSG D             |
| * 930     | 98  | Impervious                     |
| * 6       | 98  | Impervious                     |
| 23        | 30  | Meadow, non-grazed, HSG A      |
| 2         | 58  | Meadow, non-grazed, HSG B      |
| 0         | 78  | Meadow, non-grazed, HSG D      |
| * 54      | 100 | Open Water                     |
| * 1       | 76  | Ballasted RxR Tracks, HSG A    |
| * 6       | 85  | Ballasted RxR Tracks, HSG B    |
| * 0       | 89  | Ballasted RxR Tracks, HSG C    |
| * 2       | 91  | Ballasted RxR Tracks, HSG D    |
| 60        | 30  | Woods, Good, HSG A             |
| 120       | 55  | Woods, Good, HSG B             |
| 80        | 70  | Woods, Good, HSG C             |
| 17        | 77  | Woods, Good, HSG D             |
| * 6       | 48  | Woods/grass 10/90, Fair, HSG A |
| * 1       | 68  | Woods/grass 10/90, Fair, HSG B |
| * 69      | 38  | Woods/grass 10/90, Good, HSG A |
| * 34      | 60  | Woods/grass 10/90, Good, HSG B |
| * 2       | 74  | Woods/grass 10/90, Good, HSG C |
| * 3       | 80  | Woods/grass 10/90, Good, HSG D |
| * 6       | 36  | Woods/grass 25/75, Good, HSG A |
| * 56      | 60  | Woods/grass 25/75, Good, HSG B |
| * 10      | 73  | Woods/grass 25/75, Good, HSG C |
| * 70      | 79  | Woods/grass 25/75, Good, HSG D |
| * 5       | 33  | Woods/grass 40/60, Good, HSG A |
| * 121     | 59  | Woods/grass 40/60, Good, HSG B |
| * 7       | 72  | Woods/grass 40/60, Good, HSG C |
| * 39      | 79  | Woods/grass 40/60, Good, HSG D |
| * 17      | 32  | Woods/grass 50/50, Good, HSG A |
| * 250     | 58  | Woods/grass 50/50, Good, HSG B |
| * 7       | 72  | Woods/grass 50/50, Good, HSG C |
| * 24      | 79  | Woods/grass 50/50, Good, HSG D |
| * 16      | 30  | Woods/grass 75/25, Good, HSG A |
| * 94      | 57  | Woods/grass 75/25, Good, HSG B |
| * 120     | 71  | Woods/grass 75/25, Good, HSG C |
| * 76      | 78  | Woods/grass 75/25, Good, HSG D |
| 2,628     | 73  | Weighted Average               |
| 1,638     |     | 62.31% Pervious Area           |
| 991       |     | 37.69% Impervious Area         |

**NorthMillPond**

NH-NorthMillPond\_NRCC 24-hr S1 50-yr Rainfall=7.39"

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| Tc<br>(min) | Length<br>(feet) | Slope<br>(ft/ft) | Velocity<br>(ft/sec) | Capacity<br>(cfs) | Description   |
|-------------|------------------|------------------|----------------------|-------------------|---|
| 1           | 73               | 0.0133           | 1.12                 |                   | <b>Sheet Flow, Segment 1</b><br>Smooth surfaces n= 0.011 P2= 3.33"  |
| 5           | 405              | 0.0093           | 1.45                 |                   | <b>Shallow Concentrated Flow, Segment 2</b><br>Grassed Waterway Kv= 15.0 fps  |
| 11          | 1,911            | 0.0039           | 2.85                 | 3.50              | <b>Pipe Channel, Segment 3</b><br>15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31'<br>n= 0.015 Concrete sewer w/manholes & inlets    |
| 28          | 1,195            | 0.0050           | 0.71                 | 29.06             | <b>Channel Flow, Segment 4</b><br>Area= 41.0 sf Perim= 74.0' r= 0.55'<br>n= 0.100 Earth, dense brush, high stage                  |
| 1           | 407              | 0.0083           | 6.00                 | 22.11             | <b>Pipe Channel, Segment 5</b><br>26.0" Round Area= 3.7 sf Perim= 6.8' r= 0.54'<br>n= 0.015 Concrete sewer w/manholes & inlets    |
| 4           | 1,945            | 0.0083           | 7.45                 | 52.66             | <b>Pipe Channel, Segment 6</b><br>36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75'<br>n= 0.015 Concrete sewer w/manholes & inlets    |
| 4           | 1,997            | 0.0083           | 9.03                 | 113.42            | <b>Pipe Channel, Segment 7</b><br>48.0" Round Area= 12.6 sf Perim= 12.6' r= 1.00'<br>n= 0.015 Concrete sewer w/manholes & inlets  |
| 7           | 310              | 0.0062           | 0.70                 | 39.94             | <b>Channel Flow, Segment 8</b><br>Area= 57.0 sf Perim= 123.0' r= 0.46'<br>n= 0.100 Earth, dense brush, high stage                 |
| 1           | 101              | 0.0004           | 2.30                 | 45.14             | <b>Pipe Channel, Segment 9</b><br>60.0" Round Area= 19.6 sf Perim= 15.7' r= 1.25'<br>n= 0.015 Concrete sewer w/manholes & inlets  |
| 18          | 746              | 0.0035           | 0.70                 | 103.04            | <b>Channel Flow, Segment 10</b><br>Area= 148.0 sf Perim= 210.0' r= 0.70'<br>n= 0.100 Earth, dense brush, high stage               |
| 0           | 99               | 0.0065           | 9.27                 | 181.98            | <b>Pipe Channel, Segment 11</b><br>60.0" Round Area= 19.6 sf Perim= 15.7' r= 1.25'<br>n= 0.015 Concrete sewer w/manholes & inlets |
| 107         | 3,936            | 0.0037           | 0.61                 | 9.16              | <b>Channel Flow, Segment 12</b><br>Area= 15.0 sf Perim= 27.0' r= 0.56'<br>n= 0.100 Earth, dense brush, high stage                 |
| 1           | 221              | 0.0030           | 7.11                 | 201.04            | <b>Pipe Channel, Segment 13</b><br>72.0" Round Area= 28.3 sf Perim= 18.8' r= 1.50'<br>n= 0.015 Concrete sewer w/manholes & inlets |
| 25          | 512              | 0.0009           | 0.34                 | 5.71              | <b>Channel Flow, Segment 14</b><br>Area= 17.0 sf Perim= 26.0' r= 0.65'<br>n= 0.100 Earth, dense brush, high stage                 |
| 1           | 336              | 0.0022           | 6.09                 | 172.16            | <b>Pipe Channel, Segment 15</b><br>72.0" Round Area= 28.3 sf Perim= 18.8' r= 1.50'<br>n= 0.015 Concrete sewer w/manholes & inlets |
| 17          | 356              | 0.0010           | 0.34                 | 6.15              | <b>Channel Flow, Segment 16</b><br>Area= 18.0 sf Perim= 29.0' r= 0.62'<br>n= 0.100 Earth, dense brush, high stage                 |
| 4           | 684              | 0.0009           | 2.83                 | 142.28            | <b>Pipe Channel, Segment 17</b><br>96.0" Round Area= 50.3 sf Perim= 25.1' r= 2.00'<br>n= 0.025 Corrugated metal                   |
| 27          | 675              | 0.0014           | 0.42                 | 7.12              | <b>Channel Flow, Segment 18</b><br>Area= 17.0 sf Perim= 26.0' r= 0.65'  |

**NorthMillPond**

NH-NorthMillPond\_NRCC 24-hr S1 50-yr Rainfall=7.39"

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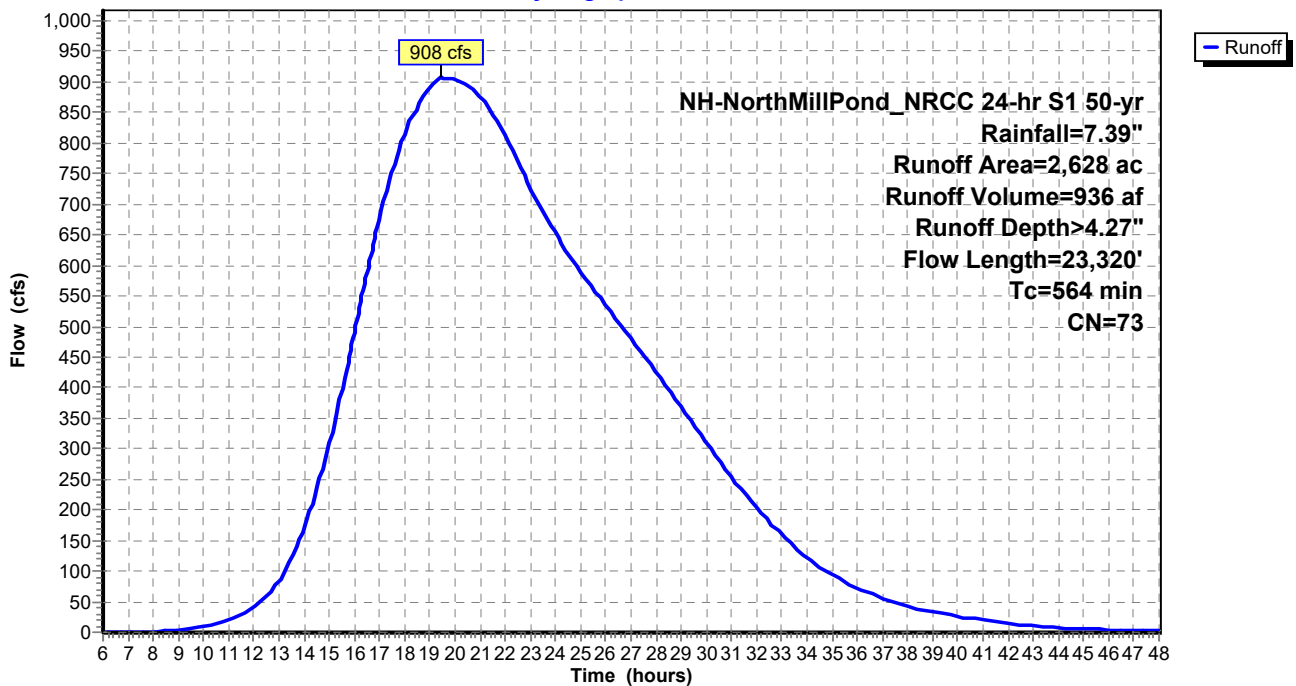
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n= 0.100 Earth, dense brush, high stage

|                         |       |        |       |        |  |
|-------------------------|-------|--------|-------|--------|--|
| 2                       | 175   | 0.0003 | 1.63  | 82.15  | <b>Pipe Channel, Segment 19</b><br>96.0" Round Area= 50.3 sf Perim= 25.1' r= 2.00'<br>n= 0.025 Corrugated metal                          |
| 130                     | 876   | 0.0001 | 0.11  | 2.36   | <b>Channel Flow, Segment 20</b><br>Area= 21.0 sf Perim= 32.0' r= 0.66' n= 0.100  |
| 1                       | 81    | 0.0004 | 1.89  | 94.86  | <b>Pipe Channel, Segment 21</b><br>96.0" Round Area= 50.3 sf Perim= 25.1' r= 2.00'<br>n= 0.025 Corrugated metal                          |
| 93                      | 581   | 0.0001 | 0.10  | 1.36   | <b>Channel Flow, Segment 22</b><br>Area= 13.0 sf Perim= 22.0' r= 0.59'<br>n= 0.100 Earth, dense brush, high stage                        |
| 0                       | 90    | 0.0197 | 13.24 | 665.68 | <b>Pipe Channel, Segment 23</b><br>96.0" Round Area= 50.3 sf Perim= 25.1' r= 2.00'<br>n= 0.025 Corrugated metal                          |
| 23                      | 1,265 | 0.0063 | 0.93  | 14.82  | <b>Channel Flow, Segment 24</b><br>Area= 16.0 sf Perim= 23.0' r= 0.70' n= 0.100  |
| 1                       | 502   | 0.0041 | 10.07 | 725.00 | <b>Pipe Channel, Segment 25</b><br>144.0" x 72.0" Box Area= 72.0 sf Perim= 36.0' r= 2.00'<br>n= 0.015 Concrete sewer w/manholes & inlets |
| 52                      | 3,841 | 0.0012 | 1.24  | 39.55  | <b>Channel Flow, Segment 26</b><br>Area= 32.0 sf Perim= 34.0' r= 0.94'<br>n= 0.040 Earth, cobble bottom, clean sides                     |
| <b>564 23,320 Total</b> |       |        |       |        |  |

**Subcatchment 1S: North Mill Pond Watershed**

Hydrograph



**Summary for Subcatchment 1S: North Mill Pond Watershed**

Runoff = 1,179 cfs @ 19.46 hrs, Volume= 1,221 af, Depth> 5.58"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 6.00-48.00 hrs, dt= 0.05 hrs  
 NH-NorthMillPond\_NRCC 24-hr S1 100-yr Rainfall=8.86"

| Area (ac) | CN  | Description                    |
|-----------|-----|--------------------------------|
| 59        | 30  | Brush, Good, HSG A             |
| 179       | 48  | Brush, Good, HSG B             |
| 33        | 65  | Brush, Good, HSG C             |
| 21        | 73  | Brush, Good, HSG D             |
| * 930     | 98  | Impervious                     |
| * 6       | 98  | Impervious                     |
| 23        | 30  | Meadow, non-grazed, HSG A      |
| 2         | 58  | Meadow, non-grazed, HSG B      |
| 0         | 78  | Meadow, non-grazed, HSG D      |
| * 54      | 100 | Open Water                     |
| * 1       | 76  | Ballasted RxR Tracks, HSG A    |
| * 6       | 85  | Ballasted RxR Tracks, HSG B    |
| * 0       | 89  | Ballasted RxR Tracks, HSG C    |
| * 2       | 91  | Ballasted RxR Tracks, HSG D    |
| 60        | 30  | Woods, Good, HSG A             |
| 120       | 55  | Woods, Good, HSG B             |
| 80        | 70  | Woods, Good, HSG C             |
| 17        | 77  | Woods, Good, HSG D             |
| * 6       | 48  | Woods/grass 10/90, Fair, HSG A |
| * 1       | 68  | Woods/grass 10/90, Fair, HSG B |
| * 69      | 38  | Woods/grass 10/90, Good, HSG A |
| * 34      | 60  | Woods/grass 10/90, Good, HSG B |
| * 2       | 74  | Woods/grass 10/90, Good, HSG C |
| * 3       | 80  | Woods/grass 10/90, Good, HSG D |
| * 6       | 36  | Woods/grass 25/75, Good, HSG A |
| * 56      | 60  | Woods/grass 25/75, Good, HSG B |
| * 10      | 73  | Woods/grass 25/75, Good, HSG C |
| * 70      | 79  | Woods/grass 25/75, Good, HSG D |
| * 5       | 33  | Woods/grass 40/60, Good, HSG A |
| * 121     | 59  | Woods/grass 40/60, Good, HSG B |
| * 7       | 72  | Woods/grass 40/60, Good, HSG C |
| * 39      | 79  | Woods/grass 40/60, Good, HSG D |
| * 17      | 32  | Woods/grass 50/50, Good, HSG A |
| * 250     | 58  | Woods/grass 50/50, Good, HSG B |
| * 7       | 72  | Woods/grass 50/50, Good, HSG C |
| * 24      | 79  | Woods/grass 50/50, Good, HSG D |
| * 16      | 30  | Woods/grass 75/25, Good, HSG A |
| * 94      | 57  | Woods/grass 75/25, Good, HSG B |
| * 120     | 71  | Woods/grass 75/25, Good, HSG C |
| * 76      | 78  | Woods/grass 75/25, Good, HSG D |
| 2,628     | 73  | Weighted Average               |
| 1,638     |     | 62.31% Pervious Area           |
| 991       |     | 37.69% Impervious Area         |

**NorthMillPond**

NH-NorthMillPond\_NRCC 24-hr S1 100-yr Rainfall=8.86"

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| Tc<br>(min) | Length<br>(feet) | Slope<br>(ft/ft) | Velocity<br>(ft/sec) | Capacity<br>(cfs) | Description   |
|-------------|------------------|------------------|----------------------|-------------------|---|
| 1           | 73               | 0.0133           | 1.12                 |                   | <b>Sheet Flow, Segment 1</b><br>Smooth surfaces n= 0.011 P2= 3.33"  |
| 5           | 405              | 0.0093           | 1.45                 |                   | <b>Shallow Concentrated Flow, Segment 2</b><br>Grassed Waterway Kv= 15.0 fps  |
| 11          | 1,911            | 0.0039           | 2.85                 | 3.50              | <b>Pipe Channel, Segment 3</b><br>15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31'<br>n= 0.015 Concrete sewer w/manholes & inlets    |
| 28          | 1,195            | 0.0050           | 0.71                 | 29.06             | <b>Channel Flow, Segment 4</b><br>Area= 41.0 sf Perim= 74.0' r= 0.55'<br>n= 0.100 Earth, dense brush, high stage                  |
| 1           | 407              | 0.0083           | 6.00                 | 22.11             | <b>Pipe Channel, Segment 5</b><br>26.0" Round Area= 3.7 sf Perim= 6.8' r= 0.54'<br>n= 0.015 Concrete sewer w/manholes & inlets    |
| 4           | 1,945            | 0.0083           | 7.45                 | 52.66             | <b>Pipe Channel, Segment 6</b><br>36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75'<br>n= 0.015 Concrete sewer w/manholes & inlets    |
| 4           | 1,997            | 0.0083           | 9.03                 | 113.42            | <b>Pipe Channel, Segment 7</b><br>48.0" Round Area= 12.6 sf Perim= 12.6' r= 1.00'<br>n= 0.015 Concrete sewer w/manholes & inlets  |
| 7           | 310              | 0.0062           | 0.70                 | 39.94             | <b>Channel Flow, Segment 8</b><br>Area= 57.0 sf Perim= 123.0' r= 0.46'<br>n= 0.100 Earth, dense brush, high stage                 |
| 1           | 101              | 0.0004           | 2.30                 | 45.14             | <b>Pipe Channel, Segment 9</b><br>60.0" Round Area= 19.6 sf Perim= 15.7' r= 1.25'<br>n= 0.015 Concrete sewer w/manholes & inlets  |
| 18          | 746              | 0.0035           | 0.70                 | 103.04            | <b>Channel Flow, Segment 10</b><br>Area= 148.0 sf Perim= 210.0' r= 0.70'<br>n= 0.100 Earth, dense brush, high stage               |
| 0           | 99               | 0.0065           | 9.27                 | 181.98            | <b>Pipe Channel, Segment 11</b><br>60.0" Round Area= 19.6 sf Perim= 15.7' r= 1.25'<br>n= 0.015 Concrete sewer w/manholes & inlets |
| 107         | 3,936            | 0.0037           | 0.61                 | 9.16              | <b>Channel Flow, Segment 12</b><br>Area= 15.0 sf Perim= 27.0' r= 0.56'<br>n= 0.100 Earth, dense brush, high stage                 |
| 1           | 221              | 0.0030           | 7.11                 | 201.04            | <b>Pipe Channel, Segment 13</b><br>72.0" Round Area= 28.3 sf Perim= 18.8' r= 1.50'<br>n= 0.015 Concrete sewer w/manholes & inlets |
| 25          | 512              | 0.0009           | 0.34                 | 5.71              | <b>Channel Flow, Segment 14</b><br>Area= 17.0 sf Perim= 26.0' r= 0.65'<br>n= 0.100 Earth, dense brush, high stage                 |
| 1           | 336              | 0.0022           | 6.09                 | 172.16            | <b>Pipe Channel, Segment 15</b><br>72.0" Round Area= 28.3 sf Perim= 18.8' r= 1.50'<br>n= 0.015 Concrete sewer w/manholes & inlets |
| 17          | 356              | 0.0010           | 0.34                 | 6.15              | <b>Channel Flow, Segment 16</b><br>Area= 18.0 sf Perim= 29.0' r= 0.62'<br>n= 0.100 Earth, dense brush, high stage                 |
| 4           | 684              | 0.0009           | 2.83                 | 142.28            | <b>Pipe Channel, Segment 17</b><br>96.0" Round Area= 50.3 sf Perim= 25.1' r= 2.00'<br>n= 0.025 Corrugated metal                   |
| 27          | 675              | 0.0014           | 0.42                 | 7.12              | <b>Channel Flow, Segment 18</b><br>Area= 17.0 sf Perim= 26.0' r= 0.65'  |

**NorthMillPond**

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NH-NorthMillPond\_NRCC 24-hr S1 100-yr Rainfall=8.86"

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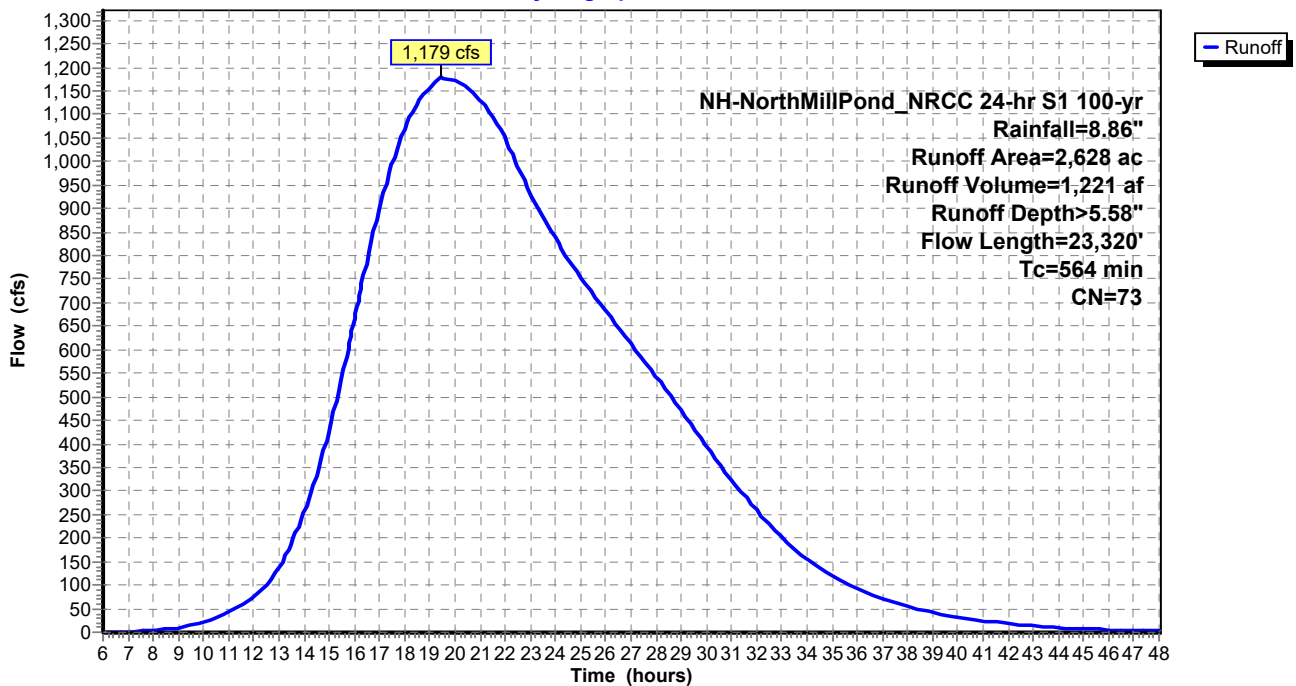
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n= 0.100 Earth, dense brush, high stage

|                         |       |        |       |        |  |
|-------------------------|-------|--------|-------|--------|--|
| 2                       | 175   | 0.0003 | 1.63  | 82.15  | <b>Pipe Channel, Segment 19</b><br>96.0" Round Area= 50.3 sf Perim= 25.1' r= 2.00'<br>n= 0.025 Corrugated metal                          |
| 130                     | 876   | 0.0001 | 0.11  | 2.36   | <b>Channel Flow, Segment 20</b><br>Area= 21.0 sf Perim= 32.0' r= 0.66' n= 0.100  |
| 1                       | 81    | 0.0004 | 1.89  | 94.86  | <b>Pipe Channel, Segment 21</b><br>96.0" Round Area= 50.3 sf Perim= 25.1' r= 2.00'<br>n= 0.025 Corrugated metal                          |
| 93                      | 581   | 0.0001 | 0.10  | 1.36   | <b>Channel Flow, Segment 22</b><br>Area= 13.0 sf Perim= 22.0' r= 0.59'<br>n= 0.100 Earth, dense brush, high stage                        |
| 0                       | 90    | 0.0197 | 13.24 | 665.68 | <b>Pipe Channel, Segment 23</b><br>96.0" Round Area= 50.3 sf Perim= 25.1' r= 2.00'<br>n= 0.025 Corrugated metal                          |
| 23                      | 1,265 | 0.0063 | 0.93  | 14.82  | <b>Channel Flow, Segment 24</b><br>Area= 16.0 sf Perim= 23.0' r= 0.70' n= 0.100  |
| 1                       | 502   | 0.0041 | 10.07 | 725.00 | <b>Pipe Channel, Segment 25</b><br>144.0" x 72.0" Box Area= 72.0 sf Perim= 36.0' r= 2.00'<br>n= 0.015 Concrete sewer w/manholes & inlets |
| 52                      | 3,841 | 0.0012 | 1.24  | 39.55  | <b>Channel Flow, Segment 26</b><br>Area= 32.0 sf Perim= 34.0' r= 0.94'<br>n= 0.040 Earth, cobble bottom, clean sides                     |
| <b>564 23,320 Total</b> |       |        |       |        |  |

**Subcatchment 1S: North Mill Pond Watershed**

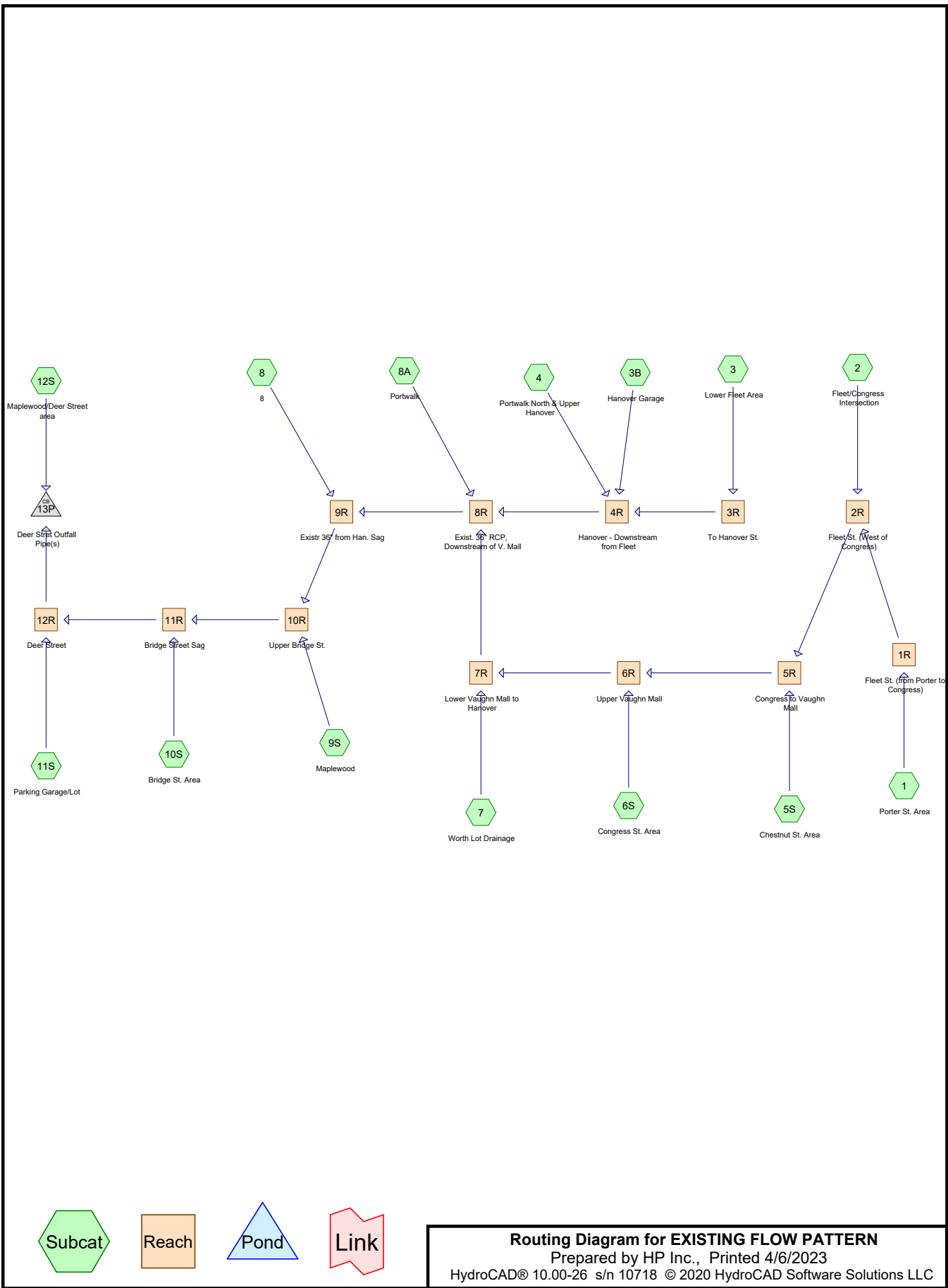
Hydrograph



**APPENDIX 3**  
**DRAINAGE OUTFALL PROJECT**  
**PRE-PROJECT HYDROLOGY CALCULATIONS**







## EXISTING FLOW PATTERN

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Type III 24-hr Rainfall=5.00"

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Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

### Subcatchment1: Porter St. Area

Runoff Area=2.500 ac Runoff Depth>4.06"  
Tc=6.0 min CN=94 Runoff=11.47 cfs 0.847 af

### Subcatchment2: Fleet/Congress Intersection

Runoff Area=1.100 ac Runoff Depth>4.25"  
Tc=6.0 min CN=96 Runoff=5.17 cfs 0.390 af

### Subcatchment3: Lower Fleet Area

Runoff Area=1.300 ac Runoff Depth>4.25"  
Tc=6.0 min CN=96 Runoff=6.11 cfs 0.461 af

### Subcatchment3B: Hanover Garage

Runoff Area=2.700 ac Runoff Depth>4.25"  
Tc=6.0 min CN=96 Runoff=12.69 cfs 0.957 af

### Subcatchment4: Portwalk North & Upper Hanover

Runoff Area=4.100 ac Runoff Depth>3.86"  
Tc=8.0 min CN=92 Runoff=17.23 cfs 1.320 af

### Subcatchment5S: Chestnut St. Area

Runoff Area=2.100 ac Runoff Depth>4.06"  
Tc=6.0 min CN=94 Runoff=9.63 cfs 0.711 af

### Subcatchment6S: Congress St. Area

Runoff Area=1.100 ac Runoff Depth>4.06"  
Tc=6.0 min CN=94 Runoff=5.05 cfs 0.373 af

### Subcatchment7: Worth Lot Drainage

Runoff Area=1.400 ac Runoff Depth>4.06"  
Tc=6.0 min CN=94 Runoff=6.42 cfs 0.474 af

### Subcatchment8: 8

Runoff Area=1.800 ac Runoff Depth>4.25"  
Tc=6.0 min CN=96 Runoff=8.46 cfs 0.638 af

### Subcatchment8A: Portwalk

Runoff Area=1.200 ac Runoff Depth>3.86"  
Tc=6.0 min CN=92 Runoff=5.34 cfs 0.386 af

### Subcatchment9S: Maplewood

Runoff Area=6.700 ac Runoff Depth>3.46"  
Tc=9.0 min CN=88 Runoff=25.08 cfs 1.931 af

### Subcatchment10S: Bridge St. Area

Runoff Area=4.500 ac Runoff Depth>3.86"  
Tc=6.0 min CN=92 Runoff=20.01 cfs 1.449 af

### Subcatchment11S: Parking Garage/Lot

Runoff Area=2.000 ac Runoff Depth>4.06"  
Tc=6.0 min CN=94 Runoff=9.17 cfs 0.677 af

### Subcatchment12S: Maplewood/Deer Street area

Runoff Area=4.500 ac Runoff Depth>3.07"  
Tc=10.0 min CN=84 Runoff=14.80 cfs 1.150 af

**Reach 1R: Fleet St. (from Porter to 18.0" Round Pipe** Avg. Flow Depth=1.16' Max Vel=7.86 fps Inflow=11.47 cfs 0.847 af  
n=0.010 L=180.0' S=0.0080 '/' Capacity=12.21 cfs Outflow=11.30 cfs 0.846 af

**Reach 2R: Fleet St. (West of Congress)** Avg. Flow Depth=1.67' Max Vel=5.84 fps Inflow=16.44 cfs 1.236 af  
24.0" Round Pipe n=0.010 L=200.0' S=0.0030 '/' Capacity=16.11 cfs Outflow=15.95 cfs 1.235 af

## EXISTING FLOW PATTERN

Type III 24-hr Rainfall=5.00"

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**Reach 3R: To Hanover St.** Avg. Flow Depth=1.06' Max Vel=5.51 fps Inflow=6.11 cfs 0.461 af  
15.0" Round Pipe n=0.010 L=80.0' S=0.0050 '/' Capacity=5.94 cfs Outflow=6.05 cfs 0.461 af

**Reach 4R: Hanover - Downstream from** Avg. Flow Depth=1.96' Max Vel=8.62 fps Inflow=35.74 cfs 2.738 af  
30.0" Round Pipe n=0.012 L=180.0' S=0.0070 '/' Capacity=37.18 cfs Outflow=35.13 cfs 2.736 af

**Reach 5R: Congress to Vaughn Mall** Avg. Flow Depth=1.50' Max Vel=10.08 fps Inflow=25.40 cfs 1.946 af  
24.0" Round Pipe n=0.012 L=100.0' S=0.0130 '/' Capacity=27.94 cfs Outflow=25.21 cfs 1.946 af

**Reach 6R: Upper Vaughn Mall** Avg. Flow Depth=1.60' Max Vel=11.19 fps Inflow=30.18 cfs 2.318 af  
24.0" Round Pipe n=0.010 L=200.0' S=0.0110 '/' Capacity=30.84 cfs Outflow=29.74 cfs 2.318 af

**Reach 7R: Lower Vaughn Mall to** Avg. Flow Depth=1.70' Max Vel=12.61 fps Inflow=35.99 cfs 2.792 af  
24.0" Round Pipe n=0.010 L=150.0' S=0.0140 '/' Capacity=34.80 cfs Outflow=35.62 cfs 2.791 af

**Reach 8R: Exist. 36" RCP,** Avg. Flow Depth=2.45' Max Vel=12.22 fps Inflow=75.93 cfs 5.914 af  
36.0" Round Pipe n=0.012 L=200.0' S=0.0110 '/' Capacity=75.78 cfs Outflow=74.85 cfs 5.912 af

**Reach 9R: Existr 36" from Han. Sag** Avg. Flow Depth=2.57' Max Vel=12.76 fps Inflow=82.94 cfs 6.550 af  
36.0" Round Pipe n=0.012 L=260.0' S=0.0120 '/' Capacity=79.15 cfs Outflow=81.35 cfs 6.548 af

**Reach 10R: Upper Bridge St.** Avg. Flow Depth=3.32' Max Vel=9.50 fps Inflow=106.28 cfs 8.478 af  
48.0" Round Pipe n=0.012 L=170.0' S=0.0045 '/' Capacity=104.73 cfs Outflow=105.46 cfs 8.475 af

**Reach 11R: Bridge Street Sag** Avg. Flow Depth=3.34' Max Vel=10.93 fps Inflow=122.72 cfs 9.925 af  
48.0" Round Pipe n=0.012 L=160.0' S=0.0060 '/' Capacity=120.54 cfs Outflow=122.01 cfs 9.922 af

**Reach 12R: Deer Street** Avg. Flow Depth=3.26' Max Vel=11.81 fps Inflow=129.83 cfs 10.599 af  
48.0" Round Pipe n=0.012 L=160.0' S=0.0070 '/' Capacity=130.20 cfs Outflow=129.15 cfs 10.596 af

**Pond 13P: Deer Stret Outfall Pipe(s)** Peak Elev=6.00' Inflow=143.94 cfs 11.746 af  
48.0" Round Culvert x 2.00 n=0.012 L=575.0' S=0.0020 '/' Outflow=143.94 cfs 11.746 af

# EXISTING FLOW PATTERN

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Type III 24-hr Rainfall=5.00"

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## Summary for Subcatchment 1: Porter St. Area

Runoff = 11.47 cfs @ 12.09 hrs, Volume= 0.847 af, Depth> 4.06"

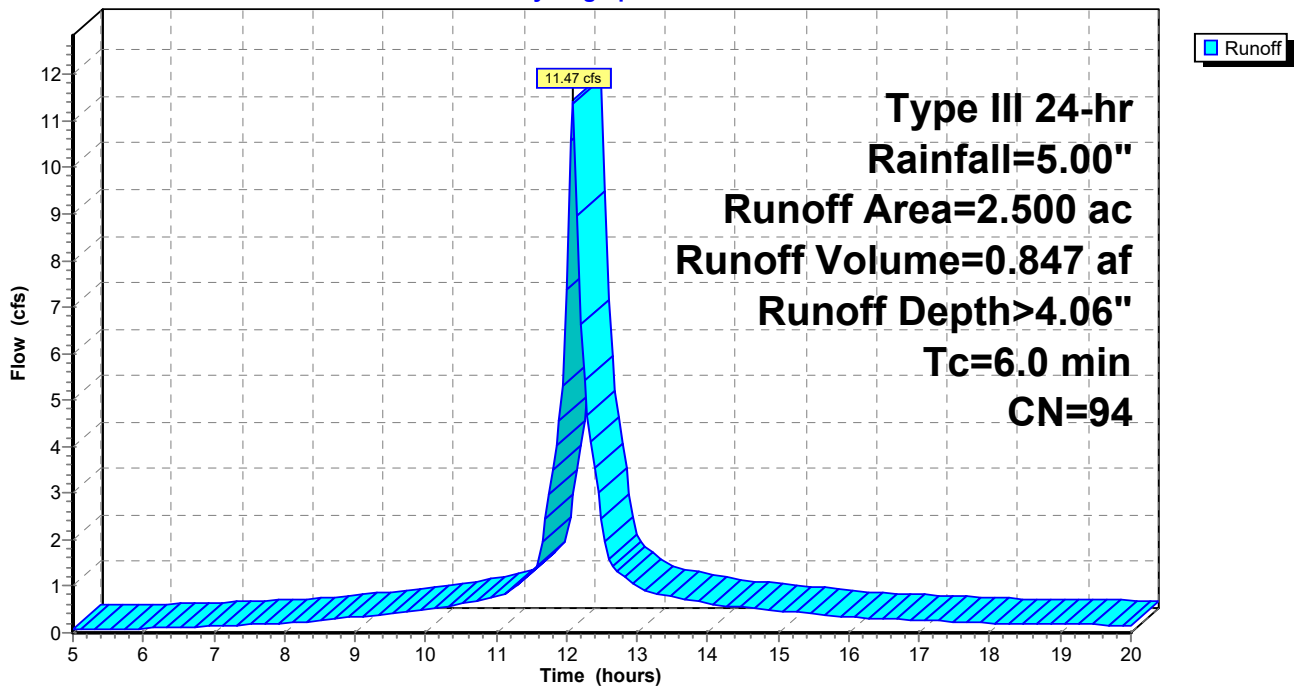
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Type III 24-hr Rainfall=5.00"

| Area (ac) | CN | Description    |
|-----------|----|----------------|
| * 2.500   | 94 | Upper Fleet St |

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

## Subcatchment 1: Porter St. Area

Hydrograph



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Type III 24-hr Rainfall=5.00"

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## Summary for Subcatchment 2: Fleet/Congress Intersection

Runoff = 5.17 cfs @ 12.09 hrs, Volume= 0.390 af, Depth> 4.25"

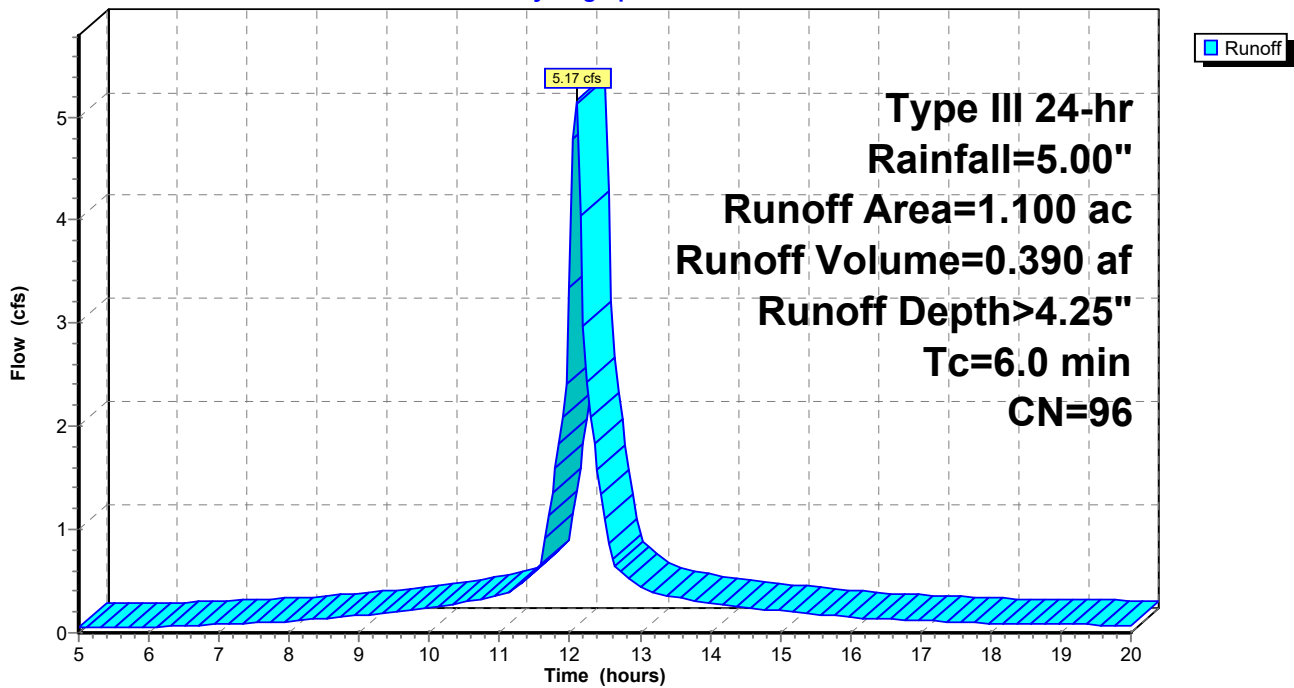
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Type III 24-hr Rainfall=5.00"

| Area (ac) | CN | Description |
|-----------|----|-------------|
| * 1.100   | 96 |             |

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

## Subcatchment 2: Fleet/Congress Intersection

Hydrograph



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Type III 24-hr Rainfall=5.00"

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**Summary for Subcatchment 3: Lower Fleet Area**

Runoff = 6.11 cfs @ 12.09 hrs, Volume= 0.461 af, Depth> 4.25"

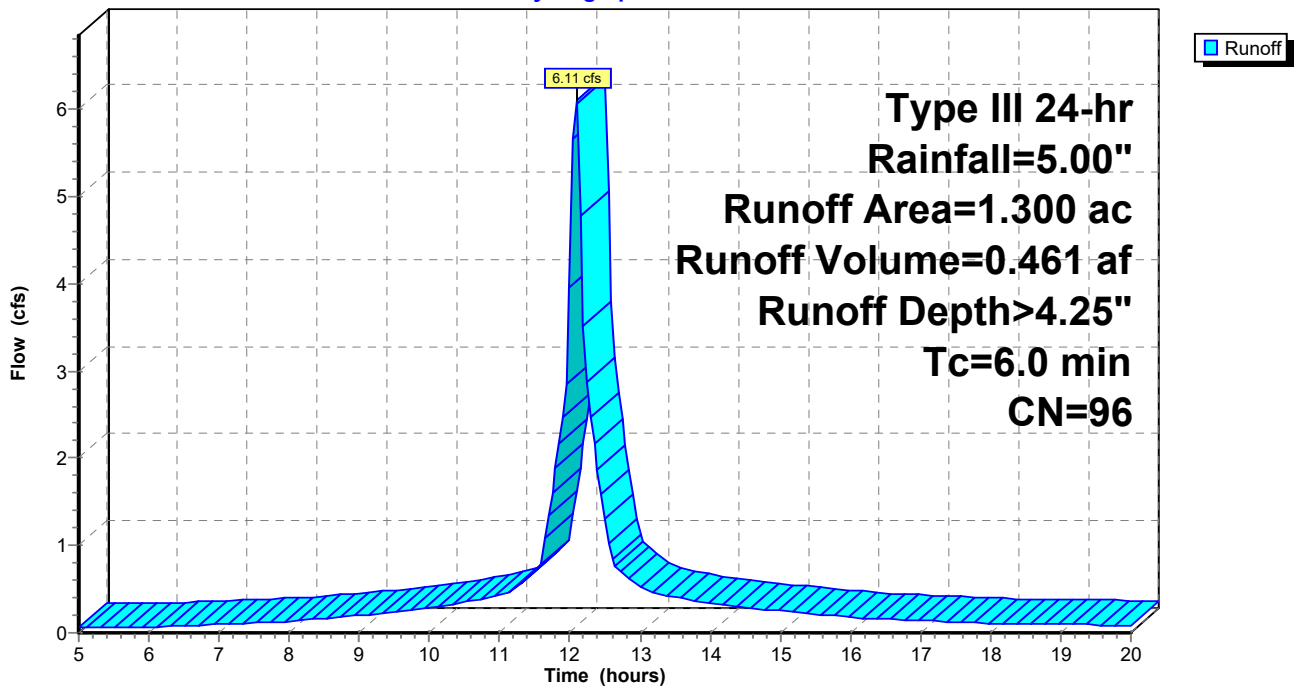
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Type III 24-hr Rainfall=5.00"

| Area (ac) | CN | Description |
|-----------|----|-------------|
| * 1.300   | 96 |             |

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

**Subcatchment 3: Lower Fleet Area**

Hydrograph



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Type III 24-hr Rainfall=5.00"

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**Summary for Subcatchment 3B: Hanover Garage**

Runoff = 12.69 cfs @ 12.09 hrs, Volume= 0.957 af, Depth> 4.25"

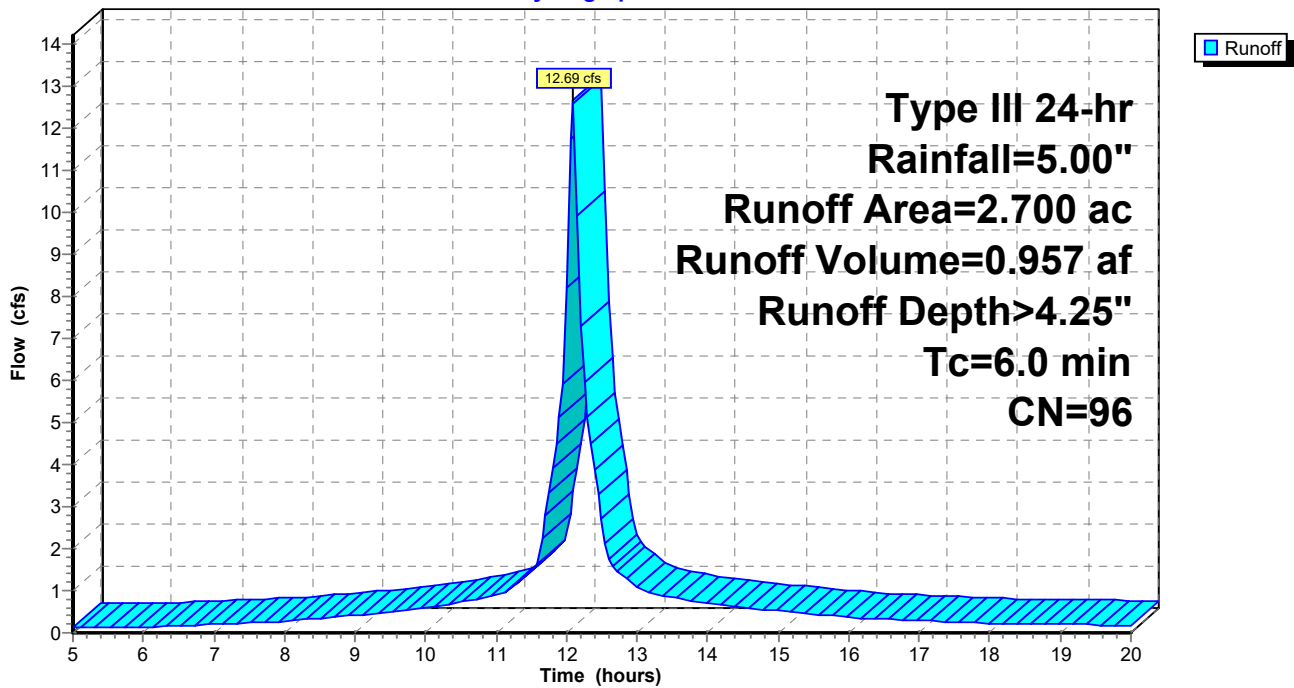
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Type III 24-hr Rainfall=5.00"

| Area (ac) | CN | Description |
|-----------|----|-------------|
| * 2.700   | 96 |             |

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

**Subcatchment 3B: Hanover Garage**

Hydrograph



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Type III 24-hr Rainfall=5.00"

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**Summary for Subcatchment 4: Portwalk North & Upper Hanover**

Runoff = 17.23 cfs @ 12.11 hrs, Volume= 1.320 af, Depth> 3.86"

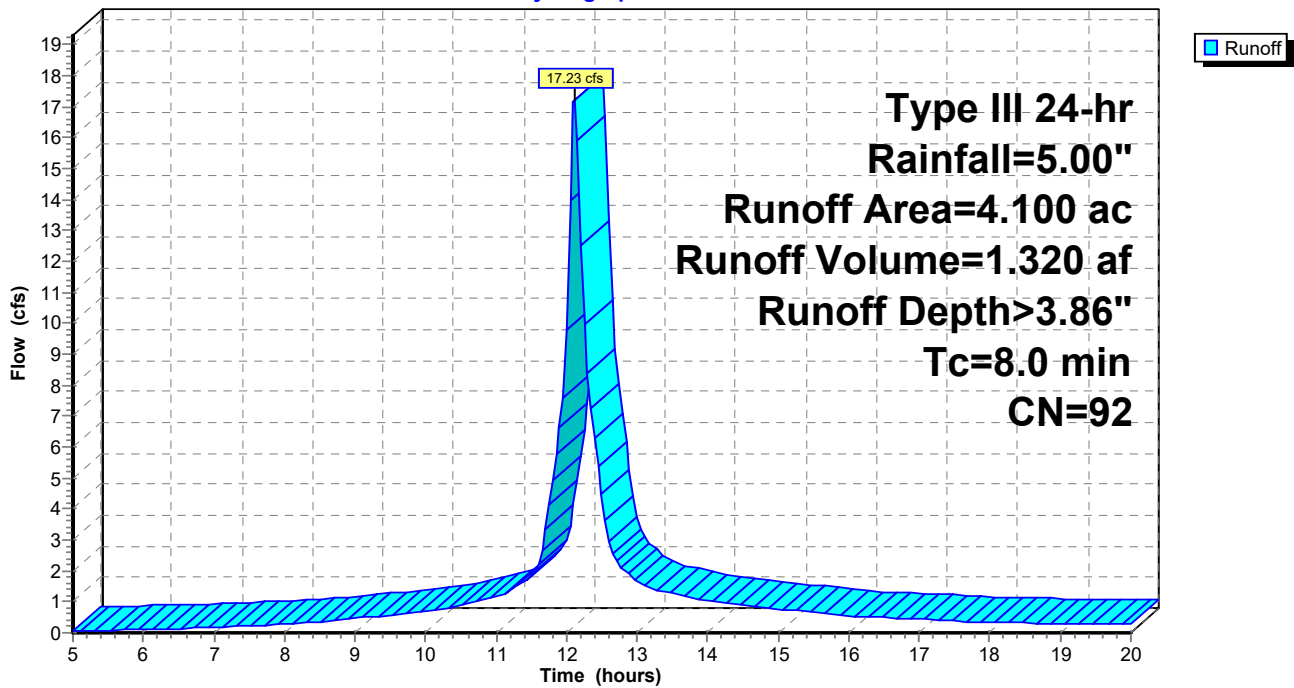
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Type III 24-hr Rainfall=5.00"

| Area (ac) | CN | Description |
|-----------|----|-------------|
| * 4.100   | 92 |             |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description   |
|----------|---------------|---------------|-------------------|----------------|---------------|
| 8.0      |               |               |                   |                | Direct Entry, |

**Subcatchment 4: Portwalk North & Upper Hanover**

Hydrograph





# EXISTING FLOW PATTERN

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Type III 24-hr Rainfall=5.00"

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## Summary for Subcatchment 5S: Chestnut St. Area

Runoff = 9.63 cfs @ 12.09 hrs, Volume= 0.711 af, Depth> 4.06"

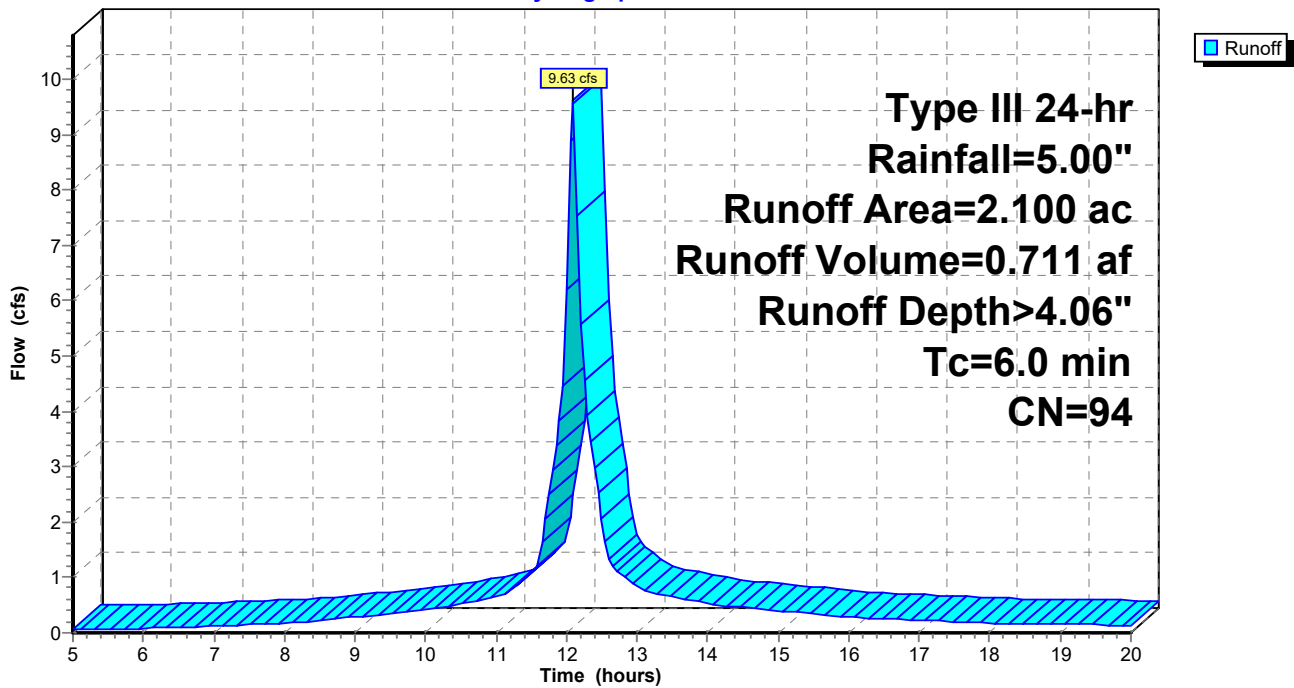
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Type III 24-hr Rainfall=5.00"

| Area (ac) | CN | Description |
|-----------|----|-------------|
| * 2.100   | 94 |             |

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

## Subcatchment 5S: Chestnut St. Area

Hydrograph



# EXISTING FLOW PATTERN

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Type III 24-hr Rainfall=5.00"

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## Summary for Subcatchment 6S: Congress St. Area

Runoff = 5.05 cfs @ 12.09 hrs, Volume= 0.373 af, Depth> 4.06"

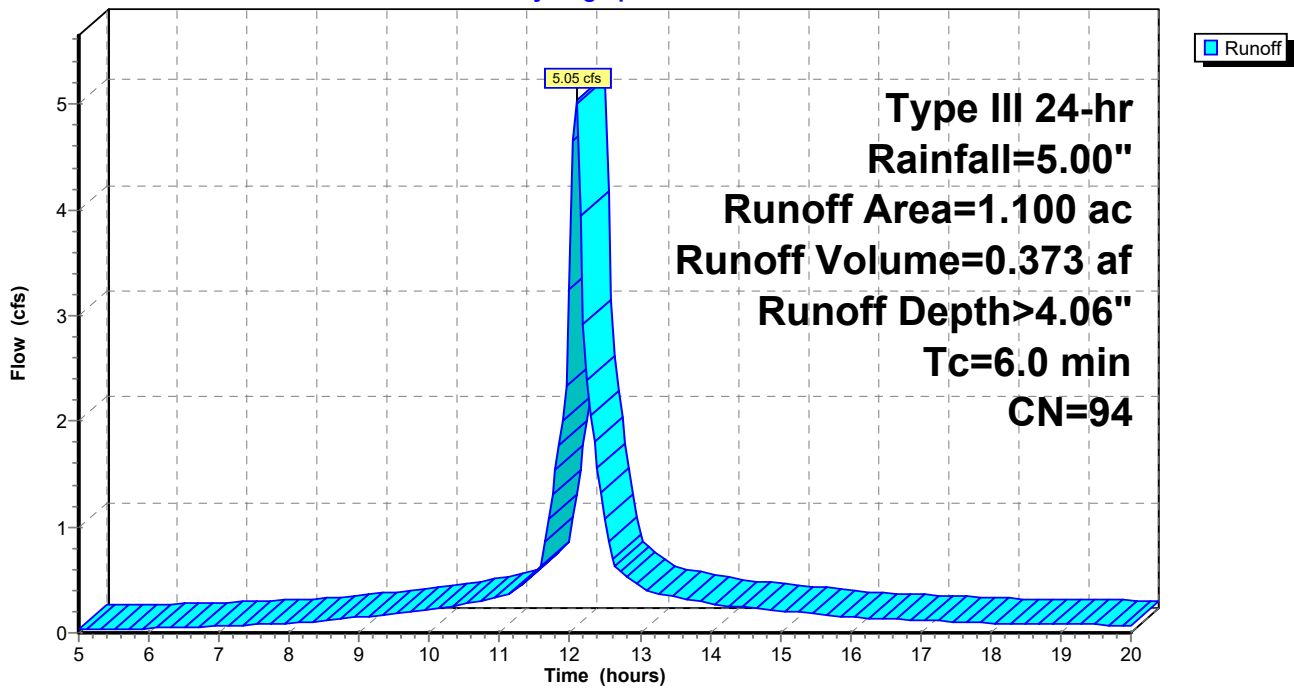
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Type III 24-hr Rainfall=5.00"

| Area (ac) | CN | Description |
|-----------|----|-------------|
| * 1.100   | 94 |             |

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

## Subcatchment 6S: Congress St. Area

Hydrograph



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Type III 24-hr Rainfall=5.00"

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## Summary for Subcatchment 7: Worth Lot Drainage

Runoff = 6.42 cfs @ 12.09 hrs, Volume= 0.474 af, Depth> 4.06"

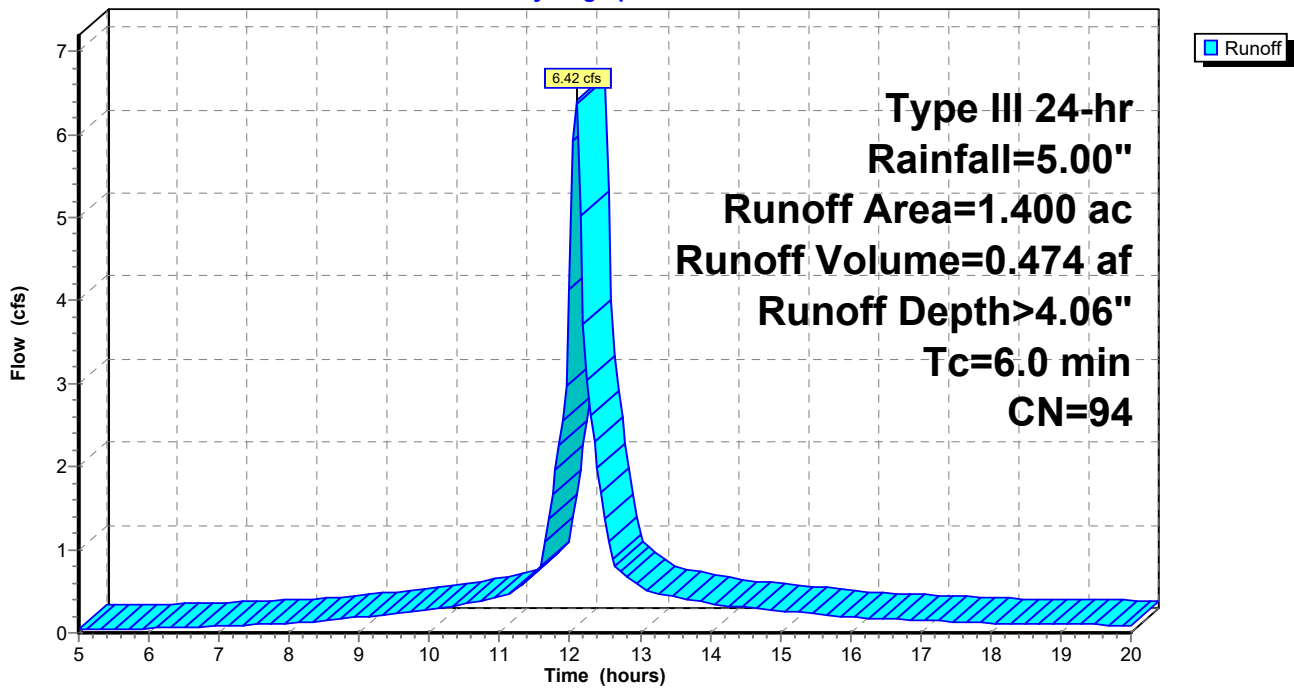
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Type III 24-hr Rainfall=5.00"

| Area (ac) | CN | Description |
|-----------|----|-------------|
| * 1.400   | 94 |             |

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

## Subcatchment 7: Worth Lot Drainage

Hydrograph



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Type III 24-hr Rainfall=5.00"

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**Summary for Subcatchment 8: 8**

Runoff = 8.46 cfs @ 12.09 hrs, Volume= 0.638 af, Depth> 4.25"

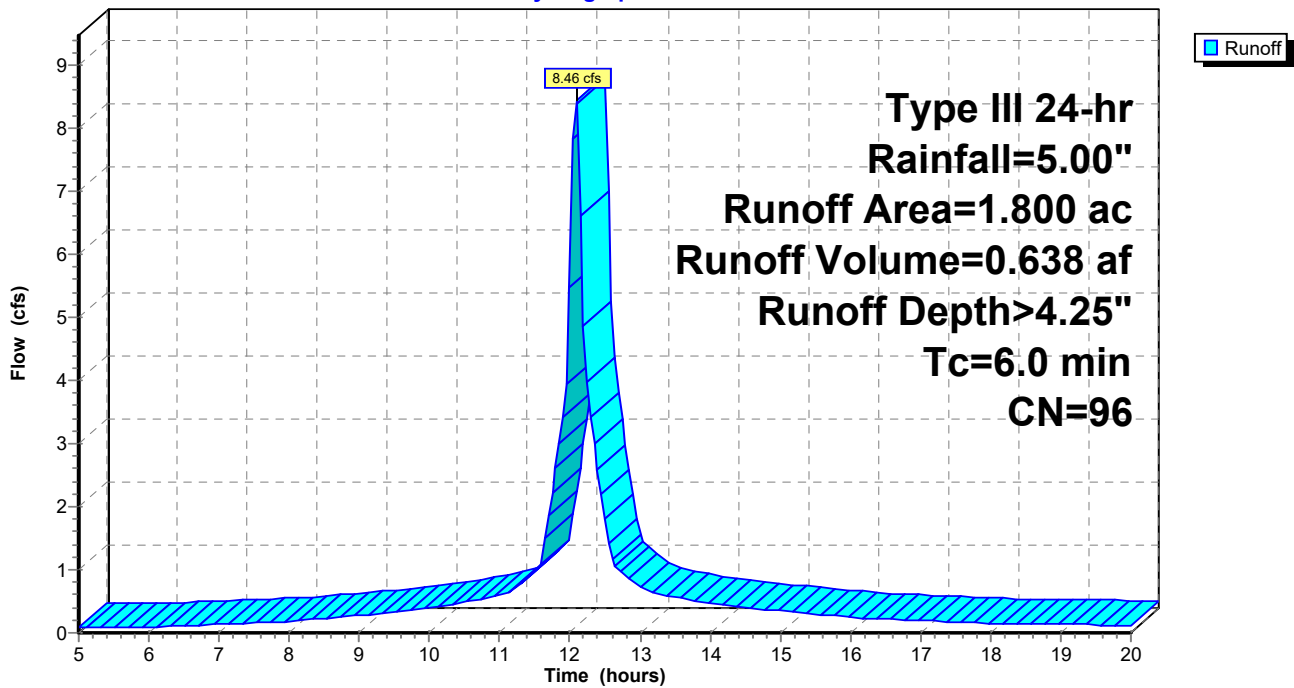
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Type III 24-hr Rainfall=5.00"

| Area (ac) | CN | Description |
|-----------|----|-------------|
| * 1.800   | 96 |             |

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

**Subcatchment 8: 8**

Hydrograph



**EXISTING FLOW PATTERN**

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Type III 24-hr Rainfall=5.00"

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**Summary for Subcatchment 8A: Portwalk**

Runoff = 5.34 cfs @ 12.09 hrs, Volume= 0.386 af, Depth> 3.86"

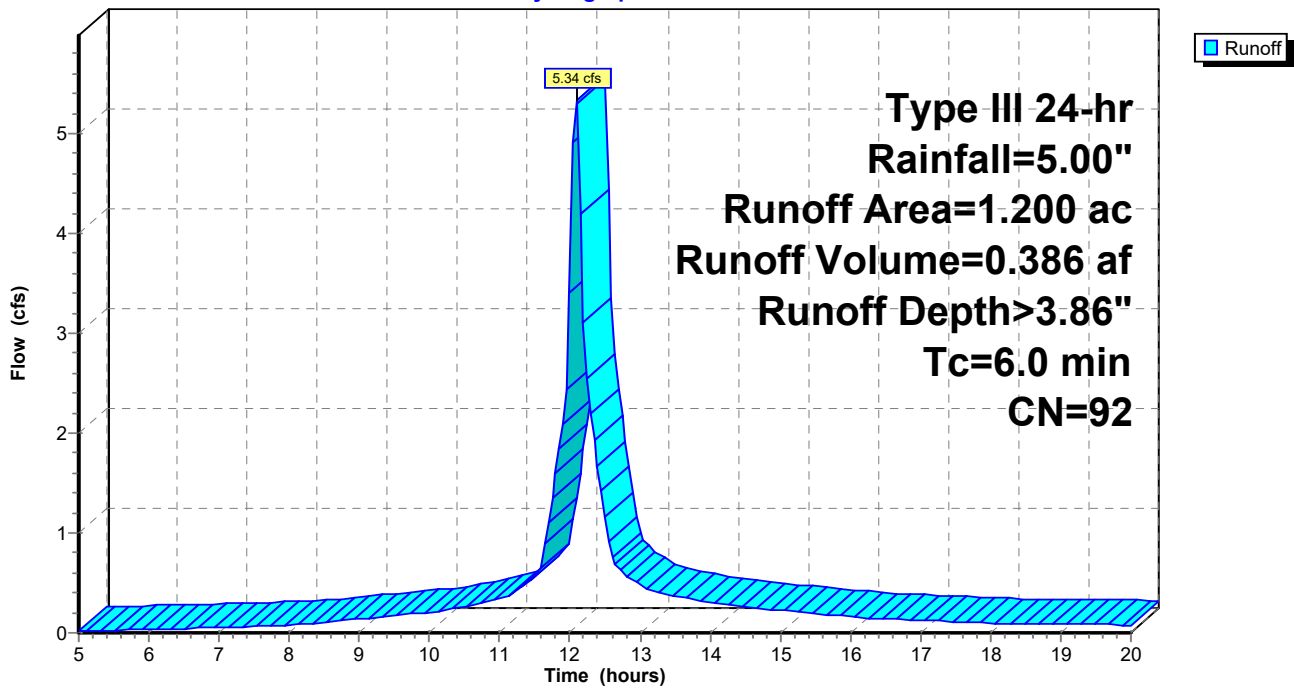
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Type III 24-hr Rainfall=5.00"

| Area (ac) | CN | Description |
|-----------|----|-------------|
| * 1.200   | 92 |             |

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

**Subcatchment 8A: Portwalk**

Hydrograph



**EXISTING FLOW PATTERN**

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Type III 24-hr Rainfall=5.00"

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**Summary for Subcatchment 9S: Maplewood**

Runoff = 25.08 cfs @ 12.12 hrs, Volume= 1.931 af, Depth> 3.46"

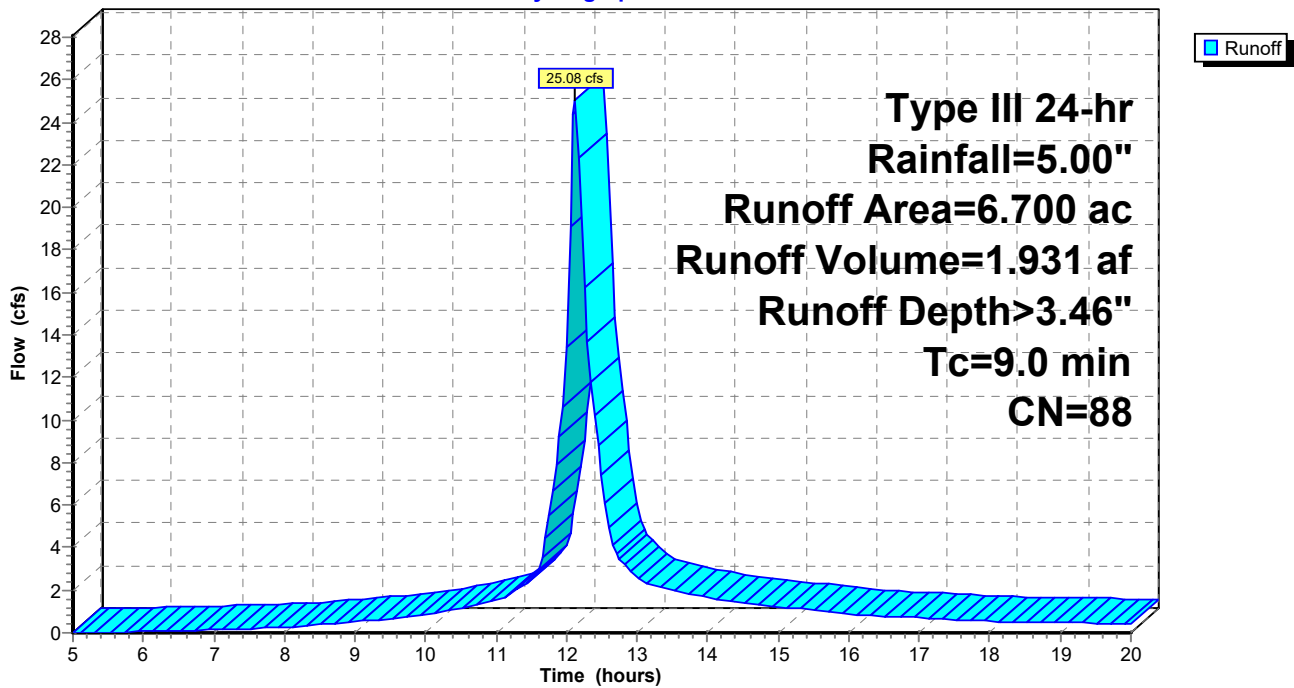
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Type III 24-hr Rainfall=5.00"

| Area (ac) | CN | Description |
|-----------|----|-------------|
| * 6.700   | 88 |             |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description   |
|----------|---------------|---------------|-------------------|----------------|---------------|
| 9.0      |               |               |                   |                | Direct Entry, |

**Subcatchment 9S: Maplewood**

Hydrograph



**EXISTING FLOW PATTERN**

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Type III 24-hr Rainfall=5.00"

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**Summary for Subcatchment 10S: Bridge St. Area**

Runoff = 20.01 cfs @ 12.09 hrs, Volume= 1.449 af, Depth> 3.86"

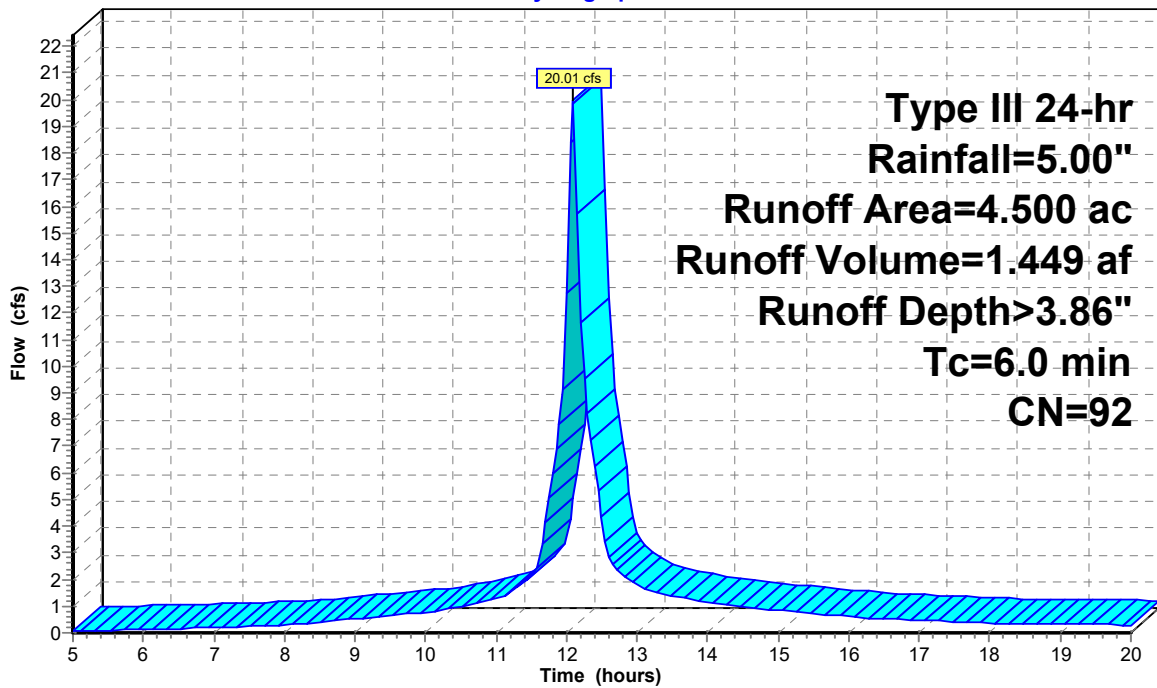
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Type III 24-hr Rainfall=5.00"

| Area (ac) | CN | Description |
|-----------|----|-------------|
| * 4.500   | 92 |             |

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

**Subcatchment 10S: Bridge St. Area**

Hydrograph



Runoff

**Type III 24-hr  
Rainfall=5.00"  
Runoff Area=4.500 ac  
Runoff Volume=1.449 af  
Runoff Depth>3.86"  
Tc=6.0 min  
CN=92**

**EXISTING FLOW PATTERN**

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Type III 24-hr Rainfall=5.00"

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**Summary for Subcatchment 11S: Parking Garage/Lot**

Runoff = 9.17 cfs @ 12.09 hrs, Volume= 0.677 af, Depth> 4.06"

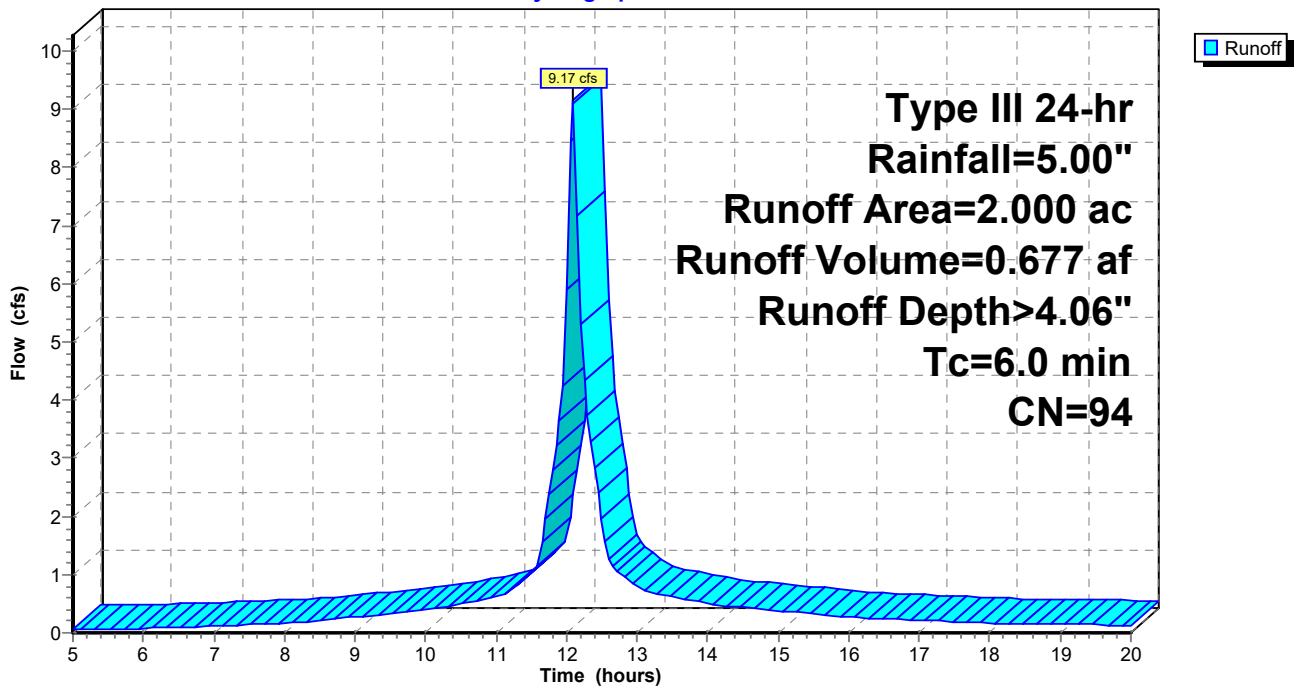
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Type III 24-hr Rainfall=5.00"

| Area (ac) | CN | Description |
|-----------|----|-------------|
| * 2.000   | 94 |             |

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

**Subcatchment 11S: Parking Garage/Lot**

Hydrograph





**EXISTING FLOW PATTERN**

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Type III 24-hr Rainfall=5.00"

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**Summary for Subcatchment 12S: Maplewood/Deer Street area**

Runoff = 14.80 cfs @ 12.14 hrs, Volume= 1.150 af, Depth> 3.07"

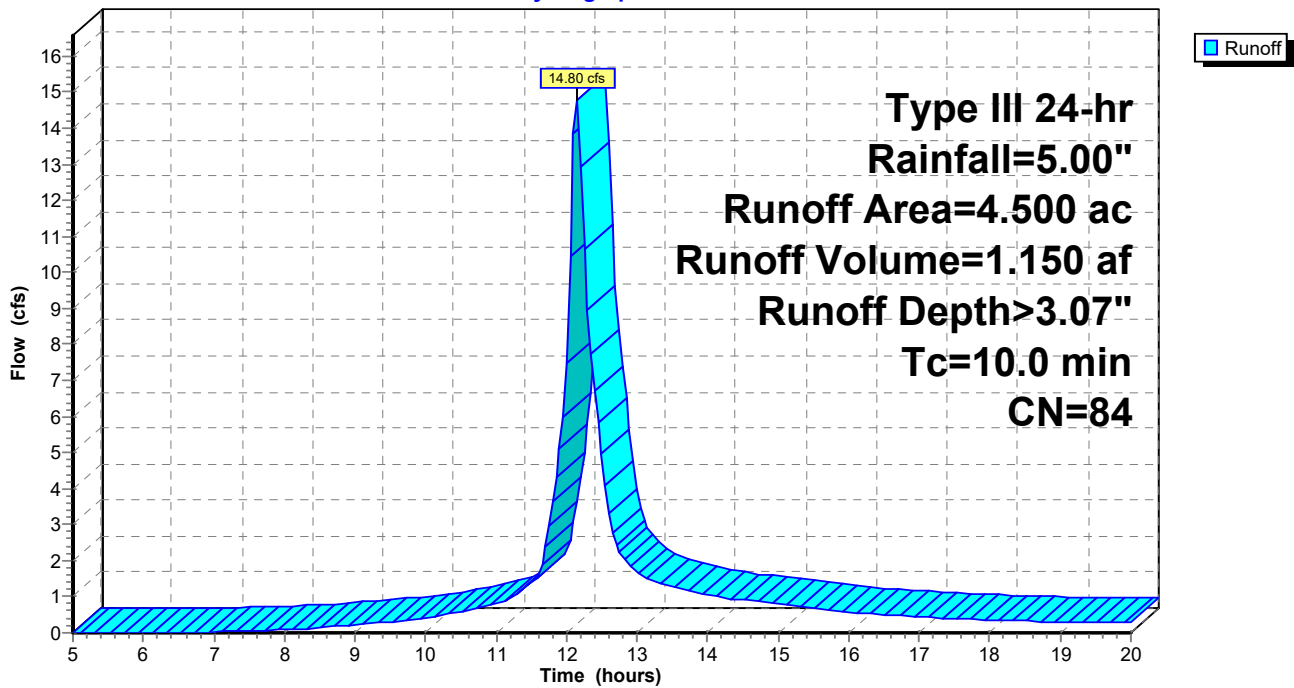
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Type III 24-hr Rainfall=5.00"

| Area (ac) | CN | Description |
|-----------|----|-------------|
| * 4.500   | 84 |             |

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

**Subcatchment 12S: Maplewood/Deer Street area**

Hydrograph



# EXISTING FLOW PATTERN

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Type III 24-hr Rainfall=5.00"

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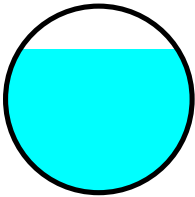
## Summary for Reach 1R: Fleet St. (from Porter to Congress)

Inflow Area = 2.500 ac, Inflow Depth > 4.06"  
Inflow = 11.47 cfs @ 12.09 hrs, Volume= 0.847 af  
Outflow = 11.30 cfs @ 12.10 hrs, Volume= 0.846 af, Atten= 1%, Lag= 0.7 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Max. Velocity= 7.86 fps, Min. Travel Time= 0.4 min  
Avg. Velocity = 3.19 fps, Avg. Travel Time= 0.9 min

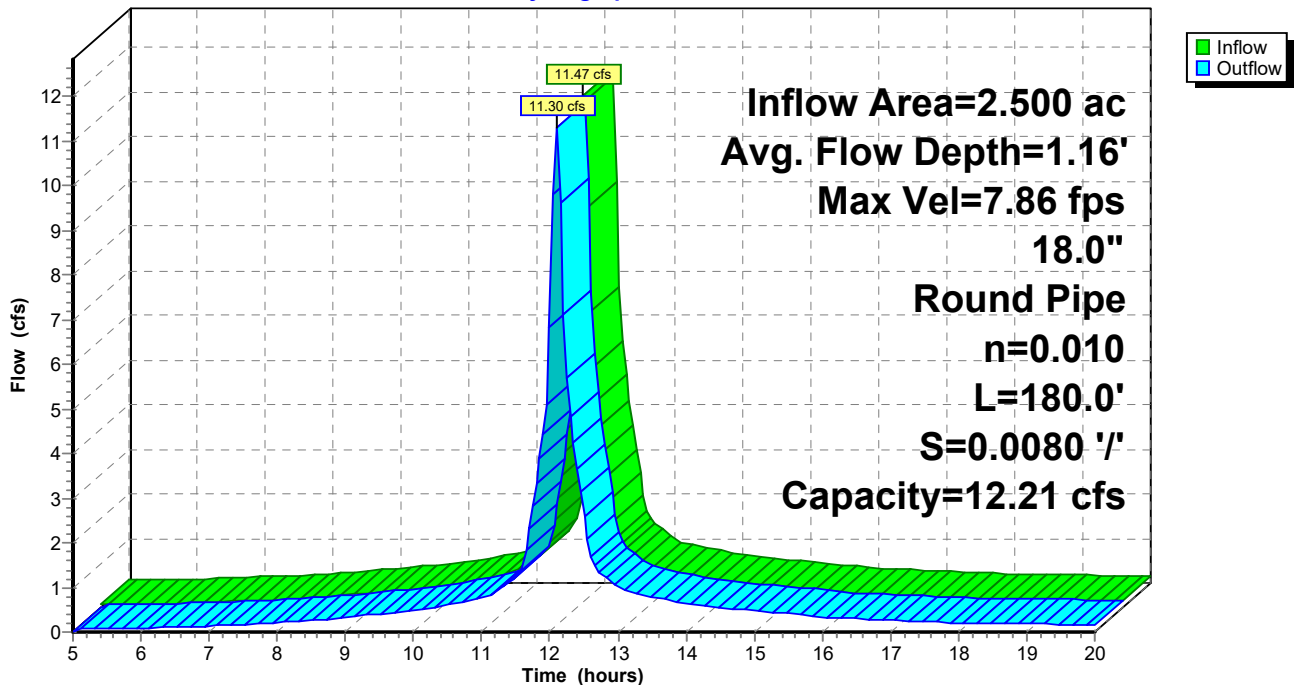
Peak Storage= 263 cf @ 12.09 hrs  
Average Depth at Peak Storage= 1.16'  
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 12.21 cfs

18.0" Round Pipe  
n= 0.010  
Length= 180.0' Slope= 0.0080 '/'  
Inlet Invert= 0.00', Outlet Invert= -1.44'



## Reach 1R: Fleet St. (from Porter to Congress)

Hydrograph



# EXISTING FLOW PATTERN

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Type III 24-hr Rainfall=5.00"

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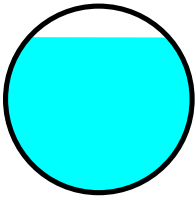
## Summary for Reach 2R: Fleet St. (West of Congress)

Inflow Area = 3.600 ac, Inflow Depth > 4.12"  
Inflow = 16.44 cfs @ 12.09 hrs, Volume= 1.236 af  
Outflow = 15.95 cfs @ 12.11 hrs, Volume= 1.235 af, Atten= 3%, Lag= 1.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Max. Velocity= 5.84 fps, Min. Travel Time= 0.6 min  
Avg. Velocity = 2.45 fps, Avg. Travel Time= 1.4 min

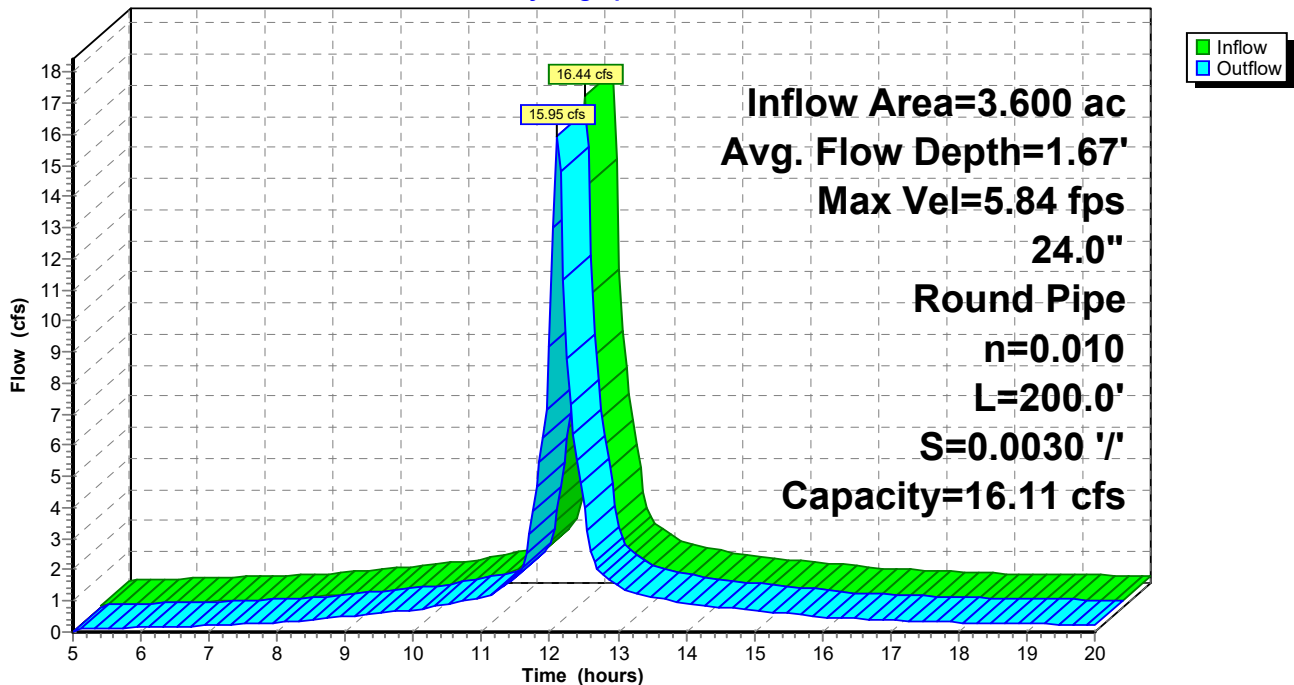
Peak Storage= 559 cf @ 12.10 hrs  
Average Depth at Peak Storage= 1.67'  
Bank-Full Depth= 2.00' Flow Area= 3.1 sf, Capacity= 16.11 cfs

24.0" Round Pipe  
n= 0.010  
Length= 200.0' Slope= 0.0030 '/'  
Inlet Invert= 0.00', Outlet Invert= -0.60'



## Reach 2R: Fleet St. (West of Congress)

Hydrograph



# EXISTING FLOW PATTERN

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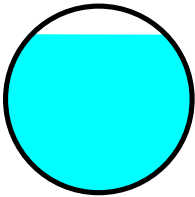
## Summary for Reach 3R: To Hanover St.

Inflow Area = 1.300 ac, Inflow Depth > 4.25"  
Inflow = 6.11 cfs @ 12.09 hrs, Volume= 0.461 af  
Outflow = 6.05 cfs @ 12.09 hrs, Volume= 0.461 af, Atten= 1%, Lag= 0.4 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Max. Velocity= 5.51 fps, Min. Travel Time= 0.2 min  
Avg. Velocity = 2.33 fps, Avg. Travel Time= 0.6 min

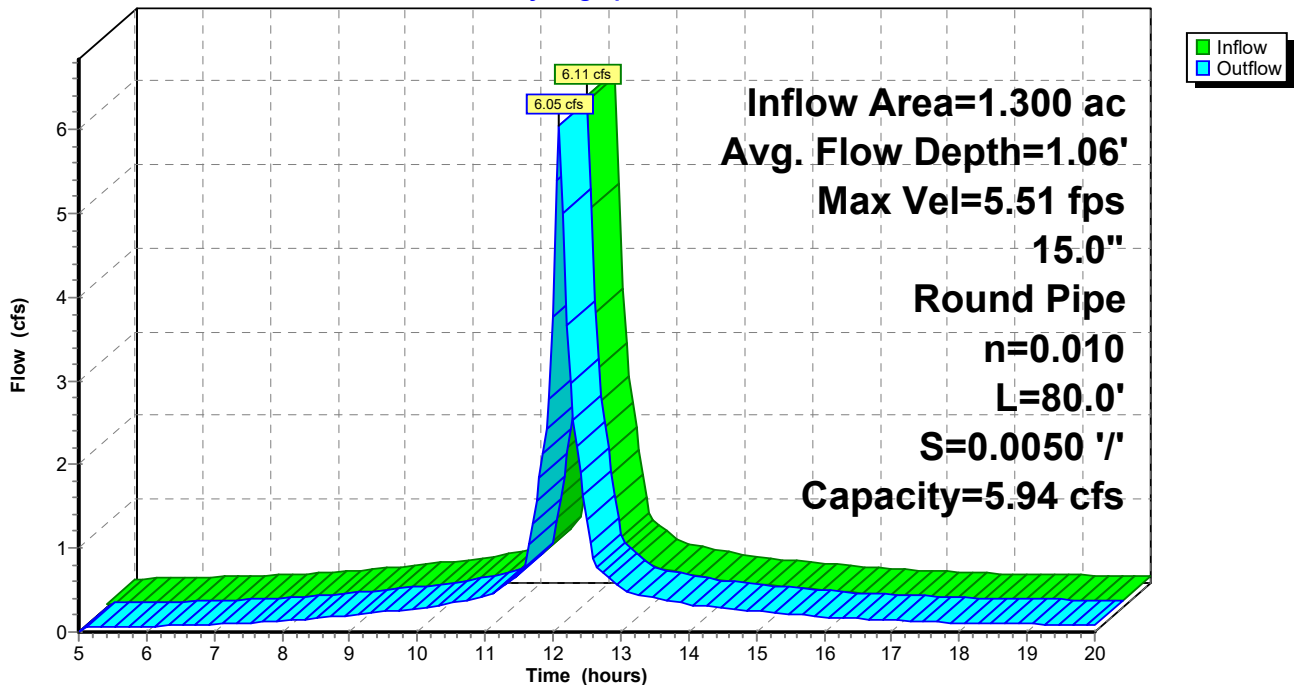
Peak Storage= 89 cf @ 12.09 hrs  
Average Depth at Peak Storage= 1.06'  
Bank-Full Depth= 1.25' Flow Area= 1.2 sf, Capacity= 5.94 cfs

15.0" Round Pipe  
n= 0.010  
Length= 80.0' Slope= 0.0050 '/'  
Inlet Invert= 0.00', Outlet Invert= -0.40'



## Reach 3R: To Hanover St.

Hydrograph



# EXISTING FLOW PATTERN

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Type III 24-hr Rainfall=5.00"

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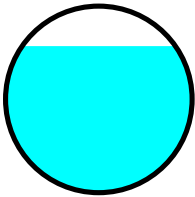
## Summary for Reach 4R: Hanover - Downstream from Fleet

Inflow Area = 8.100 ac, Inflow Depth > 4.06"  
Inflow = 35.74 cfs @ 12.10 hrs, Volume= 2.738 af  
Outflow = 35.13 cfs @ 12.11 hrs, Volume= 2.736 af, Atten= 2%, Lag= 0.6 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Max. Velocity= 8.62 fps, Min. Travel Time= 0.3 min  
Avg. Velocity = 3.57 fps, Avg. Travel Time= 0.8 min

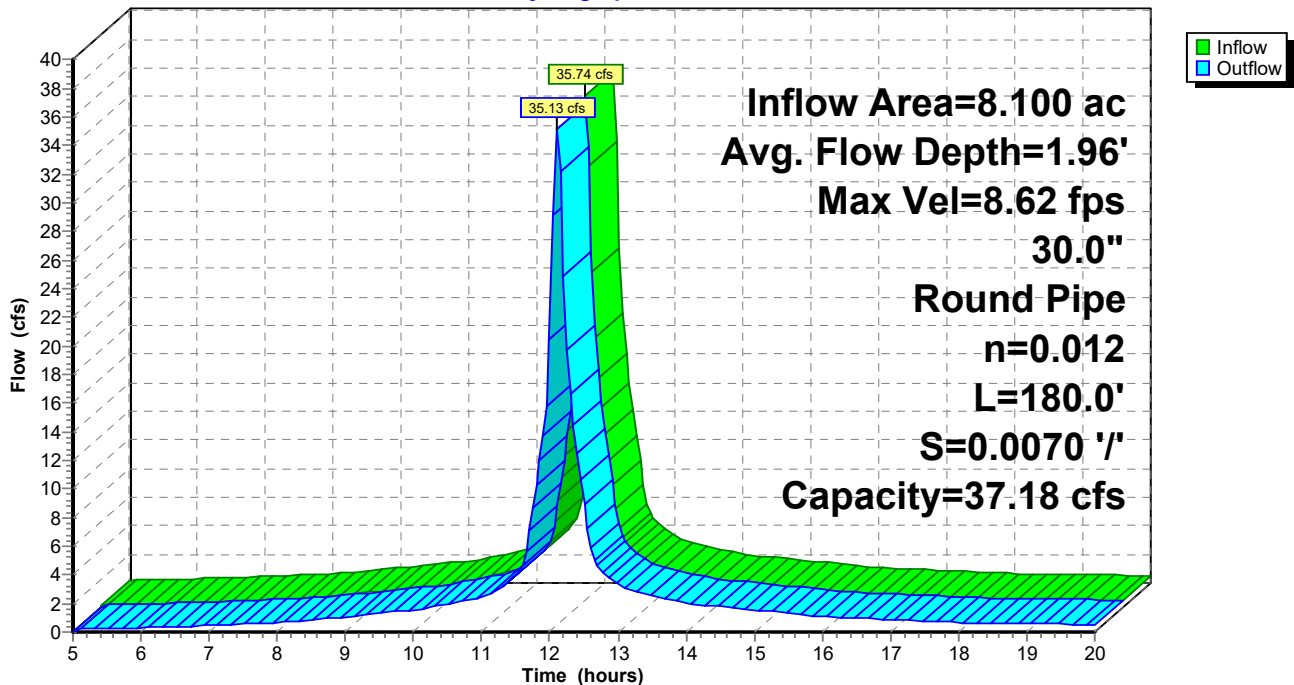
Peak Storage= 744 cf @ 12.10 hrs  
Average Depth at Peak Storage= 1.96'  
Bank-Full Depth= 2.50' Flow Area= 4.9 sf, Capacity= 37.18 cfs

30.0" Round Pipe  
n= 0.012  
Length= 180.0' Slope= 0.0070 '/'  
Inlet Invert= 0.00', Outlet Invert= -1.26'



## Reach 4R: Hanover - Downstream from Fleet

Hydrograph



# EXISTING FLOW PATTERN

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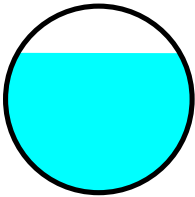
## Summary for Reach 5R: Congress to Vaughn Mall

Inflow Area = 5.700 ac, Inflow Depth > 4.10"  
Inflow = 25.40 cfs @ 12.10 hrs, Volume= 1.946 af  
Outflow = 25.21 cfs @ 12.11 hrs, Volume= 1.946 af, Atten= 1%, Lag= 0.3 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Max. Velocity= 10.08 fps, Min. Travel Time= 0.2 min  
Avg. Velocity = 4.12 fps, Avg. Travel Time= 0.4 min

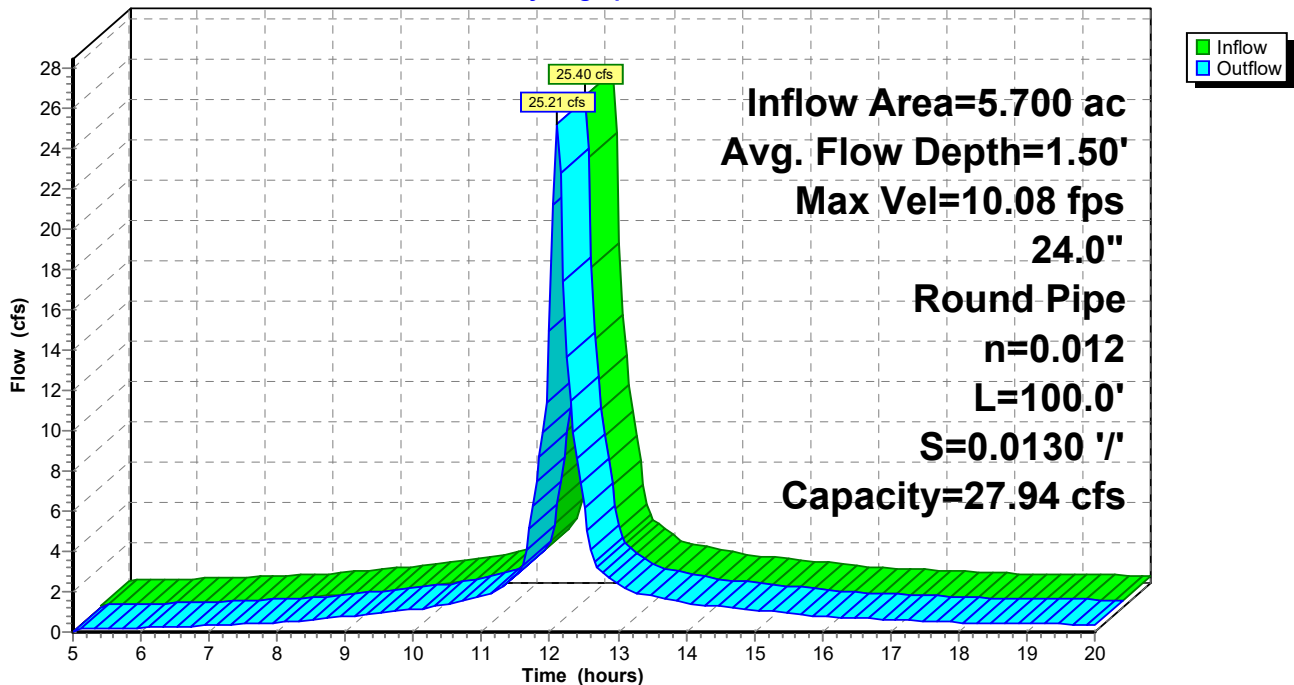
Peak Storage= 252 cf @ 12.10 hrs  
Average Depth at Peak Storage= 1.50'  
Bank-Full Depth= 2.00' Flow Area= 3.1 sf, Capacity= 27.94 cfs

24.0" Round Pipe  
n= 0.012  
Length= 100.0' Slope= 0.0130 '/'  
Inlet Invert= 0.00', Outlet Invert= -1.30'



## Reach 5R: Congress to Vaughn Mall

Hydrograph



# EXISTING FLOW PATTERN

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Type III 24-hr Rainfall=5.00"

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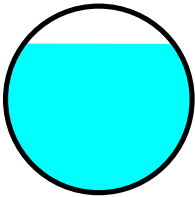
## Summary for Reach 6R: Upper Vaughn Mall

Inflow Area = 6.800 ac, Inflow Depth > 4.09"  
Inflow = 30.18 cfs @ 12.10 hrs, Volume= 2.318 af  
Outflow = 29.74 cfs @ 12.11 hrs, Volume= 2.318 af, Atten= 1%, Lag= 0.5 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Max. Velocity= 11.19 fps, Min. Travel Time= 0.3 min  
Avg. Velocity = 4.65 fps, Avg. Travel Time= 0.7 min

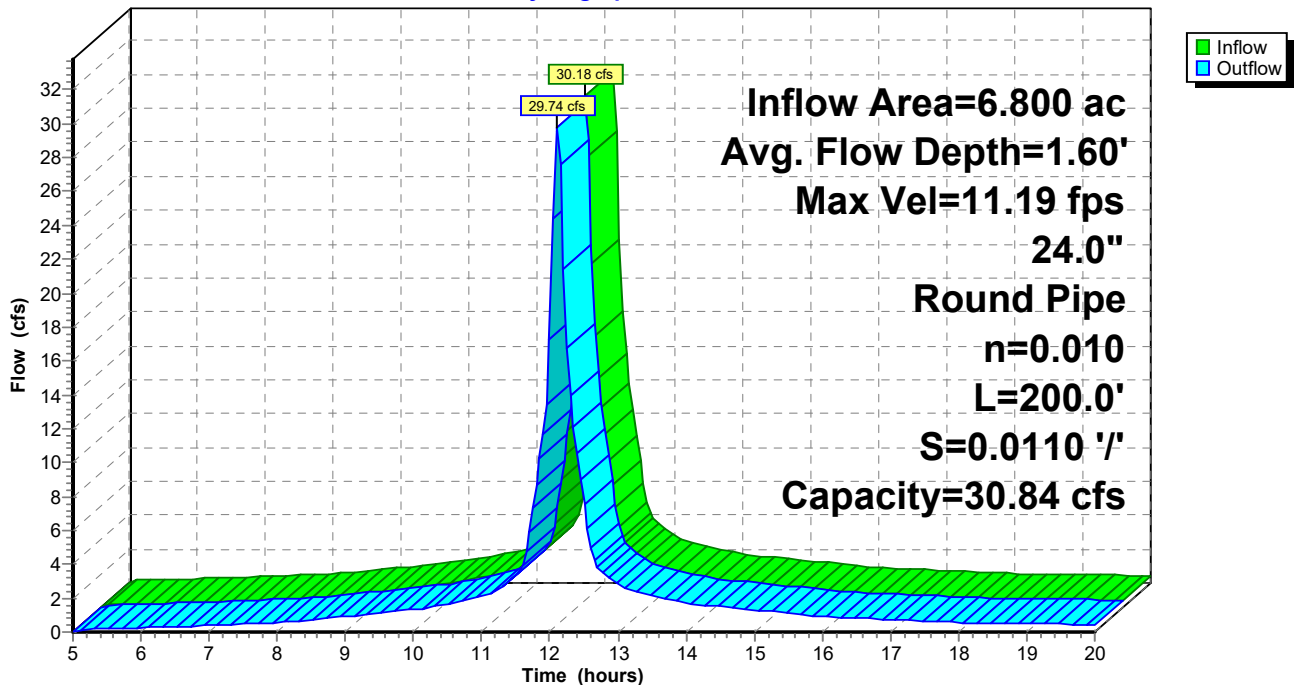
Peak Storage= 538 cf @ 12.11 hrs  
Average Depth at Peak Storage= 1.60'  
Bank-Full Depth= 2.00' Flow Area= 3.1 sf, Capacity= 30.84 cfs

24.0" Round Pipe  
n= 0.010  
Length= 200.0' Slope= 0.0110 '/'  
Inlet Invert= 0.00', Outlet Invert= -2.20'



## Reach 6R: Upper Vaughn Mall

Hydrograph



# EXISTING FLOW PATTERN

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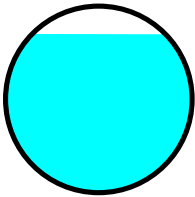
## Summary for Reach 7R: Lower Vaughn Mall to Hanover

Inflow Area = 8.200 ac, Inflow Depth > 4.09"  
Inflow = 35.99 cfs @ 12.11 hrs, Volume= 2.792 af  
Outflow = 35.62 cfs @ 12.11 hrs, Volume= 2.791 af, Atten= 1%, Lag= 0.4 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Max. Velocity= 12.61 fps, Min. Travel Time= 0.2 min  
Avg. Velocity = 5.35 fps, Avg. Travel Time= 0.5 min

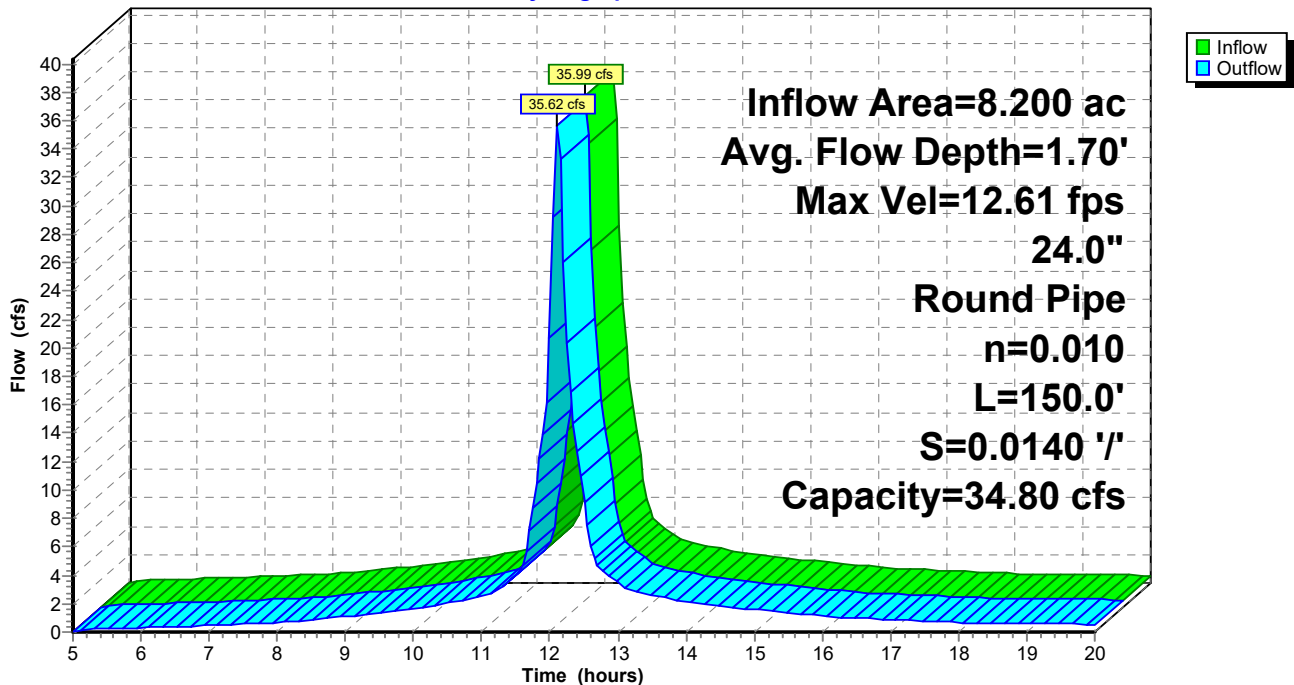
Peak Storage= 427 cf @ 12.11 hrs  
Average Depth at Peak Storage= 1.70'  
Bank-Full Depth= 2.00' Flow Area= 3.1 sf, Capacity= 34.80 cfs

24.0" Round Pipe  
n= 0.010  
Length= 150.0' Slope= 0.0140 '/'  
Inlet Invert= 0.00', Outlet Invert= -2.10'



## Reach 7R: Lower Vaughn Mall to Hanover

Hydrograph





**EXISTING FLOW PATTERN**

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Type III 24-hr Rainfall=5.00"

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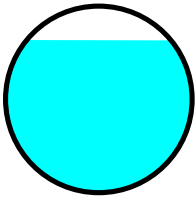
**Summary for Reach 8R: Exist. 36" RCP, Downstream of V. Mall**

Inflow Area = 17.500 ac, Inflow Depth > 4.06"  
 Inflow = 75.93 cfs @ 12.11 hrs, Volume= 5.914 af  
 Outflow = 74.85 cfs @ 12.12 hrs, Volume= 5.912 af, Atten= 1%, Lag= 0.5 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
 Max. Velocity= 12.22 fps, Min. Travel Time= 0.3 min  
 Avg. Velocity = 5.13 fps, Avg. Travel Time= 0.6 min

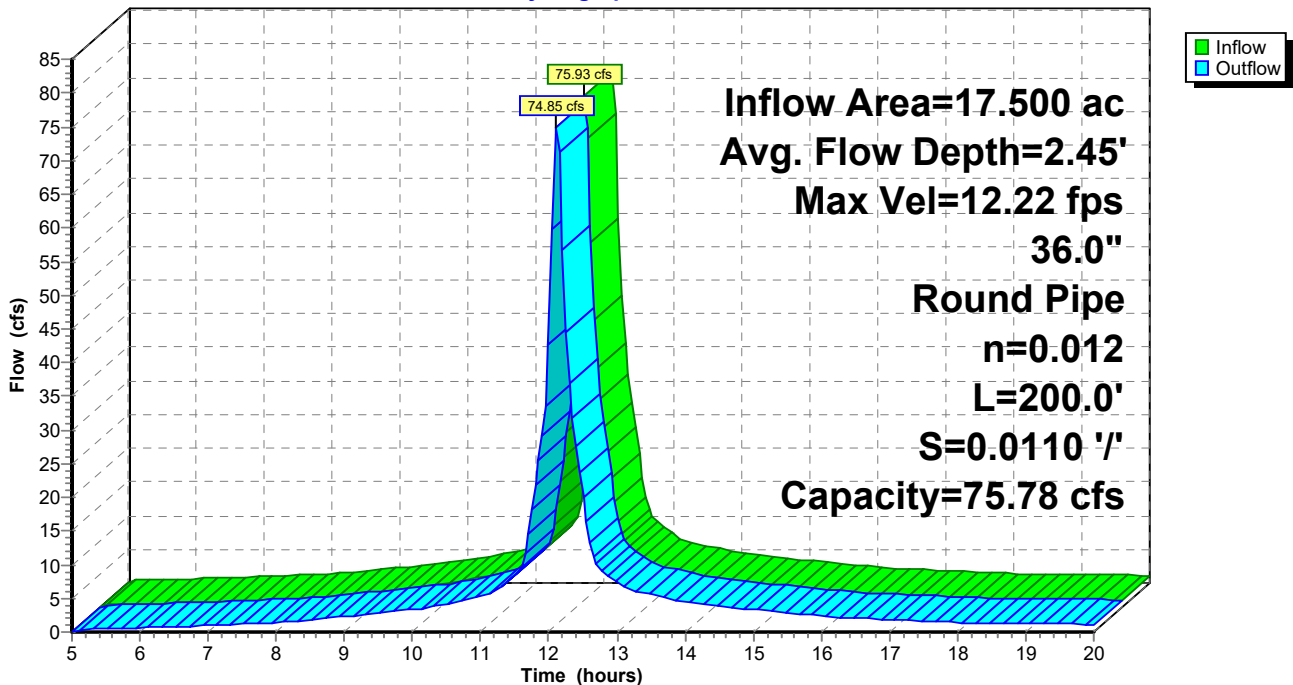
Peak Storage= 1,237 cf @ 12.11 hrs  
 Average Depth at Peak Storage= 2.45'  
 Bank-Full Depth= 3.00' Flow Area= 7.1 sf, Capacity= 75.78 cfs

36.0" Round Pipe  
 n= 0.012  
 Length= 200.0' Slope= 0.0110 '/'  
 Inlet Invert= 0.00', Outlet Invert= -2.20'



**Reach 8R: Exist. 36" RCP, Downstream of V. Mall**

Hydrograph



# EXISTING FLOW PATTERN

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Type III 24-hr Rainfall=5.00"

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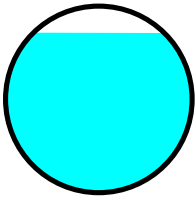
## Summary for Reach 9R: Existr 36" from Han. Sag

Inflow Area = 19.300 ac, Inflow Depth > 4.07"  
Inflow = 82.94 cfs @ 12.11 hrs, Volume= 6.550 af  
Outflow = 81.35 cfs @ 12.13 hrs, Volume= 6.548 af, Atten= 2%, Lag= 0.7 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Max. Velocity= 12.76 fps, Min. Travel Time= 0.3 min  
Avg. Velocity = 5.45 fps, Avg. Travel Time= 0.8 min

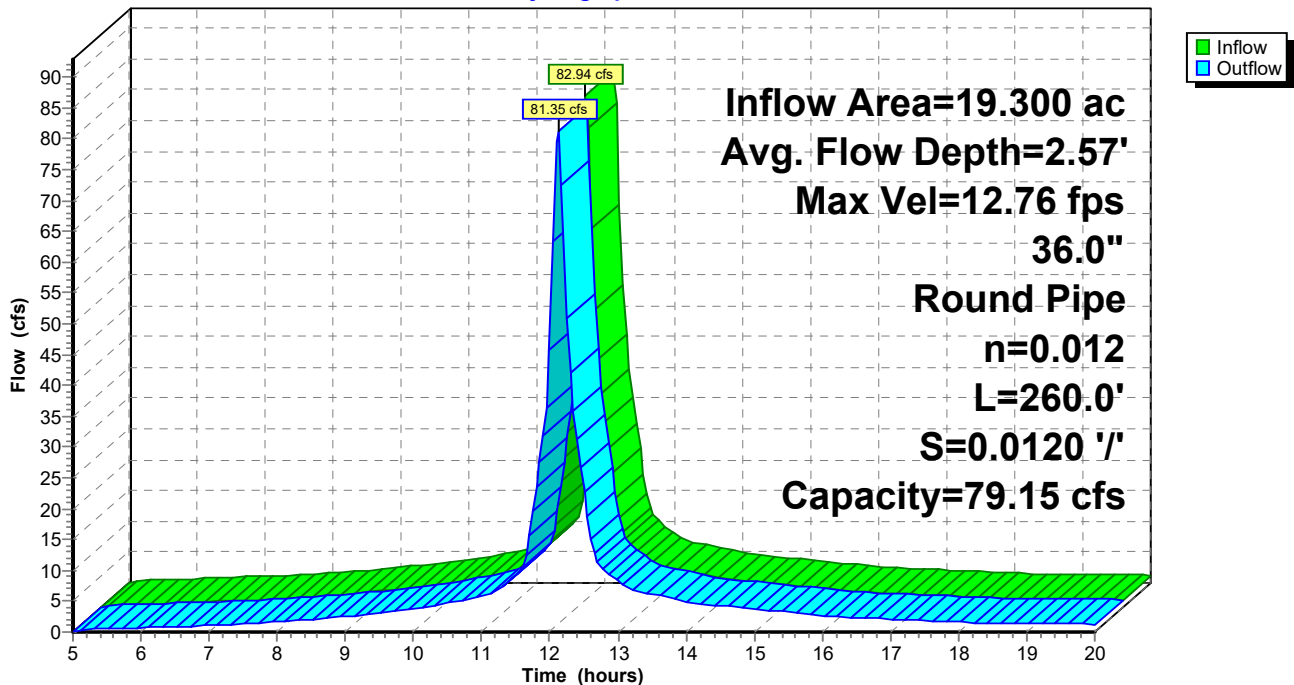
Peak Storage= 1,681 cf @ 12.12 hrs  
Average Depth at Peak Storage= 2.57'  
Bank-Full Depth= 3.00' Flow Area= 7.1 sf, Capacity= 79.15 cfs

36.0" Round Pipe  
n= 0.012  
Length= 260.0' Slope= 0.0120 '/'  
Inlet Invert= 0.00', Outlet Invert= -3.12'



## Reach 9R: Existr 36" from Han. Sag

Hydrograph



# EXISTING FLOW PATTERN

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Type III 24-hr Rainfall=5.00"

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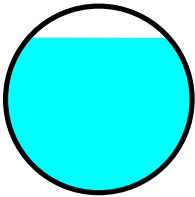
## Summary for Reach 10R: Upper Bridge St.

Inflow Area = 26.000 ac, Inflow Depth > 3.91"  
Inflow = 106.28 cfs @ 12.13 hrs, Volume= 8.478 af  
Outflow = 105.46 cfs @ 12.14 hrs, Volume= 8.475 af, Atten= 1%, Lag= 0.7 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Max. Velocity= 9.50 fps, Min. Travel Time= 0.3 min  
Avg. Velocity = 4.01 fps, Avg. Travel Time= 0.7 min

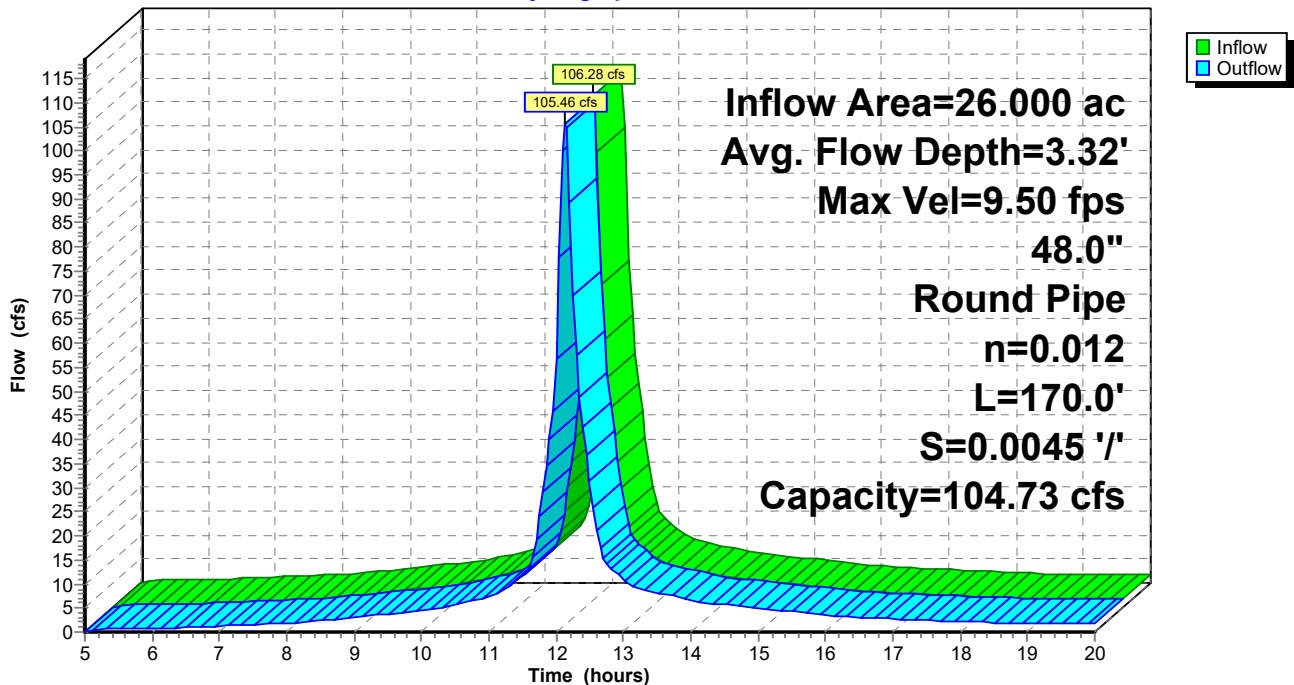
Peak Storage= 1,900 cf @ 12.13 hrs  
Average Depth at Peak Storage= 3.32'  
Bank-Full Depth= 4.00' Flow Area= 12.6 sf, Capacity= 104.73 cfs

48.0" Round Pipe  
n= 0.012  
Length= 170.0' Slope= 0.0045 '/'  
Inlet Invert= 0.00', Outlet Invert= -0.77'



## Reach 10R: Upper Bridge St.

Hydrograph



# EXISTING FLOW PATTERN

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Type III 24-hr Rainfall=5.00"

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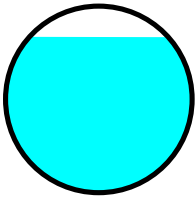
## Summary for Reach 11R: Bridge Street Sag

Inflow Area = 30.500 ac, Inflow Depth > 3.90"  
Inflow = 122.72 cfs @ 12.13 hrs, Volume= 9.925 af  
Outflow = 122.01 cfs @ 12.14 hrs, Volume= 9.922 af, Atten= 1%, Lag= 0.6 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Max. Velocity= 10.93 fps, Min. Travel Time= 0.2 min  
Avg. Velocity = 4.63 fps, Avg. Travel Time= 0.6 min

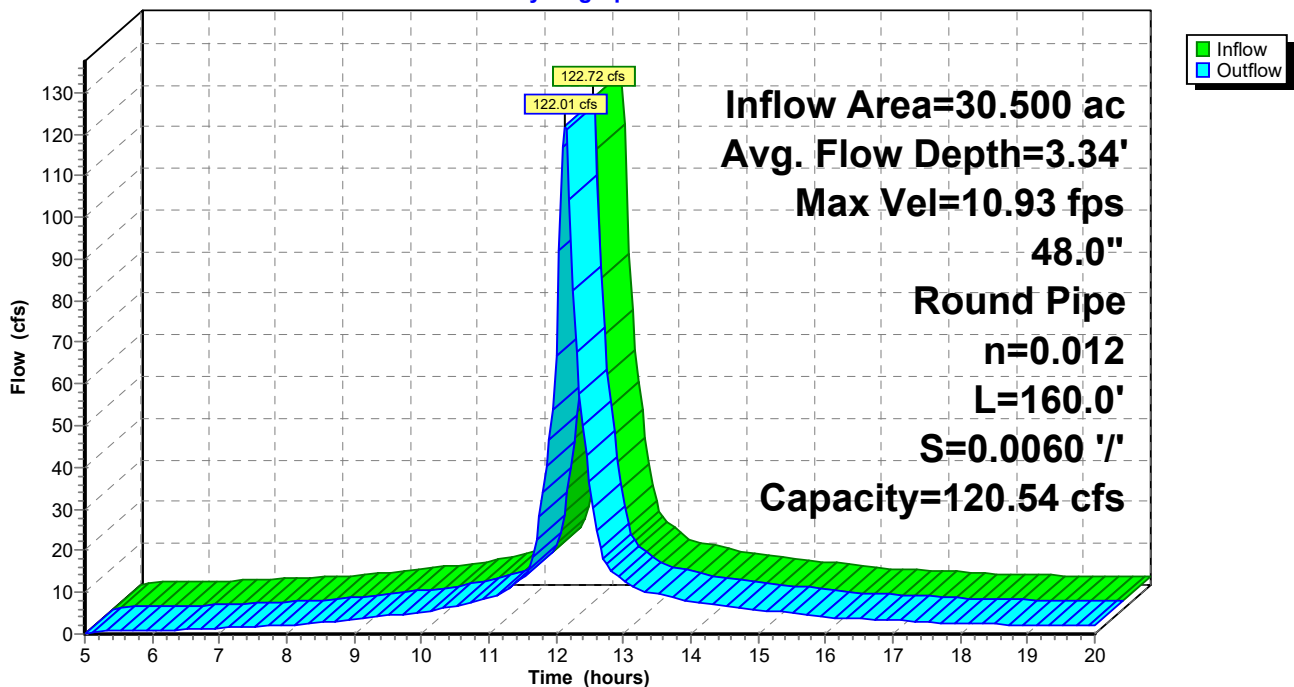
Peak Storage= 1,795 cf @ 12.13 hrs  
Average Depth at Peak Storage= 3.34'  
Bank-Full Depth= 4.00' Flow Area= 12.6 sf, Capacity= 120.54 cfs

48.0" Round Pipe  
n= 0.012  
Length= 160.0' Slope= 0.0060 '/'  
Inlet Invert= 0.00', Outlet Invert= -0.96'



## Reach 11R: Bridge Street Sag

Hydrograph



# EXISTING FLOW PATTERN

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Type III 24-hr Rainfall=5.00"

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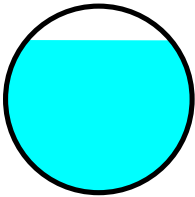
## Summary for Reach 12R: Deer Street

Inflow Area = 32.500 ac, Inflow Depth > 3.91"  
Inflow = 129.83 cfs @ 12.13 hrs, Volume= 10.599 af  
Outflow = 129.15 cfs @ 12.14 hrs, Volume= 10.596 af, Atten= 1%, Lag= 0.5 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Max. Velocity= 11.81 fps, Min. Travel Time= 0.2 min  
Avg. Velocity = 4.98 fps, Avg. Travel Time= 0.5 min

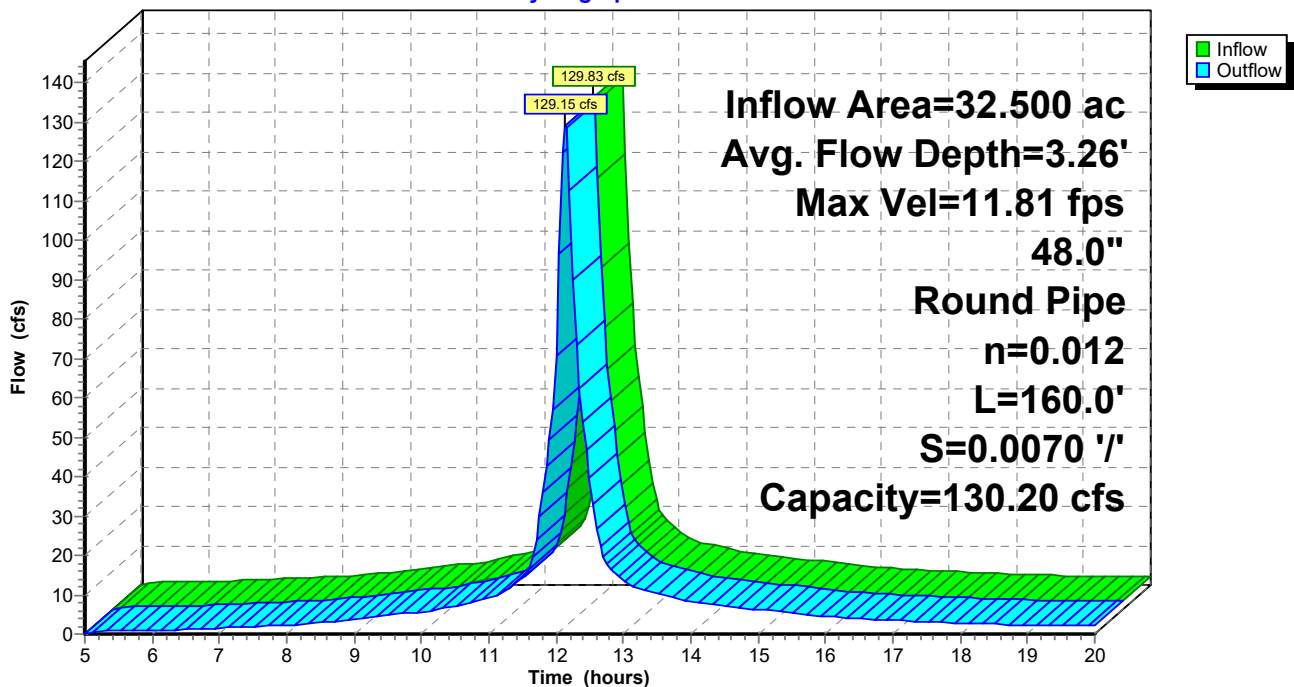
Peak Storage= 1,758 cf @ 12.14 hrs  
Average Depth at Peak Storage= 3.26'  
Bank-Full Depth= 4.00' Flow Area= 12.6 sf, Capacity= 130.20 cfs

48.0" Round Pipe  
n= 0.012  
Length= 160.0' Slope= 0.0070 '/'  
Inlet Invert= 0.00', Outlet Invert= -1.12'



## Reach 12R: Deer Street

Hydrograph



**EXISTING FLOW PATTERN**

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Type III 24-hr Rainfall=5.00"

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**Summary for Pond 13P: Deer Stret Outfall Pipe(s)**

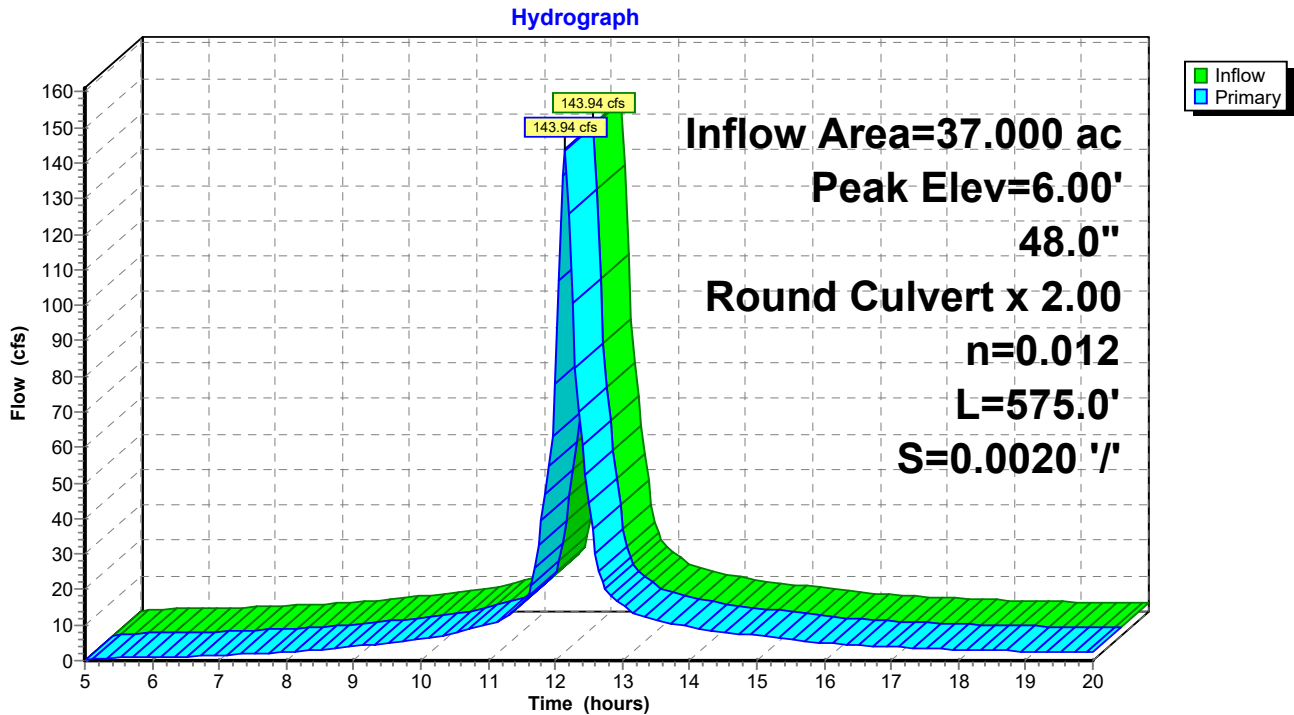
Inflow Area = 37.000 ac, Inflow Depth > 3.81"  
 Inflow = 143.94 cfs @ 12.14 hrs, Volume= 11.746 af  
 Outflow = 143.94 cfs @ 12.14 hrs, Volume= 11.746 af, Atten= 0%, Lag= 0.0 min  
 Primary = 143.94 cfs @ 12.14 hrs, Volume= 11.746 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
 Peak Elev= 6.00' @ 12.14 hrs

| Device | Routing | Invert | Outlet Devices  |
|--------|---------|--------|---|
| #1     | Primary | 0.00'  | <b>48.0" Round Twin Culverts X 2.00</b><br>L= 575.0' RCP, sq.cut end projecting, Ke= 0.500<br>Inlet / Outlet Invert= 0.00' / -1.15' S= 0.0020 '/ Cc= 0.900<br>n= 0.012, Flow Area= 12.57 sf |

**Primary OutFlow** Max=141.87 cfs @ 12.14 hrs HW=5.94' TW=4.00' (Fixed TW Elev= 4.00')  
 ↳1=Twin Culverts (Outlet Controls 141.87 cfs @ 5.64 fps)

**Pond 13P: Deer Stret Outfall Pipe(s)**



**APPENDIX 4**  
**DRAINAGE OUTFALL PROJECT**  
**POST-PROJECT HYDROLOGY CALCULATIONS**



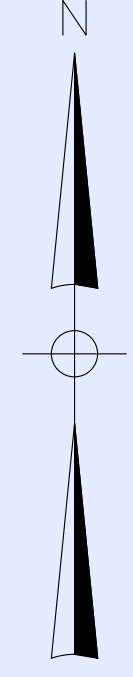


# Deer Street Outfall & Fleet Street Drainage Areas Portsmouth, New Hampshire ~~November 2020~~

Project Conditions  
October 2022

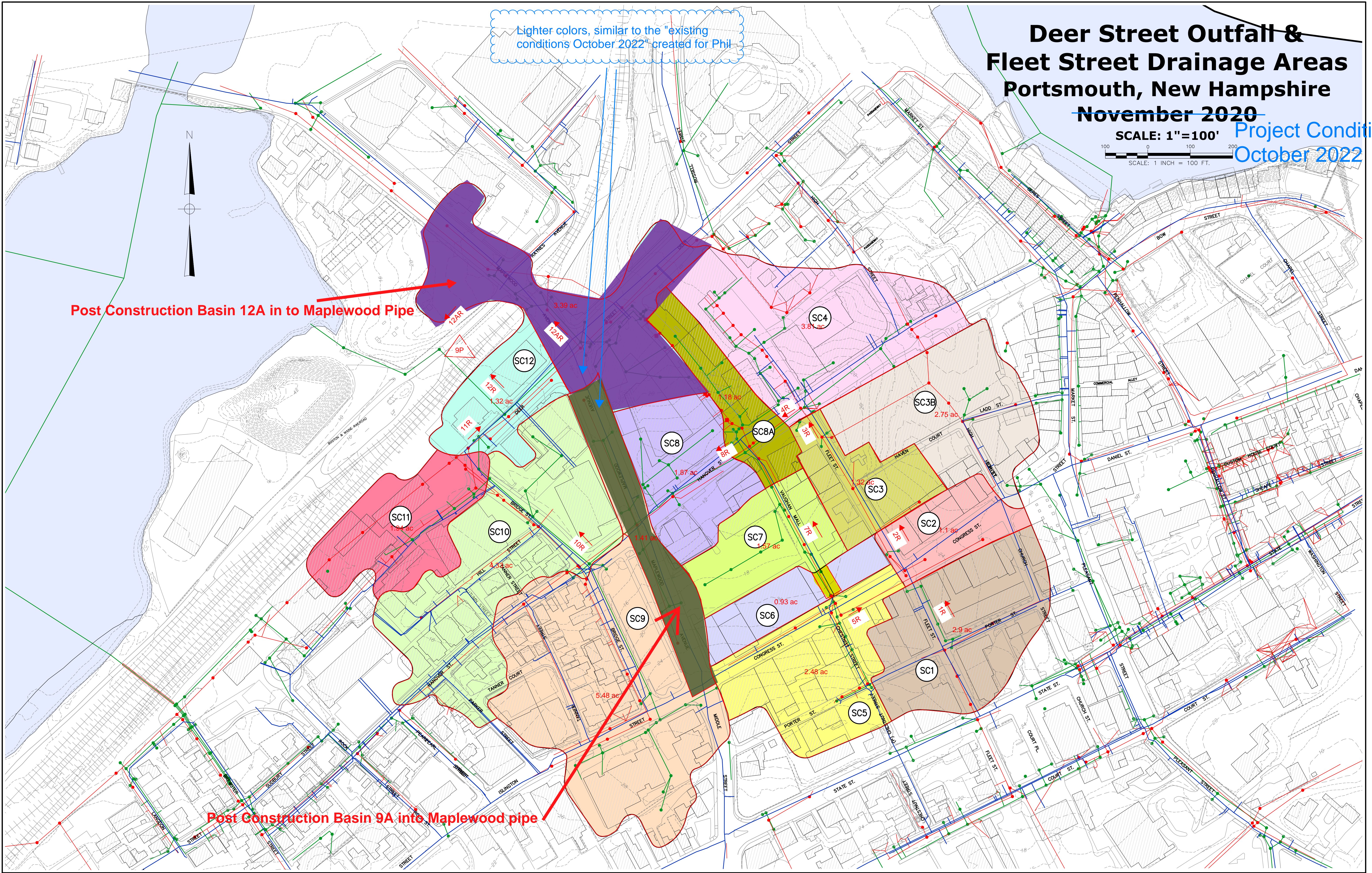
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SCALE: 1 INCH = 100 FT.

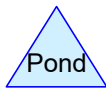
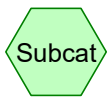
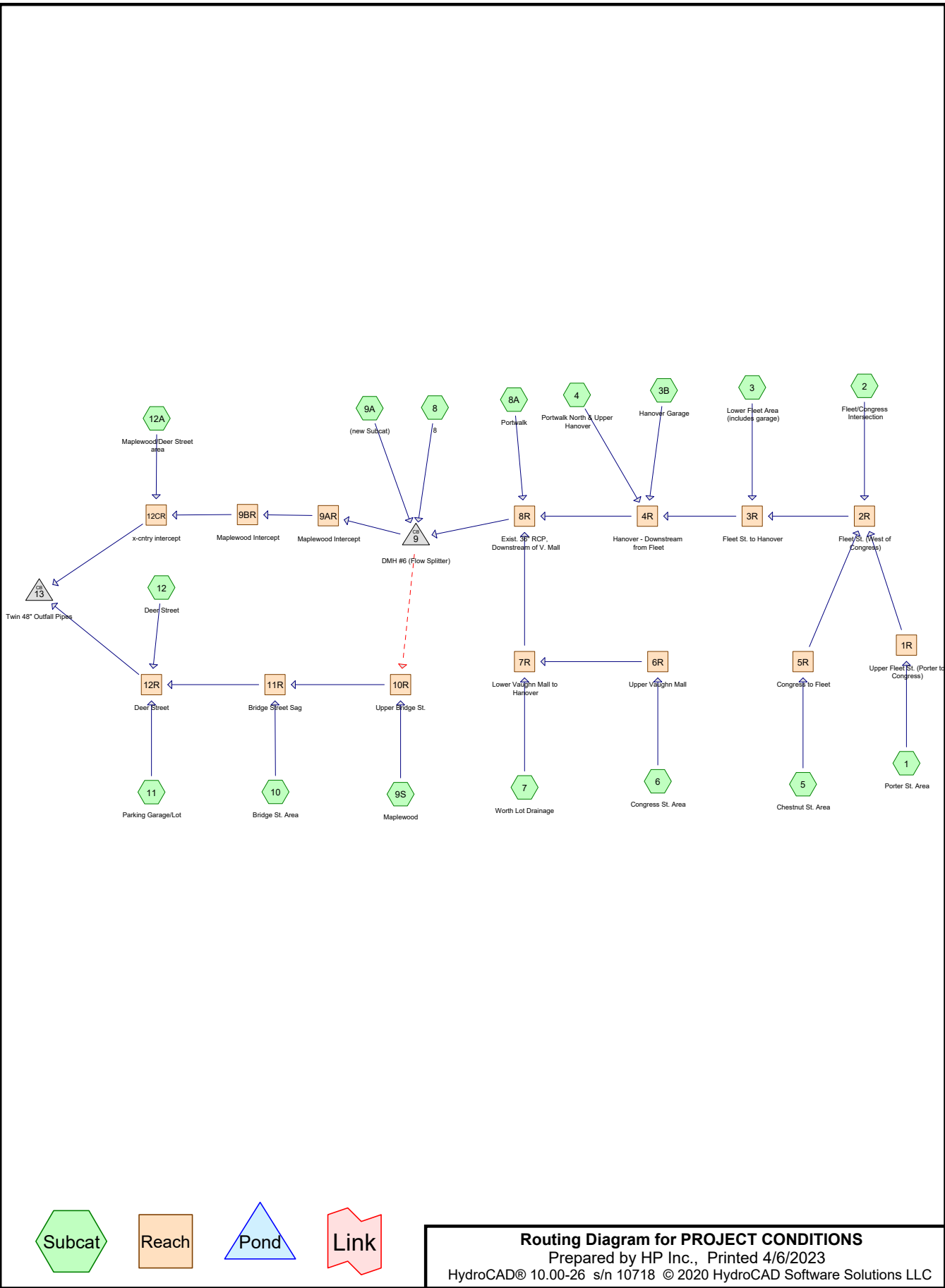
Lighter colors, similar to the "existing conditions October 2022" created for Phil



Post Construction Basin 12A in to Maplewood Pipe

Post Construction Basin 9A into Maplewood pipe





**Routing Diagram for PROJECT CONDITIONS**  
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## PROJECT CONDITIONS

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Type III 24-hr Rainfall=5.00"

Printed 4/6/2023

Page 2

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

### Subcatchment1: Porter St. Area

Runoff Area=2.500 ac Runoff Depth>4.31"  
Tc=6.0 min CN=94 Runoff=11.47 cfs 0.897 af

### Subcatchment2: Fleet/Congress Intersection

Runoff Area=1.100 ac Runoff Depth>4.53"  
Tc=6.0 min CN=96 Runoff=5.17 cfs 0.415 af

### Subcatchment3: Lower Fleet Area (includes garage)

Runoff Area=1.300 ac Runoff Depth>4.53"  
Tc=6.0 min CN=96 Runoff=6.11 cfs 0.491 af

### Subcatchment3B: Hanover Garage

Runoff Area=2.700 ac Runoff Depth>4.53"  
Tc=6.0 min CN=96 Runoff=12.69 cfs 1.019 af

### Subcatchment4: Portwalk North & Upper Hanover

Runoff Area=4.100 ac Runoff Depth>4.09"  
Tc=8.0 min CN=92 Runoff=17.23 cfs 1.396 af

### Subcatchment5: Chestnut St. Area

Runoff Area=2.100 ac Runoff Depth>4.31"  
Tc=6.0 min CN=94 Runoff=9.63 cfs 0.753 af

### Subcatchment6: Congress St. Area

Runoff Area=1.100 ac Runoff Depth>4.31"  
Tc=6.0 min CN=94 Runoff=5.05 cfs 0.395 af

### Subcatchment7: Worth Lot Drainage

Runoff Area=1.400 ac Runoff Depth>4.31"  
Tc=6.0 min CN=94 Runoff=6.42 cfs 0.502 af

### Subcatchment8: 8

Runoff Area=1.800 ac Runoff Depth>4.53"  
Tc=6.0 min CN=96 Runoff=8.46 cfs 0.679 af

### Subcatchment8A: Portwalk

Runoff Area=1.200 ac Runoff Depth>4.09"  
Tc=6.0 min CN=92 Runoff=5.34 cfs 0.409 af

### Subcatchment9A: (new Subcat)

Runoff=0.00 cfs 0.000 af

### Subcatchment9S: Maplewood

Runoff Area=6.700 ac Runoff Depth>3.66"  
Tc=9.0 min CN=88 Runoff=25.08 cfs 2.046 af

### Subcatchment10: Bridge St. Area

Runoff Area=4.500 ac Runoff Depth>4.09"  
Tc=6.0 min CN=92 Runoff=20.01 cfs 1.532 af

### Subcatchment11: Parking Garage/Lot

Runoff Area=2.000 ac Runoff Depth>4.31"  
Tc=6.0 min CN=94 Runoff=9.17 cfs 0.718 af

### Subcatchment12: Deer Street

Runoff Area=1.500 ac Runoff Depth>3.27"  
Tc=6.0 min CN=84 Runoff=5.59 cfs 0.408 af

### Subcatchment12A: Maplewood/Deer Street area

Runoff Area=3.000 ac Runoff Depth>3.27"  
Tc=8.0 min CN=84 Runoff=10.53 cfs 0.817 af

## PROJECT CONDITIONS

Type III 24-hr Rainfall=5.00"

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|  |                       |                   |                  |          |
|--|-----------------------|-------------------|------------------|----------|
| <b>Reach 1R: Upper Fleet St. (Porter to</b>              | Avg. Flow Depth=1.23' | Max Vel=7.37 fps  | Inflow=11.47 cfs | 0.897 af |
| 18.0" Round Pipe n=0.010 L=180.0' S=0.0070 '/'           | Capacity=11.43 cfs    | Outflow=11.27 cfs | 0.897 af         |          |
| <b>Reach 2R: Fleet St. (West of Congress)</b>            | Avg. Flow Depth=1.59' | Max Vel=9.54 fps  | Inflow=25.76 cfs | 2.065 af |
| 24.0" Round Pipe n=0.010 L=380.0' S=0.0080 '/'           | Capacity=26.30 cfs    | Outflow=24.86 cfs | 2.064 af         |          |
| <b>Reach 3R: Fleet St. to Hanover</b>                    | Avg. Flow Depth=1.72' | Max Vel=10.67 fps | Inflow=30.71 cfs | 2.555 af |
| 24.0" Round Pipe n=0.010 L=100.0' S=0.0100 '/'           | Capacity=29.41 cfs    | Outflow=30.45 cfs | 2.554 af         |          |
| <b>Reach 4R: Hanover - Downstream from</b>               | Avg. Flow Depth=2.42' | Max Vel=9.75 fps  | Inflow=59.96 cfs | 4.969 af |
| 36.0" Round Pipe n=0.012 L=180.0' S=0.0070 '/'           | Capacity=60.45 cfs    | Outflow=59.02 cfs | 4.968 af         |          |
| <b>Reach 5R: Congress to Fleet</b>                       | Avg. Flow Depth=1.22' | Max Vel=6.23 fps  | Inflow=9.63 cfs  | 0.753 af |
| 18.0" Round Pipe n=0.010 L=220.0' S=0.0050 '/'           | Capacity=9.66 cfs     | Outflow=9.38 cfs  | 0.753 af         |          |
| <b>Reach 6R: Upper Vaughn Mall</b>                       | Avg. Flow Depth=0.83' | Max Vel=5.82 fps  | Inflow=5.05 cfs  | 0.395 af |
| 15.0" Round Pipe n=0.013 L=200.0' S=0.0100 '/'           | Capacity=6.46 cfs     | Outflow=4.93 cfs  | 0.394 af         |          |
| <b>Reach 7R: Lower Vaughn Mall to</b>                    | Avg. Flow Depth=1.17' | Max Vel=5.93 fps  | Inflow=11.31 cfs | 0.897 af |
| 24.0" Round Pipe n=0.013 L=150.0' S=0.0060 '/'           | Capacity=17.52 cfs    | Outflow=11.11 cfs | 0.896 af         |          |
| <b>Reach 8R: Exist. 36" RCP,</b>                         | Avg. Flow Depth=2.55' | Max Vel=11.65 fps | Inflow=75.20 cfs | 6.273 af |
| 36.0" Round Pipe n=0.012 L=200.0' S=0.0100 '/'           | Capacity=72.26 cfs    | Outflow=74.07 cfs | 6.272 af         |          |
| <b>Reach 9AR: Maplewood Intercept</b>                    | Avg. Flow Depth=2.36' | Max Vel=10.93 fps | Inflow=65.53 cfs | 6.255 af |
| 36.0" Round Pipe n=0.010 L=31.0' S=0.0061 '/'            | Capacity=67.88 cfs    | Outflow=65.38 cfs | 6.255 af         |          |
| <b>Reach 9BR: Maplewood Intercept</b>                    | Avg. Flow Depth=2.68' | Max Vel=8.14 fps  | Inflow=65.38 cfs | 6.255 af |
| 42.0" Round Pipe n=0.012 L=600.0' S=0.0040 '/'           | Capacity=68.93 cfs    | Outflow=62.79 cfs | 6.249 af         |          |
| <b>Reach 10R: Upper Bridge St.</b>                       | Avg. Flow Depth=2.23' | Max Vel=7.31 fps  | Inflow=41.55 cfs | 2.742 af |
| 36.0" Round Pipe n=0.012 L=170.0' S=0.0040 '/'           | Capacity=45.70 cfs    | Outflow=40.88 cfs | 2.741 af         |          |
| <b>Reach 11R: Bridge Street Sag</b>                      | Avg. Flow Depth=2.61' | Max Vel=9.02 fps  | Inflow=59.33 cfs | 4.274 af |
| 36.0" Round Pipe n=0.012 L=160.0' S=0.0060 '/'           | Capacity=55.97 cfs    | Outflow=58.29 cfs | 4.273 af         |          |
| <b>Reach 12CR: x-cntry intercept</b>                     | Avg. Flow Depth=3.41' | Max Vel=6.31 fps  | Inflow=72.44 cfs | 7.066 af |
| 48.0" Round Pipe n=0.012 L=210.0' S=0.0020 '/'           | Capacity=69.59 cfs    | Outflow=71.03 cfs | 7.062 af         |          |
| <b>Reach 12R: Deer Street</b>                            | Avg. Flow Depth=3.39' | Max Vel=6.31 fps  | Inflow=72.39 cfs | 5.399 af |
| 48.0" Round Pipe n=0.012 L=160.0' S=0.0020 '/'           | Capacity=69.59 cfs    | Outflow=70.96 cfs | 5.397 af         |          |
| <b>Pond 9: DMH #6 (Flow Splitter)</b>                    | Peak Elev=9.69'       | Inflow=82.02 cfs  | 6.951 af         |          |
| Primary=65.53 cfs 6.255 af Secondary=16.49 cfs 0.696 af  | Outflow=82.02 cfs     | 6.951 af          |                  |          |
| <b>Pond 13: Twin 48" Outfall Pipes</b>                   | Peak Elev=6.46'       | Inflow=140.28 cfs | 12.459 af        |          |
| 48.0" Round Culvert x 2.00 n=0.012 L=360.0' S=0.0020 '/' | Outflow=140.28 cfs    | 12.459 af         |                  |          |

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Type III 24-hr Rainfall=5.00"

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**Summary for Subcatchment 1: Porter St. Area**

Runoff = 11.47 cfs @ 12.09 hrs, Volume= 0.897 af, Depth> 4.31"

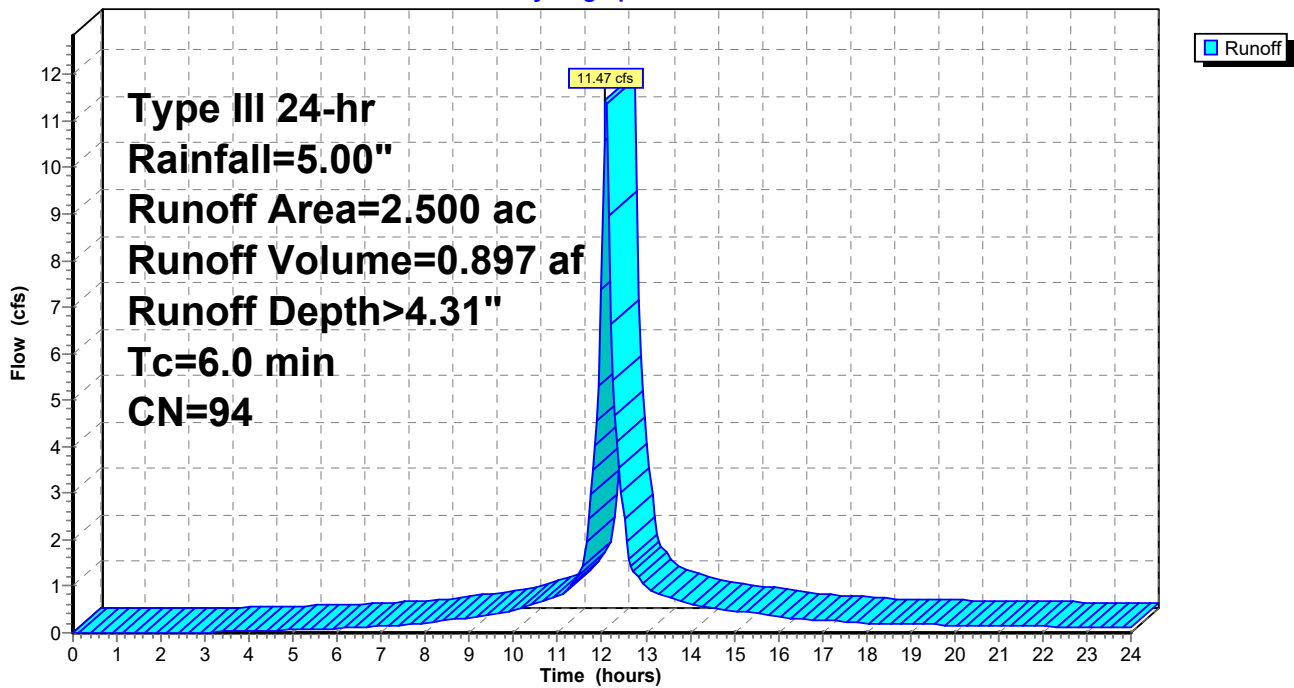
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type III 24-hr Rainfall=5.00"

| Area (ac) | CN | Description    |
|-----------|----|----------------|
| * 2.500   | 94 | Upper Fleet St |

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

**Subcatchment 1: Porter St. Area**

Hydrograph



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Type III 24-hr Rainfall=5.00"

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**Summary for Subcatchment 2: Fleet/Congress Intersection**

Runoff = 5.17 cfs @ 12.09 hrs, Volume= 0.415 af, Depth> 4.53"

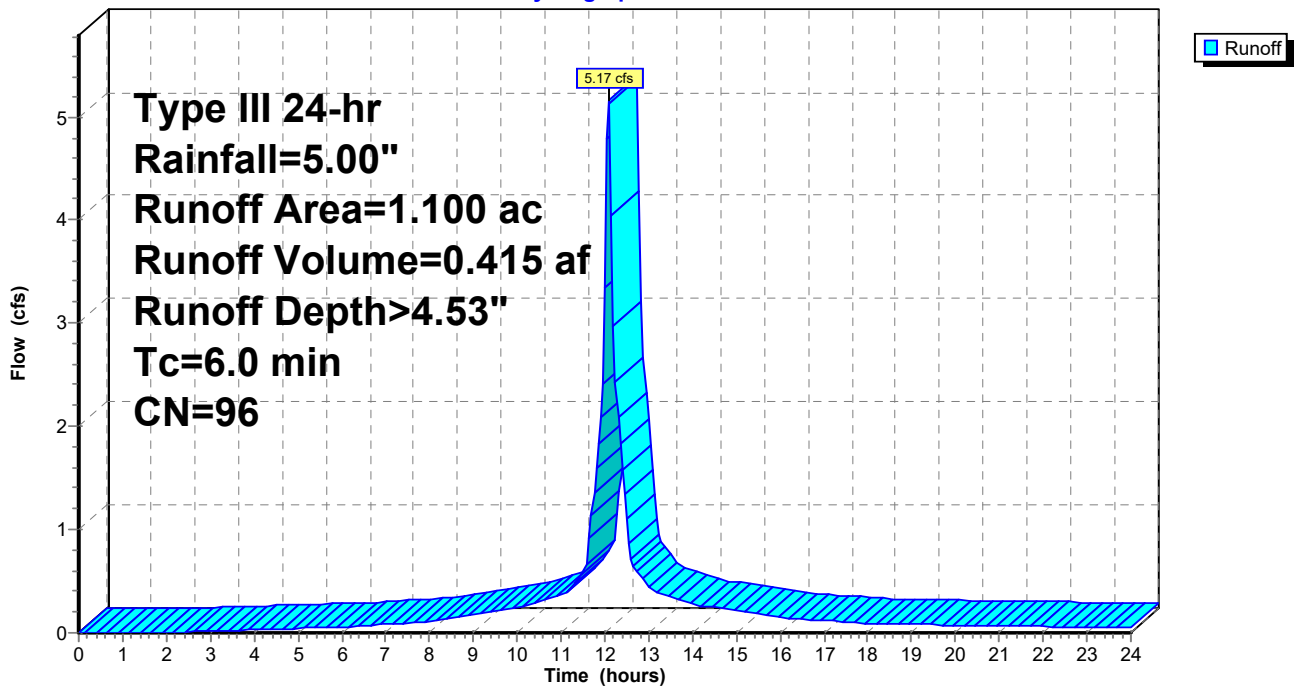
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type III 24-hr Rainfall=5.00"

| Area (ac) | CN | Description |
|-----------|----|-------------|
| * 1.100   | 96 |             |

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

**Subcatchment 2: Fleet/Congress Intersection**

Hydrograph



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Type III 24-hr Rainfall=5.00"

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**Summary for Subcatchment 3: Lower Fleet Area (includes garage)**

Runoff = 6.11 cfs @ 12.09 hrs, Volume= 0.491 af, Depth> 4.53"

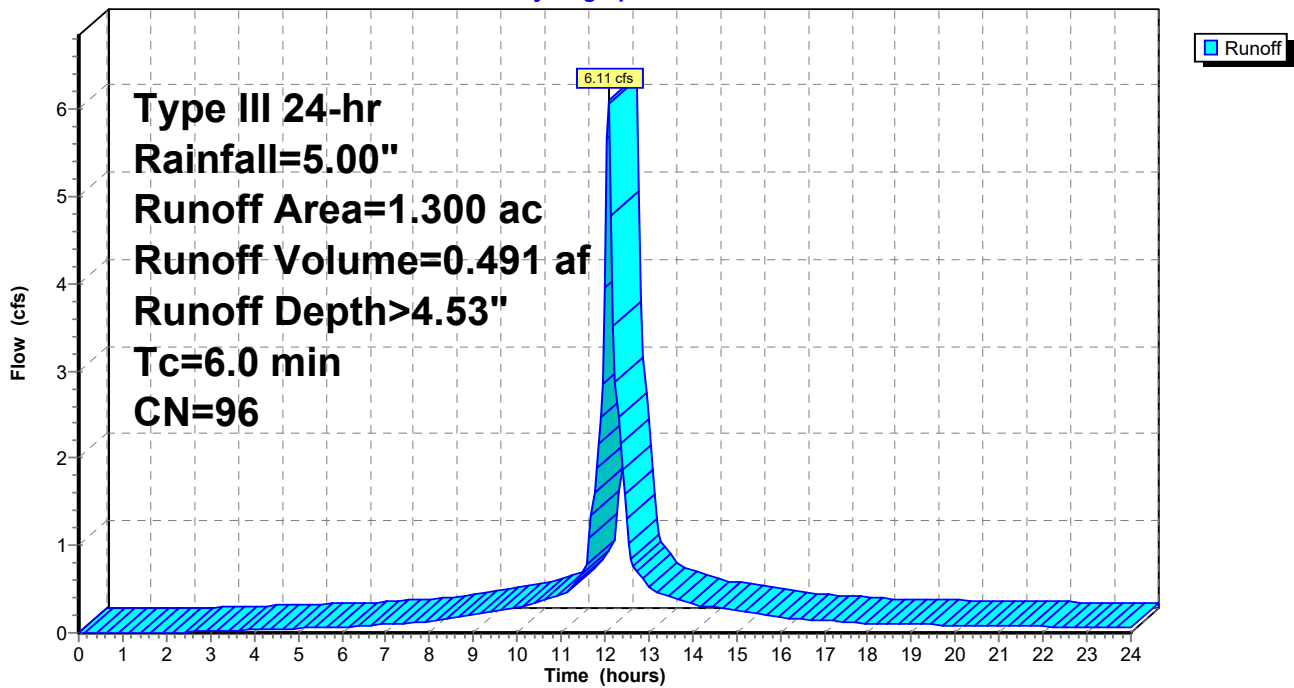
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type III 24-hr Rainfall=5.00"

| Area (ac) | CN | Description |
|-----------|----|-------------|
| * 1.300   | 96 |             |

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

**Subcatchment 3: Lower Fleet Area (includes garage)**

Hydrograph



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Type III 24-hr Rainfall=5.00"

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**Summary for Subcatchment 3B: Hanover Garage**

Runoff = 12.69 cfs @ 12.09 hrs, Volume= 1.019 af, Depth> 4.53"

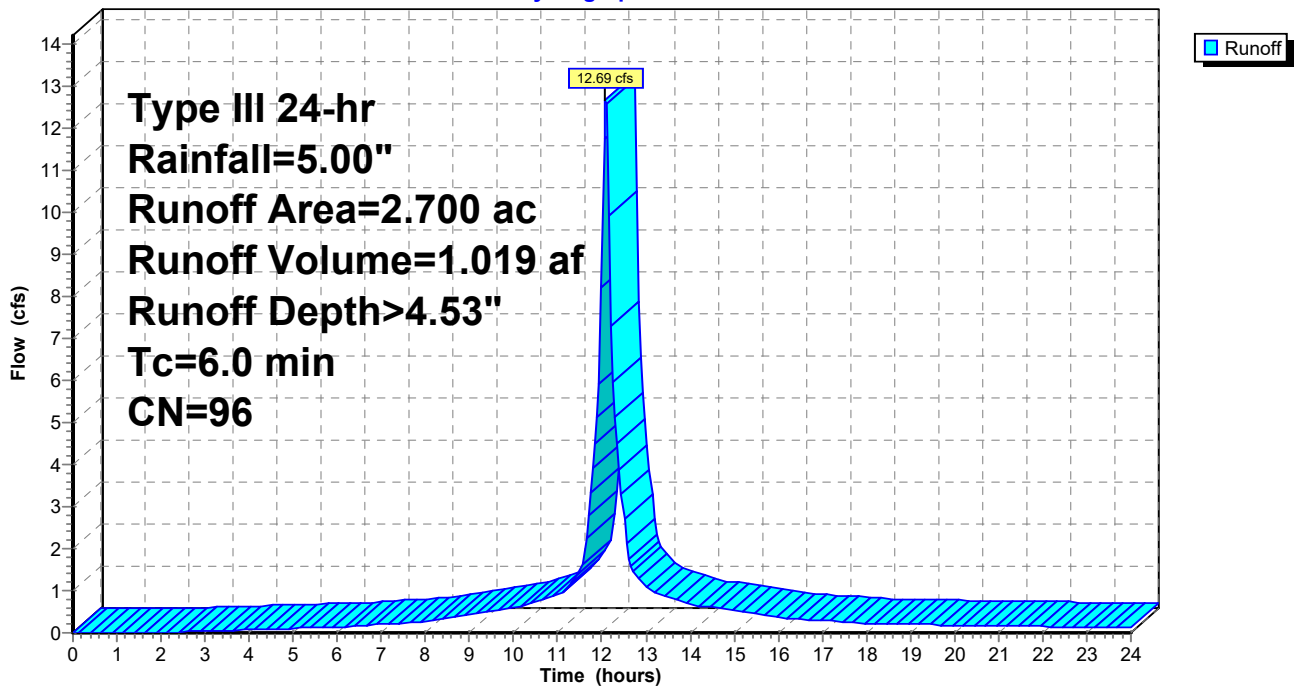
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type III 24-hr Rainfall=5.00"

| Area (ac) | CN | Description |
|-----------|----|-------------|
| * 2.700   | 96 |             |

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

**Subcatchment 3B: Hanover Garage**

Hydrograph





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Type III 24-hr Rainfall=5.00"

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**Summary for Subcatchment 4: Portwalk North & Upper Hanover**

Runoff = 17.23 cfs @ 12.11 hrs, Volume= 1.396 af, Depth> 4.09"

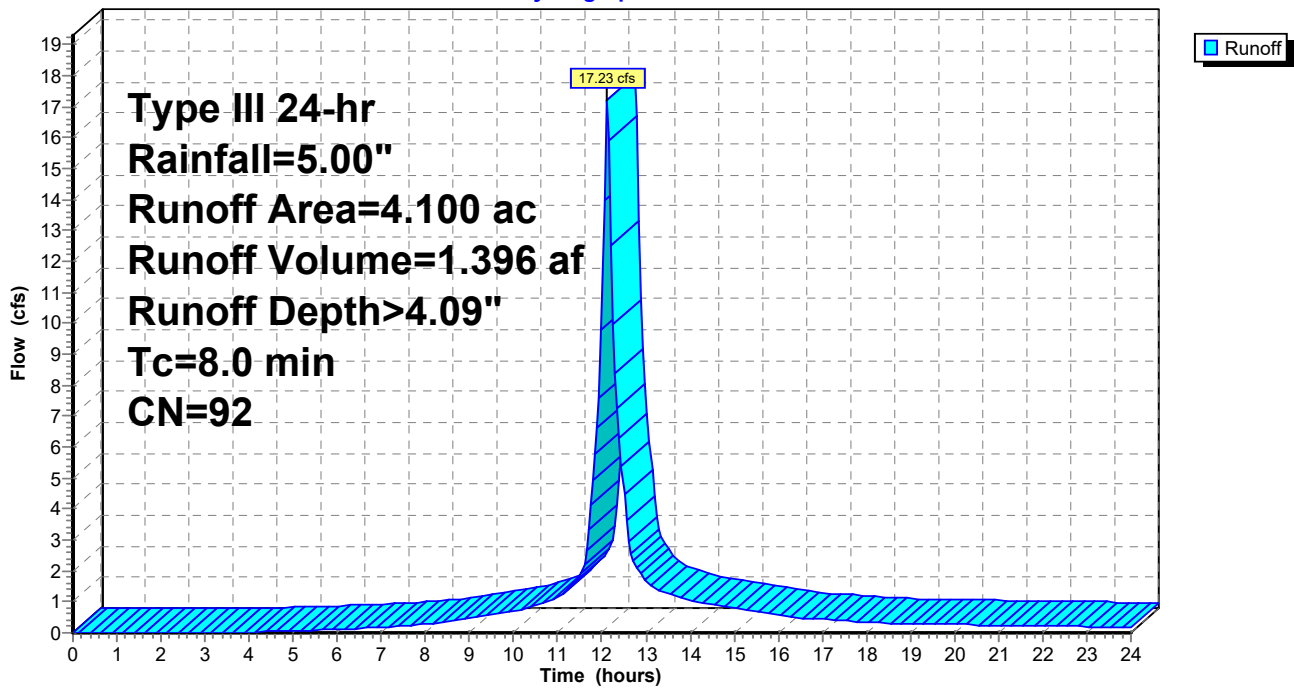
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type III 24-hr Rainfall=5.00"

| Area (ac) | CN | Description |
|-----------|----|-------------|
| * 4.100   | 92 |             |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description   |
|----------|---------------|---------------|-------------------|----------------|---------------|
| 8.0      |               |               |                   |                | Direct Entry, |

**Subcatchment 4: Portwalk North & Upper Hanover**

Hydrograph



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Type III 24-hr Rainfall=5.00"

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**Summary for Subcatchment 5: Chestnut St. Area**

Runoff = 9.63 cfs @ 12.09 hrs, Volume= 0.753 af, Depth> 4.31"

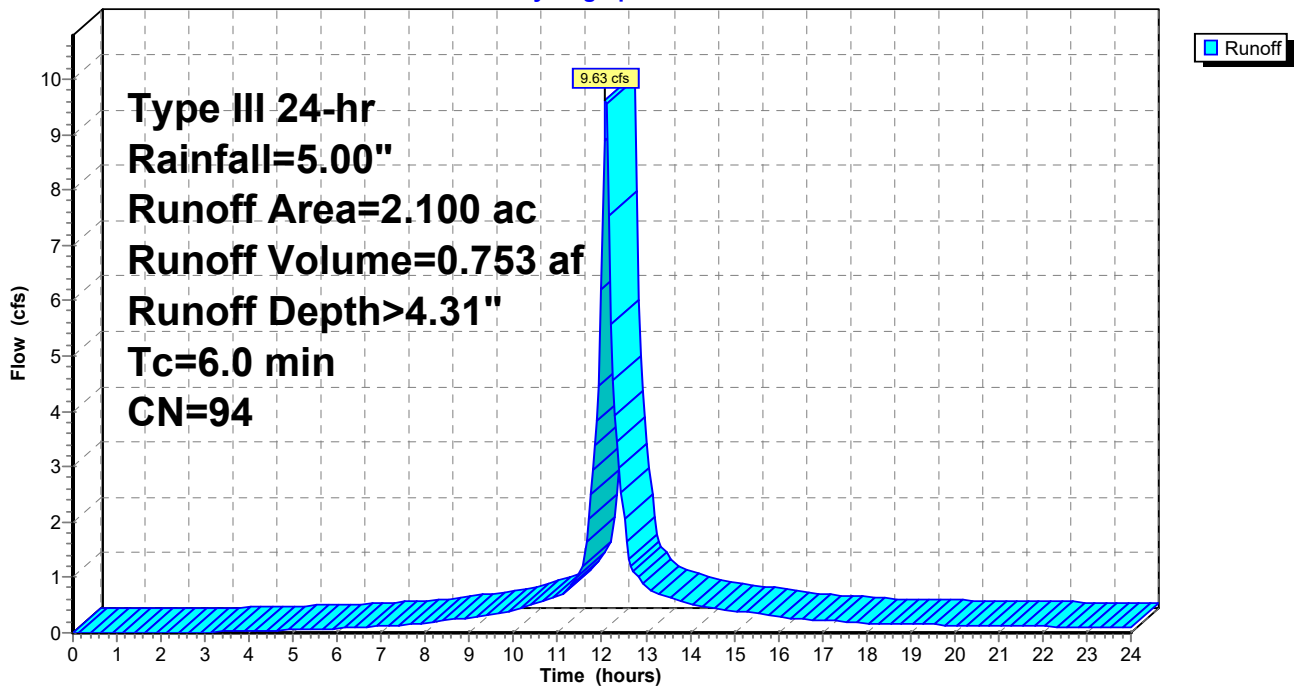
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type III 24-hr Rainfall=5.00"

| Area (ac) | CN | Description |
|-----------|----|-------------|
| * 2.100   | 94 |             |

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

**Subcatchment 5: Chestnut St. Area**

Hydrograph



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Type III 24-hr Rainfall=5.00"

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**Summary for Subcatchment 6: Congress St. Area**

Runoff = 5.05 cfs @ 12.09 hrs, Volume= 0.395 af, Depth> 4.31"

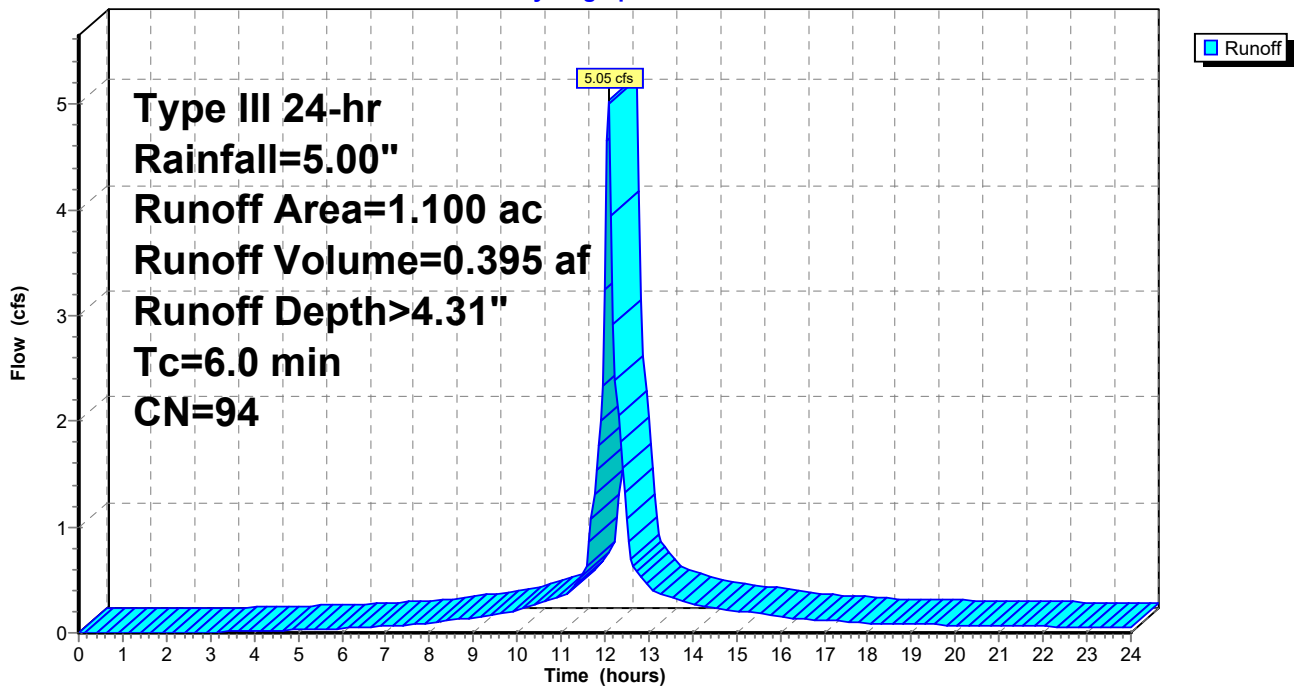
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type III 24-hr Rainfall=5.00"

| Area (ac) | CN | Description |
|-----------|----|-------------|
| * 1.100   | 94 |             |

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

**Subcatchment 6: Congress St. Area**

Hydrograph



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Type III 24-hr Rainfall=5.00"

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**Summary for Subcatchment 7: Worth Lot Drainage**

Runoff = 6.42 cfs @ 12.09 hrs, Volume= 0.502 af, Depth> 4.31"

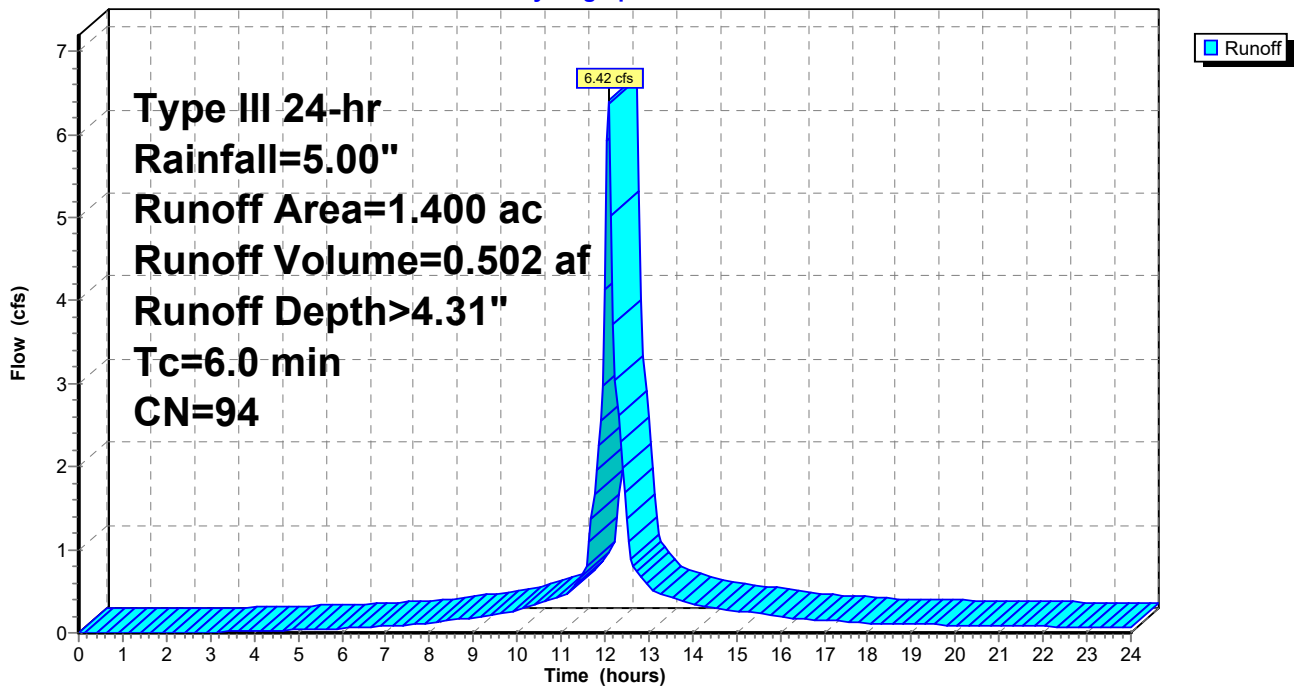
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type III 24-hr Rainfall=5.00"

| Area (ac) | CN | Description |
|-----------|----|-------------|
| * 1.400   | 94 |             |

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

**Subcatchment 7: Worth Lot Drainage**

Hydrograph



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Type III 24-hr Rainfall=5.00"

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**Summary for Subcatchment 8: 8**

Runoff = 8.46 cfs @ 12.09 hrs, Volume= 0.679 af, Depth> 4.53"

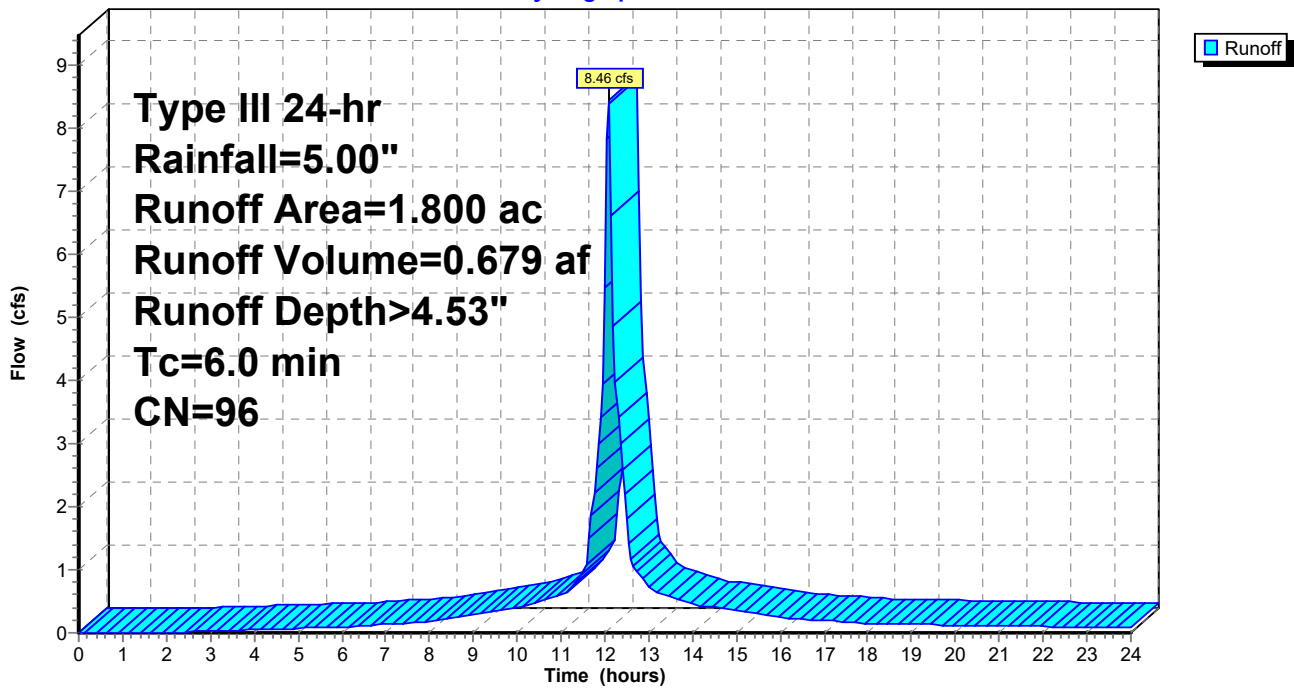
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type III 24-hr Rainfall=5.00"

| Area (ac) | CN | Description |
|-----------|----|-------------|
| * 1.800   | 96 |             |

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

**Subcatchment 8: 8**

Hydrograph



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Type III 24-hr Rainfall=5.00"

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**Summary for Subcatchment 8A: Portwalk**

Runoff = 5.34 cfs @ 12.09 hrs, Volume= 0.409 af, Depth> 4.09"

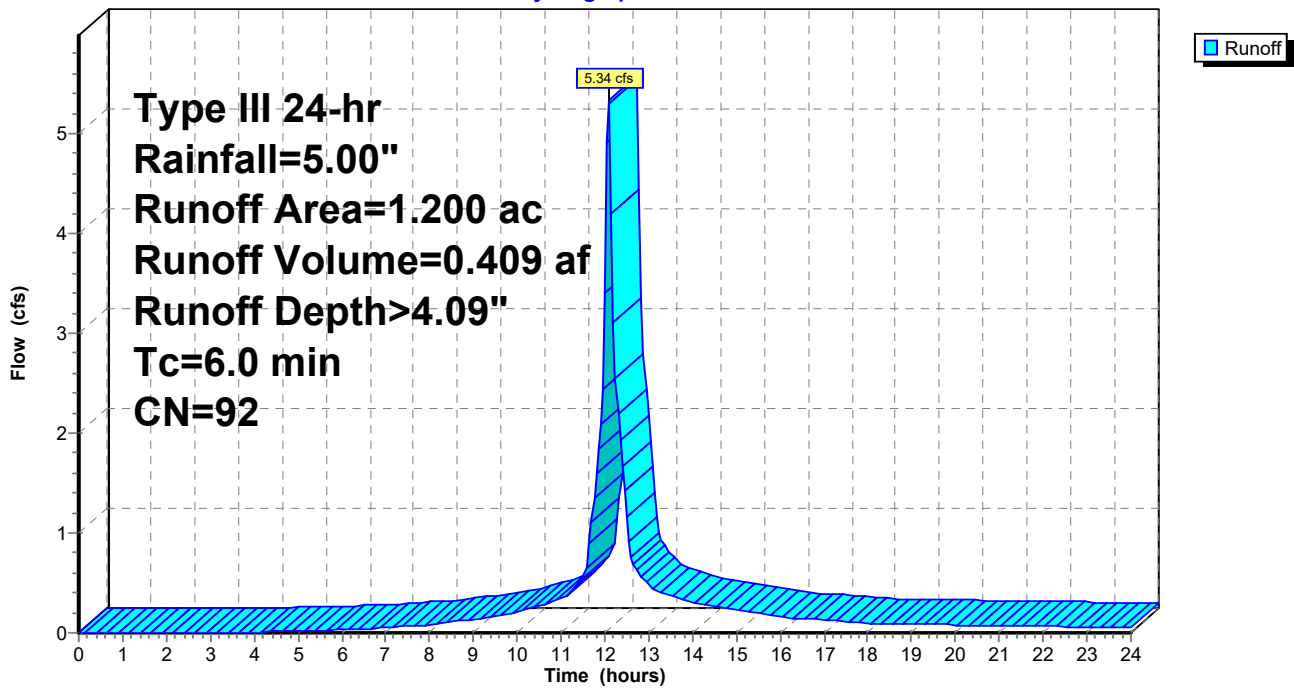
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type III 24-hr Rainfall=5.00"

| Area (ac) | CN | Description |
|-----------|----|-------------|
| * 1.200   | 92 |             |

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

**Subcatchment 8A: Portwalk**

Hydrograph



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Type III 24-hr Rainfall=5.00"

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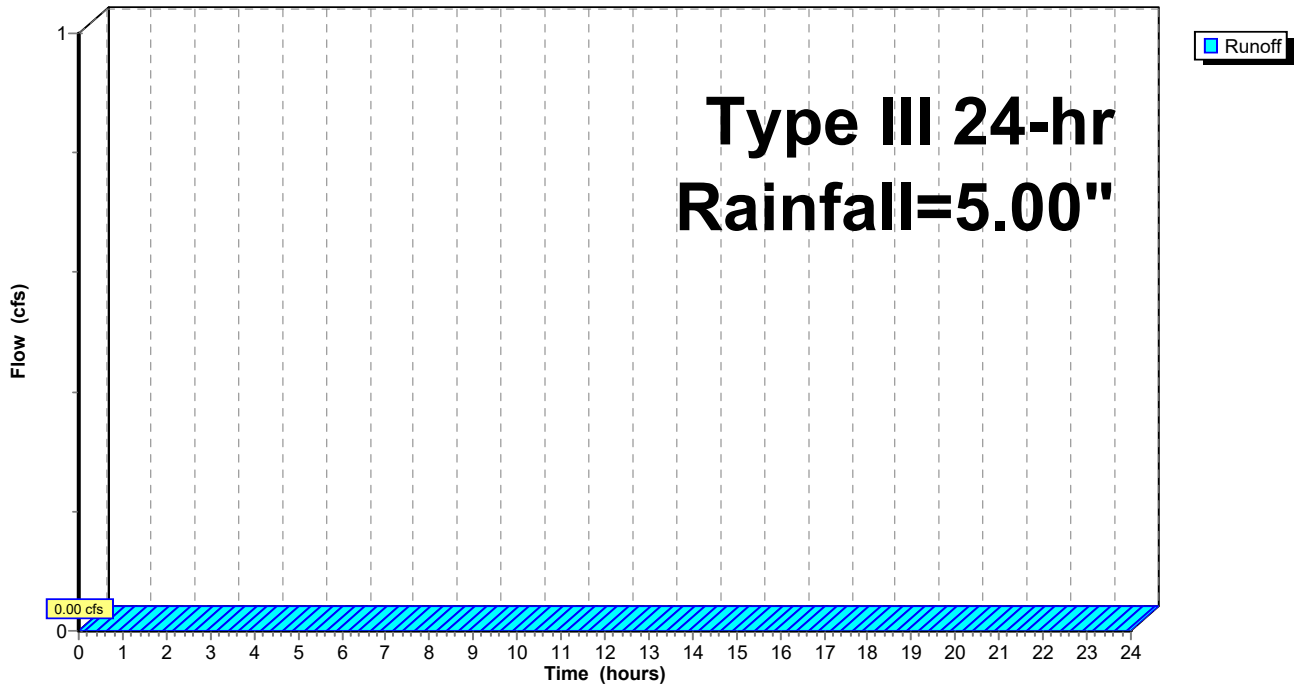
**Summary for Subcatchment 9A: (new Subcat)**

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

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type III 24-hr Rainfall=5.00"

**Subcatchment 9A: (new Subcat)**

Hydrograph



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Type III 24-hr Rainfall=5.00"

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**Summary for Subcatchment 9S: Maplewood**

Runoff = 25.08 cfs @ 12.12 hrs, Volume= 2.046 af, Depth> 3.66"

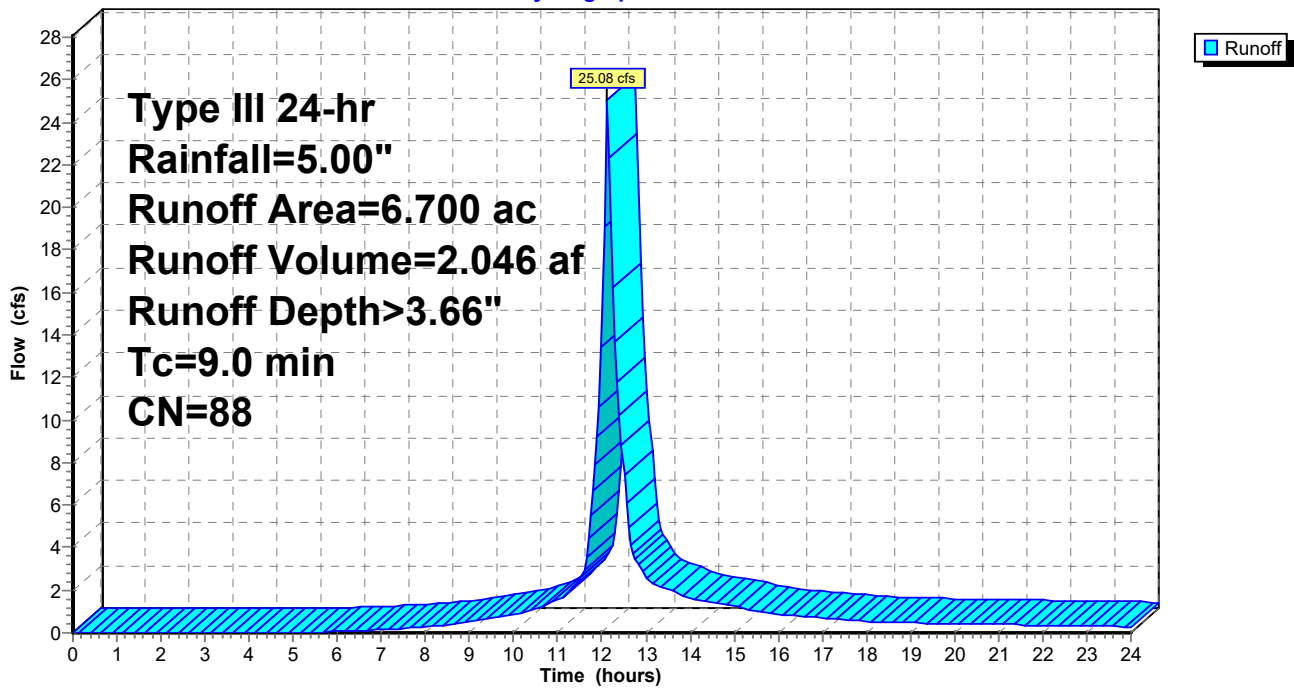
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type III 24-hr Rainfall=5.00"

| Area (ac) | CN | Description |
|-----------|----|-------------|
| * 6.700   | 88 |             |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description   |
|----------|---------------|---------------|-------------------|----------------|---------------|
| 9.0      |               |               |                   |                | Direct Entry, |

**Subcatchment 9S: Maplewood**

Hydrograph





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Type III 24-hr Rainfall=5.00"

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**Summary for Subcatchment 10: Bridge St. Area**

Runoff = 20.01 cfs @ 12.09 hrs, Volume= 1.532 af, Depth> 4.09"

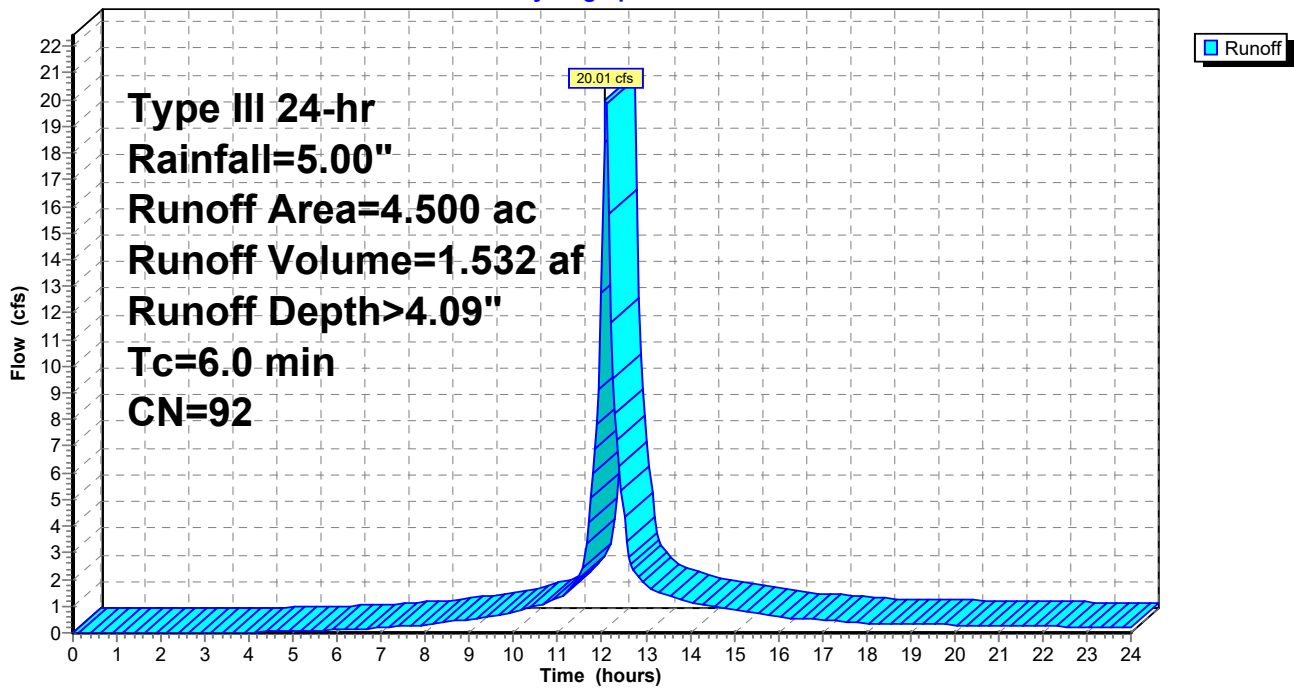
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type III 24-hr Rainfall=5.00"

| Area (ac) | CN | Description |
|-----------|----|-------------|
| * 4.500   | 92 |             |

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

**Subcatchment 10: Bridge St. Area**

Hydrograph



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Type III 24-hr Rainfall=5.00"

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**Summary for Subcatchment 11: Parking Garage/Lot**

Runoff = 9.17 cfs @ 12.09 hrs, Volume= 0.718 af, Depth> 4.31"

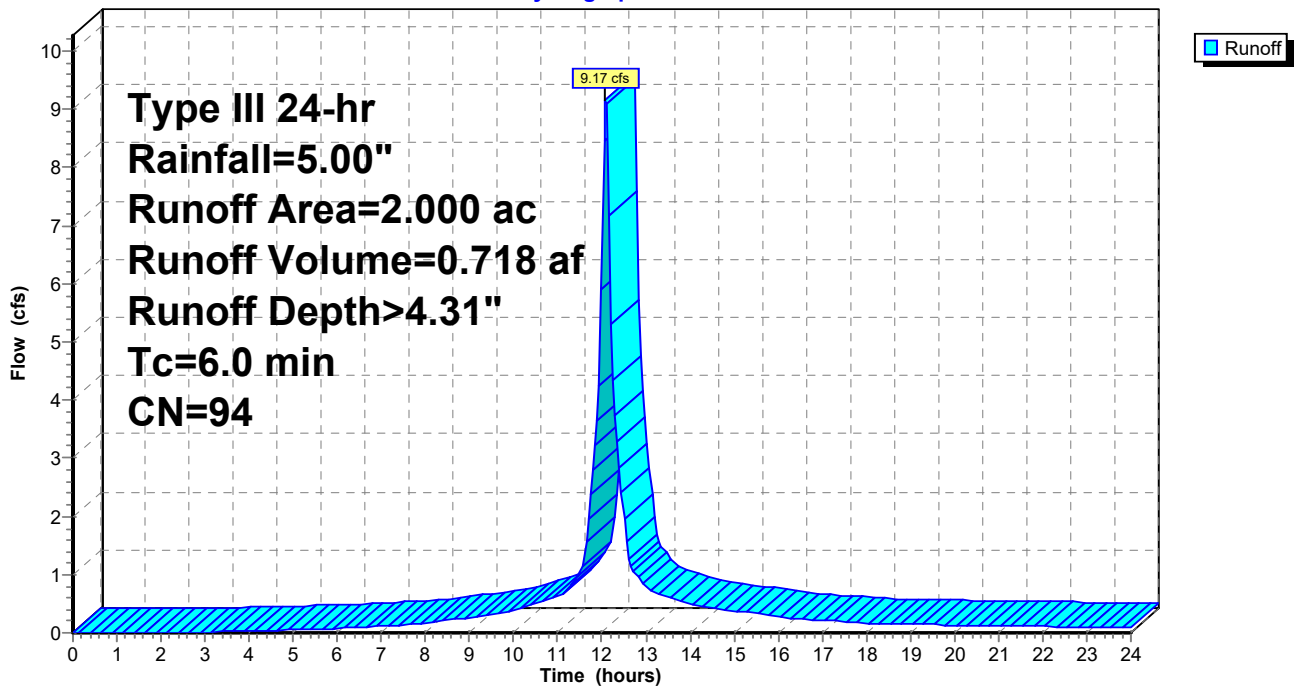
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type III 24-hr Rainfall=5.00"

| Area (ac) | CN | Description |
|-----------|----|-------------|
| * 2.000   | 94 |             |

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

**Subcatchment 11: Parking Garage/Lot**

Hydrograph



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Type III 24-hr Rainfall=5.00"

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**Summary for Subcatchment 12: Deer Street**

Runoff = 5.59 cfs @ 12.09 hrs, Volume= 0.408 af, Depth> 3.27"

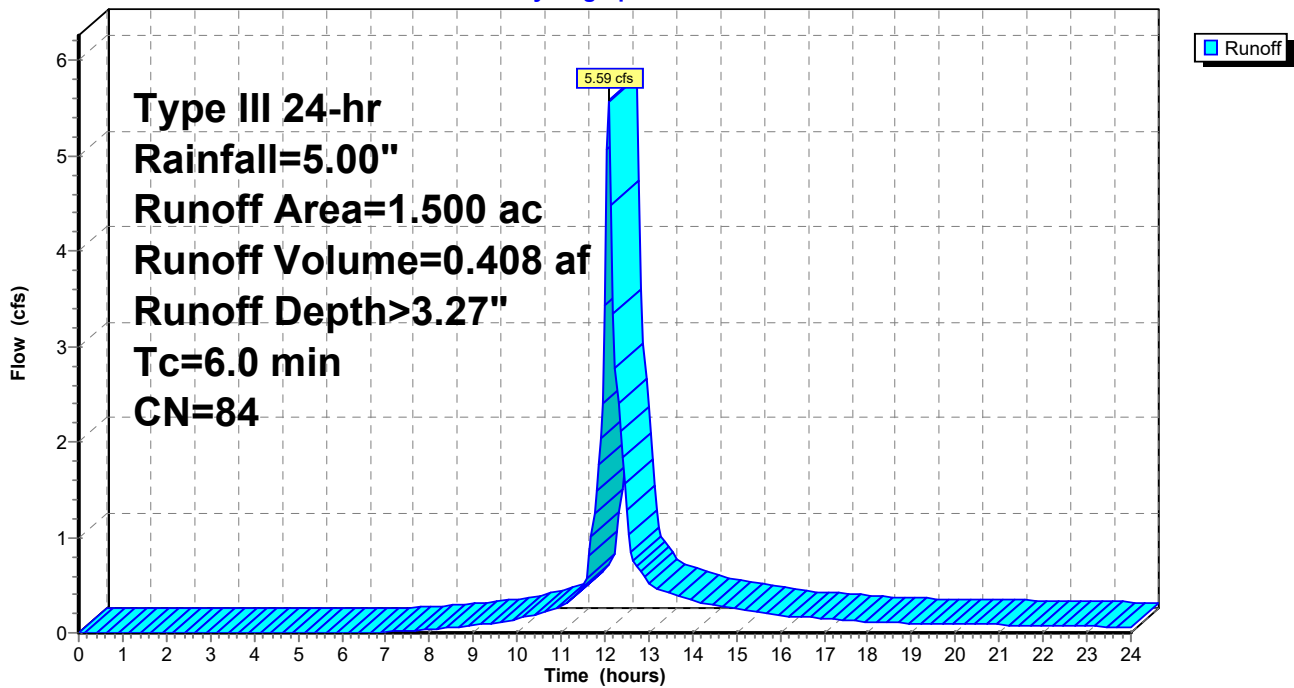
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type III 24-hr Rainfall=5.00"

| Area (ac) | CN | Description |
|-----------|----|-------------|
| * 1.500   | 84 |             |

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

**Subcatchment 12: Deer Street**

Hydrograph



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Type III 24-hr Rainfall=5.00"

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**Summary for Subcatchment 12A: Maplewood/Deer Street area**

Runoff = 10.53 cfs @ 12.11 hrs, Volume= 0.817 af, Depth> 3.27"

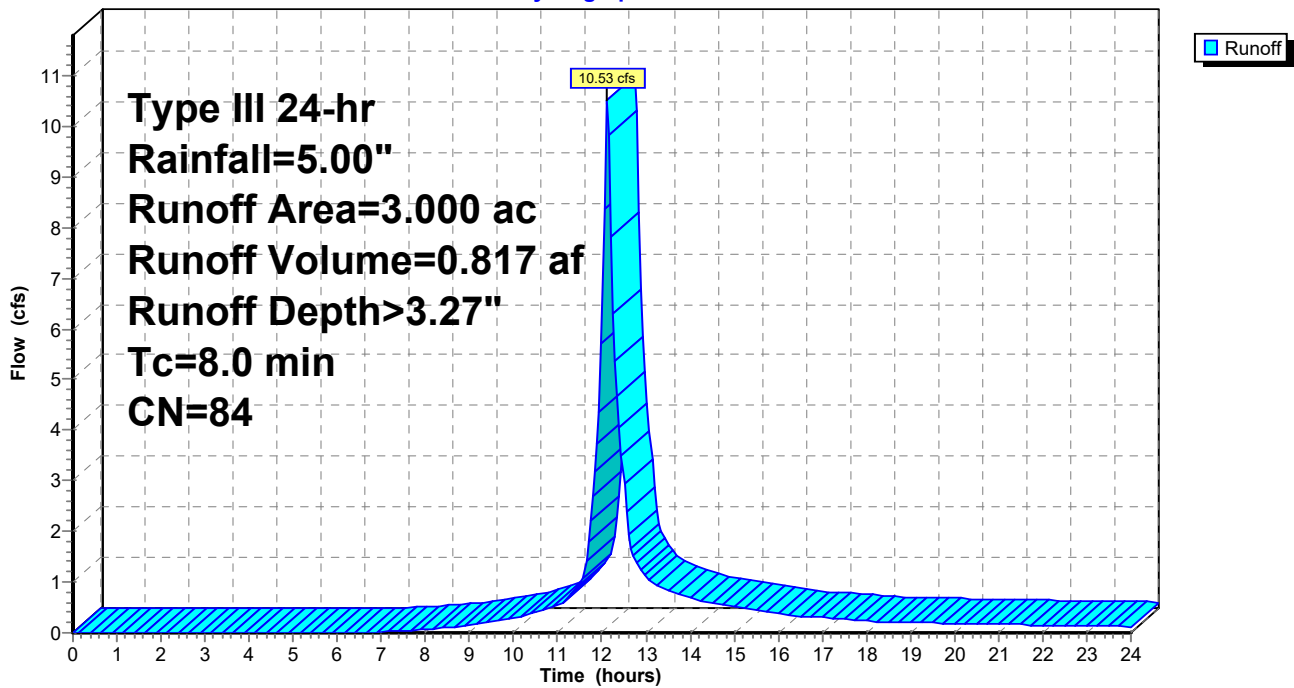
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type III 24-hr Rainfall=5.00"

| Area (ac) | CN | Description |
|-----------|----|-------------|
| * 3.000   | 84 |             |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description   |
|----------|---------------|---------------|-------------------|----------------|---------------|
| 8.0      |               |               |                   |                | Direct Entry, |

**Subcatchment 12A: Maplewood/Deer Street area**

Hydrograph



**PROJECT CONDITIONS**

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Type III 24-hr Rainfall=5.00"

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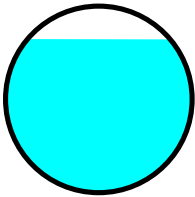
**Summary for Reach 1R: Upper Fleet St. (Porter to Congress)**

Inflow Area = 2.500 ac, Inflow Depth > 4.31"  
 Inflow = 11.47 cfs @ 12.09 hrs, Volume= 0.897 af  
 Outflow = 11.27 cfs @ 12.10 hrs, Volume= 0.897 af, Atten= 2%, Lag= 0.7 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
 Max. Velocity= 7.37 fps, Min. Travel Time= 0.4 min  
 Avg. Velocity = 2.69 fps, Avg. Travel Time= 1.1 min

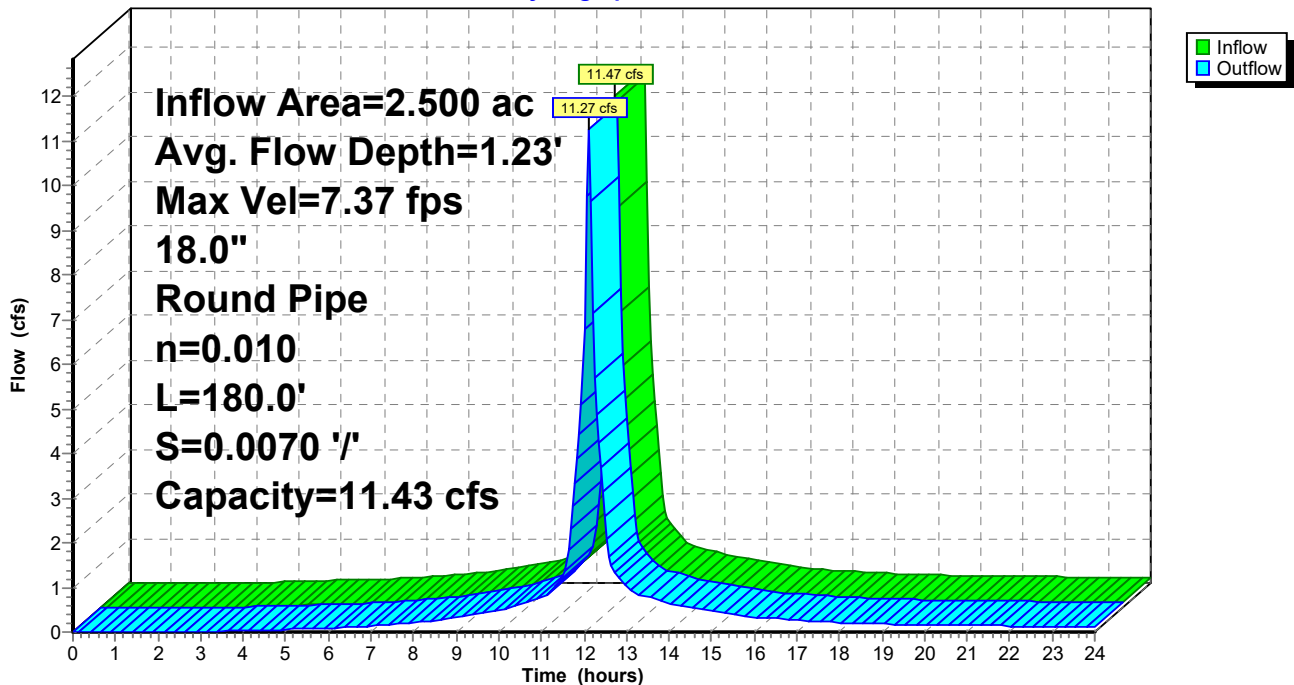
Peak Storage= 280 cf @ 12.09 hrs  
 Average Depth at Peak Storage= 1.23'  
 Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 11.43 cfs

18.0" Round Pipe  
 n= 0.010  
 Length= 180.0' Slope= 0.0070 '/'  
 Inlet Invert= 0.00', Outlet Invert= -1.26'



**Reach 1R: Upper Fleet St. (Porter to Congress)**

Hydrograph



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Type III 24-hr Rainfall=5.00"

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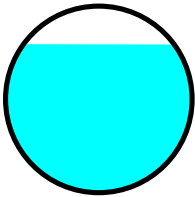
**Summary for Reach 2R: Fleet St. (West of Congress)**

Inflow Area = 5.700 ac, Inflow Depth > 4.35"  
 Inflow = 25.76 cfs @ 12.10 hrs, Volume= 2.065 af  
 Outflow = 24.86 cfs @ 12.12 hrs, Volume= 2.064 af, Atten= 4%, Lag= 1.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
 Max. Velocity= 9.54 fps, Min. Travel Time= 0.7 min  
 Avg. Velocity = 3.40 fps, Avg. Travel Time= 1.9 min

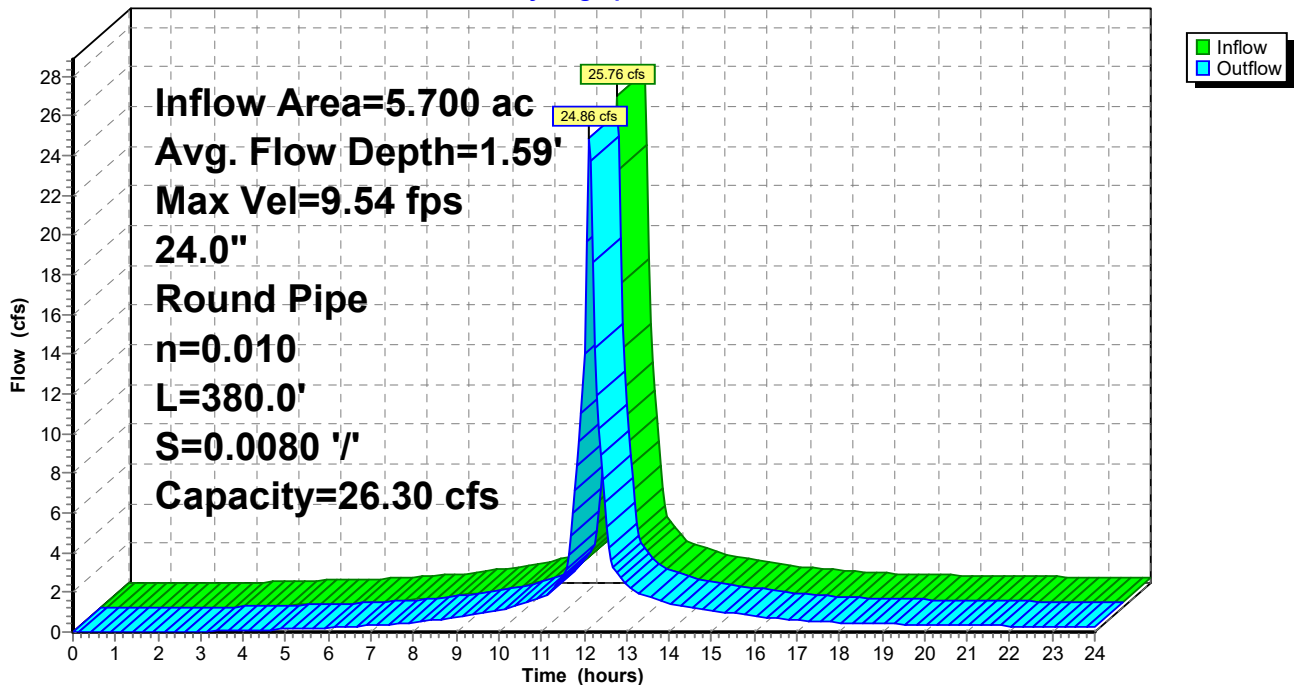
Peak Storage= 1,017 cf @ 12.11 hrs  
 Average Depth at Peak Storage= 1.59'  
 Bank-Full Depth= 2.00' Flow Area= 3.1 sf, Capacity= 26.30 cfs

24.0" Round Pipe  
 n= 0.010  
 Length= 380.0' Slope= 0.0080 '/'  
 Inlet Invert= 0.00', Outlet Invert= -3.04'



**Reach 2R: Fleet St. (West of Congress)**

Hydrograph



# PROJECT CONDITIONS

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Type III 24-hr Rainfall=5.00"

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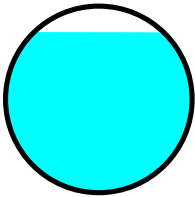
## Summary for Reach 3R: Fleet St. to Hanover

Inflow Area = 7.000 ac, Inflow Depth > 4.38"  
Inflow = 30.71 cfs @ 12.11 hrs, Volume= 2.555 af  
Outflow = 30.45 cfs @ 12.12 hrs, Volume= 2.554 af, Atten= 1%, Lag= 0.3 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Max. Velocity= 10.67 fps, Min. Travel Time= 0.2 min  
Avg. Velocity = 3.92 fps, Avg. Travel Time= 0.4 min

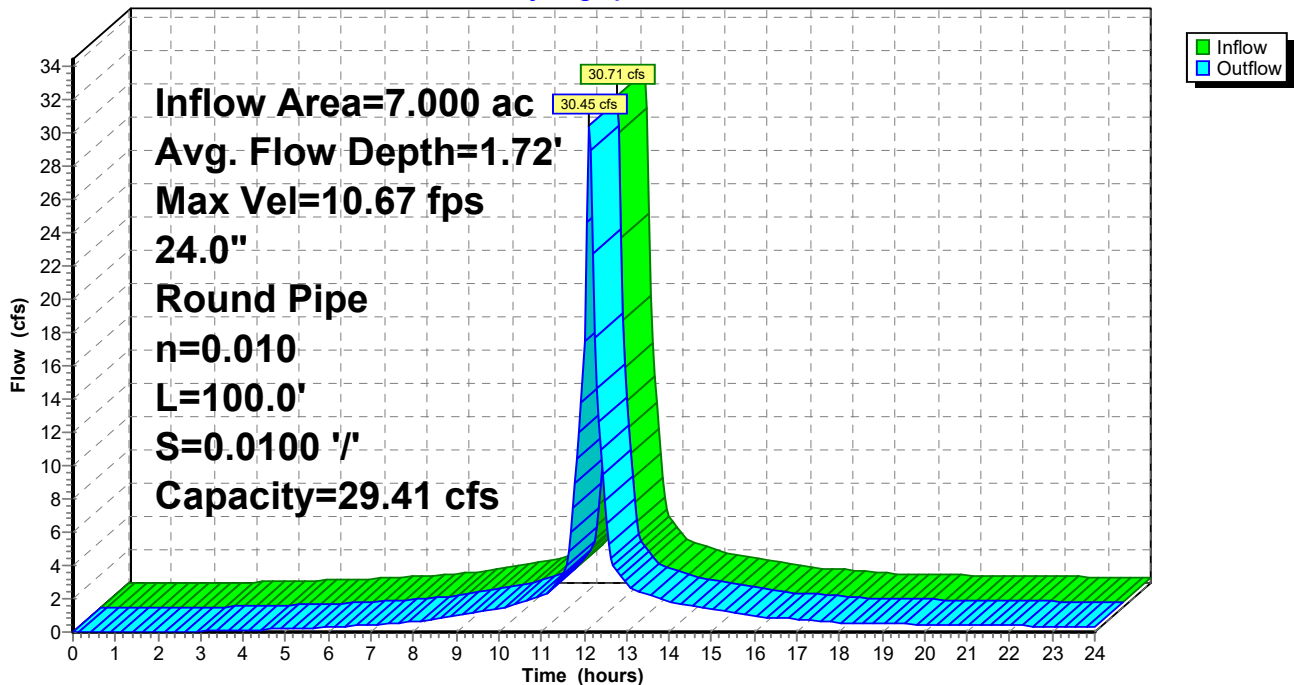
Peak Storage= 288 cf @ 12.11 hrs  
Average Depth at Peak Storage= 1.72'  
Bank-Full Depth= 2.00' Flow Area= 3.1 sf, Capacity= 29.41 cfs

24.0" Round Pipe  
n= 0.010  
Length= 100.0' Slope= 0.0100 '/'  
Inlet Invert= 0.00', Outlet Invert= -1.00'



## Reach 3R: Fleet St. to Hanover

Hydrograph



# PROJECT CONDITIONS

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Type III 24-hr Rainfall=5.00"

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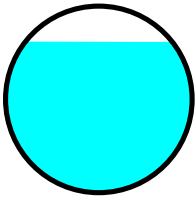
## Summary for Reach 4R: Hanover - Downstream from Fleet

Inflow Area = 13.800 ac, Inflow Depth > 4.32"  
Inflow = 59.96 cfs @ 12.11 hrs, Volume= 4.969 af  
Outflow = 59.02 cfs @ 12.12 hrs, Volume= 4.968 af, Atten= 2%, Lag= 0.6 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Max. Velocity= 9.75 fps, Min. Travel Time= 0.3 min  
Avg. Velocity = 3.52 fps, Avg. Travel Time= 0.9 min

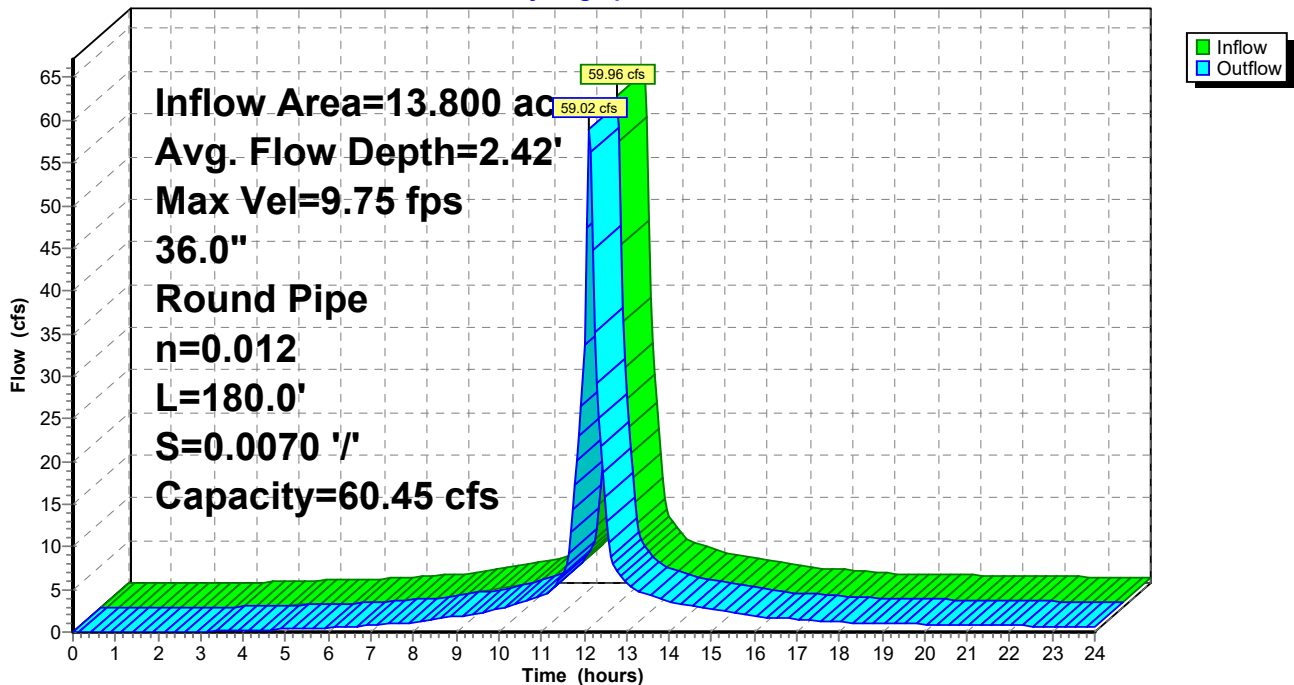
Peak Storage= 1,102 cf @ 12.11 hrs  
Average Depth at Peak Storage= 2.42'  
Bank-Full Depth= 3.00' Flow Area= 7.1 sf, Capacity= 60.45 cfs

36.0" Round Pipe  
n= 0.012  
Length= 180.0' Slope= 0.0070 '/'  
Inlet Invert= 0.00', Outlet Invert= -1.26'



## Reach 4R: Hanover - Downstream from Fleet

Hydrograph





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Type III 24-hr Rainfall=5.00"

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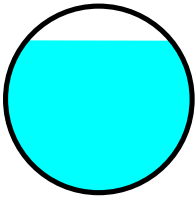
## Summary for Reach 5R: Congress to Fleet

Inflow Area = 2.100 ac, Inflow Depth > 4.31"  
Inflow = 9.63 cfs @ 12.09 hrs, Volume= 0.753 af  
Outflow = 9.38 cfs @ 12.10 hrs, Volume= 0.753 af, Atten= 3%, Lag= 1.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Max. Velocity= 6.23 fps, Min. Travel Time= 0.6 min  
Avg. Velocity = 2.27 fps, Avg. Travel Time= 1.6 min

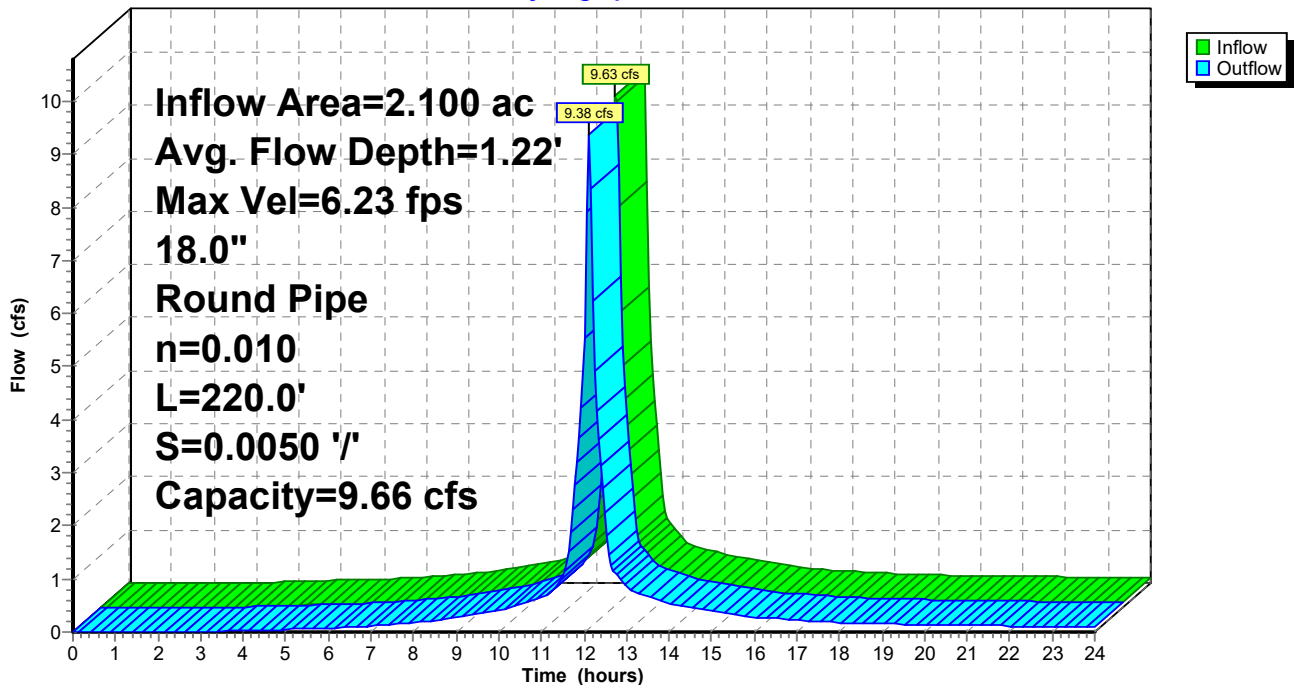
Peak Storage= 339 cf @ 12.10 hrs  
Average Depth at Peak Storage= 1.22'  
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 9.66 cfs

18.0" Round Pipe  
n= 0.010  
Length= 220.0' Slope= 0.0050 '/'  
Inlet Invert= 0.00', Outlet Invert= -1.10'



## Reach 5R: Congress to Fleet

Hydrograph



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Type III 24-hr Rainfall=5.00"

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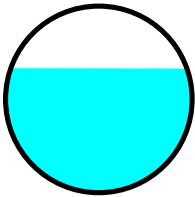
**Summary for Reach 6R: Upper Vaughn Mall**

|               |            |                |         |                                   |
|---------------|------------|----------------|---------|-----------------------------------|
| Inflow Area = | 1.100 ac,  | Inflow Depth > | 4.31"   |                                   |
| Inflow =      | 5.05 cfs @ | 12.09 hrs,     | Volume= | 0.395 af                          |
| Outflow =     | 4.93 cfs @ | 12.10 hrs,     | Volume= | 0.394 af, Atten= 2%, Lag= 1.0 min |

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
 Max. Velocity= 5.82 fps, Min. Travel Time= 0.6 min  
 Avg. Velocity = 2.03 fps, Avg. Travel Time= 1.6 min

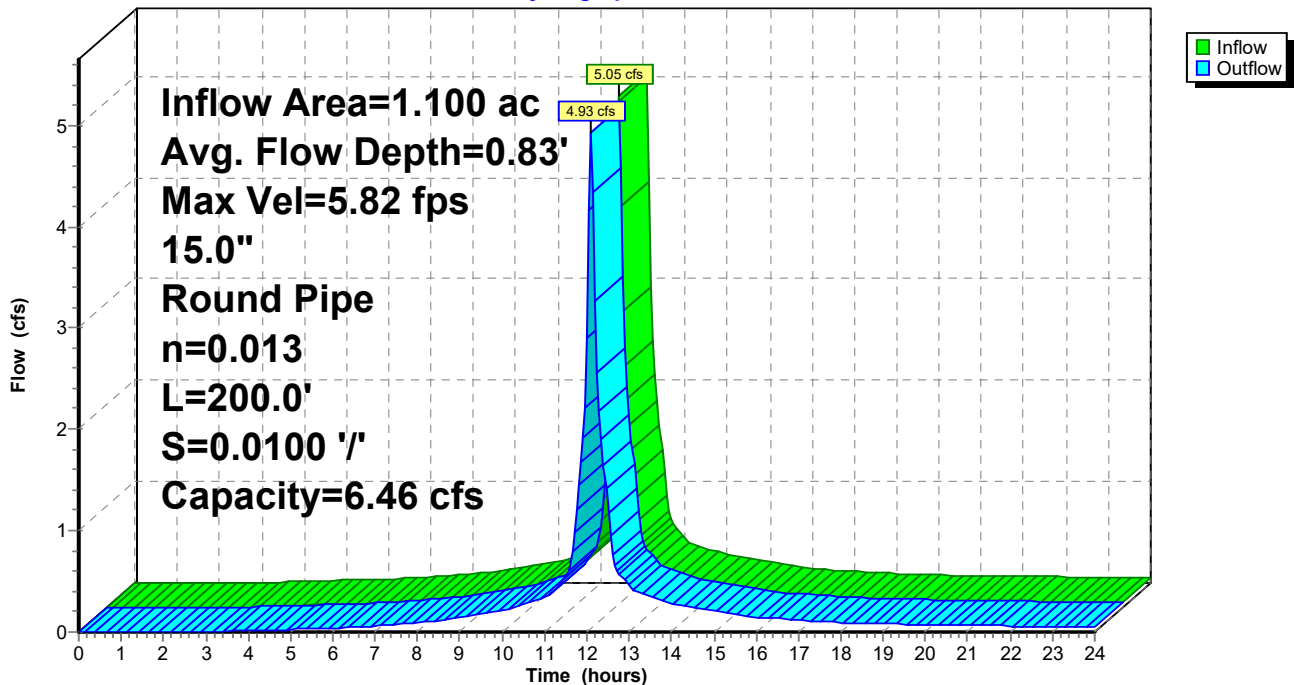
Peak Storage= 173 cf @ 12.10 hrs  
 Average Depth at Peak Storage= 0.83'  
 Bank-Full Depth= 1.25' Flow Area= 1.2 sf, Capacity= 6.46 cfs

15.0" Round Pipe  
 n= 0.013  
 Length= 200.0' Slope= 0.0100 '/'  
 Inlet Invert= 0.00', Outlet Invert= -2.00'



**Reach 6R: Upper Vaughn Mall**

Hydrograph



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Type III 24-hr Rainfall=5.00"

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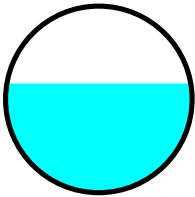
**Summary for Reach 7R: Lower Vaughn Mall to Hanover**

Inflow Area = 2.500 ac, Inflow Depth > 4.30"  
 Inflow = 11.31 cfs @ 12.09 hrs, Volume= 0.897 af  
 Outflow = 11.11 cfs @ 12.11 hrs, Volume= 0.896 af, Atten= 2%, Lag= 0.7 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
 Max. Velocity= 5.93 fps, Min. Travel Time= 0.4 min  
 Avg. Velocity = 2.04 fps, Avg. Travel Time= 1.2 min

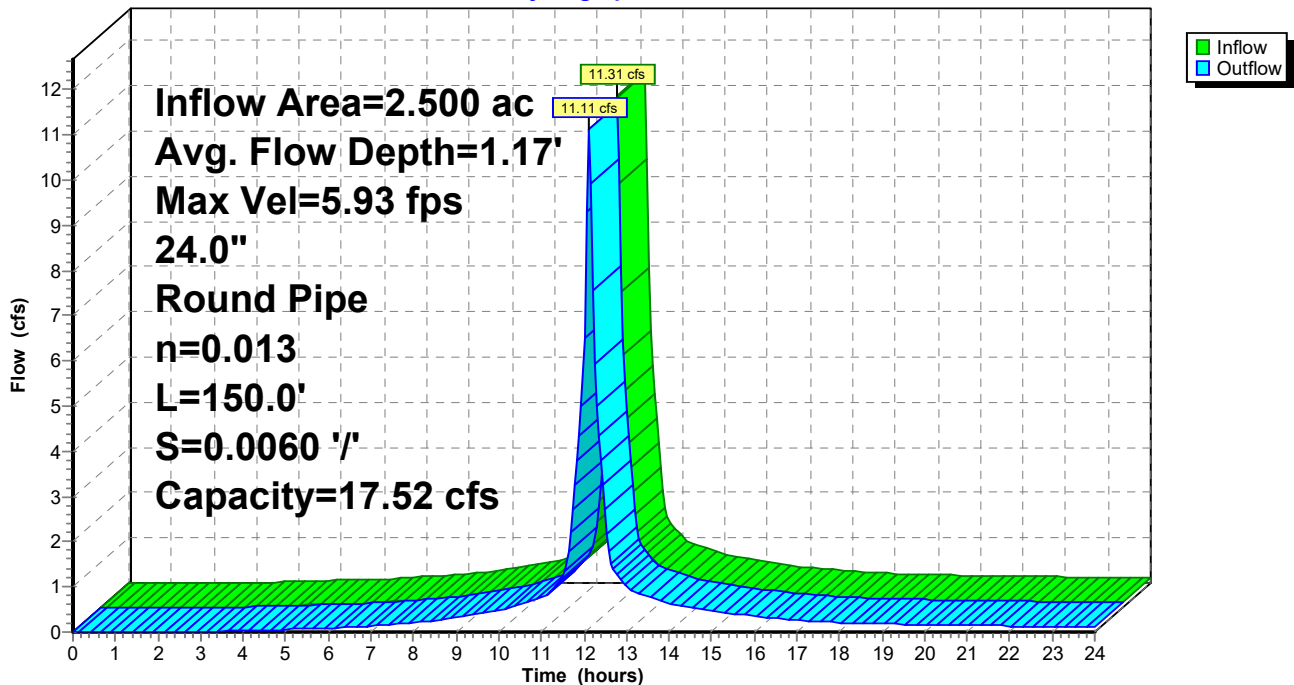
Peak Storage= 286 cf @ 12.10 hrs  
 Average Depth at Peak Storage= 1.17'  
 Bank-Full Depth= 2.00' Flow Area= 3.1 sf, Capacity= 17.52 cfs

24.0" Round Pipe  
 n= 0.013  
 Length= 150.0' Slope= 0.0060 '/'  
 Inlet Invert= 0.00', Outlet Invert= -0.90'



**Reach 7R: Lower Vaughn Mall to Hanover**

Hydrograph



**PROJECT CONDITIONS**

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Type III 24-hr Rainfall=5.00"

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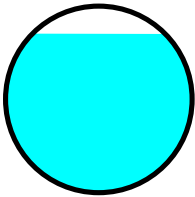
**Summary for Reach 8R: Exist. 36" RCP, Downstream of V. Mall**

Inflow Area = 17.500 ac, Inflow Depth > 4.30"  
 Inflow = 75.20 cfs @ 12.11 hrs, Volume= 6.273 af  
 Outflow = 74.07 cfs @ 12.12 hrs, Volume= 6.272 af, Atten= 2%, Lag= 0.6 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
 Max. Velocity= 11.65 fps, Min. Travel Time= 0.3 min  
 Avg. Velocity = 4.27 fps, Avg. Travel Time= 0.8 min

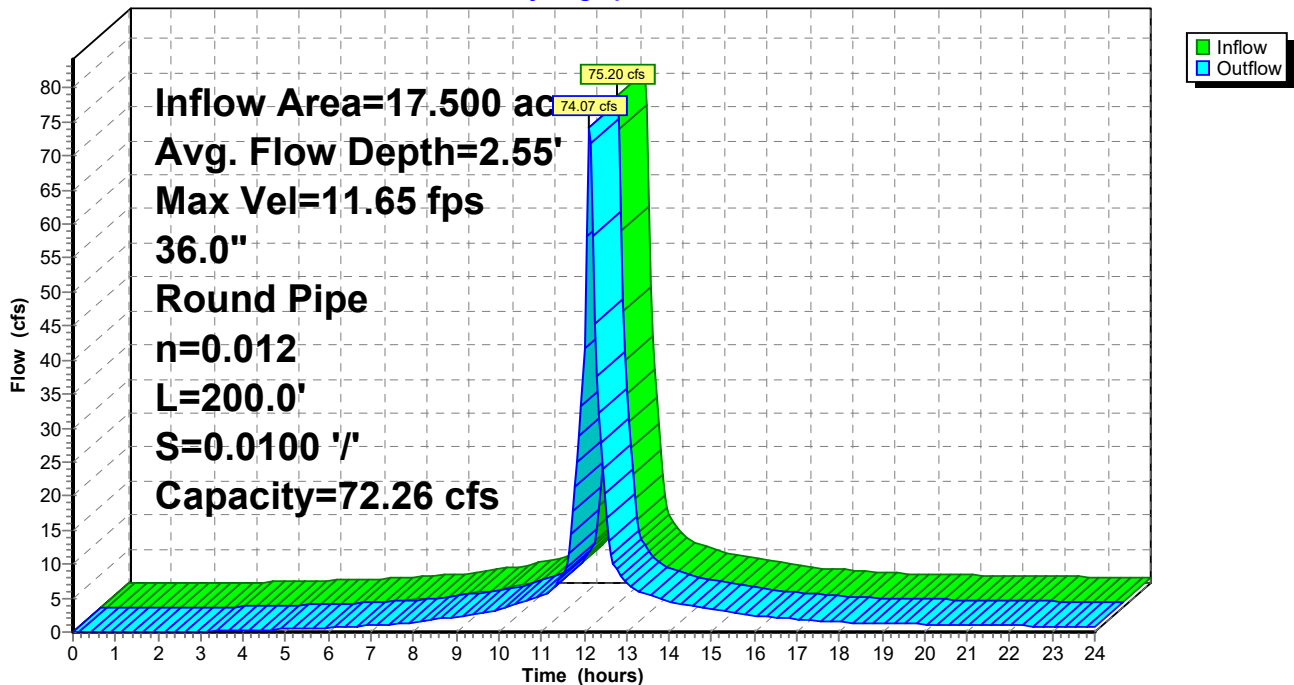
Peak Storage= 1,285 cf @ 12.12 hrs  
 Average Depth at Peak Storage= 2.55'  
 Bank-Full Depth= 3.00' Flow Area= 7.1 sf, Capacity= 72.26 cfs

36.0" Round Pipe  
 n= 0.012  
 Length= 200.0' Slope= 0.0100 '/'  
 Inlet Invert= 0.00', Outlet Invert= -2.00'



**Reach 8R: Exist. 36" RCP, Downstream of V. Mall**

Hydrograph



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Type III 24-hr Rainfall=5.00"

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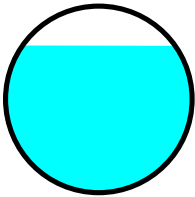
**Summary for Reach 9AR: Maplewood Intercept**

Inflow Area = 19.300 ac, Inflow Depth > 3.89"  
 Inflow = 65.53 cfs @ 12.12 hrs, Volume= 6.255 af  
 Outflow = 65.38 cfs @ 12.12 hrs, Volume= 6.255 af, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
 Max. Velocity= 10.93 fps, Min. Travel Time= 0.0 min  
 Avg. Velocity = 4.18 fps, Avg. Travel Time= 0.1 min

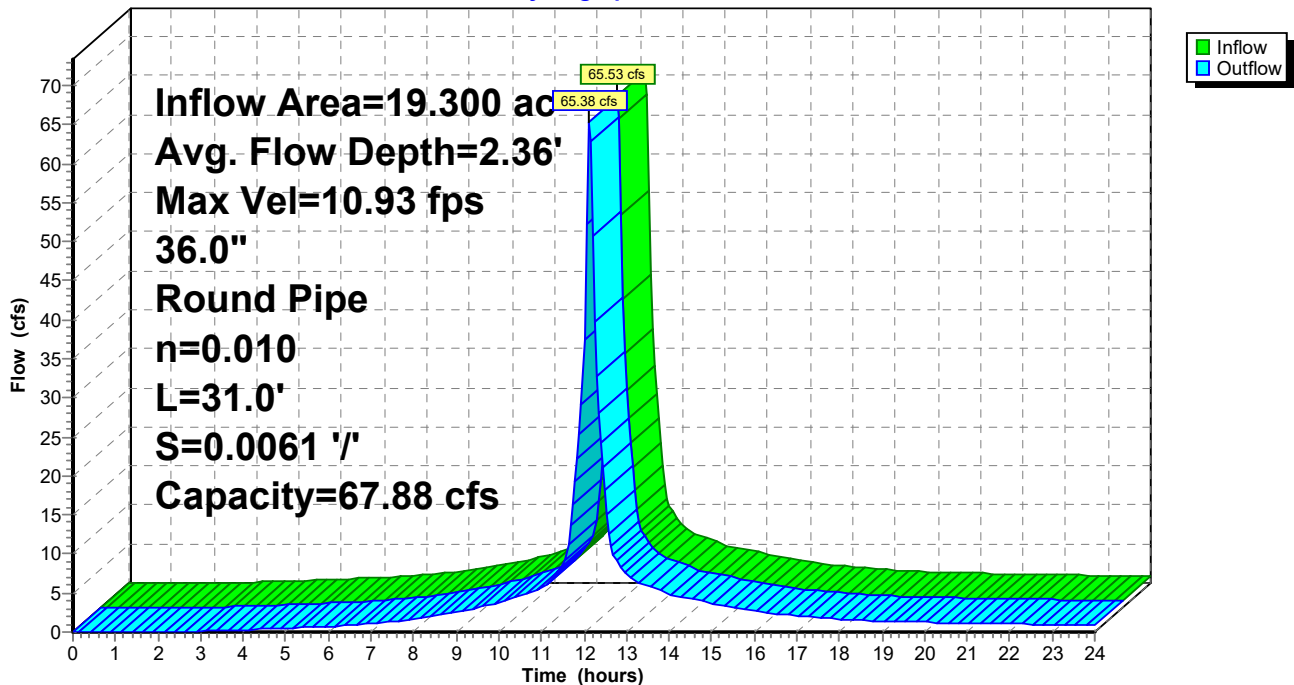
Peak Storage= 185 cf @ 12.12 hrs  
 Average Depth at Peak Storage= 2.36'  
 Bank-Full Depth= 3.00' Flow Area= 7.1 sf, Capacity= 67.88 cfs

36.0" Round Pipe  
 n= 0.010  
 Length= 31.0' Slope= 0.0061 '/'  
 Inlet Invert= 0.00', Outlet Invert= -0.19'



**Reach 9AR: Maplewood Intercept**

Hydrograph



# PROJECT CONDITIONS

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Type III 24-hr Rainfall=5.00"

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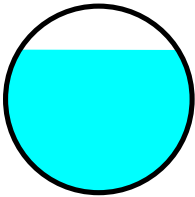
## Summary for Reach 9BR: Maplewood Intercept

Inflow Area = 19.300 ac, Inflow Depth > 3.89"  
Inflow = 65.38 cfs @ 12.12 hrs, Volume= 6.255 af  
Outflow = 62.79 cfs @ 12.16 hrs, Volume= 6.249 af, Atten= 4%, Lag= 2.4 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Max. Velocity= 8.14 fps, Min. Travel Time= 1.2 min  
Avg. Velocity = 3.10 fps, Avg. Travel Time= 3.2 min

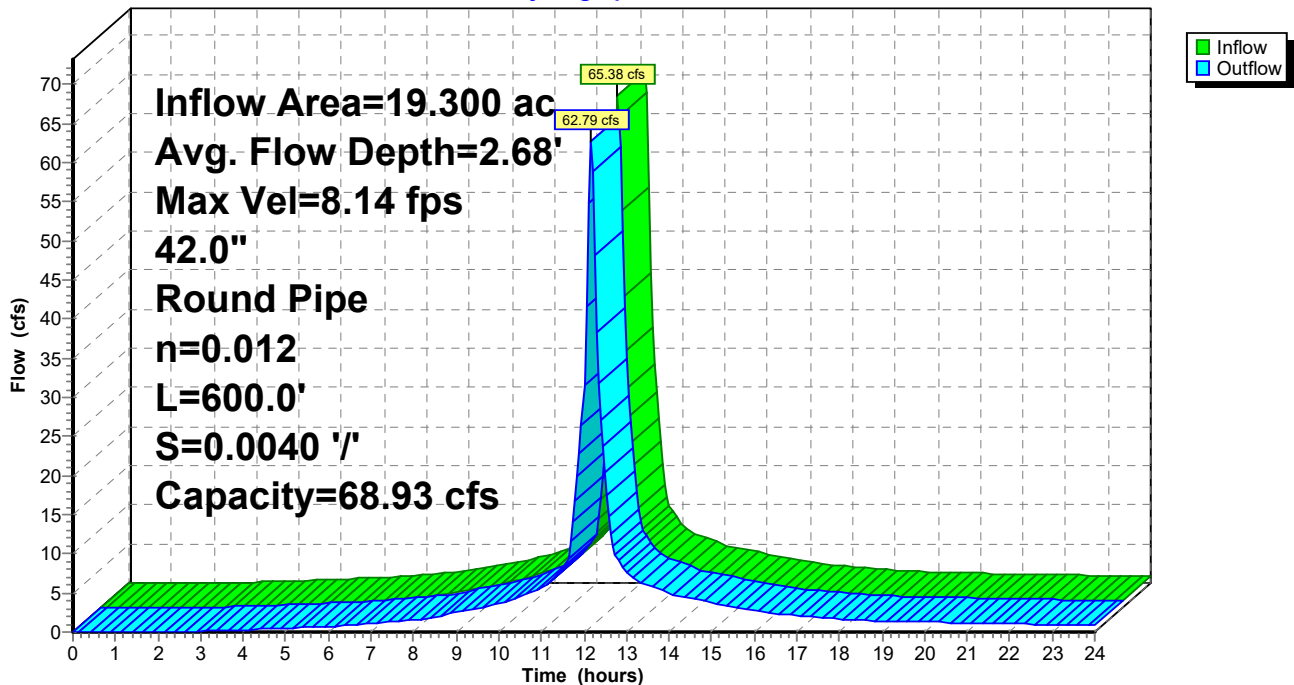
Peak Storage= 4,740 cf @ 12.14 hrs  
Average Depth at Peak Storage= 2.68'  
Bank-Full Depth= 3.50' Flow Area= 9.6 sf, Capacity= 68.93 cfs

42.0" Round Pipe  
n= 0.012  
Length= 600.0' Slope= 0.0040 '/'  
Inlet Invert= 0.00', Outlet Invert= -2.40'



## Reach 9BR: Maplewood Intercept

Hydrograph



**PROJECT CONDITIONS**

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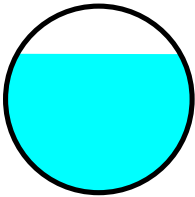
**Summary for Reach 10R: Upper Bridge St.**

Inflow Area = 6.700 ac, Inflow Depth > 4.91"  
 Inflow = 41.55 cfs @ 12.12 hrs, Volume= 2.742 af  
 Outflow = 40.88 cfs @ 12.14 hrs, Volume= 2.741 af, Atten= 2%, Lag= 0.9 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
 Max. Velocity= 7.31 fps, Min. Travel Time= 0.4 min  
 Avg. Velocity = 2.41 fps, Avg. Travel Time= 1.2 min

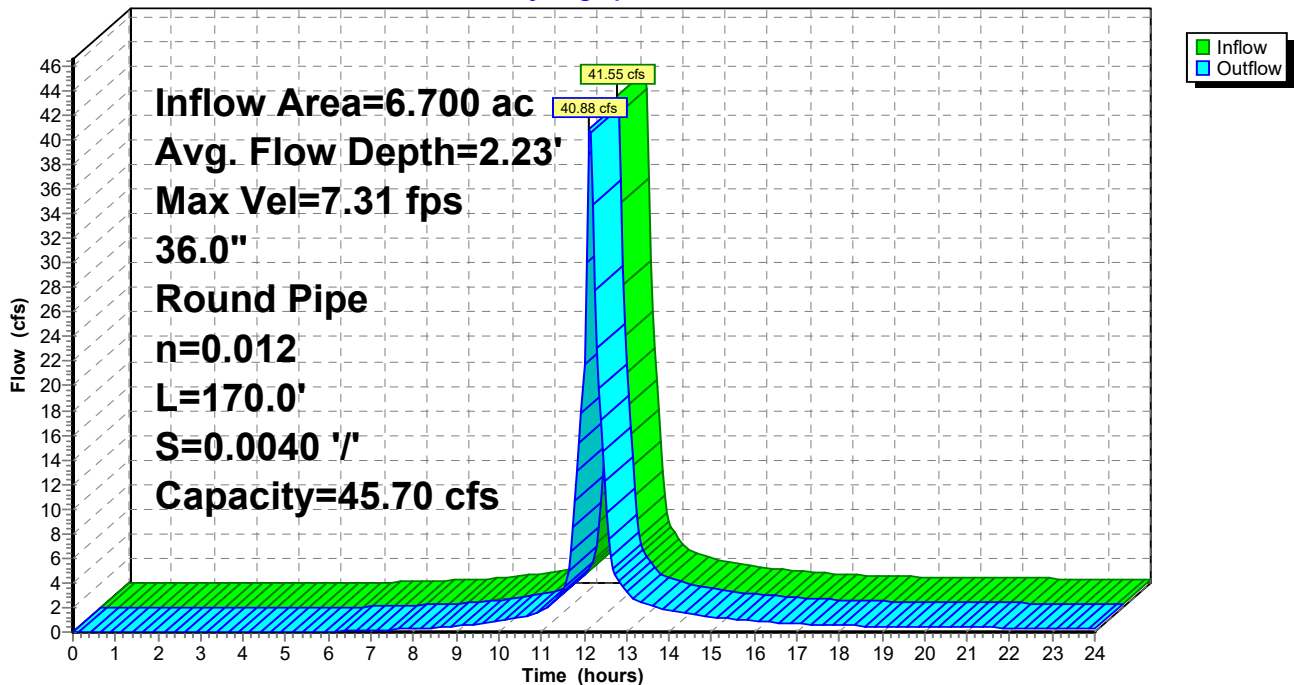
Peak Storage= 959 cf @ 12.13 hrs  
 Average Depth at Peak Storage= 2.23'  
 Bank-Full Depth= 3.00' Flow Area= 7.1 sf, Capacity= 45.70 cfs

36.0" Round Pipe  
 n= 0.012  
 Length= 170.0' Slope= 0.0040 '/'  
 Inlet Invert= 0.00', Outlet Invert= -0.68'



**Reach 10R: Upper Bridge St.**

Hydrograph



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Type III 24-hr Rainfall=5.00"

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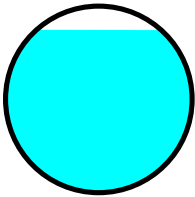
**Summary for Reach 11R: Bridge Street Sag**

Inflow Area = 11.200 ac, Inflow Depth > 4.58"  
 Inflow = 59.33 cfs @ 12.12 hrs, Volume= 4.274 af  
 Outflow = 58.29 cfs @ 12.13 hrs, Volume= 4.273 af, Atten= 2%, Lag= 0.7 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
 Max. Velocity= 9.02 fps, Min. Travel Time= 0.3 min  
 Avg. Velocity = 3.12 fps, Avg. Travel Time= 0.9 min

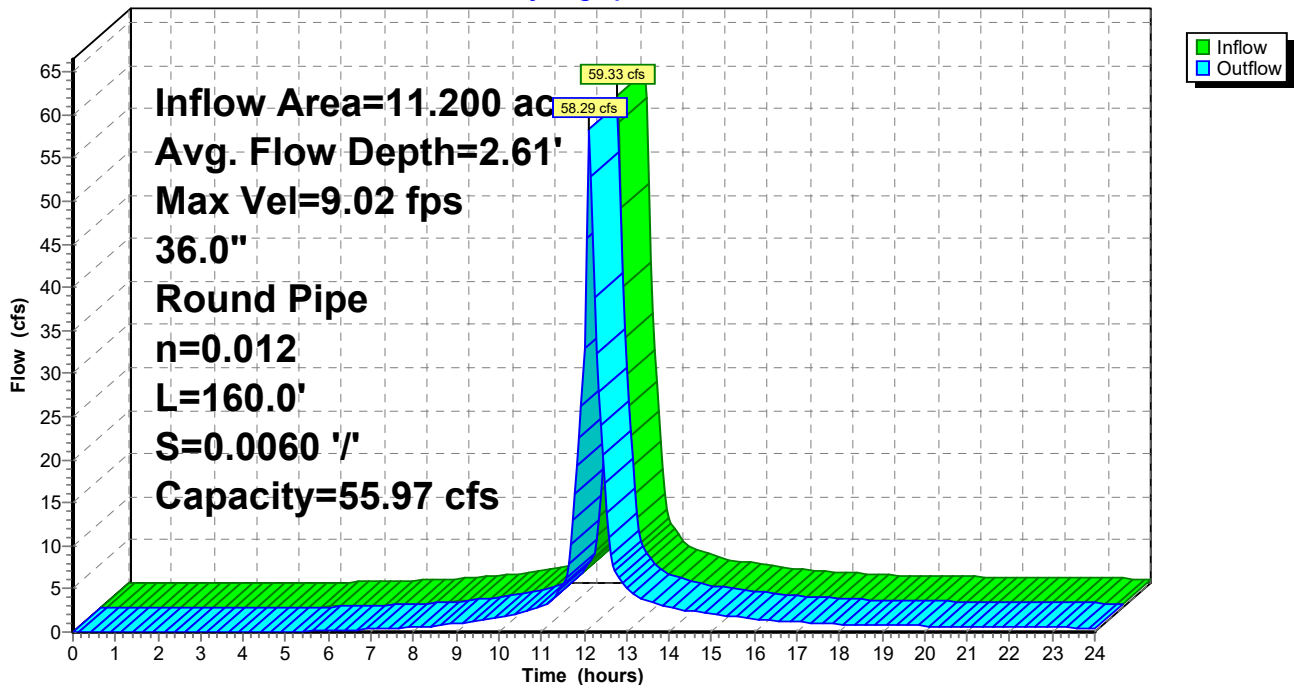
Peak Storage= 1,049 cf @ 12.12 hrs  
 Average Depth at Peak Storage= 2.61'  
 Bank-Full Depth= 3.00' Flow Area= 7.1 sf, Capacity= 55.97 cfs

36.0" Round Pipe  
 n= 0.012  
 Length= 160.0' Slope= 0.0060 '/'  
 Inlet Invert= 0.00', Outlet Invert= -0.96'



**Reach 11R: Bridge Street Sag**

Hydrograph





# PROJECT CONDITIONS

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Type III 24-hr Rainfall=5.00"

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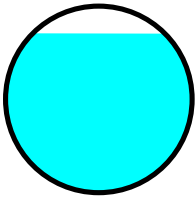
## Summary for Reach 12CR: x-cntry intercept

Inflow Area = 22.300 ac, Inflow Depth > 3.80"  
Inflow = 72.44 cfs @ 12.15 hrs, Volume= 7.066 af  
Outflow = 71.03 cfs @ 12.17 hrs, Volume= 7.062 af, Atten= 2%, Lag= 1.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Max. Velocity= 6.31 fps, Min. Travel Time= 0.6 min  
Avg. Velocity = 2.46 fps, Avg. Travel Time= 1.4 min

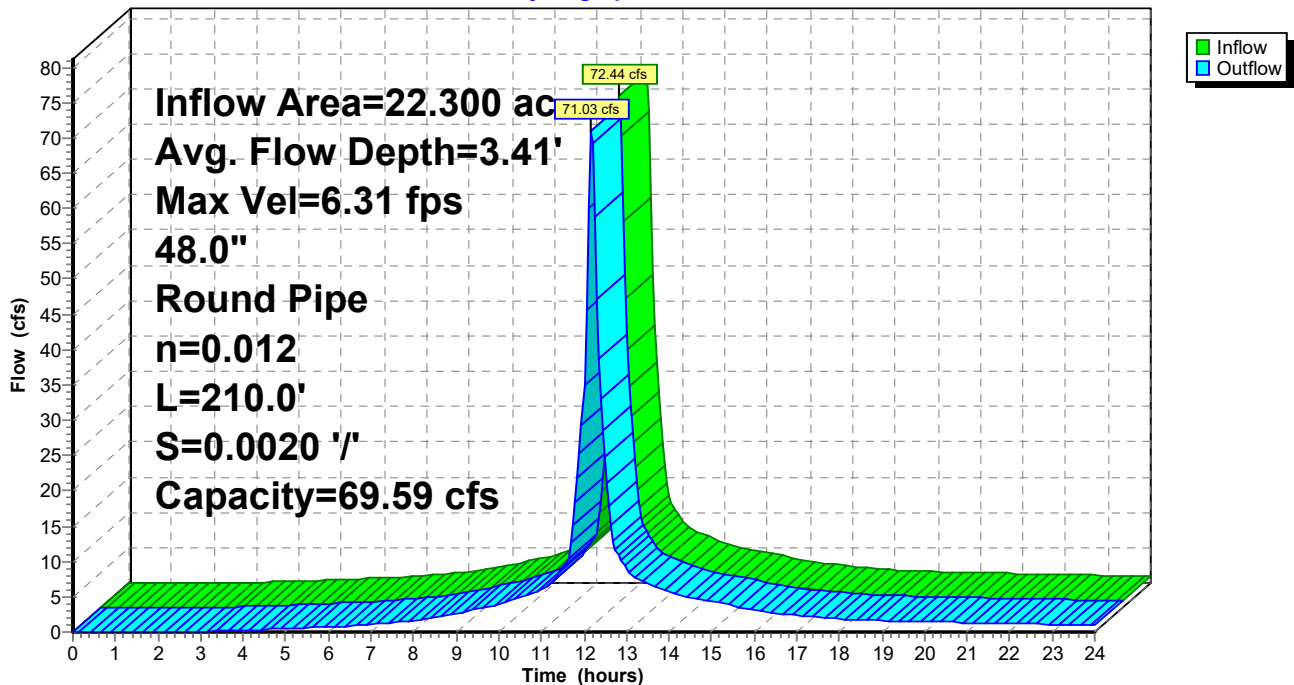
Peak Storage= 2,400 cf @ 12.16 hrs  
Average Depth at Peak Storage= 3.41'  
Bank-Full Depth= 4.00' Flow Area= 12.6 sf, Capacity= 69.59 cfs

48.0" Round Pipe  
n= 0.012  
Length= 210.0' Slope= 0.0020 '/'  
Inlet Invert= 0.00', Outlet Invert= -0.42'



## Reach 12CR: x-cntry intercept

Hydrograph



**PROJECT CONDITIONS**

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Type III 24-hr Rainfall=5.00"

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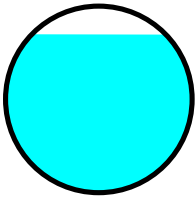
**Summary for Reach 12R: Deer Street**

Inflow Area = 14.700 ac, Inflow Depth > 4.41"  
 Inflow = 72.39 cfs @ 12.12 hrs, Volume= 5.399 af  
 Outflow = 70.96 cfs @ 12.13 hrs, Volume= 5.397 af, Atten= 2%, Lag= 1.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
 Max. Velocity= 6.31 fps, Min. Travel Time= 0.4 min  
 Avg. Velocity = 2.16 fps, Avg. Travel Time= 1.2 min

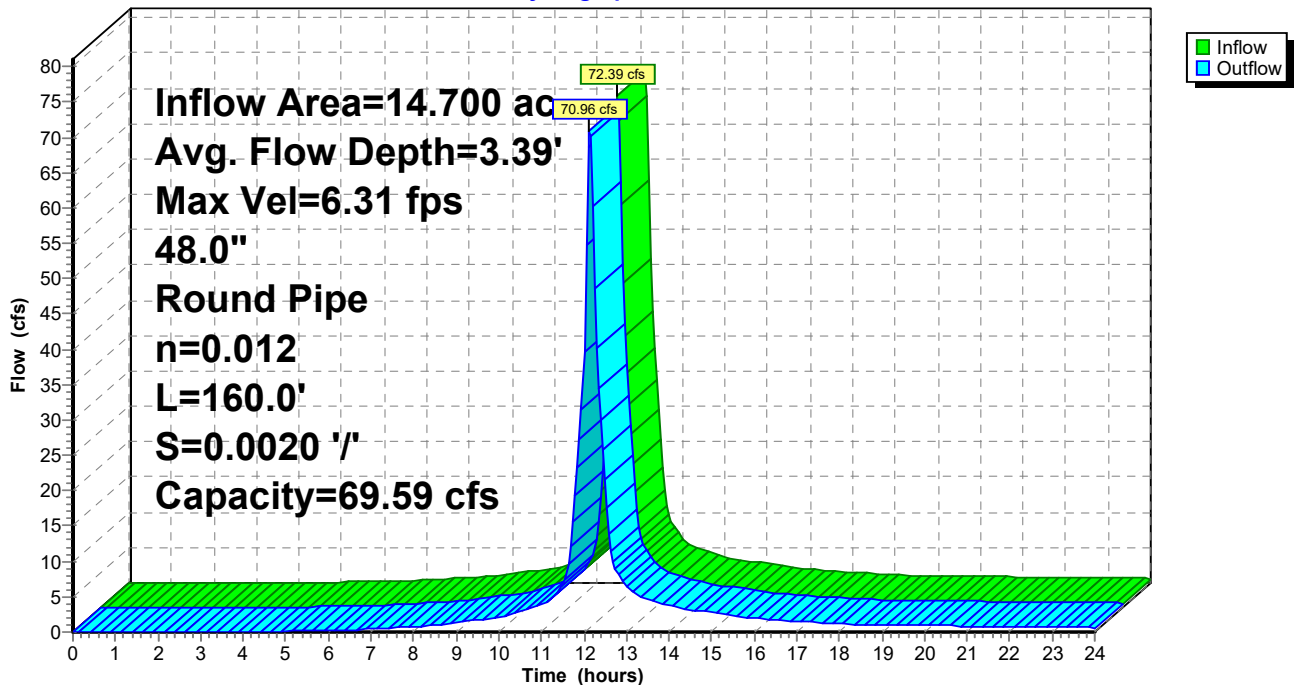
Peak Storage= 1,823 cf @ 12.12 hrs  
 Average Depth at Peak Storage= 3.39'  
 Bank-Full Depth= 4.00' Flow Area= 12.6 sf, Capacity= 69.59 cfs

48.0" Round Pipe  
 n= 0.012  
 Length= 160.0' Slope= 0.0020 '/'  
 Inlet Invert= 0.00', Outlet Invert= -0.32'



**Reach 12R: Deer Street**

Hydrograph



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Type III 24-hr Rainfall=5.00"

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## Summary for Pond 9: DMH #6 (Flow Splitter)

Inflow Area = 19.300 ac, Inflow Depth > 4.32"  
Inflow = 82.02 cfs @ 12.12 hrs, Volume= 6.951 af  
Outflow = 82.02 cfs @ 12.12 hrs, Volume= 6.951 af, Atten= 0%, Lag= 0.0 min  
Primary = 65.53 cfs @ 12.12 hrs, Volume= 6.255 af  
Secondary = 16.49 cfs @ 12.12 hrs, Volume= 0.696 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Peak Elev= 9.69' @ 12.12 hrs

| Device | Routing   | Invert | Outlet Devices                     |
|--------|-----------|--------|------------------------------------|
| #1     | Primary   | 4.50'  | 36.0" Vert. Orifice/Grate C= 0.600 |
| #2     | Secondary | 5.20'  | 18.0" Vert. Orifice/Grate C= 0.600 |

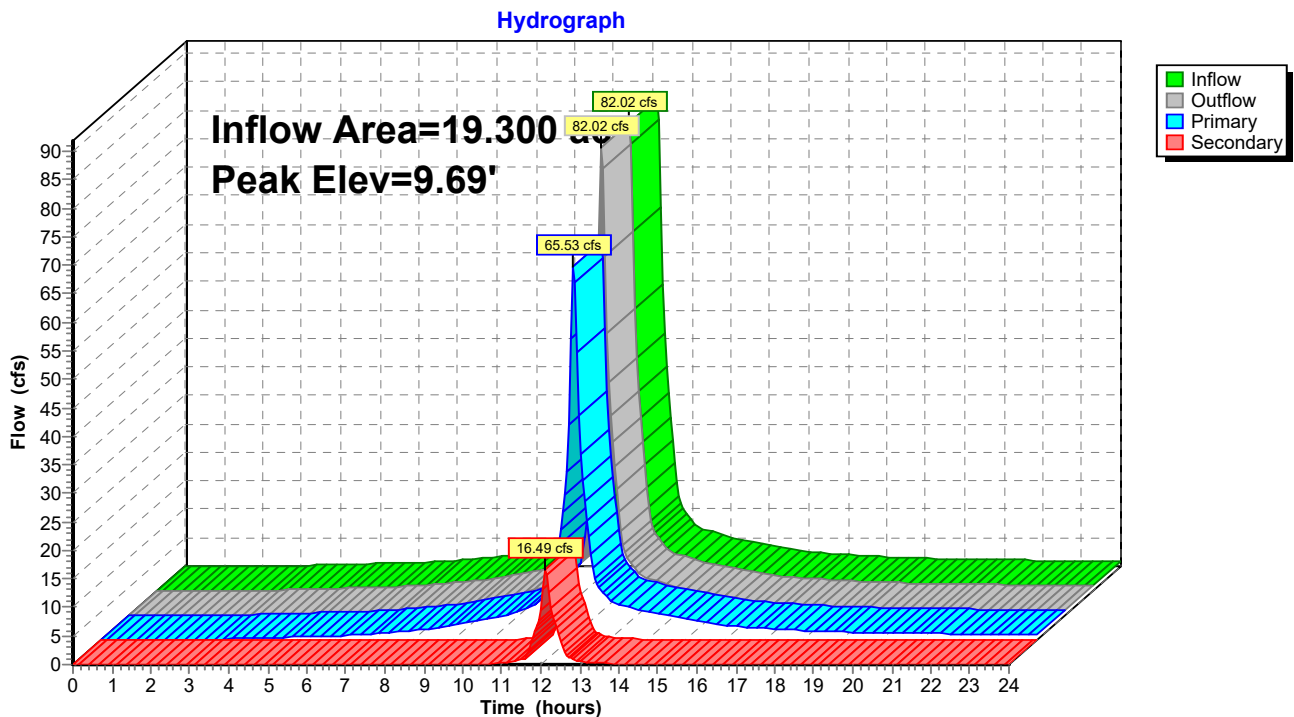
**Primary OutFlow** Max=63.94 cfs @ 12.12 hrs HW=9.53' (Free Discharge)

↳1=Orifice/Grate (Orifice Controls 63.94 cfs @ 9.05 fps)

**Secondary OutFlow** Max=16.10 cfs @ 12.12 hrs HW=9.53' (Free Discharge)

↳2=Orifice/Grate (Orifice Controls 16.10 cfs @ 9.11 fps)

## Pond 9: DMH #6 (Flow Splitter)



# PROJECT CONDITIONS

Prepared by HP Inc.

HydroCAD® 10.00-26 s/n 10718 © 2020 HydroCAD Software Solutions LLC

Type III 24-hr Rainfall=5.00"

Printed 4/6/2023

Page 35

## Summary for Pond 13: Twin 48" Outfall Pipes

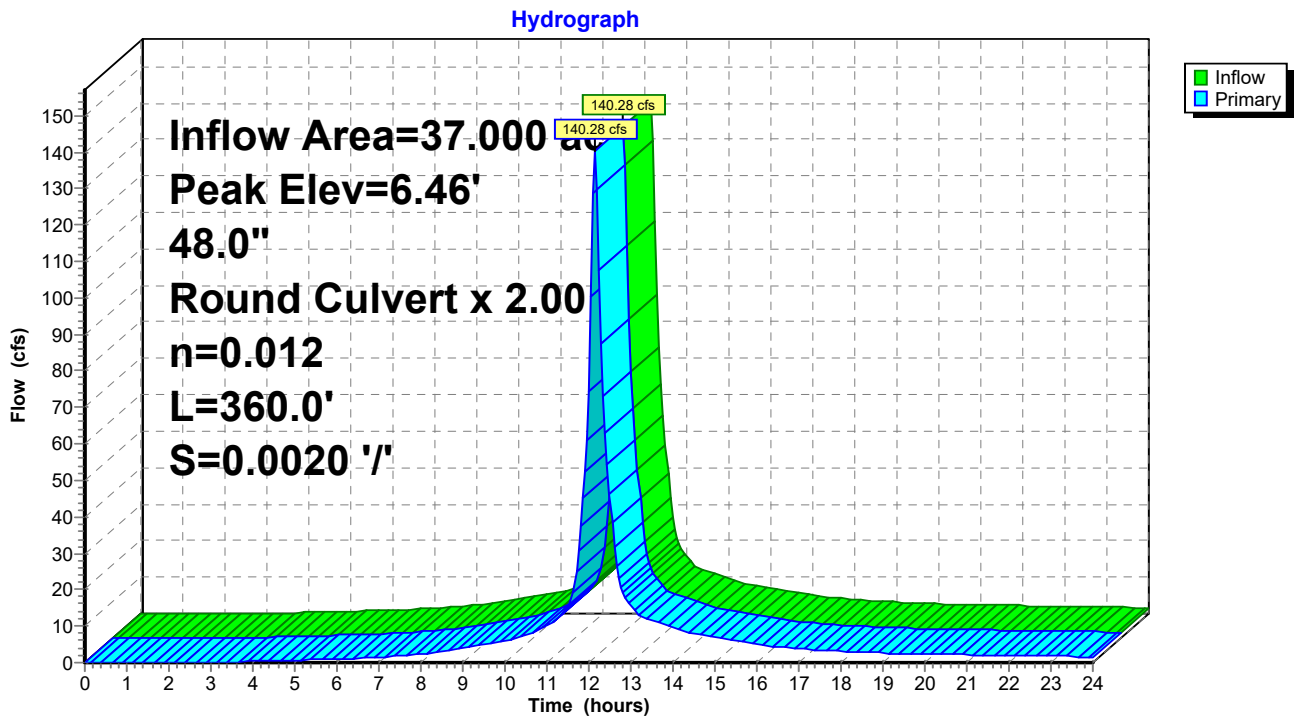
Inflow Area = 37.000 ac, Inflow Depth > 4.04"  
Inflow = 140.28 cfs @ 12.15 hrs, Volume= 12.459 af  
Outflow = 140.28 cfs @ 12.15 hrs, Volume= 12.459 af, Atten= 0%, Lag= 0.0 min  
Primary = 140.28 cfs @ 12.15 hrs, Volume= 12.459 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Peak Elev= 6.46' @ 12.15 hrs

| Device | Routing | Invert | Outlet Devices   |
|--------|---------|--------|--|
| #1     | Primary | -0.40' | <b>48.0" Round New 48" X 2.00</b><br>L= 360.0' RCP, sq.cut end projecting, Ke= 0.500<br>Inlet / Outlet Invert= -0.40' / -1.12' S= 0.0020 '/ Cc= 0.900<br>n= 0.012, Flow Area= 12.57 sf |

**Primary OutFlow** Max=140.08 cfs @ 12.15 hrs HW=6.46' TW=5.00' (Fixed TW Elev= 5.00')  
↑1=New 48" (Outlet Controls 140.08 cfs @ 5.57 fps)

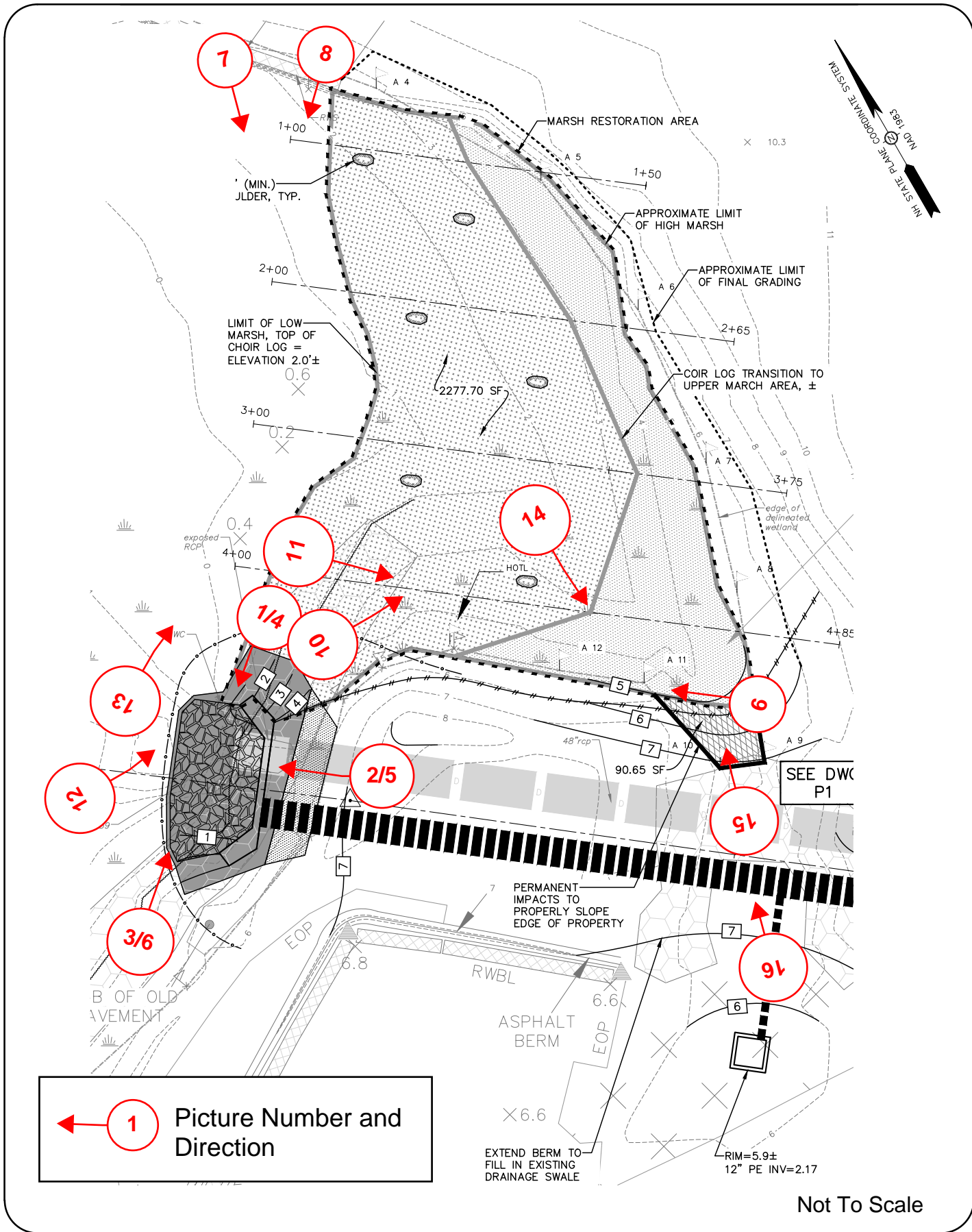
## Pond 13: Twin 48" Outfall Pipes



# **ATTACHMENT H**

## **Photos**





**1** Picture Number and Direction

DATE  
 3-6-24  
 PROJECT  
 2542

**UNDERWOOD**  
 engineers  
 25 Vaughan Mall, Portsmouth, N.H. 03801  
 Tel. 603-436-6192 Fax. 603-431-4733

**Photo index**  
 Outfall Improvements and Marsh Restoration  
 Portsmouth, New Hampshire

FIG.  
 3.1

Project Area Photos  
Maplewood Avenue Outfall Improvements  
Portsmouth, NH



**Photo 1** – Existing outfall headwall, exposed 48” RCP pipe, and tidal embankment looking west at approximate high tide.  
Taken 9/28/22



**Photo 2** – Existing outfall headwall and exposed 48” RCP pipe looking northwest at approximate high tide. Taken 9/28/22



Project Area Photos  
Maplewood Avenue Outfall Improvements  
Portsmouth, NH



**Photo 3** – Existing outfall headwall, exposed 48” RCP pipe, and tidal embankment looking east at approximate high tide.  
Taken 9/28/22



**Photo 4** – Existing outfall headwall, exposed 48” RCP pipe, and tidal embankment looking west at approximate low tide.  
Taken 9/29/22

Project Area Photos  
Maplewood Avenue Outfall Improvements  
Portsmouth, NH



**Photo 5** – Existing outfall headwall and exposed 48” RCP pipe looking northwest at approximate low tide. Taken 9/29/22



**Photo 6** – Existing outfall headwall, exposed 48” RCP pipe, and tidal embankment looking east at approximate low tide.  
Taken 9/29/22

Project Area Photos  
Maplewood Avenue Outfall Improvements  
Portsmouth, NH



**Photo 7** – Mitigation area, looking south at approximate low tide. Taken 3/20/24



**Photo 8** – Mitigation area, looking southeast at approximate low tide. Note existing large rocks to be stockpiled for use on stabilized slope and ice breakers. Taken 3/20/24

Project Area Photos  
Maplewood Avenue Outfall Improvements  
Portsmouth, NH



**Photo 9** – Small existing marsh area in mitigation area looking northwest at approximate low tide. Note proposed grading will work to include within the proposed high marsh area. Taken 3/20/24



**Photo 10** – Mitigation area looking east at approximate low tide. Note undercut embankment below cemetery. Marsh restoration will provide revetement. Trees and vegetation on embankment to remain, tree canopy to be trimmed up approximately 20' from ground surface. Taken 3/20/24

Project Area Photos  
Maplewood Avenue Outfall Improvements  
Portsmouth, NH



**Photo 11** – Small existing marsh area in mitigation area looking northwest at approximate low tide. Note proposed grading will work to include within the proposed high marsh area. Taken 3/20/24



**Photo 12** – Existing outfall headwall with mitigation area in background looking east at approximate low tide. Taken 3/20/24

Project Area Photos  
Maplewood Avenue Outfall Improvements  
Portsmouth, NH



**Photo 13** – Approximate location of proposed stabilized marsh sill, looking northeast at approximate low tide. Taken 3/20/24



**Photo 14** – Eroded channel in mitigation area at outlet of drainage swale (to be eliminated), looking south at approximate low tide. Taken 3/20/24

Project Area Photos  
Maplewood Avenue Outfall Improvements  
Portsmouth, NH



**Photo 15** – Existing drainage swale outlet (to be eliminated) and erosion in mitigation area looking north at approximate low tide. Taken 3/20/24



**Photo 16** – Existing drainage swale (to be eliminated) looking north at approximate low tide. Taken 3/20/24





# **ATTACHMENT I**

## **Work Sequence Narrative**



**Maplewood Avenue Outfall Improvements and Marsh Restoration**  
Portsmouth, New Hampshire

**Work Sequence Narrative**

Note: The sequence of work provided below is a typical sequence for the work proposed. Bidding documents will require the contractor to provide a detailed sequence of work based on their preferred method of installation.

Pipe Installation

Temporary and permanent erosion control devices will be installed at the project site prior to the start of construction in accordance with the Contractor's Approved SWPPP. Silt booms will also be installed in accordance with the project plans in the vicinity of the work. It is anticipated that the contractor will complete all installations during low tide and low flow conditions and permanent flow diversions and engineered dewatering systems will not be required. Any trench dewatering that occurs during installation will be discharged to appropriate silt bags or haybale detention ponds.

The trench for the new proposed 48" reinforced concrete pipe will be excavated through the embankment at North Mill Pond in parallel to the existing 48" reinforced concrete pipe. Following the removal of the existing outfall headwall, a new headwall for the existing and proposed 48" pipes will be constructed in the embankment at low tide. The proposed 48" pipe will be installed in the finished trench and dewatering and daily gravel installation measures will be performed as stated on the project plans.

Site restoration efforts after the completion of the pipe installation will include filling excavations and stabilizing the embankment and other disturbed areas within the jurisdictional wetlands. The temporary and permanent erosion control measures will be removed from the site once vegetation is established and all disturbed areas are fully stabilized.

Marsh Restoration

Contractor will ensure the silt boom is installed across the entire marsh restoration area. Sequence his work to complete all grading and fill operation during low tide conditions. Planting shall be scheduled to occur immediately following the completion of grading to begin establishing vegetation as soon as possible. Tree limb trimming as described on the drawings shall occur anytime prior to the planting of marsh vegetation

Following planting of vegetation, the marsh area shall be routinely monitored for erosion and vegetation establishment. Weather conditions will also be monitored so that vegetation is to be watered as required during times of drought. Monitoring will also be in place to ensure that geese and other waterfowl are not negatively impacting the newly planted areas. If waterfowl impacts are observed than measured shall be put in place to deter waterfowl until vegetation is established. Long term observation and maintenance will be conducted by a certified wetlands scientist as required by NHDES to ensure long term success of the mitigated area.



**ATTACHMENT J**

**NHB Datacheck  
NHF&G Communication**





## NHB DataCheck Results Letter

NH Natural Heritage Bureau

Please note: maps and NHB record pages are **confidential** and shall be redacted from public documents.

To: Dan Rochette, Underwood Engineers  
25 Vaughan Mall  
Portsmouth, NH 03801  
drochette@underwoodengineers.com

From: NHB Review  
NH Natural Heritage Bureau  
Main Contact: Ashley Litwinenko - [nhbreview@dncr.nh.gov](mailto:nhbreview@dncr.nh.gov)

cc: NHFG Review

Date: 02/20/2024 (valid until 02/20/2025)

Re: DataCheck Review by NH Natural Heritage Bureau and NH Fish & Game

Permits: NHDES - Wetland Standard Dredge & Fill - Major

**NHB ID: NHB24-0476**

Town: Portsmouth

Location: Maplewood Avenue

**Project Description:** Upgrade and existing drainage outfall at North Mill pond to increase capacity and complete a marsh restoration adjacent to the outfall area

### **Next Steps for Applicant:**

NHB's database has been searched for records of rare species and exemplary natural communities. Please carefully read the comments and consultation requirements below.

**NHB Comments:** No comments at this time.

**NHFG Comments:** Please refer to NHFG consultation requirements below.

### **NHB Consultation**

If this NHB DataCheck letter includes records of rare plants and/or natural communities/systems, please contact NHB and provide any requested supplementary materials by emailing [nhbreview@dncr.nh.gov](mailto:nhbreview@dncr.nh.gov).

If this NHB DataCheck letter DOES NOT include any records of rare plants and/or natural communities/systems, no further consultation with NHB is required.

### **NH Fish and Game Department Consultation**

If this NHB DataCheck letter DOES NOT include ANY wildlife species records, then, based on the information submitted, no further consultation with the NH Fish and Game Department pursuant to Fis 1004 is required.



## NHB DataCheck Results Letter

NH Natural Heritage Bureau

Please note: maps and NHB record pages are **confidential** and shall be redacted from public documents.

If this NHB DataCheck letter includes a record for a threatened (T) or endangered (E) wildlife species, consultation with the New Hampshire Fish and Game Department under Fis 1004 may be required. To review the Fis 1000 rules (effective February 3, 2022), please go to <https://www.wildlife.nh.gov/wildlife-and-habitat/nongame-and-endangered-species/environmental-review>. All requests for consultation and submittals should be sent via email to [NHFGreview@wildlife.nh.gov](mailto:NHFGreview@wildlife.nh.gov) or can be sent by mail, and **must include the NHB DataCheck results letter number and "Fis 1004 consultation request" in the subject line.**

If the NHB DataCheck response letter does not include a threatened or endangered wildlife species but includes other wildlife species (e.g., Species of Special Concern), consultation under Fis 1004 is not required; however, some species are protected under other state laws or rules, so coordination with NH Fish & Game is highly recommended or may be required for certain permits. While some permitting processes are exempt from required consultation under Fis 1004 (e.g., *statutory permit by notification, permit by rule, permit by notification, routine roadway registration, docking structure registration, or conditional authorization by rule*), coordination with NH Fish & Game may still be required under the rules governing those specific permitting processes, and it is recommended you contact the applicable permitting agency. For projects not requiring consultation under Fis 1004, but where additional coordination with NH Fish and Game is requested, please email [NHFGreview@wildlife.nh.gov](mailto:NHFGreview@wildlife.nh.gov), and include the NHB DataCheck results letter number and "review request" in the email subject line.

**Contact NH Fish & Game at (603) 271-0467 with questions.**





## NHB DataCheck Results Letter

NH Natural Heritage Bureau

Please note: maps and NHB record pages are **confidential** and shall be redacted from public documents.

### NHB Database Records:

The following record(s) have been documented in the vicinity of the proposed project.  
Please see the map and detailed information about the record(s) on the following pages.

| Vertebrate species                         | State <sup>1</sup> | Federal | Notes  |
|--|--------------------|---------|--|
| American Eel ( <i>Anguilla rostrata</i> )* | SC                 | --      | Contact the NH Fish & Game Dept (see above). |

<sup>1</sup>Codes: "E" = Endangered, "T" = Threatened, "SC" = Special Concern, "--" = an exemplary natural community, or a rare species tracked by NH Natural Heritage that has not yet been added to the official state list.

An asterisk (\*) indicates that the most recent report for that occurrence was 20 or more years ago.

*For all animal reviews, refer to 'IMPORTANT: NHFG Consultation' section above.*

**Disclaimer:** NHB's database can only tell you of known occurrences that have been reported to NHFG/NHB. Known occurrences are based on information gathered by qualified biologists or members of the public, reported to our offices, and verified by NHB/NHFG.

However, many areas have never been surveyed, or have only been surveyed for certain species.

NHB recommends surveys to determine what species/natural communities are present onsite.



## NHB DataCheck Results Letter

NH Natural Heritage Bureau

Please note: maps and NHB record pages are **confidential** and shall be redacted from public documents.

### NHB24-0476



## NHB DataCheck Results Letter

NH Natural Heritage Bureau

Please note: maps and NHB record pages are **confidential** and shall be redacted from public documents.

NHB24-0476

EOCODE:

AFCEA01010\*004\*NH

## New Hampshire Natural Heritage Bureau - Animal Record

### American Eel (*Anguilla rostrata*)

#### Legal Status

---

Federal: Not listed  
State: Special Concern

#### Conservation Status

---

Global: Apparently secure but with cause for concern  
State: Rare or uncommon

#### Description at this Location

---

Conservation Rank: Not ranked  
Comments on Rank: --

Detailed Description: 2000: Area 13217: Not enumerated.

General Area: --

General Comments: --

Management: --

Comments:

#### Location

---

Survey Site Name: Portsmouth Harbor

Managed By:

County: Rockingham

Town(s): Portsmouth

Size: 1.9 acres

Elevation:

Precision: Within (but not necessarily restricted to) the area indicated on the map.

Directions: 2000: Hodgson Brook

#### Dates documented

---

First reported: 2000

Last reported: 2000

The New Hampshire Fish & Game Department has jurisdiction over rare wildlife in New Hampshire. Please contact them at 11 Hazen Drive, Concord, NH 03301 or at (603) 271-2461.

## Allison Rees

---

**From:** Sullivan, Kevin <Kevin.M.Sullivan@wildlife.nh.gov>  
**Sent:** Wednesday, April 3, 2024 10:11 AM  
**To:** Daniel Rochette  
**Cc:** Jacob Stoddard; Allison Rees; FGC: NHFG review  
**Subject:** NHB24-0476 Maplewood Ave Portsmouth NHDES D&F Not Yet Filed NHFG Recommendations (Non-Fis)  
**Attachments:** American Eel.pdf

Some people who received this message don't often get email from kevin.m.sullivan@wildlife.nh.gov. [Learn why this is important](#)

Dan,

Thank you for the update on the status of NHDES application and the tax map. See recommendations below.

Hello Mr. Rochette,

New Hampshire Fish and Game has completed review of materials submitted for consultation for NHB24-0476 on April 3, 2024 (site plans dated March 14, 2024) prepared by Underwood Engineers. The project involves upgrading an existing drainage outfall at North Mill pond to increase capacity and complete a marsh restoration adjacent to the outfall area. The site is located on North Mill Pond near 90 Maplewood Avenue in Portsmouth, NH (Tax Map 125, Lot 19 & Tax Map 124, Lot 2).

**Incorporation of NHFG recommendations is not required for Species of Special Concern; however, American Eel are protected under other state laws or rules, and incorporation of recommendations is highly recommended or may be required for certain permits. Applicants would still be responsible for any actions that may result in the take of this species. The recommendations below should be incorporated into site plans in order to help minimize potential take.**

**Permit applications associated with this project:**

(note if you apply for other permits not listed below, you must notify NHFG and request a response to see if recommendations provided below can be applied to other permit applications. All anticipated permits that may be required or will be applied for MUST be identified on the NHB datacheck results letter or the NHB letter is not considered valid and cannot be applied to a consultation/permit application review).

### **NHDES STANDARD DREDGE & FILL WETLANDS Permit MAJOR — File# (NOT YET FILED)**

Based on the NHB DataCheck results letter and the information provided in the submission as well as in communications and materials provided during our consultation review, we request the following recommended permit conditions. **THESE RECOMMENDED PERMIT CONDITIONS ARE APPLICABLE TO ALL STATE PERMITS LISTED ABOVE.**

- For consideration in the AoT permit review process, please incorporate recommendations along with associated materials as detailed, into the final sheet plans as written below (update highlighted text as applicable) and provide to NHDES for final review and copy NHFG.

- For all other permits, please include recommended permit conditions in final plan sheets plans as written below (update highlighted text as applicable) and provide to NHDES for final review and copy NHFG. Permit reviewers will adopt/include NHFG permit conditions in the permit if approved.

### New Hampshire Fish and Game Recommended Permit Conditions:

1. American Eel (State Species of Special Concern) occur within the vicinity of the project area. Based on the details provided in the materials reviewed for the proposed project and the location of the project site, NHFG does not anticipate impacts to these species at this time. However, all operators and personnel working on or entering the site shall be made aware of the potential presence of these species and shall be provided flyers for the rare turtle species that help to identify these species, along with NHFG contact information. **See Plan Sheet xxxxxx** *Include attached flyers to plan sheet set.*
2. Rare species information (e.g. identification, observation and reporting of observations, when to contact NHFG immediately and NHFG contact information) shall be communicated during morning tailgate meetings prior to work commencement during the construction phase of the project. **See Plan Sheet xxxxxx**. *Include attached flyers to plan sheet set.*
3. All manufactured erosion and sediment control products, with the exception of turf reinforcement mats, utilized for, but not limited to, slope protection, runoff diversion, slope interruption, perimeter control, inlet protection, check dams, and sediment traps shall not contain plastic, or multifilament or monofilament polypropylene netting or mesh with an opening size of greater than 1/8 inches. **See Plan Sheet xxxxxx**.
4. All observations of threatened or endangered species on the project site shall be reported immediately to the NHFG nongame and endangered wildlife environmental review program by phone at 603-271-2461 and by email at [NHFGreview@wildlife.nh.gov](mailto:NHFGreview@wildlife.nh.gov), with the email subject line containing the NHB DataCheck tool results letter assigned number, the project name, and the term Wildlife Species Observation.
5. Photographs of the observed species and nearby elements of habitat or areas of land disturbance shall be provided to NHFG in digital format at the above email address for verification, as feasible.
6. In the event a threatened or endangered species is observed on the project site during the term of the permit, the species shall not be disturbed, handled, or harmed in any way prior to consultation with NHFG and implementation of corrective actions recommended by NHFG.
  - a. Site operators shall be allowed to relocate wildlife encountered if discovered within the active work zone if in direct harm from project activities. Wildlife shall be relocated in close proximity to the capture location but outside of the work zone and in the direction the individual was heading. NHFG shall be contacted immediately if this action occurs.
7. NHFG, including its employees and authorized agents, shall have access to the property during the term of the permit.

NHFG has completed our review of materials submitted for non-Fis consultation. No further coordination with NHFG is requested at this time. Please note that additional or a new consultation may be required in accordance with [Fis 1004.08\(b\)4](#) if there are changes in project design that is referenced above which

might result in potential impacts to threatened and endangered species, whether suggested to avoid harm to the species, or which could serve to increase the potential of adverse impacts to species.

Respectfully,  
Kevin

*Kevin Sullivan*

Environmental Review Supervisor  
NH Fish & Game Department  
11 Hazen Drive  
Concord NH 03301  
Phone: 603-271-2605  
Email: [Kevn.M.Sullivan@wildlife.nh.gov](mailto:Kevn.M.Sullivan@wildlife.nh.gov)

New Hampshire Fish and Game requirements for environmental review consultation can be found at: [https://gencourt.state.nh.us/rules/state\\_agencies/fis1000.html](https://gencourt.state.nh.us/rules/state_agencies/fis1000.html). ALL requests for consultation and submittals should be sent via email to [NHFGreview@wildlife.nh.gov](mailto:NHFGreview@wildlife.nh.gov) or can be sent hardcopy by mail. **The NHB datacheck results letter number needs to be included in the email subject line to read as "NHBxx-xxxx\_Project Name\_FIS 1004 Consultation Submittal".**

The requirements for consultation (Fis 1004) shall not apply to the following: statutory permit by notification, permit by rule, permit by notification, routine roadway registration, docking structure registration, or conditional authorization by rule. Review requests for these projects or other project types should be submitted to [NHFGreview@wildlife.nh.gov](mailto:NHFGreview@wildlife.nh.gov) or can be sent hardcopy by mail – email or mail subject line for these review requests should read "NHBxx-xxxx\_Project Name\_ Env. Review Request".

**Please provide shapefiles/KMZ/KMLs of the project site (and relevant features if applicable) with your submittal.** Review statements provided in the NHB Datacheck Results letter for additional guidance.

*The Nongame and Endangered Wildlife Program works to conserve over 400 species of mammals, birds, fish, reptiles, and amphibians, as well as thousands of insects and other invertebrates. The program relies in part on private contributions to accomplish its work, and to raise matching funds required for state and federal grants. Learn more at [www.wildnh.com/nongame](http://www.wildnh.com/nongame)*



---

**From:** Daniel Rochette <[drochette@underwoodengineers.com](mailto:drochette@underwoodengineers.com)>  
**Sent:** Wednesday, April 3, 2024 9:40 AM  
**To:** Sullivan, Kevin <[Kevin.M.Sullivan@wildlife.nh.gov](mailto:Kevin.M.Sullivan@wildlife.nh.gov)>; FGC: NHFG review <[NHFGreview@wildlife.nh.gov](mailto:NHFGreview@wildlife.nh.gov)>  
**Cc:** Jacob Stoddard <[jstoddard@underwoodengineers.com](mailto:jstoddard@underwoodengineers.com)>; Allison Rees <[arees@underwoodengineers.com](mailto:arees@underwoodengineers.com)>  
**Subject:** RE: NHB24-0476 Maplewood Ave, Portsmouth - Env. Review Request

**EXTERNAL: Do not open attachments or click on links unless you recognize and trust the sender.**

---

Good morning Kevin,

We have not submitted the permit yet. We had our pre-application mitigation meeting yesterday morning with the group and hope to submit the permit in early May

Attached as requested is the Tax Map for the location of wetland impacts.

Call with any questions.

Thanks

-Dan



*Client service and  
teamwork for over 40 years!*

**Daniel J. Rochette, P.E. (NH)**  
Senior Project Engineer & Technical Leader  
Underwood Engineers  
Phone: (603) 436-6192  
<http://www.underwoodengineers.com>

---

**From:** Sullivan, Kevin <[Kevin.M.Sullivan@wildlife.nh.gov](mailto:Kevin.M.Sullivan@wildlife.nh.gov)>  
**Sent:** Tuesday, April 2, 2024 3:14 PM  
**To:** Daniel Rochette <[drochette@underwoodengineers.com](mailto:drochette@underwoodengineers.com)>; FGC: NHFG review <[NHFGreview@wildlife.nh.gov](mailto:NHFGreview@wildlife.nh.gov)>  
**Cc:** Jacob Stoddard <[jstoddard@underwoodengineers.com](mailto:jstoddard@underwoodengineers.com)>; Allison Rees <[arees@underwoodengineers.com](mailto:arees@underwoodengineers.com)>  
**Subject:** RE: NHB24-0476 Maplewood Ave, Portsmouth - Env. Review Request

Hello Dan,

For my clarification. Have you applied for a NHDES permit yet? If so, can you tell me the application File #. Also, can you give me the Tax Map and Lots that cover the project work area.

Thank you,  
Kevin

*Kevin Sullivan*

Environmental Review Supervisor  
NH Fish & Game Department  
11 Hazen Drive  
Concord NH 03301  
Phone: 603-271-2605  
Email: [Kevn.M.Sullivan@wildlife.nh.gov](mailto:Kevn.M.Sullivan@wildlife.nh.gov)

New Hampshire Fish and Game requirements for environmental review consultation can be found at: [https://gencourt.state.nh.us/rules/state\\_agencies/fis1000.html](https://gencourt.state.nh.us/rules/state_agencies/fis1000.html). ALL requests for consultation and submittals should be sent via email to [NHFGreview@wildlife.nh.gov](mailto:NHFGreview@wildlife.nh.gov) or can be sent hardcopy by mail. **The NHB datacheck results letter number needs to be included in the email subject line to read as "NHBxx-xxxx\_Project Name\_FIS 1004 Consultation Submittal".**

The requirements for consultation (Fis 1004) shall not apply to the following: statutory permit by notification, permit by rule, permit by notification, routine roadway registration, docking structure registration, or conditional authorization by rule. Review requests for these projects or other project types should be submitted to [NHFGreview@wildlife.nh.gov](mailto:NHFGreview@wildlife.nh.gov) or can be sent hardcopy by mail – email or mail subject line for these review requests should read "NHBxx-xxxx\_Project Name\_ Env. Review Request".

Please provide shapefiles/KMZ/KMLs of the project site (and relevant features if applicable) with your submittal. Review statements provided in the NHB Datacheck Results letter for additional guidance.

The Nongame and Endangered Wildlife Program works to conserve over 400 species of mammals, birds, fish, reptiles, and amphibians, as well as thousands of insects and other invertebrates. The program relies in part on private contributions to accomplish its work, and to raise matching funds required for state and federal grants. Learn more at [www.wildnh.com/nongame](http://www.wildnh.com/nongame)



---

**From:** Daniel Rochette <[drochette@underwoodengineers.com](mailto:drochette@underwoodengineers.com)>  
**Sent:** Thursday, March 28, 2024 9:44 AM  
**To:** FGC: NHFG review <[NHFGreview@wildlife.nh.gov](mailto:NHFGreview@wildlife.nh.gov)>  
**Cc:** Jacob Stoddard <[jstoddard@underwoodengineers.com](mailto:jstoddard@underwoodengineers.com)>; Sullivan, Kevin <[Kevin.M.Sullivan@wildlife.nh.gov](mailto:Kevin.M.Sullivan@wildlife.nh.gov)>; Allison Rees <[arees@underwoodengineers.com](mailto:arees@underwoodengineers.com)>  
**Subject:** NHB24-0476 Maplewood Ave, Portsmouth - Env. Review Request

**EXTERNAL:** Do not open attachments or click on links unless you recognize and trust the sender.

---

Good morning,

Attached to begin the consultation/review process for the above referenced project is the package that was submitted to NHDES to meeting the requirements for the preapplication meeting (scheduled for April 2<sup>nd</sup>).

Please do not hesitate to call with any questions.

Thank You

-Dan



*Client service and  
teamwork for over 40 years!*

Daniel J. Rochette, P.E. (NH)  
Senior Project Engineer & Technical Leader  
Underwood Engineers  
Phone: (603) 436-6192  
<http://www.underwoodengineers.com>



## Daniel Rochette

---

**From:** FGC: NHFG review <NHFGreview@wildlife.nh.gov>  
**Sent:** Thursday, March 21, 2024 11:34 AM  
**To:** Daniel Rochette; FGC: NHFG review  
**Cc:** Jacob Stoddard; Sullivan, Kevin  
**Subject:** RE: NHB24-0476 Review need for Consultation

Some people who received this message don't often get email from nhfgreview@wildlife.nh.gov. [Learn why this is important](#)

Hi Dan,

Thank you for reaching out. I appreciate your patience while we navigate staffing shortages. You are correct, if the NHB datacheck results letter does not include records of Threatened and/or Endangered species, then consultation with NHFG does is not required to follow Fis rules. However, as you also correctly noted, NHFG consultation is still required for many state permits, including wetlands permit applications. This can make things a bit confusing!

In general, our review of a proposed project follows the same process whether or not a project is required by Fis rules. Depending on the species, some of the recommendations provided by NHFG may be required or strongly recommended in order to avoid impacts to species that may be protected by NH or federal laws (such as migratory birds which have state and federal protection).

You could proceed in two ways. You could provide us with the wetlands pre-application package as a submittal, and we could follow up with you if we have any questions or require additional information. Or, you could submit what you have available currently and request a non-Fis consultation review and provide similar details laid out in Fis 1004. Whatever you decide, you should submit materials via email to [NHFGreview@wildlife.nh.gov](mailto:NHFGreview@wildlife.nh.gov) with the subject line **NHB24-0476 Maplewood Ave, Portsmouth - Env. Review Request**.

We have already assigned you a program review manager for this project. His name is Kevin Sullivan, and his email is [kevin.m.sullivan@wildlife.nh.gov](mailto:kevin.m.sullivan@wildlife.nh.gov) if you have specific questions and would like to reach out to him.

I hope this helps clarify things, and please let us know if you have further questions.

Thank you,

**Hayley Bibaud**  
**Environmental Review Planner**  
NH Fish & Game Department  
11 Hazen Drive  
Concord NH 03301  
Phone: (603) 271 - 0467  
Email: [hayley.a.bibaud@wildlife.nh.gov](mailto:hayley.a.bibaud@wildlife.nh.gov)

New Hampshire Fish and Game requirements for environmental review consultation can be found at: [https://gencourt.state.nh.us/rules/state\\_agencies/fis1000.html](https://gencourt.state.nh.us/rules/state_agencies/fis1000.html). ALL requests for consultation and submittals should be sent via email to [NHFGreview@wildlife.nh.gov](mailto:NHFGreview@wildlife.nh.gov) or can be sent hardcopy by mail. The NHB datacheck results letter number needs to be included in the email subject line to read as “**NHBxx-xxxx\_Project Name\_FIS 1004 Consultation Submittal**”.

The requirements for consultation (Fis 1004) shall not apply to the following: statutory permit by notification, permit by rule, permit by notification, routine roadway registration, docking structure registration, or conditional authorization by rule. Review requests for these projects or other project types should be submitted to [NHFGreview@wildlife.nh.gov](mailto:NHFGreview@wildlife.nh.gov) or can be sent hardcopy by mail – email or mail subject line for these review requests should read “**NHBxx-xxxx\_Project Name\_ Env. Review Request**”.

Please provide shapefiles/KMZ/KMLs of the project site (and relevant features if applicable) with your submittal. Review statements provided in the NHB Datacheck Results letter for additional guidance.

**Did you know?** New Hampshire Fish and Game protects, conserves, and manages more than 500 species of wildlife and thousands of invertebrates. Learn more at [www.wildnh.com/nongame](http://www.wildnh.com/nongame)

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**From:** Daniel Rochette <drochette@underwoodengineers.com>  
**Sent:** Wednesday, February 21, 2024 11:04 AM  
**To:** FGC: NHFG review <NHFGreview@wildlife.nh.gov>  
**Cc:** Jacob Stoddard <jstoddard@underwoodengineers.com>  
**Subject:** NHB24-0476 Review need for Consultation

**EXTERNAL: Do not open attachments or click on links unless you recognize and trust the sender.**

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Good afternoon,

We received the attached NHB24-0476 record review yesterday with a record of an American Eel reported in the vicinity of our project. The project involves upgrading an existing outfall on North Mill Pond in Portsmouth, NH and marsh restoration adjacent to the outfall location as mitigation. As we are working in tidal waters and the wetlands permit will be categorized as a major impact project. I wanted to reach out to ensure we are following the proper procedures with NHF&G as the eel is listed as a 'special concern' species and per the guidance provided, a consultation with NHF&G is not required but coordination is recommended depending on the type of project.

We are currently in the process of scheduling or pre application mitigation meeting with the wetlands bureau and I believe NHF&G is typically a part of that meeting.

Please let me know how to proceed from here or what additional information you may need. I believe we have had other projects in our office with "special concern" results where a formal consultation was not required but some guidance and considerations were provided by NHF&G to be included as part of the construction documents after discussing the project.

Thank You

-Dan



*Client service and  
teamwork for over 40 years!*

**Daniel J. Rochette, P.E. (NH)**  
Senior Project Engineer & Technical Leader  
Underwood Engineers  
Phone: (603) 436-6192  
<http://www.underwoodengineers.com>

# **ATTACHMENT K**

## **Conservation Commission Comments**



CONSERVATION COMMISSION

RECEIVED  
APR 15 2024  
UNDERWOOD ENGINEERS  
PORTSMOUTH, NH

April 12, 2024

TO: DES Wetlands – Coastal Region  
222 International Drive, Suite 175  
Portsmouth, NH 03801

Attn: Permit Coordinator

RE: Standard Dredge and Fill Application

MEETING DATE: April 10, 2024

CONSTRUCTION SITE: 0 Maplewood Avenue

This Commission recommends approval of the cited project.

This Commission requests the statutory 40-day delay in order to allow for further investigation of the project. (See below)

This Commission recommends denial of the cited project for the reasons.

Other

*After due deliberation, the Commission voted to recommend **approval** of the State Wetlands Bureau Application as presented with the following stipulations:*

- 1. In accordance with Section 10.1018.40 of the Zoning Ordinance, applicant shall install permanent wetland boundary markers. These markers shall be placed along the 25' vegetative buffer at intervals of every 50' along the City-owned property. These must be installed prior to the start of any construction. These can be purchased through the City of Portsmouth Planning and Sustainability Department. In addition to the wetland boundary markers, an educational sign describing the project shall be installed near the restoration area and fencing should be utilized to keep disturbances such as dogs and geese from the area.*
- 2. A long-term maintenance schedule and plan be included in the permit application and submitted to the Planning & Sustainability Department that commits to long-term maintenance of the marsh restoration area and a commitment to ensuring a marsh migration pathway for marsh adaptation impacts from climate change on City-owned land.*

3. *A note will be added to the plans stating that all soil and plant material excavated on site shall be removed and disposed of off-site, as recommended by the TES Environmental Consultants LLC report.*
4. *All necessary approvals from involved property owners will be acquired prior to the issuance of a City building permit and prior to any associated approvals from the New Hampshire Department of Environmental Services.*
5. *A conservation seed mix or other appropriate native species seed mix and/or plantings shall be used for surface areas disturbed by the pipe installation within the wetland buffer.*

FOR THE COMMISSION:

Sincerely,

A handwritten signature in black ink, appearing to read 'S. Collins', written in a cursive style.

Samantha Collins, Chair  
Conservation Commission

cc: Peter Britz, Planning and Sustainability Director  
Peter Rice, Owner  
Daniel Rochette, Applicant

**ATTACHMENT L**

**EASEMENTS**

**Granite State Minerals**

**Boston and Maine Railroad**





## UTILITY EASEMENT DEED

**KNOW ALL MEN BY THESE PRESENTS**, that 90 Maplewood Avenue LLC with a mailing address of 27 Austin Street, Portsmouth, New Hampshire 03801, County of Rockingham, State of New Hampshire, (herein "Grantor")

**FOR CONSIDERATION PAID** in the amount of One Dollar (\$1.00), receipt of which is hereby acknowledged, grant to the **CITY OF PORTSMOUTH**, its employees, agents, or assigns acting on behalf of the City of Portsmouth, New Hampshire, a municipal body politic, having a mailing address of 1 Junkins Ave, Portsmouth, New Hampshire, 03801, County of Portsmouth, State of New Hampshire (herein referred to as the "Grantee").

**WITH QUITCLAIM COVENANTS**, the following easement rights with respect to the Grantor's property situated at #90 Maplewood Ave, Portsmouth, Rockingham County, New Hampshire (the "Premises"), Assessor's Map 125, Lot 19. Said easements are further bounded and described as follows:

1. Temporary Easement: Conveying to the Grantee the temporary right and privilege to enter onto the land of the Grantor, for the initial purpose of construction of the drainage pipelines in the area shown on the Easement Plan. The Temporary Easement will expire one year following acceptance of the drainage construction by the City of Portsmouth.
2. Permanent Easement: The Permanent Easement shall be to the limits as they are described on the Easement Plan.
3. Purpose and Rights: It is further agreed that within the described Easements, the Grantor convey to the Grantee the perpetual, permanent, uninterrupted, and unobstructed exclusive easement and right of way in, under, across and over the Easement area for the purpose of installing, operating, maintaining, inspecting, removing, repairing, and replacing: the drain line with their associated pipes, catch basins, manholes, and appurtenances; along the length of the drain line. The Grantee shall have the right to remove pavement, trees, bushes, undergrowth, and other obstructions interfering with the activities authorized herein and to take such other actions as may be reasonably necessary, useful, or convenient for the enjoyment of the easement rights herein granted.
4. Grantee's Responsibility to Restore: Disturbed areas within the Temporary and Permanent Easement areas shall be backfilled and restored along the length of the drain. Pavement will be replaced in kind and other areas disturbed will be loamed and seeded, restored to existing condition, or as otherwise shown on the Easement Plan. Any fences removed will be reset.
5. Grantor's Retained Rights: Grantor retains the right to freely use and enjoy its interest in the Permanent Easement Area insofar as the exercise thereof does not endanger or interfere with the purpose of this instrument. Grantor shall not, however, erect any structure within the Permanent Easement area or substantially change the grade or slope, or otherwise restrict access to the drain operated by the Grantee, without prior written consent of the Grantee.
6. Easement to Run with Land: All rights and privileges, obligations and liabilities created by this instrument shall inure to the benefit of, and be binding upon, the heirs, devisees,

administrators, executor, successors and assignees of the Grantee and of the Grantor, the parties hereto and all subsequent owners of the Premises and shall run with the land.

7. Recording of Easement: It is the intention of the grantor and grantee that the easement will be permanently defined with metes and bounds including monumentation following construction of the drainage. The Permanent Easement plan will then be recorded at the Rockingham County Registry of Deeds, at the Grantee's expense.

MEANING AND INTENDING to convey an easement over a portion of the premises conveyed to the within Grantor by deed of 90 Maplewood Avenue LLC dated March 15, 2019, and recorded in Book 5986 Page 661 of the Rockingham County Registry of Deeds.

DATED this \_\_\_\_\_ day of \_\_\_\_\_, 2024.

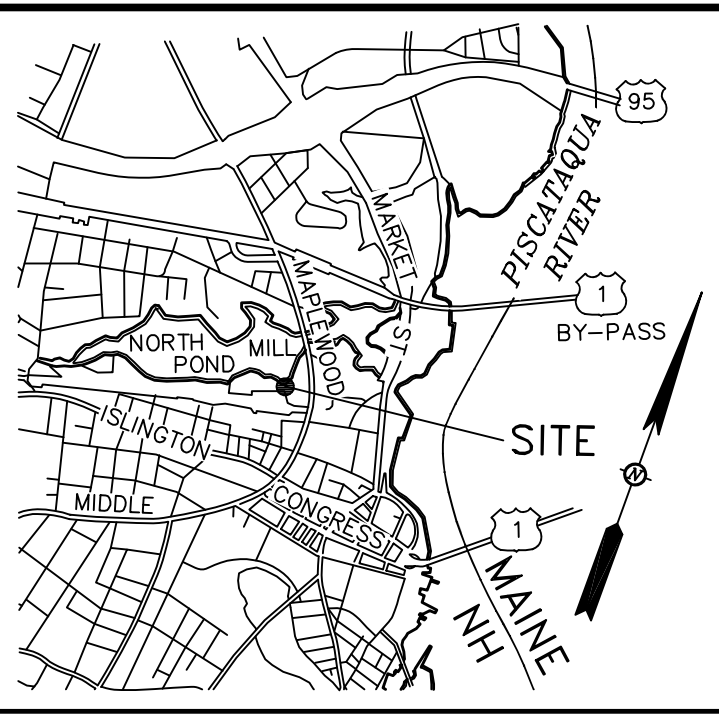
By: \_\_\_\_\_  
Grantor: 90 Maplewood Avenue LLC

STATE OF NEW HAMPSHIRE  
COUNTY OF ROCKINGHAM

The foregoing instrument was acknowledged before me this \_\_\_\_\_ day of \_\_\_\_\_, 2024  
by \_\_\_\_\_ (Grantor)

\_\_\_\_\_  
Justice of the Peace/Notary Public  
Printed Name:

My Commission Expires:

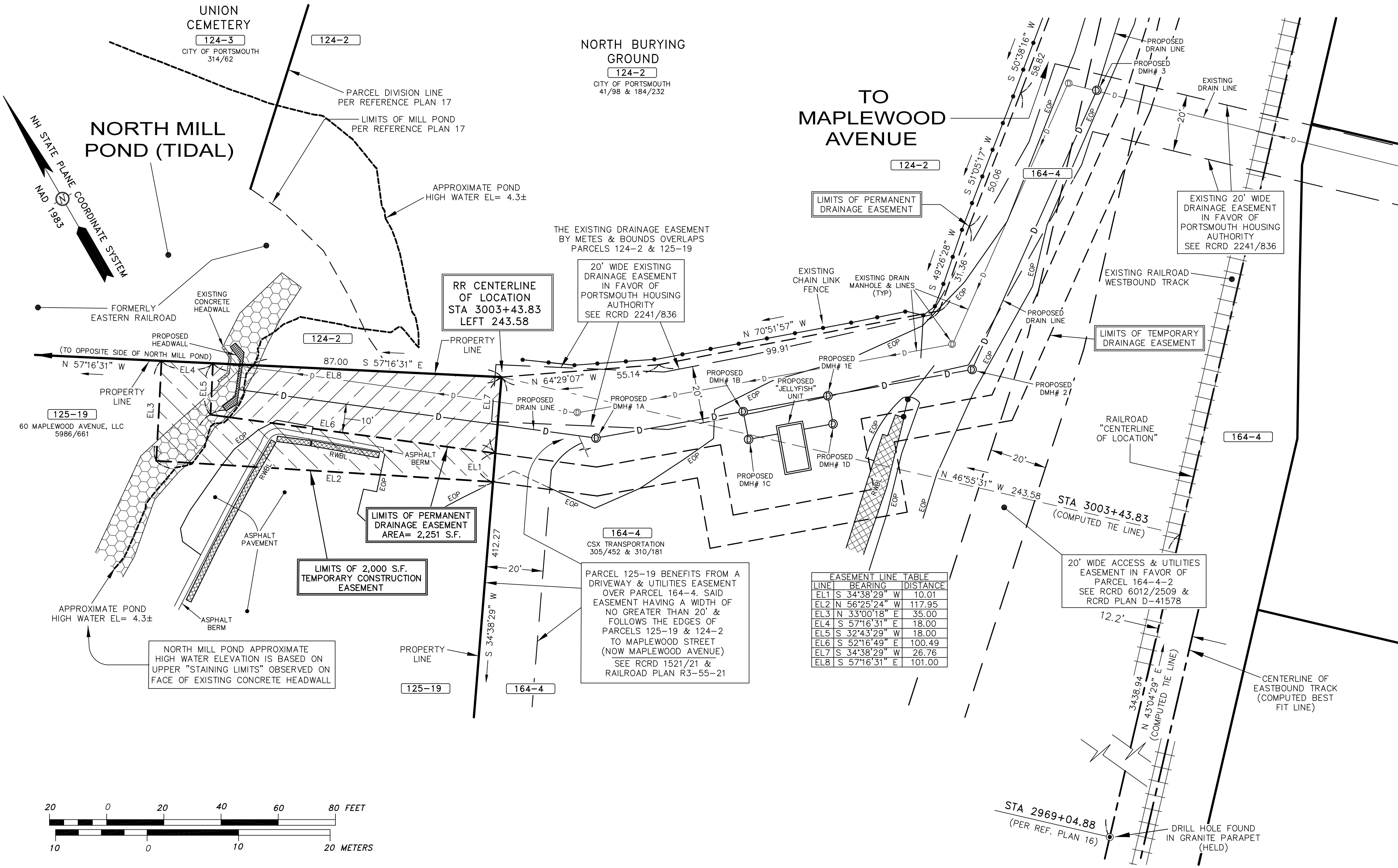
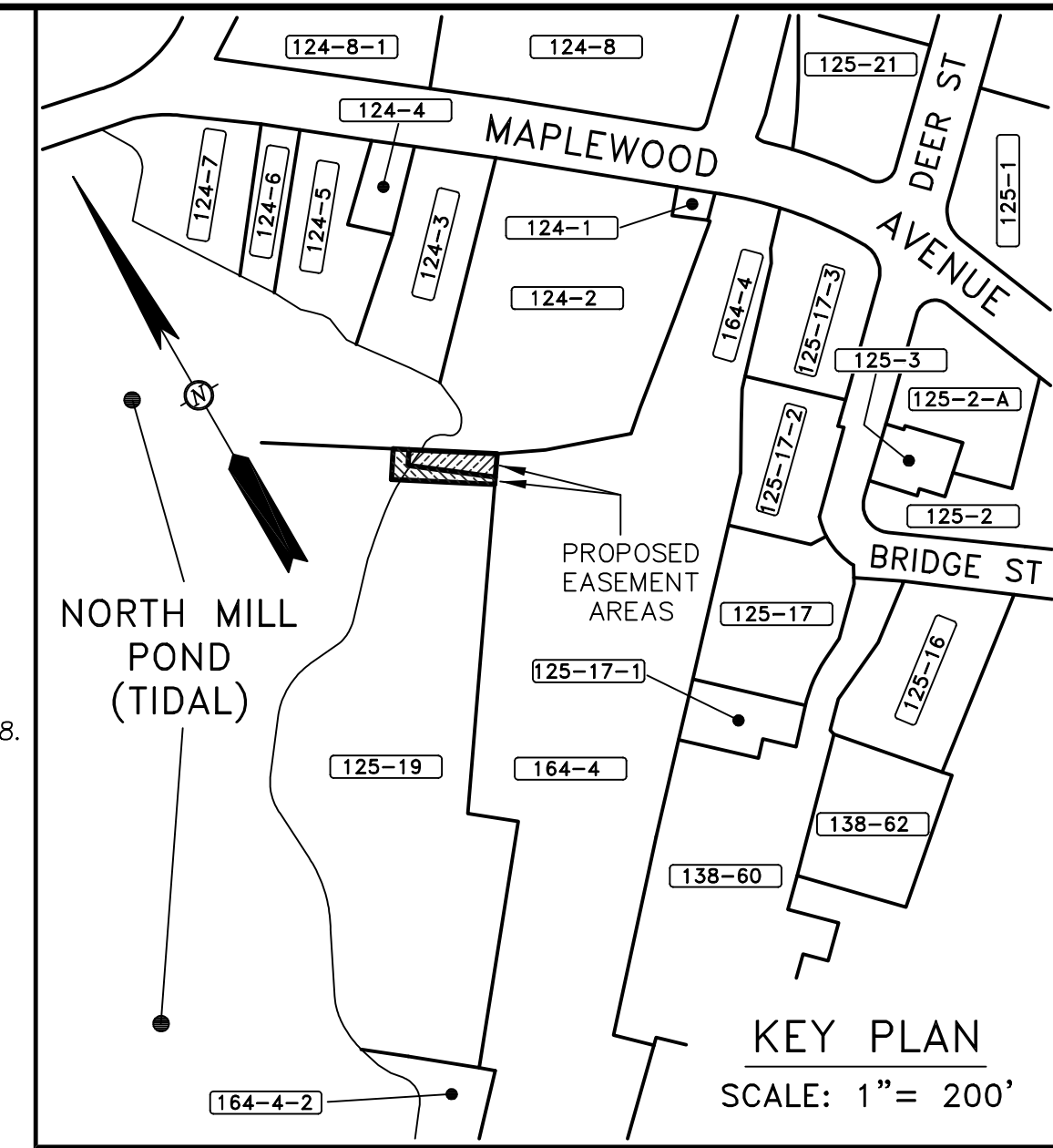


**NOTES:**

- OWNER OF RECORD..... 90 MAPLEWOOD AVENUE, LLC  
ADDRESS..... 27 AUSTIN ST, PORTSMOUTH, NH 03801  
DEED REFERENCE..... 5986/661  
TAX SHEET / LOT..... 125-19
- THIS PLAN IS BASED ON A FIELD SURVEY BY JAMES VERRA AND ASSOCIATES, INC. 12/2019-6/2022, ON SITE CONTROL ESTABLISHED USING SURVEY GRADE GPS UNITS. HORIZONTAL DATUM: NAD 1983 (1986 ADJUSTMENT)  
PRIMARY BM: NHDOT 379-0150 (PORTSMOUTH TRAFFIC CIRCLE)  
VERTICAL DATUM: NAVD 1988  
PRIMARY BM: CITY CONTROL POINT "ALBA"  
UNITS: US SURVEY FOOT
- THE LOCATION OF ALL UNDERGROUND UTILITIES SHOWN HEREON ARE APPROXIMATE AND ARE BASED UPON THE FIELD LOCATION OF ALL VISIBLE STRUCTURES (IE CATCH BASINS, MANHOLES, WATER GATES ETC.) AND INFORMATION COMPILED FROM PLANS PROVIDED BY UTILITY COMPANIES AND GOVERNMENTAL AGENCIES. ALL CONTRACTORS SHOULD NOTIFY, IN WRITING, SAID AGENCIES PRIOR TO ANY EXCAVATION WORK AND CALL DIG-SAFE @ 1-888-DIG-SAFE.  
NOTE: VERY LITTLE UNDERGROUND UTILITY MARKING WAS COMPLETED PRIOR TO THE FIELD SURVEY.
- THE RELATIVE ERROR OF CLOSURE WAS LESS THAN 1 FOOT IN 15,000 FEET.

**REFERENCE PLANS:**

- VAUGHAN STREET PROJECT, PROJECT NO. R-10, PLAN OF PERIMETER SURVEY, FOR PORTSMOUTH HOUSING AUTHORITY, PORTSMOUTH, N.H., SCALE: 1"= 40', REVISED TO 7/10/1969, BY JOHN W. DURGIN, CIVIL ENGINEER, NOT RECORDED.
- DISPOSITION MAP, VAUGHAN STREET URBAN RENEWAL PROJECT, N.H. R-10, PORTSMOUTH, N.H., BY ANDERSON-NICHOLS & CO., INC., REVISED TO 11/5/1970, RCRD PLAN D-2408.
- DISPOSITION MAP, PARCEL 4, VAUGHAN STREET URBAN RENEWAL PROJECT, N.H. R-10, PORTSMOUTH, N.H., BY ANDERSON-NICHOLS & CO., INC., REVISED TO 8/11/1972, RCRD PLAN C-3525.
- DISPOSITION MAP, PARCEL 4, VAUGHAN STREET URBAN RENEWAL PROJECT, N.H. R-10, PORTSMOUTH, N.H., BY ANDERSON-NICHOLS & CO., INC., DATED 10/1973, RCRD PLAN C-4116.
- REVISED DISPOSITION MAP, PARCEL 2C, VAUGHAN STREET URBAN RENEWAL PROJECT, N.H. R-10, PORTSMOUTH, N.H., BY ANDERSON-NICHOLS & CO., INC., DATED 7/1974, RCRD PLAN C-4701.
- SKETCH, RAILROAD PROPERTY LINES - WEST OF DEPOT, PORTSMOUTH, N.H., SCALE: 1"= 30', DATED 4/1938, VAL. SEC. 3, MAP 55 (M222-48), NOT RECORDED.
- LAND IN PORTSMOUTH, N.H., BOSTON AND MAINE RAILROAD TO CITY CONCRETE CO., INC., SCALE: 1"= 80', RR PLAN: R3-55-21, DATED 1/1955, NOT RECORDED.
- LAND IN PORTSMOUTH, N.H., BOSTON AND MAINE RAILROAD TO RAYLEEN REALTY COMPANY, RR PLAN: R3-55A-2, DATED 7/1960, RCRD PLAN 03276.
- LAND IN PORTSMOUTH, N.H., BOSTON AND MAINE RAILROAD TO ALL STATE REALTY CORPORATION, RR PLAN: R3-54-6, DATED 2/1961, RCRD PLAN 00160.
- LAND IN PORTSMOUTH, N.H., BOSTON AND MAINE RAILROAD TO RAYLEEN REALTY COMPANY, RR PLAN: R3-55-27, DATED 4/1961, RCRD PLAN 03226.
- BOUNDARY LINE AGREEMENT PLAN & CORRECTIVE PLAN OF LAND FOR THE GAGE COMPANY, DEER STREET ASSOCIATES AND B&M CORPORATION, PORTSMOUTH, N.H., DATED 9/1996, RCRD PLAN D-25007.
- LOT LINE RELOCATION PLAN, LAND IN PORTSMOUTH, N.H., BOSTON AND MAINE CORPORATION TO DEER STREET ASSOCIATES, BRIDGE, DEER & HILL STREETS, REVISED TO 5/5/2015, RCRD PLAN D-38906.
- CONSOLIDATION & SUBDIVISION PLAN, DEER STREET ASSOCIATES, BRIDGE, DEER & HILL STREETS, PORTSMOUTH, N.H., REVISED TO 5/18/2016, RCRD PLAN D-39699.
- LOT LINE RELOCATION PLAN, BOSTON AND MAINE CORPORATION & IRON HORSE PROPERTIES, LLC, PROPERTY LOCATED BETWEEN BARTLETT STREET & MAPLEWOOD AVENUE, PORTSMOUTH, N.H., REVISED TO 5/30/2019, RCRD PLAN D-41570.
- PROPOSED EASEMENT PLAN, BOSTON & MAINE CORPORATION TO BENEFIT IRON HORSE PROPERTIES, LLC, PROPERTY LOCATED BETWEEN BARTLETT STREET & MAPLEWOOD AVENUE, PORTSMOUTH, N.H., REVISED TO 6/27/2019, RCRD PLAN D-41578.
- STATION MAP-LANDS, BOSTON AND MAINE RAILROAD, V3NH/SL55, REVISED TO 8/2004.
- PLAN OF THE NORTH BURYING GROUND, IN THE TOWN OF PORTSMOUTH, DATED 1850, NOT RECORDED, ON FILE AT THE PORTSMOUTH DEPARTMENT OF PUBLIC WORKS.



**LEGEND:**

- 110-5 ..... TAX SHEET - LOT NUMBER
- RCRD ..... ROCKINGHAM COUNTY REGISTRY OF DEEDS
- ..... CHAIN LINK FENCE
- RWBL ..... MODULAR BLOCK RETAINING WALL
- ☆ ..... LIGHT POLE
- ..... UTILITY POLE W/TRANSFORMER
- ..... UTILITY POLE
- ..... CATCH BASIN
- ..... DRAIN MANHOLE
- ..... DECIDUOUS TREE
- D ..... DRAIN LINE
- ..... CEMENT CONCRETE
- ..... RETAINING WALL
- ..... RIP RAP

**EASEMENT LINE TABLE**

| LINE | BEARING       | DISTANCE |
|------|---------------|----------|
| EL1  | S 34°38'29" W | 10.01    |
| EL2  | N 56°25'24" W | 117.95   |
| EL3  | N 33°00'18" E | 35.00    |
| EL4  | S 57°16'31" E | 18.00    |
| EL5  | S 32°43'29" W | 18.00    |
| EL6  | S 52°16'49" E | 100.49   |
| EL7  | S 34°38'29" W | 26.76    |
| EL8  | S 57°16'31" E | 101.00   |

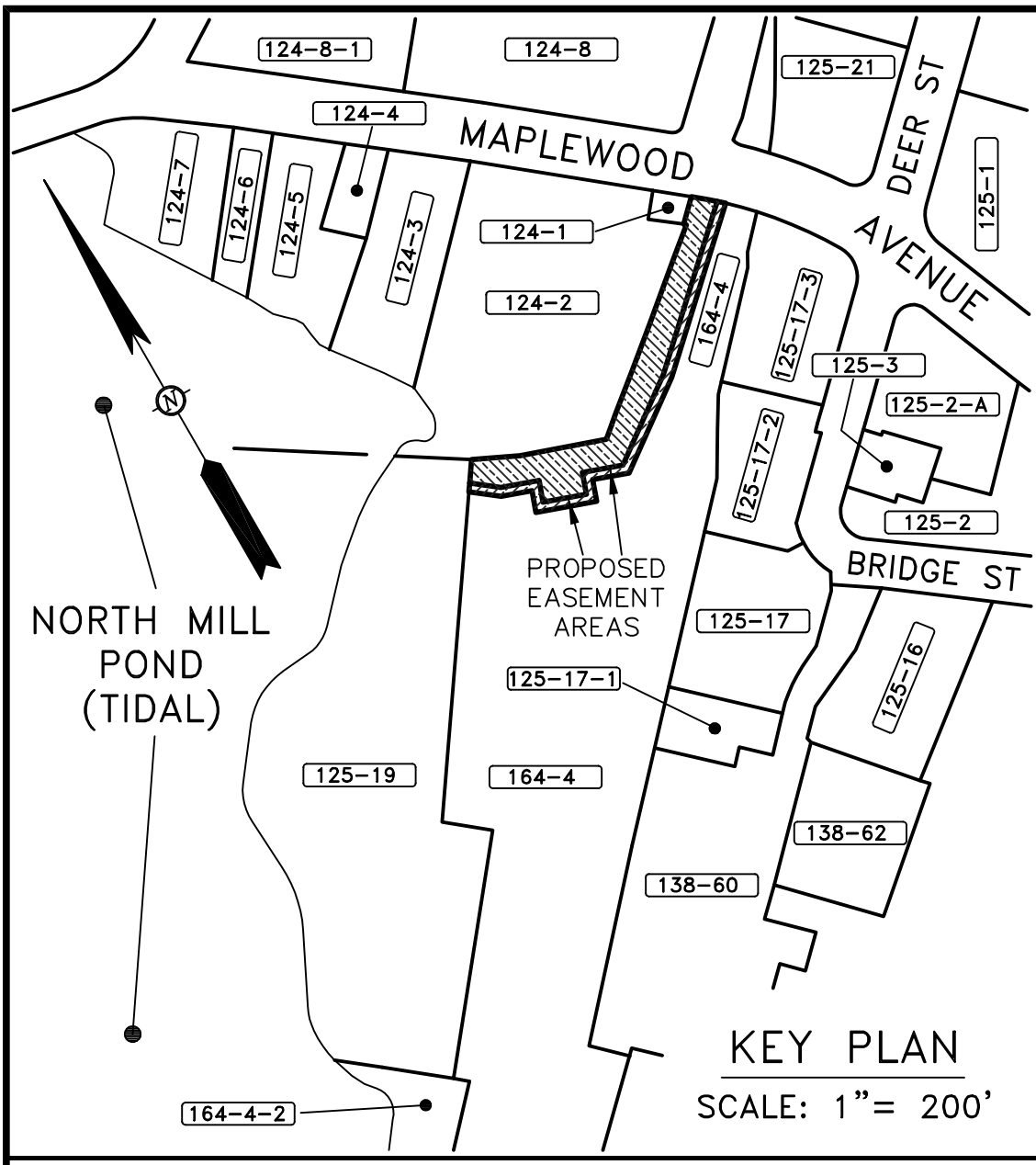
PURSUANT TO RSA 676:18,III AND RSA 672:14  
I CERTIFY THAT THIS SURVEY PLAT IS NOT A SUBDIVISION PURSUANT TO THIS TITLE AND THAT THE LINES OF STREETS AND WAYS SHOWN ARE THOSE OF PUBLIC OR PRIVATE STREETS OR WAYS ALREADY ESTABLISHED AND THAT NO NEW WAYS ARE SHOWN.

*James Verra*  
JAMES VERRA  
12/26/2023  
DATE

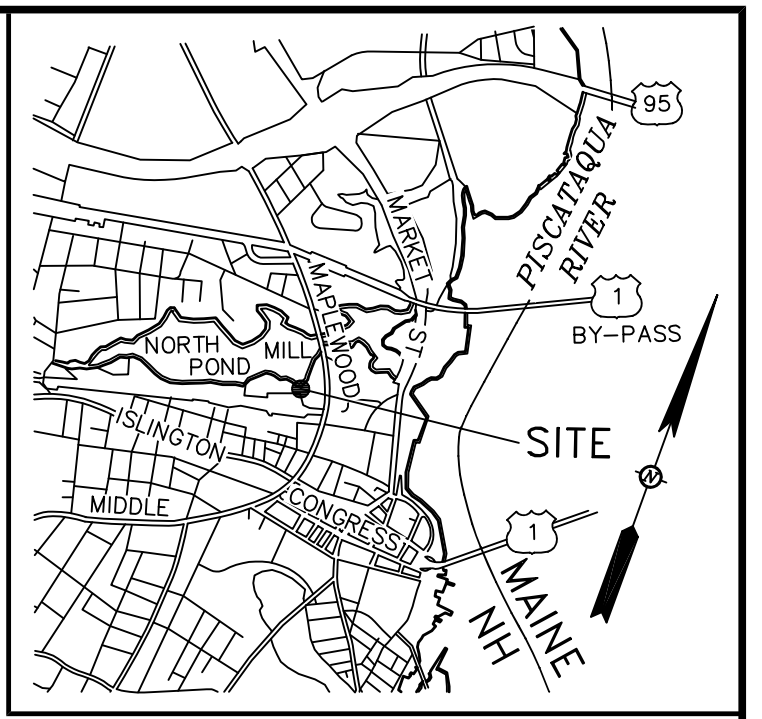
| REV. NO. | DATE       | DESCRIPTION   | APPR'D |
|----------|------------|---|--------|
| 3        | 12/26/2023 | REVISE PER PROJECT SURVEYOR COMMENTS                | JV     |
| 2        | 12/21/2023 | MODIFY BOUNDARY LINE LANGUAGE                       | JV     |
| 1        | 8/8/2023   | MODIFY TEMPORARY CONSTRUCTION EASEMENT PER ENGINEER | JV     |

**EASEMENT PLAN**  
off MAPLEWOOD AVENUE  
**PORTSMOUTH, NEW HAMPSHIRE**  
NORTH MILL POND DRAINAGE OUTFALL  
over land of 90 MAPLEWOOD AVENUE, LLC  
ASSESSOR'S PARCEL 125-19  
for UNDERWOOD ENGINEERS, INC.

|   |                 |                      |
|---|-----------------|----------------------|
| JAMES VERRA and ASSOCIATES, INC.  |                 | DATE: 3/16/2023      |
| 101 SHATTUCK WAY<br>SUITE 8<br>NEWINGTON, N.H. 03801-7876<br>603-436-3557 |                 | JOB NO: 23824-2      |
| JV<br>PROJECT MGR   | JCS<br>DRAWN BY | SCALE: 1" = 20'      |
| COPYRIGHT © 2023 by JAMES VERRA and ASSOCIATES, INC.                      |                 | DWG NAME: 23824-ESMT |
|   |                 | PLAN NO: 23824-ESMT  |
|   |                 | SHEET: 1 OF 1        |



- NOTES:**
- OWNER OF RECORD..... CSX TRANSPORTATION (FORMERLY PAN AM RAILWAYS)  
 ADDRESS..... 500 WATER ST, JACKSONVILLE, FL 32202  
 DEED REFERENCE..... \*SEE BELOW  
 TAX SHEET / LOT..... 164-4  
 \*RCRD 305/452, 1843  
 RCRD 310/181, 1843  
 TAKING OF 8/9/1871. GRANTOR: JEREMIAH D. GOODRICH, ET AL
  - THIS PLAN IS BASED ON A FIELD SURVEY BY JAMES VERRA AND ASSOCIATES, INC. 12/2019-6/2022. ON SITE CONTROL ESTABLISHED USING SURVEY GRADE GPS UNITS. HORIZONTAL DATUM: NAD 1983 (1986 ADJUSTMENT) PRIMARY BM: NHDOT 379-0150 (PORTSMOUTH TRAFFIC CIRCLE) VERTICAL DATUM: NAVD 1988 PRIMARY BM: CITY CONTROL POINT "ALBA" UNITS: US SURVEY FOOT
  - THE LOCATION OF ALL UNDERGROUND UTILITIES SHOWN HEREON ARE APPROXIMATE AND ARE BASED UPON THE FIELD LOCATION OF ALL VISIBLE STRUCTURES (IE CATCH BASINS, MANHOLES, WATER GATES ETC.) AND INFORMATION COMPILED FROM PLANS PROVIDED BY UTILITY COMPANIES AND GOVERNMENTAL AGENCIES. ALL CONTRACTORS SHOULD NOTIFY, IN WRITING, SAID AGENCIES PRIOR TO ANY EXCAVATION WORK AND CALL DIG-SAFE @ 1-888-DIG-SAFE.  
 NOTE: VERY LITTLE UNDERGROUND UTILITY MARKING WAS COMPLETED PRIOR TO THE FIELD SURVEY.
  - THE RELATIVE ERROR OF CLOSURE WAS LESS THAN 1 FOOT IN 15,000 FEET.
  - THE BOUNDARY LINE BETWEEN ASSESSOR'S PARCEL 124-2, THE CITY OF PORTSMOUTH AND ASSESSOR'S PARCEL 164-4, CSX TRANSPORTATION, CAN NOT BE DEFINED DUE TO A LACK OF PHYSICAL EVIDENCE AS WELL AS OVERLAPS AND GAPS PER THE DEEDS, REFERENCE PLANS AND MONUMENTATION. A BOUNDARY LINE AGREEMENT PER NHRSA 472:1 IS RECOMMENDED.



**REFERENCE PLANS:**

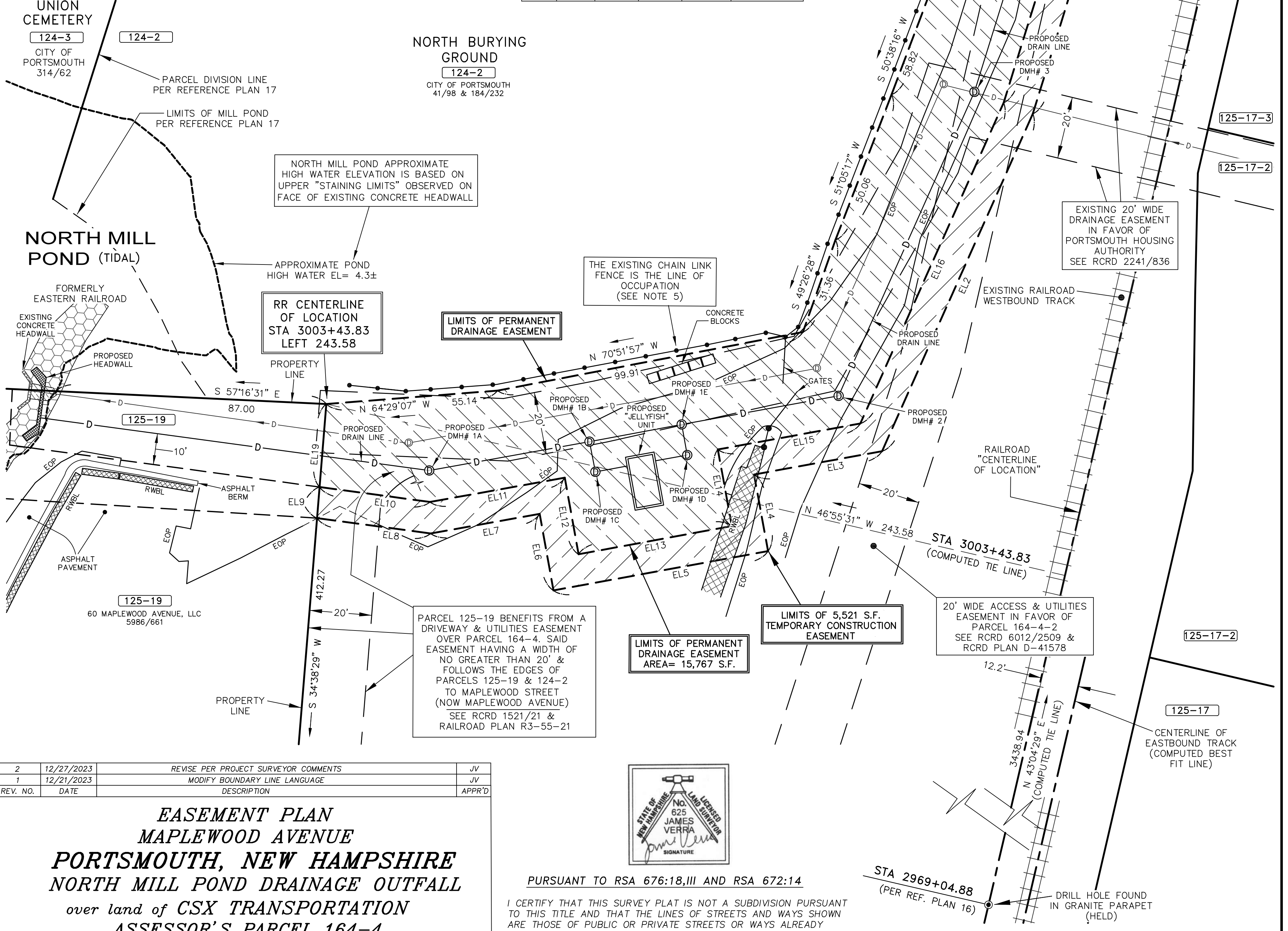
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- LAND IN PORTSMOUTH, N.H., BOSTON AND MAINE RAILROAD TO ALL STATE REALTY CORPORATION, RR PLAN: R3-54-6, DATED 2/1961, RCRD PLAN 00160.
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- BOUNDARY LINE AGREEMENT PLAN & CORRECTIVE PLAN OF LAND FOR THE GAGE COMPANY, DEER STREET ASSOCIATES AND B&M CORPORATION, PORTSMOUTH, N.H., DATED 9/1996, RCRD PLAN D-25007.
- LOT LINE RELOCATION PLAN, LAND IN PORTSMOUTH, N.H., BOSTON AND MAINE CORPORATION TO DEER STREET ASSOCIATES, BRIDGE, DEER & HILL STREETS, REVISED TO 5/5/2015, RCRD PLAN D-38906.
- CONSOLIDATION & SUBDIVISION PLAN, DEER STREET ASSOCIATES, BRIDGE, DEER & HILL STREETS, PORTSMOUTH, N.H., REVISED TO 5/18/2016, RCRD PLAN D-39699.
- LOT LINE RELOCATION PLAN, BOSTON AND MAINE CORPORATION & IRON HORSE PROPERTIES, LLC, PROPERTY LOCATED BETWEEN BARTLETT STREET & MAPLEWOOD AVENUE, PORTSMOUTH, N.H., REVISED TO 9/30/2019, RCRD PLAN D-41570.
- PROPOSED EASEMENT PLAN, BOSTON & MAINE CORPORATION TO BENEFIT IRON HORSE PROPERTIES, LLC, PROPERTY LOCATED BETWEEN BARTLETT STREET & MAPLEWOOD AVENUE, PORTSMOUTH, N.H., REVISED TO 6/27/2019, RCRD PLAN D-41578.
- STATION MAP-LANDS, BOSTON AND MAINE RAILROAD, V3NH/SL55, REVISED TO 8/2004.
- PLAN OF THE NORTH BURYING GROUND, IN THE TOWN OF PORTSMOUTH, DATED 1850, NOT RECORDED, ON FILE AT THE PORTSMOUTH DEPARTMENT OF PUBLIC WORKS.

**LEGEND:**

- 110-5 ..... TAX SHEET - LOT NUMBER
- RCRD ..... ROCKINGHAM COUNTY REGISTRY OF DEEDS
- ..... CHAIN LINK FENCE
- EOP ..... EDGE OF PAVEMENT
- RWBL ..... MODULAR BLOCK RETAINING WALL
- ..... LIGHT POLE
- ..... UTILITY POLE W/TRANSFORMER
- ..... UTILITY POLE
- ..... CATCH BASIN
- ..... DRAIN MANHOLE
- ..... DECIDUOUS TREE
- ..... DRAIN LINE
- ..... CEMENT CONCRETE
- ..... RETAINING WALL
- ..... RIP RAP

| LINE | BEARING       | DISTANCE |
|------|---------------|----------|
| EL1  | S 47°15'26" W | 206.72   |
| EL2  | S 54°03'54" W | 118.71   |
| EL3  | N 70°20'15" W | 41.80    |
| EL4  | S 19°39'45" W | 25.00    |
| EL5  | N 70°23'45" W | 70.08    |
| EL6  | N 19°47'18" E | 25.00    |
| EL7  | N 70°12'42" W | 35.59    |
| EL8  | N 52°16'49" W | 36.80    |
| EL9  | N 34°38'29" E | 10.01    |
| EL10 | S 52°16'49" E | 35.76    |
| EL11 | N 70°12'42" E | 44.01    |
| EL12 | S 19°47'18" W | 25.00    |
| EL13 | N 70°26'39" E | 50.05    |
| EL14 | N 19°39'45" E | 25.00    |
| EL15 | N 70°20'15" E | 46.53    |
| EL16 | N 54°03'54" E | 112.85   |
| EL17 | N 47°15'26" E | 205.30   |
| EL18 | S 50°51'45" E | 5.81     |
| EL19 | N 34°38'29" E | 26.76    |
| EL20 | S 39°31'06" E | 3.07     |

| CURVE | RADIUS | ARC L | DELTA    | CHORD L | CHORD BRG.    |
|-------|--------|-------|----------|---------|---------------|
| EC1   | 486.00 | 10.03 | 1°10'59" | 10.03   | S 47°27'59" E |
| EC2   | 486.00 | 24.00 | 2°49'44" | 23.99   | S 49°28'20" E |



|          |            |                                      |        |
|----------|------------|--------------------------------------|--------|
| 2        | 12/27/2023 | REVISE PER PROJECT SURVEYOR COMMENTS | JV     |
| 1        | 12/21/2023 | MODIFY BOUNDARY LINE LANGUAGE        | JV     |
| REV. NO. | DATE       | DESCRIPTION                          | APPR'D |

**EASEMENT PLAN  
MAPLEWOOD AVENUE  
PORTSMOUTH, NEW HAMPSHIRE  
NORTH MILL POND DRAINAGE OUTFALL**

over land of CSX TRANSPORTATION  
ASSESSOR'S PARCEL 164-4  
for UNDERWOOD ENGINEERS, INC.

**JAMES VERRA and ASSOCIATES, INC.**

DATE: 8/8/2023  
 JOB NO: 23824-2  
 SCALE: 1" = 20'  
 DWG NAME: 23824-ESMT  
 PLAN NO: 23824-ESMT2  
 SHEET: 1 OF 1

101 SHATTUCK WAY  
 SUITE 8  
 NEWINGTON, N.H. 03801-7876  
 603-436-3557

JV PROJECT MGR  
 JCS DRAWN BY  
 COPYRIGHT © 2023 by JAMES VERRA and ASSOCIATES, INC.

PURSUANT TO RSA 676:18,III AND RSA 672:14

I CERTIFY THAT THIS SURVEY PLAT IS NOT A SUBDIVISION PURSUANT TO THIS TITLE AND THAT THE LINES OF STREETS AND WAYS SHOWN ARE THOSE OF PUBLIC OR PRIVATE STREETS OR WAYS ALREADY ESTABLISHED AND THAT NO NEW WAYS ARE SHOWN.

12/27/2023  
 JAMES VERRA  
 DATE

20 0 20 40 60 80 FEET  
 10 0 10 20 METERS

**ATTACHMENT M**

**ABUTTER NOTIFICATION**

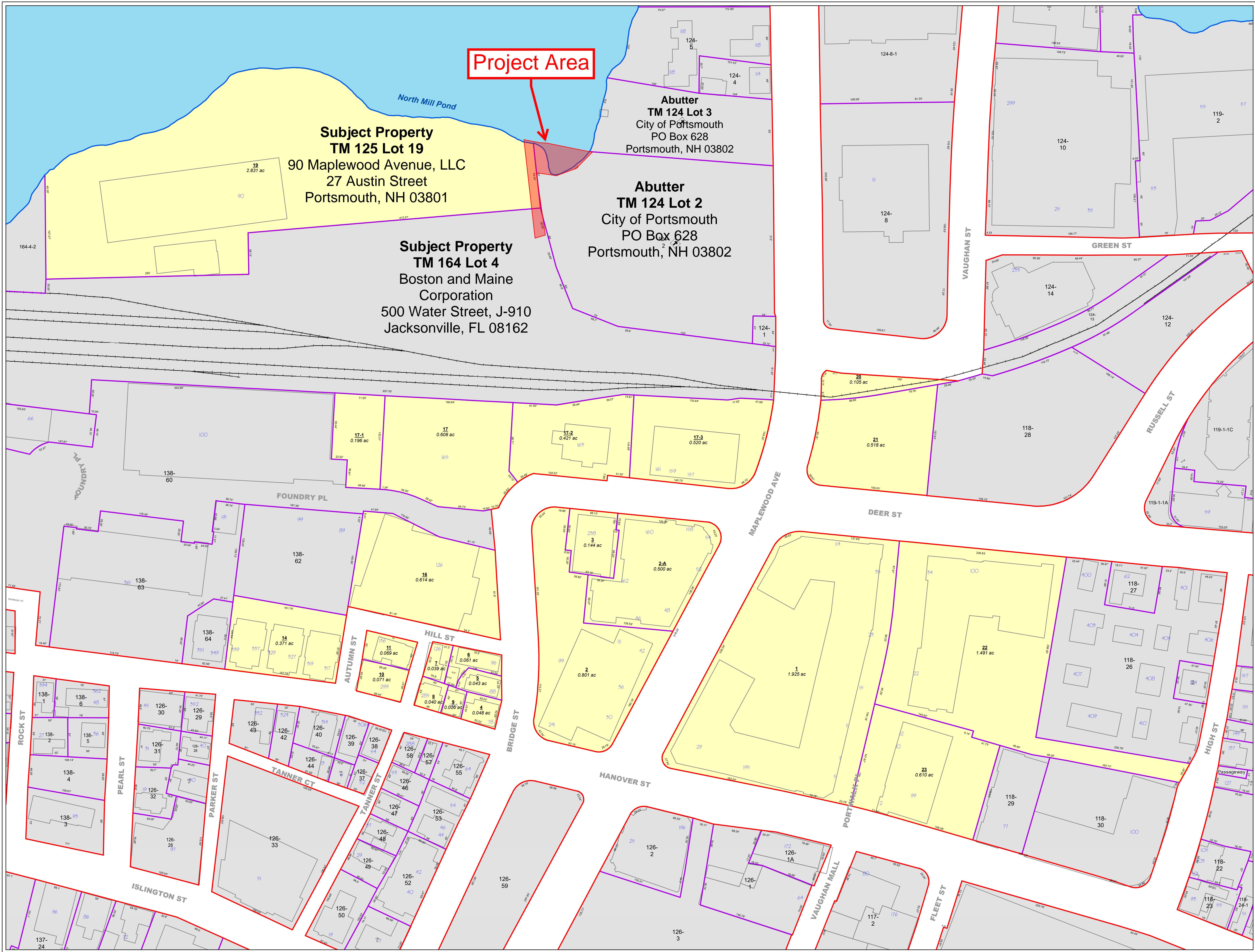
**Tax Map Figures**

**Abutter List**

**Letters**

**Certified Mail Receipts**





**Project Area**

**Subject Property**

**TM 125 Lot 19**  
 90 Maplewood Avenue, LLC  
 27 Austin Street  
 Portsmouth, NH 03801

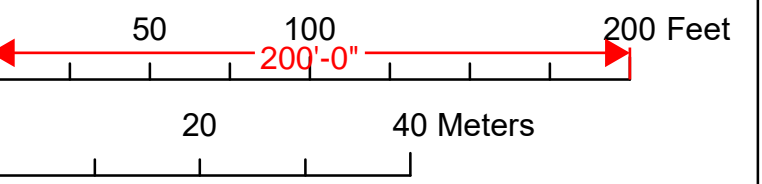
**Subject Property**

**TM 164 Lot 4**  
 Boston and Maine  
 Corporation  
 500 Water Street, J-910  
 Jacksonville, FL 08162

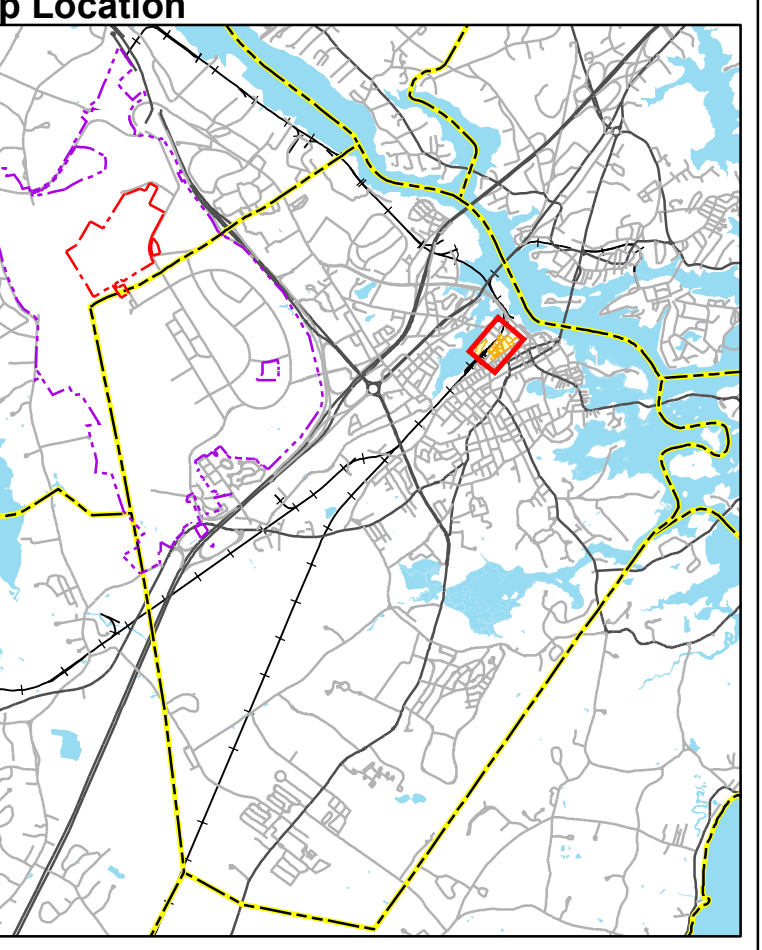
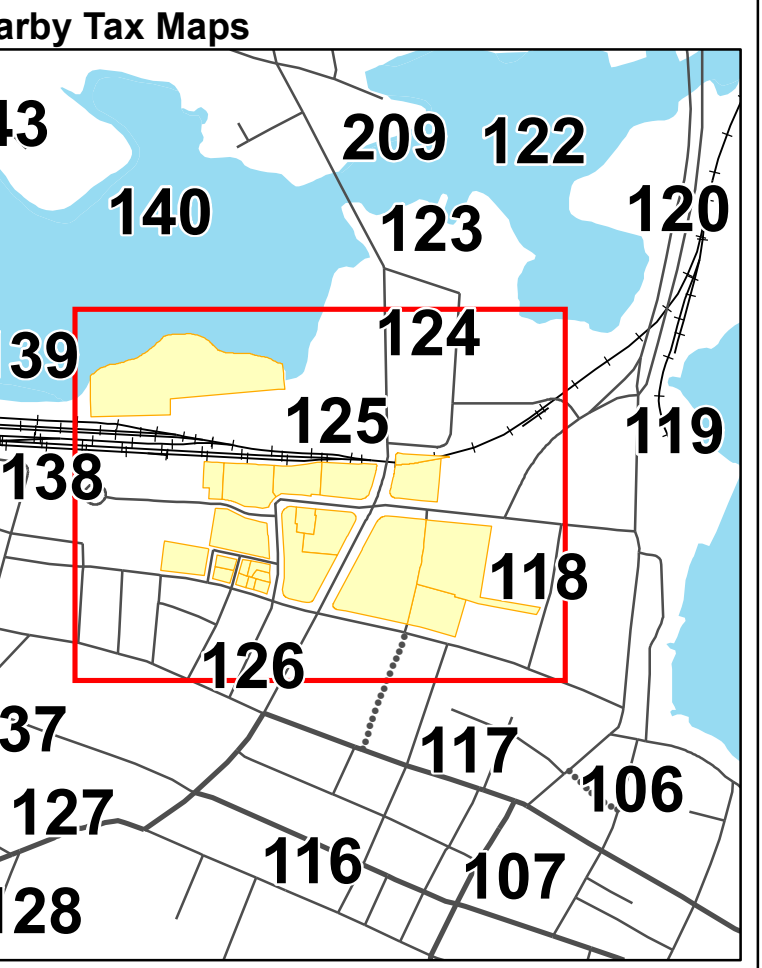
**Abutter**  
**TM 124 Lot 3**  
 City of Portsmouth  
 PO Box 628  
 Portsmouth, NH 03802

**Abutter**  
**TM 124 Lot 2**  
 City of Portsmouth  
 PO Box 628  
 Portsmouth, NH 03802

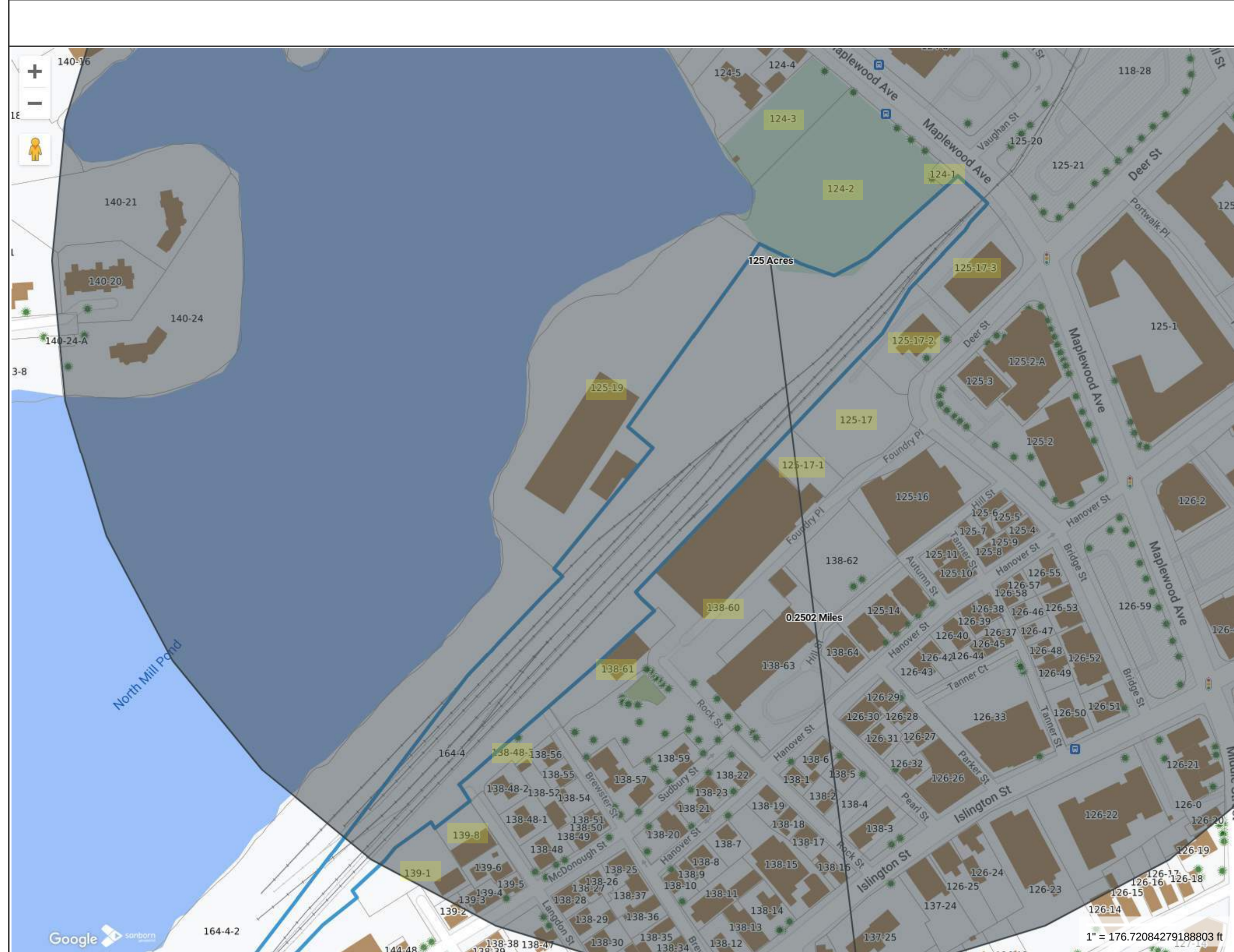
- Partial Legend**  
 See the cover sheet for the complete legend.
- 7-5A** Lot or lot-unit number
  - 2.56 ac** Parcel area in acres (ac) or square feet (sf)
  - 25** Address number
  - 233-137** Parcel number from a neighboring map
  - 68'** Parcel line dimension
  - SIMS AVE** Street name
  - Parcel/Parcel boundary
  - Parcel/ROW boundary
  - Water boundary
  - Structure (1994 data)
  - Parcel covered by this map
  - Parcel from a neighboring map (see other map for current status)



*This map is for assessment purposes only. It is not intended for legal description or conveyance. Parcels are mapped as of April 1. Building footprints are 2006 data and may not represent current structures. Streets appearing on this map may be paper (unbuilt) streets. Lot numbers take precedence over address numbers. Address numbers shown on this map may not represent posted or legal addresses.*



Portsmouth, New Hampshire  
 2021  
**Tax Map 125**



**Property Information**  
**Property ID** 0157-0002-0001  
**Location** BARTLETT ST  
**Owner** PORTSMOUTH LUMBER & HARDWARE LLC



**MAP FOR REFERENCE ONLY  
 NOT A LEGAL DOCUMENT**

City of Portsmouth, NH makes no claims and no warranties, expressed or implied, concerning the validity or accuracy of the GIS data presented on this map.

Geometry updated 08/24/2023  
 Data updated 3/9/2022

Print map scale is approximate. Critical layout or measurement activities should not be done using this resource.



**Maplewood Avenue Drainage Improvements**

Portsmouth, New Hampshire

**Quarter Mile Abutter List**

April 2024

|                       |                                    |
|-----------------------|------------------------------------|
| Location              | 90 MAPLEWOOD AVE                   |
| Map-Lot               | 0125-0019-0000                     |
| Vision Account Number | 37488                              |
| Ownership             |                                    |
| Owner                 | 90 MAPLEWOOD AVENUE LLC            |
| Address               | 27 AUSTIN ST, PORTSMOUTH, NH 03801 |

|                       |                                     |
|-----------------------|-------------------------------------|
| Location              | DEER ST                             |
| Map-Lot               | 0125-0017-0001                      |
| Vision Account Number | 52969                               |
| Ownership             |                                     |
| Owner                 | CITY OF PORTSMOUTH                  |
| Address               | 1 JUNKINS AVE, PORTSMOUTH, NH 03801 |

|                       |                                  |
|-----------------------|----------------------------------|
| Location              | MAPLEWOOD AVE                    |
| Map-Lot               | 0124-0002-0000                   |
| Vision Account Number | 37750                            |
| Ownership             |                                  |
| Owner                 | CITY OF PORTSMOUTH               |
| Address               | PO BOX 628, PORTSMOUTH, NH 03802 |

|                       |                                     |
|-----------------------|-------------------------------------|
| Location              | 100 FOUNDRY PL                      |
| Map-Lot               | 0138-0060-0000                      |
| Vision Account Number | 37770                               |
| Ownership             |                                     |
| Owner                 | CITY OF PORTSMOUTH                  |
| Address               | 1 JUNKINS AVE, PORTSMOUTH, NH 03801 |

|                       |                                  |
|-----------------------|----------------------------------|
| Location              | MAPLEWOOD AVE                    |
| Map-Lot               | 0124-0001-0000                   |
| Vision Account Number | 37749                            |
| Ownership             |                                  |
| Owner                 | CITY OF PORTSMOUTH               |
| Address               | PO BOX 628, PORTSMOUTH, NH 03802 |

|                       |                                  |
|-----------------------|----------------------------------|
| Location              | 66 ROCK ST                       |
| Map-Lot               | 0138-0061-0000                   |
| Vision Account Number | 37545                            |
| Ownership             |                                  |
| Owner                 | HAPPNY PETER GREY LISA           |
| Address               | 66 ROCK ST, PORTSMOUTH, NH 03801 |

|                       |  |
|-----------------------|--|
| Location              | 70 MAPLEWOOD AVE                       |
| Map-Lot               | 0125-0017-0003                         |
| Vision Account Number | 52967                                  |
| Ownership             |  |
| Owner                 | EIGHTKPH LLC                           |
| Address               | 233 VAUGHN ST UNIT 301, PORTSMOUTH, NH |

|                       |                                     |
|-----------------------|-------------------------------------|
| Location              | LANGDON ST                          |
| Map-Lot               | 0138-0048-0003                      |
| Vision Account Number | 52044                               |
| Ownership             |                                     |
| Owner                 | CITY OF PORTSMOUTH                  |
| Address               | 1 JUNKINS AVE, PORTSMOUTH, NH 03801 |

|                       |  |
|-----------------------|--|
| Location              | 163 DEER ST                            |
| Map-Lot               | 0125-0017-0002                         |
| Vision Account Number | 52968                                  |
| Ownership             |  |
| Owner                 | EIGHTKPH LLC                           |
| Address               | 233 VAUGHN ST UNIT 301, PORTSMOUTH, NH |

|                       |                                     |
|-----------------------|-------------------------------------|
| Location              | 94 LANGDON ST                       |
| Map-Lot               | 0139-0008-0000                      |
| Vision Account Number | 38017                               |
| Ownership             |                                     |
| Owner                 | REGAN ELECTRIC CO INC               |
| Address               | 94 LANGDON ST, PORTSMOUTH, NH 03801 |

|                       |                                    |
|-----------------------|------------------------------------|
| Location              | 165 DEER ST                        |
| Map-Lot               | 0125-0017-0000                     |
| Vision Account Number | 37487                              |
| Ownership             |                                    |
| Owner                 | DEER STREET HOSPITALITY LLC        |
| Address               | 3 GOSLING RD, PORTSMOUTH, NH 03801 |

|                       |                                     |
|-----------------------|-------------------------------------|
| Location              | 98 CORNWALL ST                      |
| Map-Lot               | 0139-0001-0000                      |
| Vision Account Number | 37548                               |
| Ownership             |                                     |
| Owner                 | REGAN ELECTRIC CO INC               |
| Address               | 94 LANGDON ST, PORTSMOUTH, NH 03801 |

|                       |                                  |
|-----------------------|----------------------------------|
| Location              | MAPLEWOOD AVE                    |
| Map-Lot               | 0124-0003-0000                   |
| Vision Account Number | 37751                            |
| Ownership             |                                  |
| Owner                 | CITY OF PORTSMOUTH               |
| Address               | PO BOX 628, PORTSMOUTH, NH 03802 |

May 3, 2024

City of Portsmouth  
1 Junkins Avenue  
Portsmouth, NH 03801

Tax Map/Lot Nos.: 124/2  
124/1  
124/3  
125/17/1  
138/60  
138/48/3

Re: ***Abutter Notification of Standard Dredge and Fill Wetlands Permit Application  
Maplewood Avenue Drainage Improvements  
Portsmouth, New Hampshire***

Dear Property Owner:

On behalf of the City of Portsmouth, please accept this letter as notification that a Standard Dredge and Fill Wetlands Permit Application is being submitted to the N.H. Department of Environmental Services (DES) Wetlands Bureau for proposed improvements to the drainage outfall at 90 Maplewood Avenue. Under state law RSA 482-A:3 I (d)(1), we are required to notify you about this wetland application, because the City's proposed work abuts your property.

Once the permit is filed, the permit application, including plans of the proposed work will be available for viewing during business hours at the City of Portsmouth's Offices or by scheduling a file review at the NHDES Wetlands Bureau offices by calling (603) 271-2919 or online through the NHDES Public Records Center at the following address:

[https://nhdes.govqa.us/WEBAPP/\\_rs/\(S\(wd23zfh3lmest04r1jgividp\)\)/SupportHome.aspx](https://nhdes.govqa.us/WEBAPP/_rs/(S(wd23zfh3lmest04r1jgividp))/SupportHome.aspx)

Please feel free to contact this office if you have any questions concerning this work.

Very truly yours,

UNDERWOOD ENGINEERS, INC.



Daniel J. Rochette, P.E.  
Project Manager

May 3, 2024

90 Maplewood Avenue LLC  
27 Austin Street  
Portsmouth, NH 03801

Tax Map/Lot No.: 125/19

Re: *Abutter Notification of Standard Dredge and Fill Wetlands Permit Application  
Maplewood Avenue Drainage Improvements  
Portsmouth, New Hampshire*

Dear Property Owner:

On behalf of the City of Portsmouth, please accept this letter as notification that a Standard Dredge and Fill Wetlands Permit Application is being submitted to the N.H. Department of Environmental Services (DES) Wetlands Bureau for proposed improvements to the drainage outfall at 90 Maplewood Avenue. Under state law RSA 482-A:3 I (d)(1), we are required to notify you about this wetland application, because the City's proposed work abuts your property.

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[https://nhdes.govqa.us/WEBAPP/\\_rs/\(S\(wd23zfh31mest04r1jgividp\)\)/SupportHome.aspx](https://nhdes.govqa.us/WEBAPP/_rs/(S(wd23zfh31mest04r1jgividp))/SupportHome.aspx)

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Very truly yours,

UNDERWOOD ENGINEERS, INC.



Daniel J. Rochette, P.E.  
Project Manager

May 3, 2024

City of Portsmouth  
PO Box 628  
Portsmouth, NH 03802

Tax Map/Lot Nos.: 124/2  
124/1  
124/3  
125/17/1  
138/60  
138/48/3

Re: ***Abutter Notification of Standard Dredge and Fill Wetlands Permit Application  
Maplewood Avenue Drainage Improvements  
Portsmouth, New Hampshire***

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Please feel free to contact this office if you have any questions concerning this work.

Very truly yours,

UNDERWOOD ENGINEERS, INC.



Daniel J. Rochette, P.E.  
Project Manager

May 3, 2024

Deer Street Hospitality, LLC  
3 Gosling Road  
Portsmouth, NH 03801

Tax Map/Lot No.: 125/17

Re: ***Abutter Notification of Standard Dredge and Fill Wetlands Permit Application  
Maplewood Avenue Drainage Improvements  
Portsmouth, New Hampshire***

Dear Property Owner:

On behalf of the City of Portsmouth, please accept this letter as notification that a Standard Dredge and Fill Wetlands Permit Application is being submitted to the N.H. Department of Environmental Services (DES) Wetlands Bureau for proposed improvements to the drainage outfall at 90 Maplewood Avenue. Under state law RSA 482-A:3 I (d)(1), we are required to notify you about this wetland application, because the City's proposed work abuts your property.

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Please feel free to contact this office if you have any questions concerning this work.

Very truly yours,

UNDERWOOD ENGINEERS, INC.



Daniel J. Rochette, P.E.  
Project Manager

May 3, 2024

EIGHTKPH LLC  
233 Vaughan Street Unit 301  
Portsmouth, NH 03801

Tax Map/Lot Nos.: 125/17/3  
125/17/2

Re: *Abutter Notification of Standard Dredge and Fill Wetlands Permit Application  
Maplewood Avenue Drainage Improvements  
Portsmouth, New Hampshire*

Dear Property Owner:

On behalf of the City of Portsmouth, please accept this letter as notification that a Standard Dredge and Fill Wetlands Permit Application is being submitted to the N.H. Department of Environmental Services (DES) Wetlands Bureau for proposed improvements to the drainage outfall at 90 Maplewood Avenue. Under state law RSA 482-A:3 I (d)(1), we are required to notify you about this wetland application, because the City's proposed work abuts your property.

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[https://nhdes.govqa.us/WEBAPP/\\_rs/\(S\(wd23zfh31mest04r1jgividp\)\)/SupportHome.aspx](https://nhdes.govqa.us/WEBAPP/_rs/(S(wd23zfh31mest04r1jgividp))/SupportHome.aspx)

Please feel free to contact this office if you have any questions concerning this work.

Very truly yours,

UNDERWOOD ENGINEERS, INC.



Daniel J. Rochette, P.E.  
Project Manager

May 3, 2024

Happny Peter Grey Lisa  
66 Rock Street  
Portsmouth, NH 03801

Tax Map/Lot No.: 138/61

Re: *Abutter Notification of Standard Dredge and Fill Wetlands Permit Application  
Maplewood Avenue Drainage Improvements*  
Portsmouth, New Hampshire

Dear Property Owner:

On behalf of the City of Portsmouth, please accept this letter as notification that a Standard Dredge and Fill Wetlands Permit Application is being submitted to the N.H. Department of Environmental Services (DES) Wetlands Bureau for proposed improvements to the drainage outfall at 90 Maplewood Avenue. Under state law RSA 482-A:3 I (d)(1), we are required to notify you about this wetland application, because the City's proposed work abuts your property.

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[https://nhdes.govqa.us/WEBAPP/\\_rs/\(S\(wd23zfh31mest04rljgividp\)\)/SupportHome.aspx](https://nhdes.govqa.us/WEBAPP/_rs/(S(wd23zfh31mest04rljgividp))/SupportHome.aspx)

Please feel free to contact this office if you have any questions concerning this work.

Very truly yours,

UNDERWOOD ENGINEERS, INC.



Daniel J. Rochette, P.E.  
Project Manager

May 3, 2024

Iron Horse Properties, LLC  
105 Bartlett Street  
Portsmouth, NH 03801

Tax Map/Lot No.: 164/4/2

Re: *Abutter Notification of Standard Dredge and Fill Wetlands Permit Application  
Maplewood Avenue Drainage Improvements*  
Portsmouth, New Hampshire

Dear Property Owner:

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Please feel free to contact this office if you have any questions concerning this work.

Very truly yours,

UNDERWOOD ENGINEERS, INC.



Daniel J. Rochette, P.E.  
Project Manager



May 3, 2024

Regan Electric Co, Inc.  
94 Langdon Street  
Portsmouth, NH 03801

Tax Map/Lot Nos.: 139/8  
139/1

Re: *Abutter Notification of Standard Dredge and Fill Wetlands Permit Application  
Maplewood Avenue Drainage Improvements  
Portsmouth, New Hampshire*

Dear Property Owner:

On behalf of the City of Portsmouth, please accept this letter as notification that a Standard Dredge and Fill Wetlands Permit Application is being submitted to the N.H. Department of Environmental Services (DES) Wetlands Bureau for proposed improvements to the drainage outfall at 90 Maplewood Avenue. Under state law RSA 482-A:3 I (d)(1), we are required to notify you about this wetland application, because the City's proposed work abuts your property.

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[https://nhdes.govqa.us/WEBAPP/\\_rs/\(S\(wd23zfh31mest04r1jgividp\)\)/SupportHome.aspx](https://nhdes.govqa.us/WEBAPP/_rs/(S(wd23zfh31mest04r1jgividp))/SupportHome.aspx)

Please feel free to contact this office if you have any questions concerning this work.

Very truly yours,

UNDERWOOD ENGINEERS, INC.



Daniel J. Rochette, P.E.  
Project Manager

**U.S. Postal Service<sup>SM</sup>**  
**CERTIFIED MAIL<sup>®</sup> RECEIPT**  
Domestic Mail Only

For delivery information, visit our website at [www.usps.com](http://www.usps.com)<sup>SM</sup>

**OFFICIAL USE**

Certified Mail Fee **4.40**

Extra Services & Fees (check box, add fee as appropriate)

- Return Receipt (hardcopy) **3.65**  
 Return Receipt (electronic)  
 Certified Mail Restricted Delivery  
 Adult Signature Required  
 Adult Signature Restricted Delivery  
 Postage **.64**

Total Postage and Fees **8.69**

Sent To **90 Maplewood Avenue, LLC**

Street and Apt. **27 Austin Street**

City, State, ZIP **Portsmouth, NH 03801**

PS Form 3800, April 2015 PSN 7530-02-000-9047 See Reverse for Instructions

7021 1970 0000 6587 2382

**U.S. Postal Service<sup>SM</sup>**  
**CERTIFIED MAIL<sup>®</sup> RECEIPT**  
Domestic Mail Only

For delivery information, visit our website at [www.usps.com](http://www.usps.com)<sup>SM</sup>

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Extra Services & Fees (check box, add fee as appropriate)

- Return Receipt (hardcopy) **3.65**  
 Return Receipt (electronic)  
 Certified Mail Restricted Delivery  
 Adult Signature Required  
 Adult Signature Restricted Delivery  
 Postage **.64**

Total Postage and Fees **8.69**

Sent To **Regan Electric Co., Inc.**

Street and Apt. **94 Langdon Street**

City, State, ZIP **Portsmouth, NH 03801**

PS Form 3800, April 2015 PSN 7530-02-000-9047 See Reverse for Instructions

7021 1970 0000 6587 2399

**SENDER: COMPLETE THIS SECTION**

- Complete items 1, 2, and 3.
- Print your name and address on the reverse so that we can return the card to you.
- Attach this card to the back of the mailpiece, or on the front if space permits.

1. Article Addressed to:

**90 Maplewood Avenue, LLC  
27 Austin Street  
Portsmouth, NH 03801**



9590 9402 8455 3156 5639 17

2. Article Number (transfer from service label)

**7021 1970 0000 6587 2382**

PS Form 3811, July 2020 PSN 7530-02-000-9045

Domestic Return Receipt

2542

**COMPLETE THIS SECTION ON DELIVERY**

- A. Signature \_\_\_\_\_  
 Agent  
 Addressee
- B. Received by (Printed Name) \_\_\_\_\_ C. Date of Delivery \_\_\_\_\_
- D. Is delivery address different from item 1?  Yes  
 If YES, enter delivery address below:  No

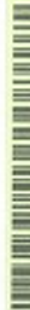
3. Service Type  
 Priority Mail Express<sup>SM</sup>  
 Registered Mail<sup>SM</sup>  
 Registered Mail Restricted Delivery  
 Certified Mail<sup>SM</sup>  
 Certified Mail Restricted Delivery  
 Signature Confirmation<sup>SM</sup>  
 Signature Confirmation Restricted Delivery  
 Collect on Delivery  
 Collect on Delivery Restricted Delivery  
 Insured Mail  
 Insured Mail Restricted Delivery  
 Over \$500

**SENDER: COMPLETE THIS SECTION**

- Complete items 1, 2, and 3.
- Print your name and address on the reverse so that we can return the card to you.
- Attach this card to the back of the mailpiece, or on the front if space permits.

1. Article Addressed to:

**Regan Electric Co., Inc.  
94 Langdon Street  
Portsmouth, NH 03801**



9590 9402 8455 3156 5639 49

2. Article Number (transfer from service label)

**7021 1970 0000 6587 2399**

PS Form 3811, July 2020 PSN 7530-02-000-9045

Domestic Return Receipt

2542

**COMPLETE THIS SECTION ON DELIVERY**

- A. Signature \_\_\_\_\_  
 Agent  
 Addressee
- B. Received by (Printed Name) \_\_\_\_\_ C. Date of Delivery \_\_\_\_\_
- D. Is delivery address different from item 1?  Yes  
 If YES, enter delivery address below:  No

3. Service Type  
 Priority Mail Express<sup>SM</sup>  
 Registered Mail<sup>SM</sup>  
 Registered Mail Restricted Delivery  
 Certified Mail<sup>SM</sup>  
 Certified Mail Restricted Delivery  
 Signature Confirmation<sup>SM</sup>  
 Signature Confirmation Restricted Delivery  
 Collect on Delivery  
 Collect on Delivery Restricted Delivery  
 Insured Mail  
 Insured Mail Restricted Delivery  
 Over \$500

7021 1970 0000 6587 2399

**U.S. Postal Service™  
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Adult Signature Restricted Delivery

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Send to Iron Horse Properties, LLC

Street and/or 105 Bartlett Street

City, State, ZIP+4® Portsmouth, NH 03801

PS Form 3800, April 2015 PSN 7530-02-000-9003

See Reverse for Instructions

5/3/24  
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Postage .64

Total Postage and Fees 8.69

Send to Happy Peter, Grey Lisa

Street and/or 66 Rock Street

City, State, ZIP+4® Portsmouth, NH 03801

PS Form 3800, April 2015 PSN 7530-02-000-9003

See Reverse for Instructions

5/3/24  
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1. Article Addressed to:

**Iron Horse Properties, LLC  
105 Bartlett Street  
Portsmouth, NH 03801**



9590 9402 8455 3156 5639 00

2. Article Number (transfer from service label)

7021 1970 0000 6587 2405

PS Form 3811, July 2020 PSN 7530-02-000-9003

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1. Article Addressed to:

**Happy Peter, Grey Lisa  
66 Rock Street  
Portsmouth, NH 03801**



9590 9402 8455 3156 5638 87

2. Article Number (transfer from service label)

7021 1970 0000 6587 2412

PS Form 3811, July 2020 PSN 7530-02-000-9003

**COMPLETE THIS SECTION ON DELIVERY**

A. Signature  Agent  
 Address

B. Received by (Printed Name) C. Date of Delivery

D. Is delivery address different from item 1?  Yes  
If YES, enter delivery address below:  No

3. Service Type  
 Priority Mail Express®  
 Registered Mail®  
 Certified Mail®  
 Certified Mail Restricted Delivery  
 Collect on Delivery  
 Collect on Delivery Restricted Delivery  
 Insured Mail  
 Insured Mail Restricted Delivery (over \$500)

Signature Confirmation  
Restricted Delivery

Domestic Return Receipt

A. Signature  Agent  
 Address

B. Received by (Printed Name) C. Date of Delivery

D. Is delivery address different from item 1?  Yes  
If YES, enter delivery address below:  No

3. Service Type  
 Priority Mail Express®  
 Registered Mail®  
 Certified Mail®  
 Certified Mail Restricted Delivery  
 Collect on Delivery  
 Collect on Delivery Restricted Delivery  
 Insured Mail  
 Insured Mail Restricted Delivery (over \$500)

Signature Confirmation  
Restricted Delivery

Domestic Return Receipt

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2542

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Extra Services & Fees (check box, and fee if applicable)

Return Receipt (hardcopy) 3.65

Return Receipt (electronic)

Certified Mail Restricted Delivery

Adult Signature Required

Adult Signature Restricted Delivery

Postage

0.64

Total Postage and Fees

8.69

Send To

**EIGHTKPH, LLC**

233 Vaughan Street, Unit 301

Portsmouth, NH 03801

PS Form 3800, April 2013 PSN 7530-02-000-9063 See Reverse for Instructions

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Return Receipt (hardcopy) 3.65

Return Receipt (electronic)

Certified Mail Restricted Delivery

Adult Signature Required

Adult Signature Restricted Delivery

Postage

0.64

Total Postage and Fees

8.69

Send To

**Deer Street Hospitality, LLC**

3 Gosling Road

Portsmouth, NH 03801

PS Form 3800, April 2013 PSN 7530-02-000-9063 See Reverse for Instructions

**SENDER: COMPLETE THIS SECTION**

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- Print your name and address on the reverse so that we can return the card to you.
- Attach this card to the back of the mailpiece, or on the front if space permits.

1. Article Addressed to:

**EIGHTKPH, LLC**  
**233 Vaughan Street, Unit 301**  
**Portsmouth, NH 03801**



9590 9402 8455 3156 5638 70

2. Article Number (transfer from service label)  
7021 1970 0000 6587 2429

PS Form 3811, July 2020 PSN 7530-02-000-9063

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- Agent  
 Addressee
- B. Received by (Printed Name) \_\_\_\_\_ C. Date of Delivery \_\_\_\_\_
- D. Is delivery address different from item 1?  Yes  
If YES, enter delivery address below:  No

3. Service Type
- Priority Mail Express®
- Registered Mail™
- Registered Mail Restricted Delivery
- Certified Mail®
- Certified Mail Restricted Delivery
- Signature Confirmation™
- Collect on Delivery
- Collect on Delivery Restricted Delivery
- Insured Mail
- Insured Mail Restricted Delivery (over \$500)

Domestic Return Receipt

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**SENDER: COMPLETE THIS SECTION**

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- Print your name and address on the reverse so that we can return the card to you.
- Attach this card to the back of the mailpiece, or on the front if space permits.

1. Article Addressed to:

**Deer Street Hospitality, LLC**  
**3 Gosling Road**  
**Portsmouth, NH 03801**



9590 9402 8455 3156 5638 63

2. Article Number (transfer from service label)  
7021 1970 0000 6587 2436

PS Form 3811, July 2020 PSN 7530-02-000-9063

**COMPLETE THIS SECTION ON DELIVERY**

- A. Signature \_\_\_\_\_
- Agent  
 Addressee
- B. Received by (Printed Name) \_\_\_\_\_ C. Date of Delivery \_\_\_\_\_
- D. Is delivery address different from item 1?  Yes  
If YES, enter delivery address below:  No

3. Service Type
- Priority Mail Express®
- Registered Mail™
- Registered Mail Restricted Delivery
- Certified Mail®
- Certified Mail Restricted Delivery
- Signature Confirmation™
- Collect on Delivery
- Collect on Delivery Restricted Delivery
- Insured Mail
- Insured Mail Restricted Delivery (over \$500)

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PS Form 3811, April 2015 PSN 7530-02-000-9053

City of Portsmouth  
1 Junkins Avenue  
Portsmouth, NH 03801

PS Form 3811, July 2020 PSN 7530-02-000-9053

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Certified Mail Fee  
4.40

PS Form 3811, April 2015 PSN 7530-02-000-9053

City of Portsmouth  
PO Box 628  
Portsmouth, NH 03802

PS Form 3811, July 2020 PSN 7530-02-000-9053

7021 1970 0000 6587 1996

SENDER: COMPLETE THIS SECTION

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- Attach this card to the back of the mailpiece, or on the front if space permits.

1. Article Addressed to:

City of Portsmouth  
1 Junkins Avenue  
Portsmouth, NH 03801



9590 9402 8455 3156 5638 56

2. Article Number (Transfer from service label)

7021 1970 0000 6587 2443

PS Form 3811, July 2020 PSN 7530-02-000-9053

COMPLETE THIS SECTION ON DELIVERY

- A. Signature  
 Agent  
 Addressee
- B. Received by (Printed Name) \_\_\_\_\_ C. Date of Delivery \_\_\_\_\_
- D. Is delivery address different from item 1?  Yes  
If YES, enter delivery address below:  No

3. Service Type
- Priority Mail Express®
  - Registered Mail™
  - Registered Mail Restricted Delivery
  - Certified Mail®
  - Certified Mail Restricted Delivery
  - Collect on Delivery
  - Collect on Delivery Restricted Delivery
  - Insured Mail
  - Insured Mail Restricted Delivery
  - Return Receipt

Domestic Return Receipt

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SENDER: COMPLETE THIS SECTION

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- Attach this card to the back of the mailpiece, or on the front if space permits.

1. Article Addressed to:

City of Portsmouth  
PO Box 628  
Portsmouth, NH 03802



9590 9402 8455 3156 5639 24

2. Article Number (Transfer from service label)

7021 1970 0000 6587 1996

PS Form 3811, July 2020 PSN 7530-02-000-9053

COMPLETE THIS SECTION ON DELIVERY

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 Agent  
 Addressee
- B. Received by (Printed Name) \_\_\_\_\_ C. Date of Delivery \_\_\_\_\_
- D. Is delivery address different from item 1?  Yes  
If YES, enter delivery address below:  No

3. Service Type
- Priority Mail Express®
  - Registered Mail™
  - Registered Mail Restricted Delivery
  - Certified Mail®
  - Certified Mail Restricted Delivery
  - Collect on Delivery
  - Collect on Delivery Restricted Delivery
  - Insured Mail
  - Insured Mail Restricted Delivery
  - Return Receipt

Domestic Return Receipt

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# **ATTACHMENT N**

## **Design Plan Set**





# City of Portsmouth, New Hampshire

## MAPLEWOOD AVENUE DRAINAGE IMPROVEMENTS

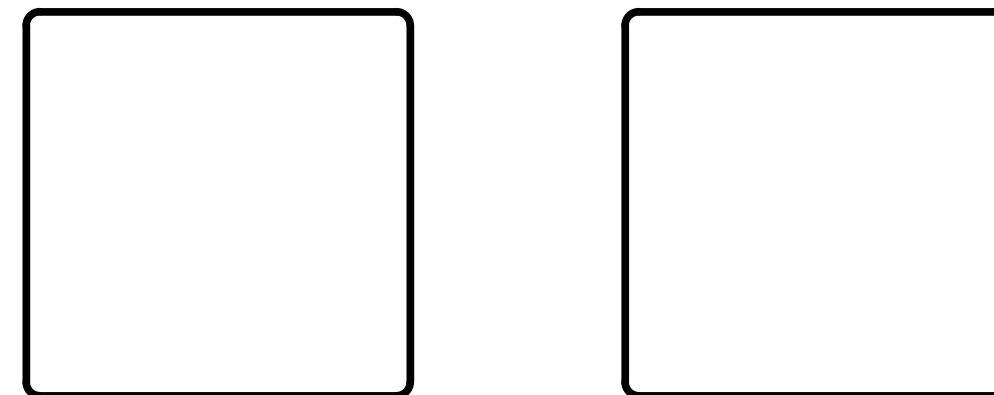


LOCATION PLAN

PROJECT AREA



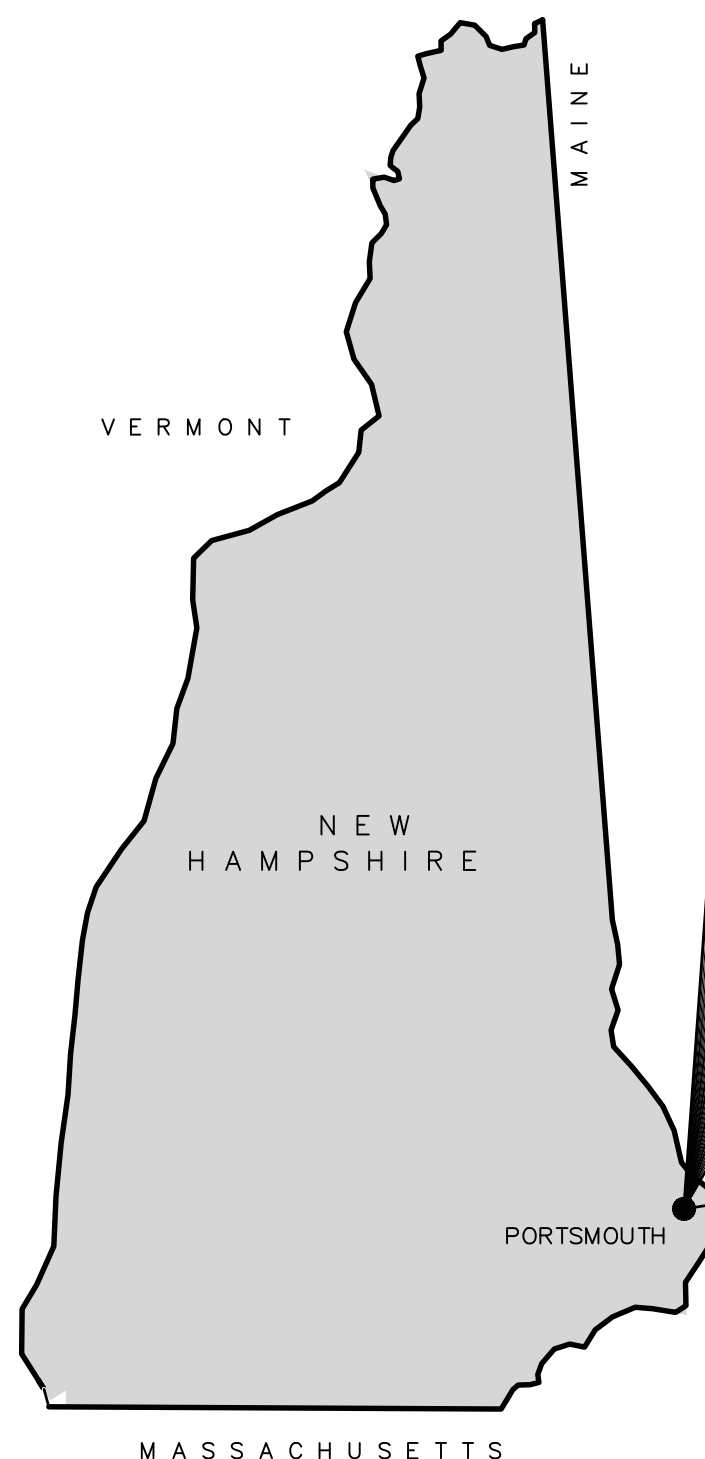
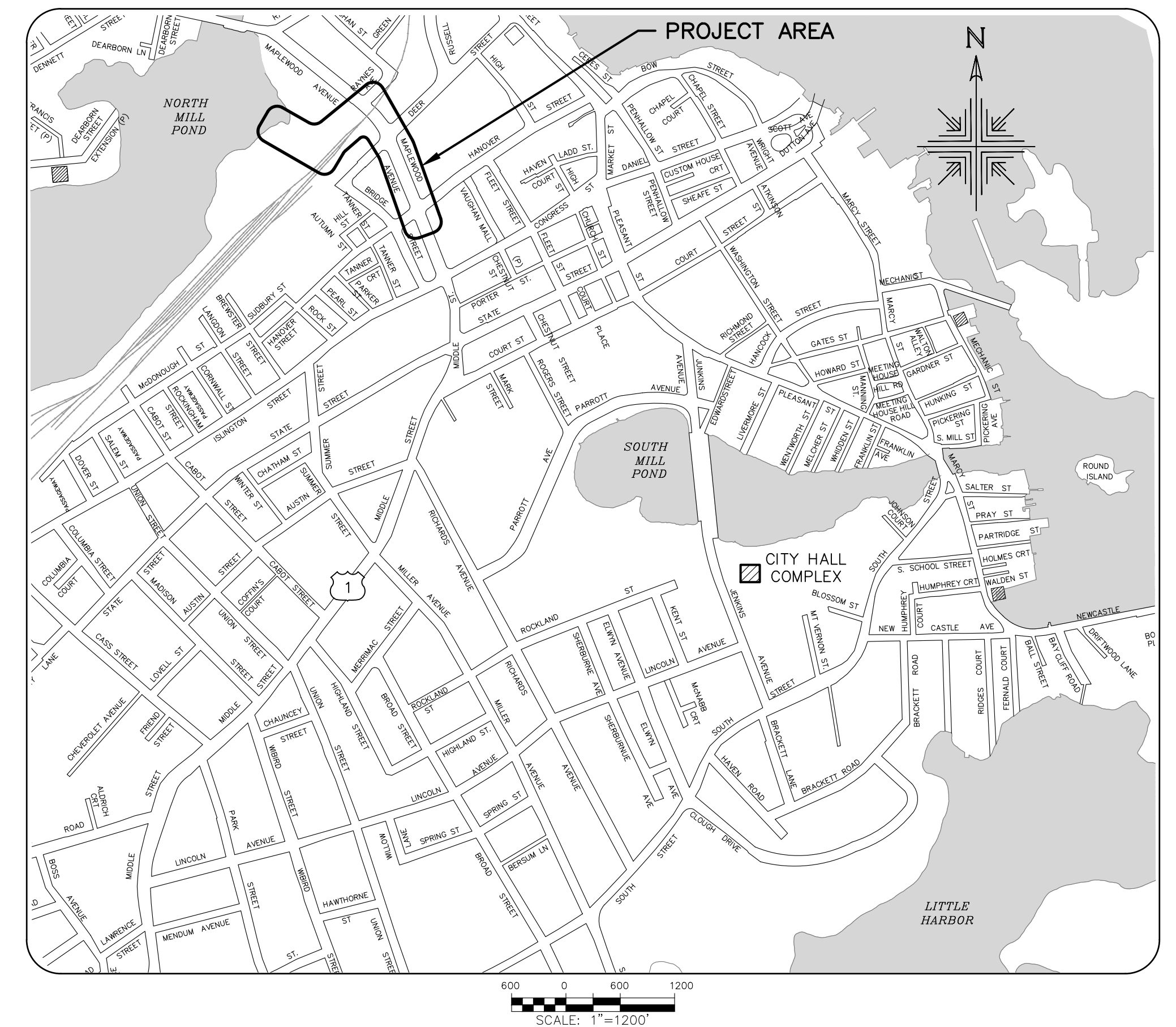
PREPARED BY  
 UNDERWOOD ENGINEERS, INC.  
 PORTSMOUTH, NEW HAMPSHIRE  
 APRIL 2024



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VICINITY MAP



UE #2542



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LEGEND:

Table with 2 columns: EXISTING and PROPOSED. Lists various symbols for structures, roads, retaining walls, utilities, and landscaping.

LEGEND (cont.):

Table with 4 columns: EXISTING, PROPOSED, and two unlabeled columns. Lists symbols for grass cover, spot grade, elevations, contours, signs, tax sheets, rocks, poles, sewer and water laterals, drain laterals, railroad signals, tracks, borings, refusals, groundwater, silts, and fences.

ABBREVIATIONS

Table with 2 columns: AC/ACP, CB, CI/CIP, CMP, DI, DMH, GIS, HDPE, I, PE, PVC, R, RCP, RCRD, RCSC, S, SMH, UP. Lists abbreviations for pipe materials, manholes, GIS, and utility poles.

SEWER TABLE

Table listing sewer manhole (SMH) and catch basin (CB) data including IDs, rim elevations, and invert elevations for various pipe types and structures.

DRAIN TABLE

Table listing drain manhole (DMH) and catch basin (CB) data including IDs, rim elevations, and invert elevations for various pipe types and structures.

Vertical sidebar containing project information: LEGEND & ABBREVIATIONS, EXISTING STRUCTURE TABLES, MAPLEWOOD AVE DRAINAGE IMPROVEMENTS, CITY OF PORTSMOUTH, PORTSMOUTH, NEW HAMPSHIRE, DWG NO G1, SHEET 2 OF 17, and UNDERWOOD engineers logo.

Vertical text on the far left edge of the page.



|  |  |   |   |                              |                  |
|--|--|---|---|------------------------------|------------------|
| <b>PLAN INDEX</b><br><b>MAPLEWOOD AVE DRAINAGE IMPROVEMENTS</b><br><b>CITY OF PORTSMOUTH</b><br><b>PORTSMOUTH, NEW HAMPSHIRE</b> |  | <b>UNDERWOOD</b><br>engineers<br>25 Vaughan Mall, Portsmouth, N.H. 03801<br>Tel. 603-436-6192 Fax. 603-431-4733 | Drawn/Chk. RMG<br>Designed FDM<br>Approved APRIL 2024<br>Date<br>Book No.<br>Project No. 2542<br>Dwg. ID 2542.pbases_M<br>Scale |                              | REVISIONS<br>NO. |
| DWG NO<br>G2   |  |   | SHEET<br>3 OF 17  |                              |                  |
| ISSUE FOR<br>BIDDING<br>Date<br>By   |  | CONSTRUCTION<br>Date<br>By  |   | RECORD DRAWING<br>Date<br>By |                  |

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**GENERAL NOTES:**

1. THE LINE WORK REPRESENTING THE EXISTING UNDERGROUND STRUCTURES AND PIPES IS BASED ON A FIELD SURVEY, TIE SHEETS, AND OTHER INFORMATION AVAILABLE, INCLUDED IN THE PROJECT MANUAL APPENDIX. THE ENGINEER/SURVEYOR MAKES NO GUARANTEE THAT THE UNDERGROUND UTILITIES SHOWN ON THE PLANS OR THE PROJECT MANUAL APPENDIX COMPRISE ALL SUCH UTILITIES IN THE AREA, EITHER IN SERVICE OR ABANDONED. THE ENGINEER/SURVEYOR FURTHER DOES NOT WARRANT THAT THE UNDERGROUND UTILITIES SHOWN ARE IN THE EXACT LOCATION INDICATED. IN ADDITION, CONTRACTOR SHALL ANTICIPATE THAT EVERY BUILDING OR UNIT WITHIN THE PROJECT AREA HAS A LEAST ONE GAS, SEWER AND WATER SERVICE EXTENDING FROM THE MAIN IN THE STREET TO THE BUILDING. THEREFORE THE CONTRACTOR SHOULD CONSIDER CONFLICTS, HAND EXCAVATION AND POSSIBLE DELAYS IN CONSTRUCTION, WHEN PREPARING THEIR BID.

2. THE CONTRACTOR IS RESPONSIBLE FOR THE LOCATION, PROTECTION AND REPAIR (IF DAMAGED) OF ALL EXISTING UTILITY MAINS AND SERVICES. THE LOCATIONS OF KNOWN SEWER, WATER AND GAS, MAINS, SHOWN ON THESE DRAWINGS ARE APPROXIMATE. HOWEVER, WATER AND SEWER SERVICE LATERALS ARE NOT SHOWN AND THE CONTRACTOR IS TO ANTICIPATE THEIR EXISTENCE. TIE SHEETS FOR THE KNOWN UTILITIES (INCLUDING GAS AND WATER) ARE PROVIDED IN THE APPENDIX OF THE PROJECT MANUAL. VIDEO LOGS AND SANITARY SURVEYS FOR SEWER LATERALS ARE AVAILABLE FROM THE ENGINEER UPON REQUEST. NOTIFY DIG-SAFE PRIOR TO COMMENCING CONSTRUCTION (1-888-344-7233). CONTRACTOR SHALL GIVE ADEQUATE NOTICE TO THE ENGINEER OF CONFLICTS OF PROPOSED WORK WITH MARKED UTILITIES PRIOR TO CONSTRUCTING THE PROPOSED WORK.

3. ALL CONFLICTS WITH GAS LINES SHALL BE COORDINATED WITH UNITIL, SUBSIDIARY.

4. THE CONTRACTOR SHALL MAINTAIN SINGLE LANE TRAFFIC AND ACCESS TO BUSINESSES AND PROPERTIES AT ALL TIMES DURING WORKING HOURS. TRAFFIC CONTROL WARNING DEVICES SHALL BE IN ACCORDANCE WITH MUTCD (LATEST EDITION) REQUIREMENTS AND SECTION 01570 OF THE PROJECT MANUAL.

5. ALL STREET OPENINGS SHALL BE BACKFILLED AT THE END OF EACH DAYS OPERATIONS TO ENSURE SAFE VEHICULAR AND PEDESTRIAN TRAFFIC. THE CONTRACTOR SHALL MAINTAIN SAFE PASSAGE FOR 2-LANES OF TRAFFIC AT THE END OF EACH WORK DAY. DUST CONTROL OPERATIONS ARE TO BE CONTINUOUS THROUGHOUT CONSTRUCTION AND IS INCIDENTAL TO THE WORK.

6. THE USE OF PLATES TO COVER OPEN EXCAVATIONS IN LIEU OF BACKFILLING WILL NOT BE PERMITTED UNLESS PRIOR APPROVAL HAS BEEN GRANTED BY THE OWNER.

7. A NPDES PERMIT FOR CONSTRUCTION ACTIVITIES IS REQUIRED FOR THIS PROJECT. THE CONTRACTOR IS REQUIRED TO PREPARE A STORM WATER POLLUTION PREVENTION PLAN (SWPPP) AND TO SUBMIT A NOTICE OF INTENT (NOI) TO THE EPA TO FULFILL PROJECT REQUIREMENTS. THE SWPPP MUST BE PREPARED IN ACCORDANCE WITH THE EPA'S REQUIREMENTS. NO WORK IS TO PROCEED UNTIL THE SWPPP AND THE NOI IS SUBMITTED AND ACCEPTED BY THE OWNER. A COPY OF THE NOI, SWPPP REQUIREMENTS, AND EXAMPLE SWPPP ARE INCLUDED IN THE PROJECT MANUAL APPENDIX.

8. THIS SET OF PLANS HAS BEEN CREATED TO BE USED IN CONJUNCTION WITH A TECHNICAL SPECIFICATION ENTITLED "PROJECT MANUAL, MAPLEWOOD AVENUE – DRAINAGE INTERCEPT, PORTSMOUTH, NH".

9. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE REMOVAL AND DISPOSAL OF ALL SURPLUS EARTHEN MATERIALS, LEDGE, CURB, PIPE, AND SEWER OR DRAIN STRUCTURES EXCAVATED DURING CONSTRUCTION, UNLESS MATERIALS ARE CLAIMED BY THE OWNER OR OTHERWISE INDICATED IN THE PROJECT MANUAL OR THE DRAWINGS.

10. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL PROPERTY RESTORATION BOTH PUBLIC AND PRIVATE. UTILITIES DAMAGED AS A RESULT OF THE CONTRACTORS OPERATIONS SHALL BE REPAIRED BY THE CONTRACTOR AT NO ADDITIONAL COST TO THE OWNER.

11. PAVING REPAIRS SHALL MAINTAIN EXISTING LINE AND GRADE UNLESS OTHERWISE INDICATED OR DIRECTED.

12. OVERHEAD WIRES AND WIRE DROPS TO BUILDINGS ARE NOT SHOWN IN ENTIRETY. THE CONTRACTOR SHALL ANTICIPATE THEIR EXISTENCE IN ALL OPERATIONS.

13. THE CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTENANCE OF ROADWAY SIGNS. ANY SIGN DAMAGED DURING THE COMPLETION OF WORK SHALL BE REPLACED AT NO ADDITIONAL COST TO THE OWNER.

14. AREAS OUTSIDE THE LIMITS OF PROPOSED WORK DISTURBED BY THE CONTRACTOR'S OPERATIONS SHALL BE RESTORED BY THE CONTRACTOR TO THEIR ORIGINAL CONDITION AT THE CONTRACTOR'S EXPENSE.

15. CONTRACTOR SHALL NOT USE ANY ADJACENT DRIVEWAYS OR PARKING LOTS WITHOUT WRITTEN PERMISSION FOR PROPERTY OWNER. DAMAGE RESULTING FROM CONSTRUCTION LOADS OUTSIDE PROPOSED LIMITS OF WORK SHALL BE REPAIRED BY THE CONTRACTOR AT NO ADDITIONAL COST TO OWNER.

16. EXISTING PROPERTY LINE MONUMENTATION DISTURBED DURING CONSTRUCTION SHALL BE SET OR RESET BY A LICENSED LAND SURVEYOR (LLS), SUBSIDIARY.

**REFERENCE PLANS:**

- PORTWALK SITE PLAN, PREPARED BY APPLIEDORE ENGINEERS INC., DATE/LAST REVISED 3/5/2010.
- 195 HANOVER STREET AS BUILT, PREPARED BY S.U.R., DATE/LAST REVISED 7/21/2015.
- PORTWALK AS BUILT, PREPARED BY MSC, DATE/LAST REVISED 9/15/2015.

**SURVEY NOTES:**

1. THIS PLAN IS BASED ON A FIELD SURVEY BY JAMES VERRA AND ASSOCIATES, INC. 12/2019-6/2022. ON SITE CONTROL ESTABLISHED USING SURVEY GRADE GPS UNITS. HORIZONTAL DATUM: NAD 1983 (1986 ADJUSTMENT) PRIMARY BM: NHDOT 379-0150 (PORTSMOUTH TRAFFIC CIRCLE) VERTICAL DATUM: NAVD 1988 PRIMARY BM: CITY CONTROL POINT "ALBA"

2. CONTRACTOR TO VERIFY SITE BENCHMARKS BY LEVELING BETWEEN 2 BENCHMARKS PRIOR TO THE SETTING OR ESTABLISHMENT OF ANY GRADES/ELEVATIONS. DISCREPANCIES ARE TO BE REPORTED TO JAMES VERRA AND ASSOC., INC.

3. THE LOCATION OF ALL UNDERGROUND UTILITIES SHOWN HEREON ARE APPROXIMATE AND ARE BASED UPON THE FIELD LOCATION OF ALL VISIBLE STRUCTURES (IE CATCH BASINS, MANHOLES, WATER GATES ETC.) AND INFORMATION COMPILED FROM PLANS PROVIDED BY UTILITY COMPANIES AND GOVERNMENTAL AGENCIES. ALL CONTRACTORS SHOULD NOTIFY, IN WRITING, SAID AGENCIES PRIOR TO ANY EXCAVATION WORK AND CALL DIG-SAFE @ 1-888-DIG-SAFE.

NOTE: VERY LITTLE UNDERGROUND UTILITY MARKING WAS COMPLETED PRIOR TO CONDUCTING THE FIELD SURVEY.

**SANITARY SEWER NOTES:**

1. ALL NEW SEWER SERVICE LATERALS SHALL BE 6" DIAMETER, UNLESS DIRECTED OTHERWISE. PRIOR TO CONSTRUCTION OF NEW SEWER MAINS IT WILL BE THE CONTRACTOR'S RESPONSIBILITY TO VERIFY EXACT SEWER SERVICE LOCATIONS, SIZES, AND ELEVATIONS, BY VIDEO INSPECTION WITH TRANSMITTER AND LOCATOR, PAY ITEM 1.18. SEWER LATERALS SHALL BE INSTALLED TO THE PROPERTY LINE (UNLESS SHOWN OTHERWISE ON THE DRAWINGS). ANY SERVICE WORK EXTENDING PAST THE PROPERTY LINE SHALL BE APPROVED BY THE PROPERTY OWNER, THE CITY, AND THE ENGINEER PRIOR TO CONSTRUCTION. MIN. SLOPE OF SERVICE PIPE = SHALL BE 0.02 FT/FT.

2. WORK ON PRIVATE PROPERTY SHALL BE COORDINATED WITH THE CITY AND THE PROPERTY OWNER.

3. SEWER CONSTRUCTION SHALL PROCEED FROM THE LOWEST POINT UPWARD UNLESS OTHERWISE APPROVED BY THE ENGINEER.

4. SMH RIMS SHALL BE SET 1/8" TO 1/4" BELOW GRADE WHEN IN PAVEMENT OR GRAVEL ROADS (I.E., PLOWED AREAS). RIMS SHALL BE SET AT GRADE IN NON-PLOWED AREAS UNLESS OTHERWISE INDICATED.

5. ALL EXISTING SEWER STRUCTURES (PIPE AND MANHOLES) TO BE ABANDONED SHALL BE PREPARED AS FOLLOWS:

MANHOLES – SHALL BE REMOVED TO A MINIMUM DEPTH OF 4' BELOW GRADE. THE BASE OF STRUCTURES SHALL BE FILLED WITH FLOWFILL OR GRAVEL, COMPACTED IN 8" LIFTS, SUBSIDIARY, UNLESS OTHERWISE PAID FOR.  
PIPE – ALL PIPE TO BE ABANDONED IN PLACE AND SHALL BE CUT & PLUGGED AT BOTH ENDS, SUBSIDIARY. PIPES EXCEEDING 12-INCH DIAMETER, TO BE ABANDONED, WILL BE FILLED WITH FLOWABLE FILL (WHERE DIRECTED BY ENGINEER) AND PAID FOR UNDER ITEM 1.11.

6. IN ORDER OF PREFERENCE SEWER SERVICE CLEANOUTS SHALL BE PLACED:
- 1) BEHIND CONCRETE SIDEWALKS.
  - 2) IN BRICK STRIP.
  - 3) IN CONCRETE SIDEWALKS.
7. ALL SEWER PIPE SHALL BE SDR 35 PVC UNLESS SHOWN OTHERWISE ON THE DRAWINGS.

**DRAINAGE SYSTEM NOTES**

1. IN GENERAL, NEW CB'S WILL BE SET AT THE LOCATIONS SHOWN. EXISTING CB STRUCTURES ARE TO BE REMOVED. (SUBSIDIARY). ALL FRAMES AND GRATES SHALL BE DELIVERED TO THE PORTSMOUTH DPW (SUBSIDIARY). ALL NEW CATCH BASIN RIMS SHALL BE SET 1/2" BELOW FINISH GRADE ELEVATION. REMOVAL OF CB'S OUTSIDE NORMAL EXCAVATION LIMITS WILL BE PAID AS ITEM 202.5.

2. MANHOLE AND CATCH BASIN BASES, RISERS, CONE SECTIONS, AND SLAB TOPS SHALL BE DESIGNED SUCH THAT THERE EXISTS A MINIMUM 6" PERIPHERY OF MONOLITHIC SOLID WALL SEPARATION BETWEEN OPENINGS (CORINGS AND SECTIONS).

3. ALL CATCH BASINS, DRAIN MANHOLES, & DRAIN LINES SHALL BE CLEANED PRIOR TO ACCEPTANCE.

4. ALL REQUIRED STORM DRAIN SERVICES MAY NOT BE SHOWN ON THE PLANS, AND SHALL BE PROVIDED WHERE DIRECTED BY THE ENGINEER.

5. DMH RIMS SHALL BE SET 1/8" TO 1/4" BELOW GRADE WHEN IN PAVEMENT OR GRAVEL ROADS (I.E., PLOWED AREAS). RIMS SHALL BE SET AT GRADE IN NON-PLOWED AREAS UNLESS OTHERWISE INDICATED.

6. LOCATIONS OF NEW DRAIN SERVICES ARE BASED ON EXISTING ROOF LEADERS OBSERVED. ACTUAL LOCATION AND CONFIGURATION MAY CHANGE BASED ON FINAL REVIEW WITH PROPERTY OWNER DURING CONSTRUCTION.

**WATER DISTRIBUTION SYSTEM NOTES:**

1. THE CONTRACTOR SHALL MAINTAIN AND PROTECT THE EXISTING WATER SYSTEM AT ALL TIMES. LOCATE AND IDENTIFY ALL EXISTING MAINS AND SERVICE LOCATIONS IN ADVANCE.

2. WATER BOXES, OR OTHER CASTINGS, DISTURBED OR RELOCATED BY CONSTRUCTION ACTIVITIES SHALL BE ADJUSTED TO EXISTING LINE AND GRADE, UNLESS SHOWN OTHERWISE ON THESE PLANS OR AS DIRECTED BY THE ENGINEER (SUBSIDIARY).

**CONSTRUCTION SEQUENCE:**

PERFORM WORK IN ACCORDANCE WITH APPROVED SCHEDULE, GENERALLY ACCEPTED INDUSTRY ORDER OF OPERATIONS UNLESS OTHERWISE APPROVED IN WRITING BY THE ENGINEER.

1. PRIOR TO THE START OF CONSTRUCTION PROVIDE A WRITTEN NARRATIVE OF THE CONSTRUCTION METHODS TO BE USED AND INCLUDE A PRELIMINARY SCHEDULE OF KEY MILESTONES, INCLUDING COORDINATION OF UTILITY PIPE INSTALLATIONS AND COORDINATION WITH GAS COMPANY, AND OTHER UTILITIES AS APPLICABLE.

2. REFER TO SECTION 01010 (SUMMARY OF WORK) AND SECTION POW (PROSECUTION OF WORK) FOR ADDITIONAL SCHEDULE AND PROJECT REQUIREMENTS.

3. INSTITUTE EXPLORATORY EXCAVATION PROGRAM WITH ENGINEER TO IDENTIFY POTENTIAL CONFLICTS AT UTILITY CROSSINGS. EXPLORATORY EXCAVATION COMPLETED WITHOUT PRIOR APPROVAL FROM THE ENGINEER WILL BE AT NO ADDITIONAL COST TO THE OWNER.

4. INSTALL AND MAINTAIN TEMPORARY AND PERMANENT EROSION CONTROL DEVICES THROUGHOUT THE CONSTRUCTION PERIOD (INCLUDING WINTER SHUT DOWN PERIODS AS REQUIRED) AS SHOWN IN THE APPROVED SWPPP, ON THE DRAWINGS, OR AS APPROVED BY THE ENGINEER.

5. PRE-DRAIN AND/OR DEWATER EXCAVATIONS BEFORE INSTALLING PIPE. INSTALL PIPE ON STABLE BEDDING (IN DRY CONDITIONS) TO THE ELEVATIONS SHOWN ON DRAWINGS.

6. DISPOSE OF SURPLUS AND UNSUITABLE MATERIALS AS THE WORK PROGRESSES. STOCKPILE OF MATERIALS WILL ONLY BE PERMITTED IN AREAS APPROVED BY THE CITY OF PORTSMOUTH, DPW.

7. INSTALL CRUSHED GRAVEL OR RECLAIMED BASE AS SHOWN ON DRAWINGS, IN TRENCH AT END OF EACH DAY. VISUAL INSPECTION, ALIGNMENT TESTS AND DEFLECTION TESTS OF PIPES SHALL BE COMPLETED NO LESS THAN THIRTY (30) DAYS FOLLOWING INSTALLATION. CONSTRUCT PAVEMENT REPAIRS AS SOON AS PRACTICAL, FOLLOWING UTILITY INSTALLATIONS AND TESTING.

8. IMMEDIATELY STABILIZE DISTURBED AREAS AFTER PIPE INSTALLATION AND REESTABLISH TEMPORARY EROSION CONTROL DEVICES MOVED DURING CONSTRUCTION.

9. FINISH GRADING, LOAM AND SEED DISTURBED AREAS AND BACK UP PAVEMENT WITH GRAVEL IMMEDIATELY FOLLOWING PAVEMENT REPAIRS.

10. REMOVE ALL TEMPORARY EROSION CONTROL DEVICES AS SOON AS VEGETATION IS ESTABLISHED AND AREAS ARE STABILIZED.

**NEW HAMPSHIRE FISH AND GAME CONDITIONS::**

1. AMERICAN EEL (STATE SPECIES OF SPECIAL CONCERN) OCCUR WITHIN THE VICINITY OF THE PROJECT AREA. BASED ON THE DETAILS PROVIDED IN THE MATERIALS REVIEWED FOR THE PROPOSED PROJECT AND THE LOCATION OF THE PROJECT SITE, NHFG DOES NOT ANTICIPATE IMPACTS TO THESE SPECIES AT THIS TIME. HOWEVER, ALL OPERATORS AND PERSONNEL WORKING ON OR ENTERING THE SITE SHALL BE MADE AWARE OF THE POTENTIAL PRESENCE OF THESE SPECIES AND SHALL BE PROVIDED FLYERS FOR THE RARE EEL SPECIES THAT HELP TO IDENTIFY THESE SPECIES, ALONG WITH NHFG CONTACT INFORMATION. SEE THE FLYER ON THIS SHEET.

2. RARE SPECIES INFORMATION (E.G. IDENTIFICATION, OBSERVATION AND REPORTING OF OBSERVATIONS, WHEN TO CONTACT NHFG IMMEDIATELY AND NHFG CONTACT INFORMATION) SHALL BE COMMUNICATED DURING MORNING TAILGATE MEETINGS PRIOR TO WORK COMMENCEMENT DURING THE CONSTRUCTION PHASE OF THE PROJECT. SEE THE FLYER ON THIS SHEET.

3. ALL MANUFACTURED EROSION AND SEDIMENT CONTROL PRODUCTS, WITH THE EXCEPTION OF TURF REINFORCEMENT MATS, UTILIZED FOR, BUT NOT LIMITED TO, SLOPE PROTECTION, RUNOFF DIVERSION, SLOPE INTERRUPTION, PERIMETER CONTROL, INLET PROTECTION, CHECK DAMS, AND SEDIMENT TRAPS SHALL NOT CONTAIN PLASTIC, OR MULTIFILAMENT OR MONOFILAMENT POLYPROPYLENE NETTING OR MESH WITH AN OPENING SIZE OF GREATER THAN 1/8 INCHES.

4. ALL OBSERVATIONS OF THREATENED OR ENDANGERED SPECIES ON THE PROJECT SITE SHALL BE REPORTED IMMEDIATELY TO THE NHFG NONGAME AND ENDANGERED WILDLIFE ENVIRONMENTAL REVIEW PROGRAM BY PHONE AT 603-271-2461 AND BY EMAIL AT NHFGREVIEW@WILDLIFE.NH.GOV, WITH THE EMAIL SUBJECT LINE CONTAINING THE NHB DATACHECK TOOL RESULTS LETTER ASSIGNED NUMBER, THE PROJECT NAME, AND THE TERM WILDLIFE SPECIES OBSERVATION.

5. PHOTOGRAPHS OF THE OBSERVED SPECIES AND NEARBY ELEMENTS OF HABITAT OR AREAS OF LAND DISTURBANCE SHALL BE PROVIDED TO NHFG IN DIGITAL FORMAT AT THE ABOVE EMAIL ADDRESS FOR VERIFICATION, AS FEASIBLE.

6. IN THE EVENT A THREATENED OR ENDANGERED SPECIES IS OBSERVED ON THE PROJECT SITE DURING THE TERM OF THE PERMIT, THE SPECIES SHALL NOT BE DISTURBED, HANDLED, OR HARMED IN ANY WAY PRIOR TO CONSULTATION WITH NHFG AND IMPLEMENTATION OF CORRECTIVE ACTIONS RECOMMENDED BY NHFG.

A. SITE OPERATORS SHALL BE ALLOWED TO RELOCATE WILDLIFE ENCOUNTERED IF DISCOVERED WITHIN THE ACTIVE WORK ZONE IF IN DIRECT HARM FROM PROJECT ACTIVITIES. WILDLIFE SHALL BE RELOCATED IN CLOSE PROXIMITY TO THE CAPTURE LOCATION BUT OUTSIDE OF THE WORK ZONE AND IN THE DIRECTION THE INDIVIDUAL WAS HEADING. NHFG SHALL BE CONTACTED IMMEDIATELY IF THIS ACTION OCCURS.

7. NHFG, INCLUDING ITS EMPLOYEES AND AUTHORIZED AGENTS, SHALL HAVE ACCESS TO THE PROPERTY DURING THE TERM OF THE PERMIT.

## American Eel

*(Anguilla rostrata)*  
**New Hampshire Species of Concern**





- Long, slender snake-like fish with thick, slimy skin
- Small mouth and tiny scales
- Has one continuous fin that runs the length of the eel's body and wraps around the tail
- Found in almost any freshwater habitat that can be accessed from the ocean




**Immediately report sightings to NH Fish and Game**  
**Melissa Winters (603-479-1129) or**  
**Josh Megyesy (978-578-0802)**  
*Please report promptly, noting specific location and date*  
**Photographs strongly encouraged**

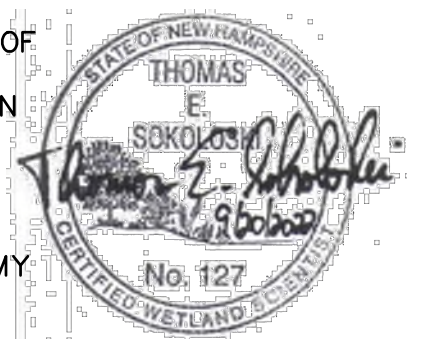



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| Drawn/Chk. Designed PDM   | Checked           | Approved   | Date         | Book No.            | Project No.    | Dwg. ID             | Scale |
|   |                   |  | APRIL 2024   |                     | 2542           | 2542.general.dwg    |       |
|  |                   |  |              |                     |                |                     |       |
| 25 Vaughan Mall, Portsmouth, N.H. 03801<br>Tel. 603-436-6192 Fax. 603-431-4733        |                   |  |              |                     |                |                     |       |
| UTILITY PLAN NOTES  |                   | MAPLEWOOD AVE DRAINAGE IMPROVEMENTS<br>CITY OF PORTSMOUTH<br>PORTSMOUTH, NEW HAMPSHIRE |              |                     |                |                     |       |
| DWG NO<br>G3  | SHEET<br>4 OF 17  |  |              |                     |                |                     |       |

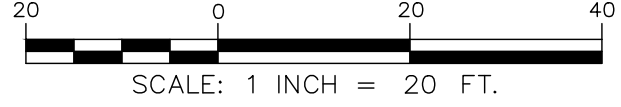
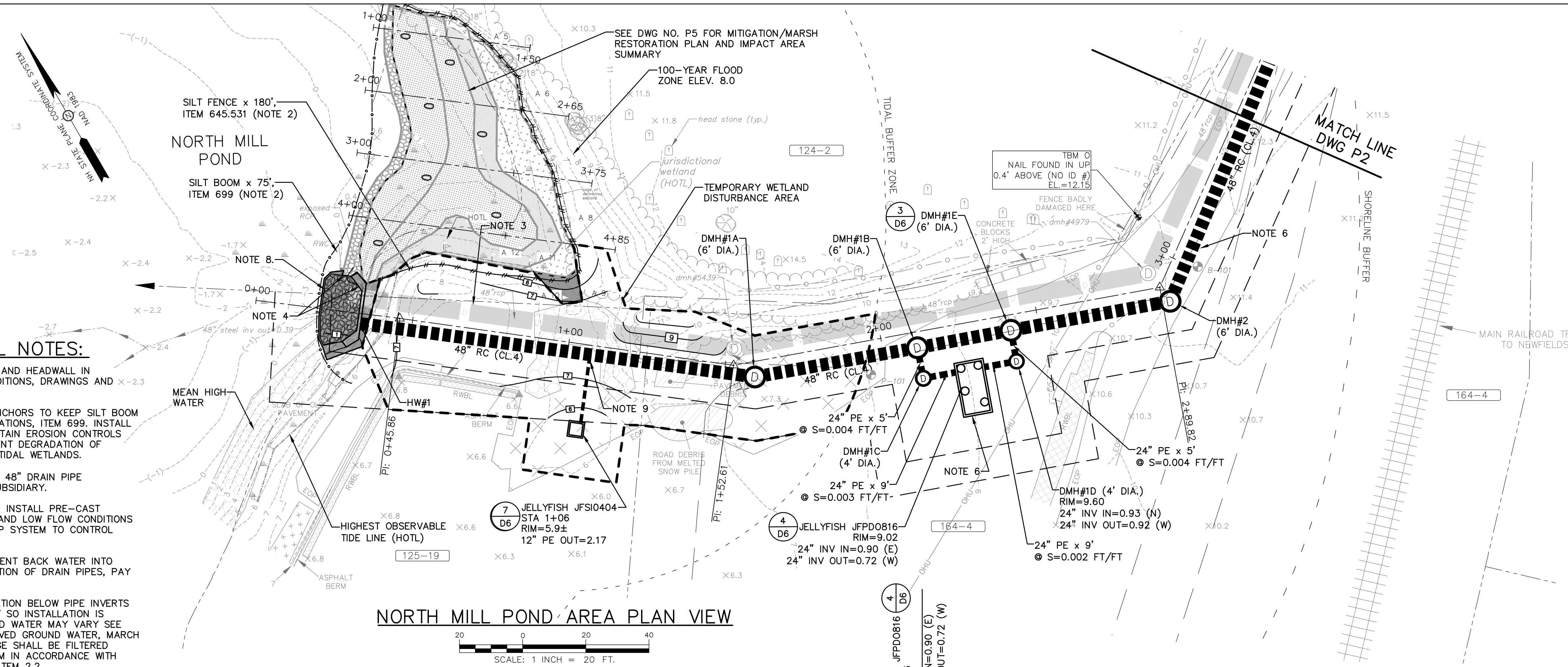
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**DRAINAGE OUTFALL NOTES:**

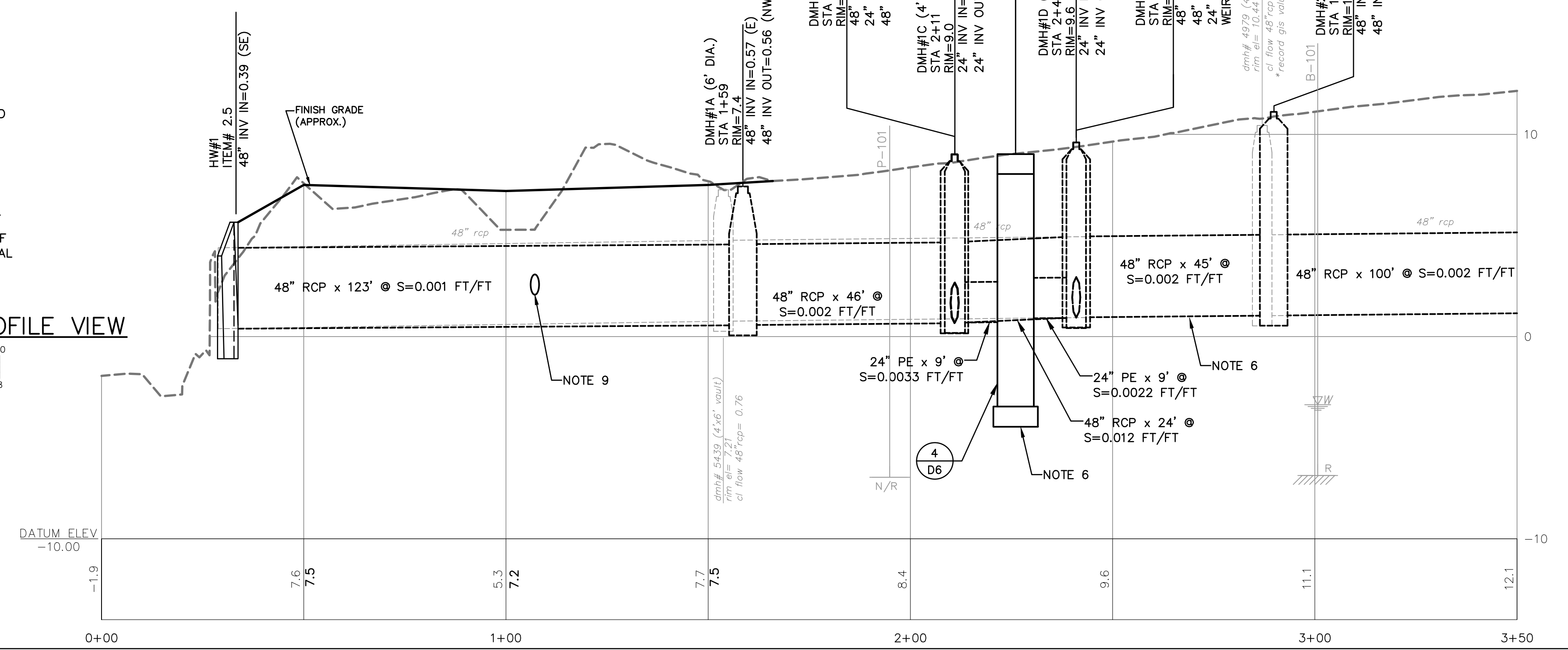
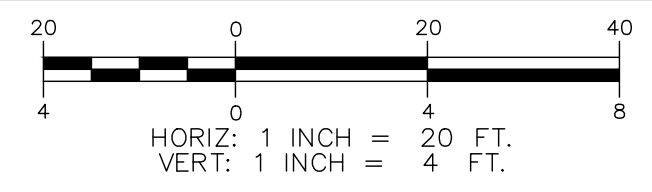
- CONSTRUCT DRAINAGE OUTFALL AND HEADWALL IN ACCORDANCE WITH PERMIT CONDITIONS, DRAWINGS AND SPECIFICATIONS.
- INSTALL SILT BOOM AND SET ANCHORS TO KEEP SILT BOOM IN PLACE DURING TIDAL FLUCTUATIONS, ITEM 699. INSTALL SILT FENCE, ITEM 645.531. MAINTAIN EROSION CONTROLS THROUGH CONSTRUCTION, PREVENT DEGRADATION OF DOWNSTREAM PROPERTIES AND TIDAL WETLANDS.
- MAINTAIN FLOW IN THE EXISTING 48" DRAIN PIPE THROUGHOUT CONSTRUCTION, SUBSIDIARY.
- REMOVE EXISTING HEADWALL AND INSTALL PRE-CAST HEADWALL DURING LOW WATER AND LOW FLOW CONDITIONS OR INSTALL SHEETING AND PUMP SYSTEM TO CONTROL BACK WATER, PAY AS ITEM 2.5.
- INSTALL TIDE VALVES AND PREVENT BACK WATER INTO DRAIN PIPES DURING CONSTRUCTION OF DRAIN PIPES, PAY AS ITEM 2.6.
- MAINTAIN GROUND WATER ELEVATION BELOW PIPE INVERTS AND BOTTOM OF JELLYFISH UNIT SO INSTALLATION IS COMPLETED IN THE DRY. GROUND WATER MAY VARY SEE B-101, APPENDIX A FOR OBSERVED GROUND WATER, MARCH 2022. GROUND WATER DISCHARGE SHALL BE FILTERED THROUGH A CONTROLLED SYSTEM IN ACCORDANCE WITH CONTRACTORS SWPPP, PAY AS ITEM 2.2.
- THOMAS SOKOLOSKI, CERTIFIED WETLAND SCIENTIST #127, OF TES ENVIRONMENTAL CONSULTANTS, L.L.C. OF BOW, NH, PERFORMED THE WETLAND IDENTIFICATION AND DELINEATION ON JUNE 28, 2022 ACCORDING TO THE CORPS OF ENGINEERS WETLAND DELINEATION MANUAL AND THE REGIONAL SUPPLEMENT TO THE CORPS OF ENGINEERS WETLAND DELINEATION MANUAL: NORTH-CENTRAL AND NORTHEAST REGION, VERSION 2.0, JANUARY 2012, US ARMY CORPS OF ENGINEERS.
- CONSTRUCT STABILIZED OUTLET. SEE DETAILS (DWG D6).
- CONNECT 12" PE TO 48" RCP WITH INSERT TEE TYPE CONNECTION. 12" PE INVERT=1.97, INCIDENTAL TO ITEM 603.82212.
- INVASIVE PLANT SPECIES ARE PRESENT IN THE AREA INCLUDING BUT ARE NOT LIMITED TO: ORIENTAL BITTERSWEET, GLOSSY BUCKTHORN, MULTIFLORA ROSE, AND BLACK SWALLOWWORT. ALL SOIL AND PLANT MATERIALS REMOVED FROM THE SITE SHALL NOT BE REUSED AND DISPOSED BY THE CONTRACTOR IN ACCORDANCE TO THE NHDOT BEST MANAGEMENT PRACTICES FOR ROADSIDE INVASIVE PLANTS (LATEST EDITION)
- CONSERVATION SEED MIX (HYDRAULIC APPLICATION) SHALL BE USED TO RE-VEGETATE DISTURBED AREAS OUTSIDE LIMITS OF EXISTING PAVEMENT AND OUTSIDE THE LIMITS OF THE PROPOSED MARSH RESTORATION WITHIN THE 100' TIDAL BUFFER ZONE.



**NORTH MILL POND AREA PLAN VIEW**



**NORTH MILL POND AREA PROFILE VIEW**



|                |              |            |           |          |
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| ISSUE FOR      | By           | Date       | REVISIONS | APPROVAL |
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| Drawn/Chk      | RMG          |            |           |          |
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| Checked        |              |            |           |          |
| Approved       |              | APRIL 2024 |           |          |
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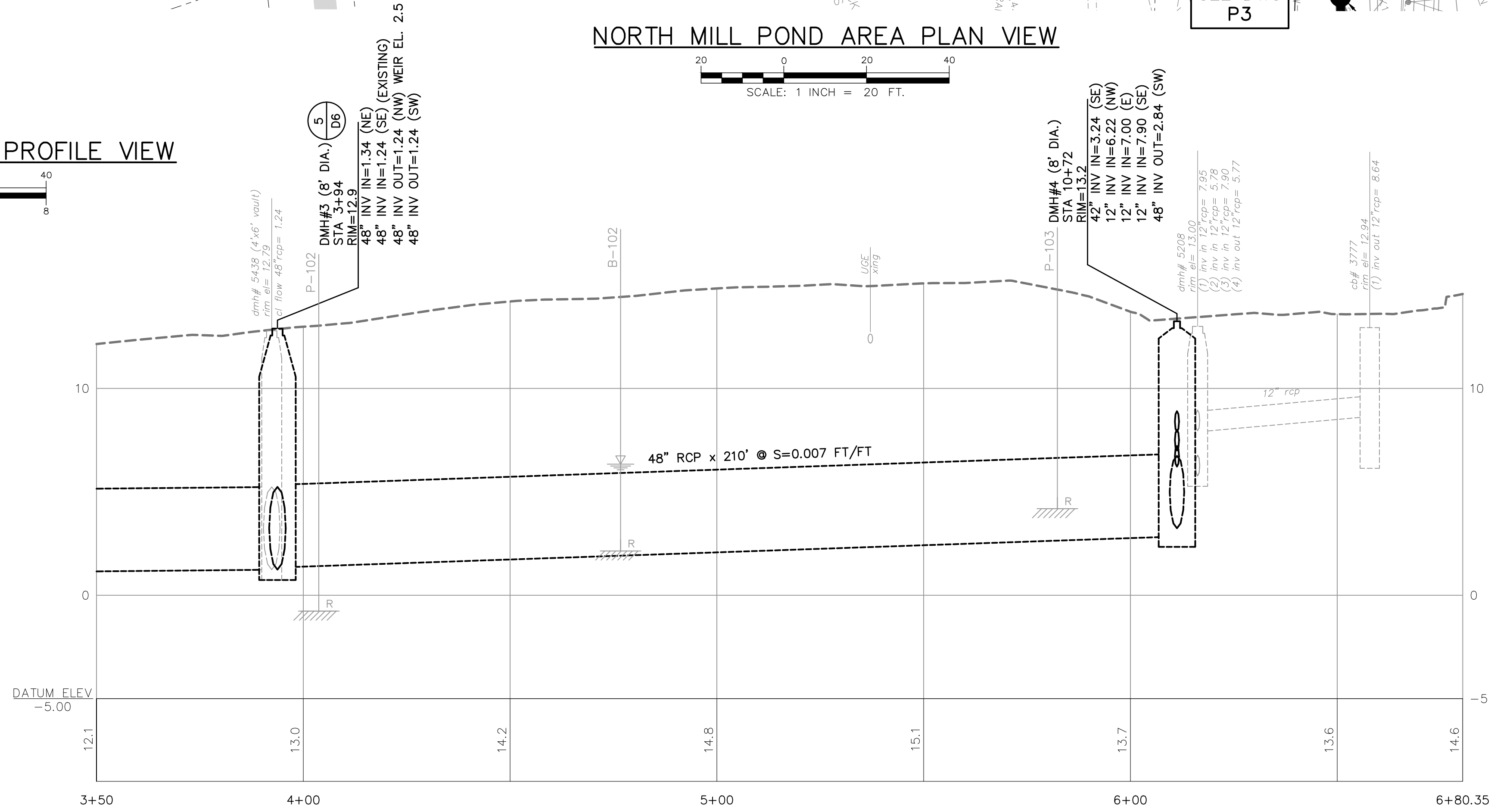
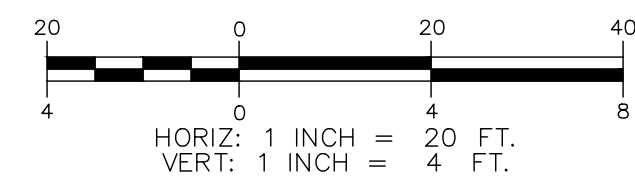
**NORTH MILL POND DRAINAGE OUTFALL PIPE PLAN AND PROFILES**

**MAPLEWOOD AVE DRAINAGE IMPROVEMENTS**

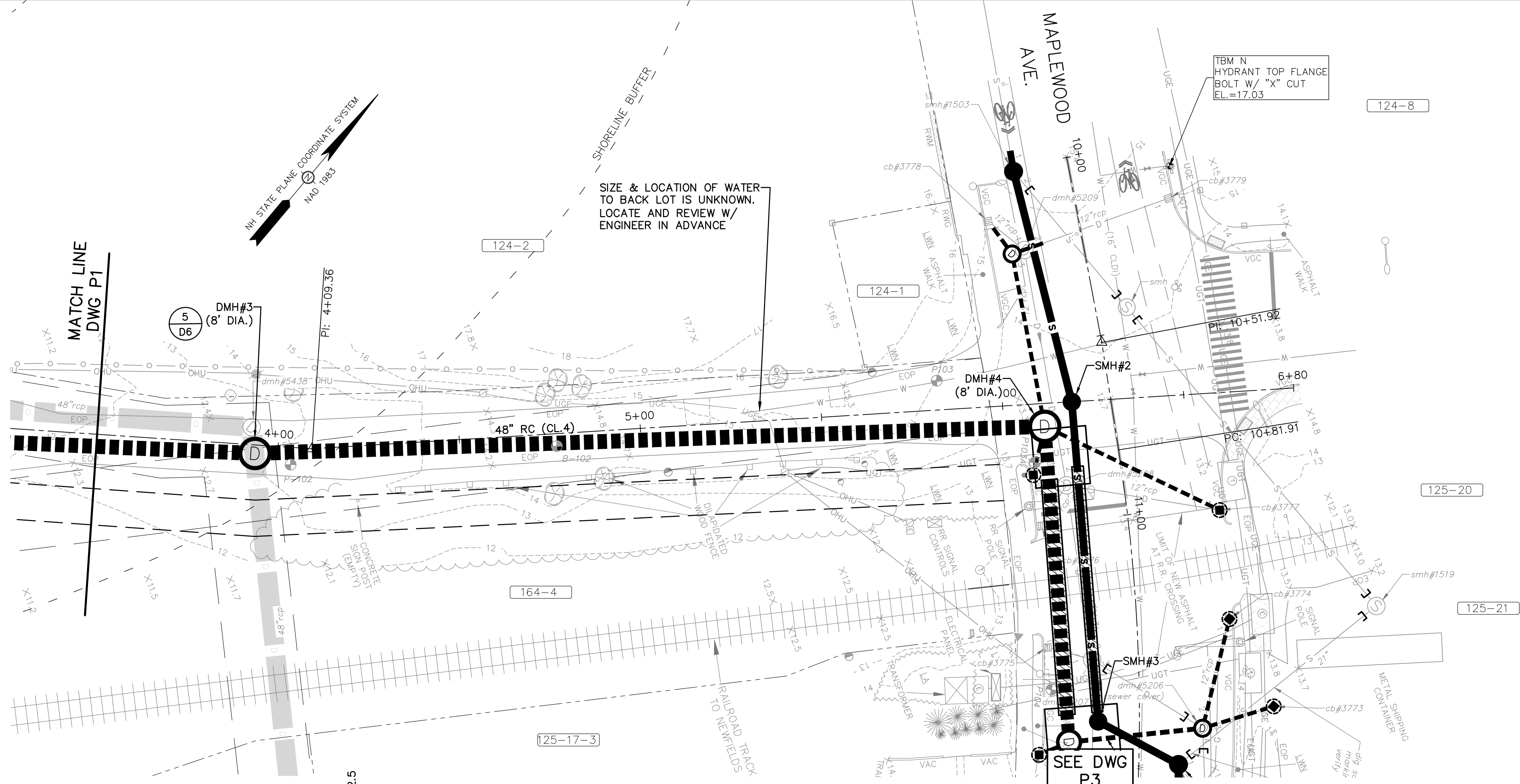
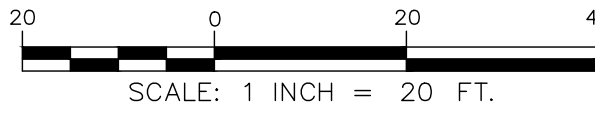
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**PORTSMOUTH, NEW HAMPSHIRE**

DWG NO P1 SHEET 5 OF 17

**NORTH MILL POND AREA PROFILE VIEW**



**NORTH MILL POND AREA PLAN VIEW**

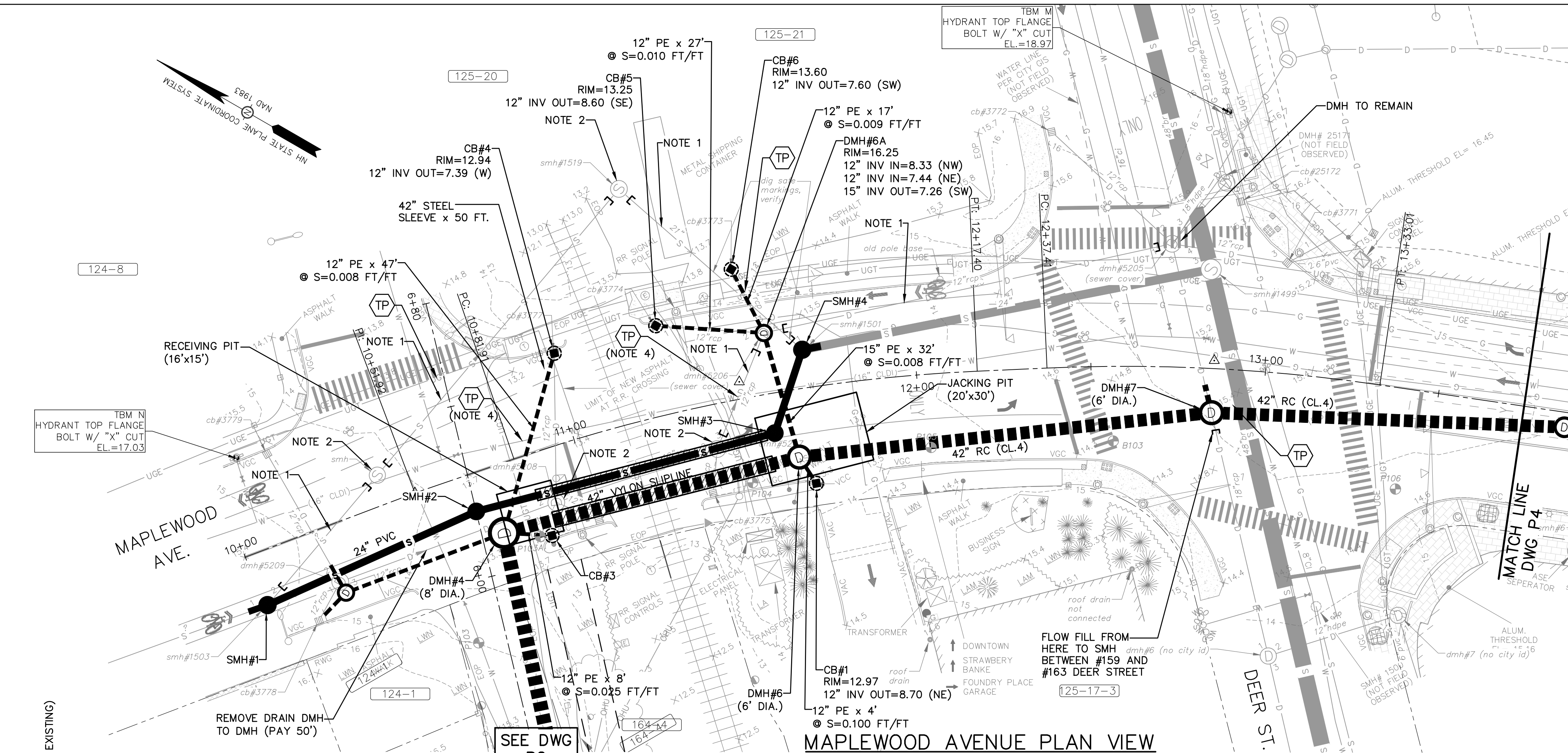


SIZE & LOCATION OF WATER TO BACK LOT IS UNKNOWN. LOCATE AND REVIEW W/ ENGINEER IN ADVANCE

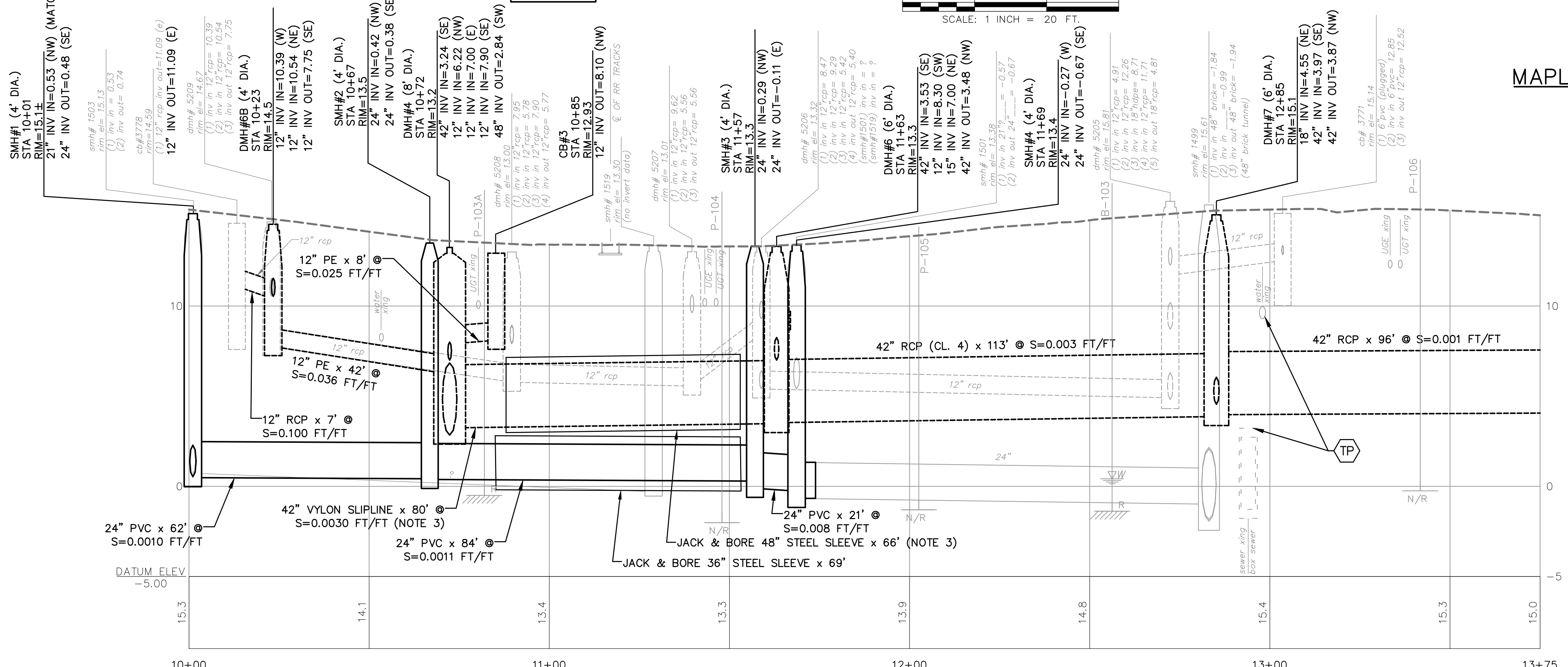
TBM N HYDRANT TOP FLANGE BOLT W/ "X" CUT EL=17.03

|  |             |  |      |
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| DWG NO<br>P2   |             | SHEET<br>6 OF 17   |      |
| <p><b>NORTH MILL POND AREA PIPE PLAN AND PROFILES</b></p> <p><b>MAPLEWOOD AVE DRAINAGE IMPROVEMENTS</b></p> <p><b>CITY OF PORTSMOUTH</b></p> <p><b>PORTSMOUTH, NEW HAMPSHIRE</b></p> |             |  |      |
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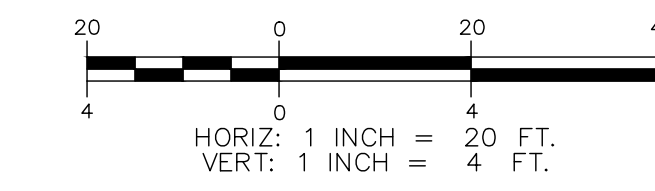
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MAPLEWOOD AVENUE PLAN VIEW



MAPLEWOOD AVENUE PROFILE VIEW



- NOTES:**
1. ABANDON EXISTING PIPES IN PLACE. PLUG AND CAP PIPE AT MANHOLES AND FILL WITH FLOWABLE FILL.
  2. REMOVE EXISTING MANHOLE FOLLOWING INSTALLATION OF NEW SEWER.
  3. DURING THE JACKING OPERATION THE FRONT OF THE CASING PIPE SHALL BE PROVIDED WITH MECHANICAL ARRANGEMENTS OR DEVICES THAT WILL POSITIVELY PREVENT THE AUGER FROM LEADING THE PIPE SO THAT NO UNSUPPORTED EXCAVATION IS AHEAD OF THE PIPE. CSXT PIPELINE SPECS. PAGE 23, ii, (c)
  4. CONTRACTOR TO PERFORM TEST PIT TO CONFIRM LOCATION OF WATER MAIN PRIOR TO JACKING AND RECEIVING PIT EXCAVATION.

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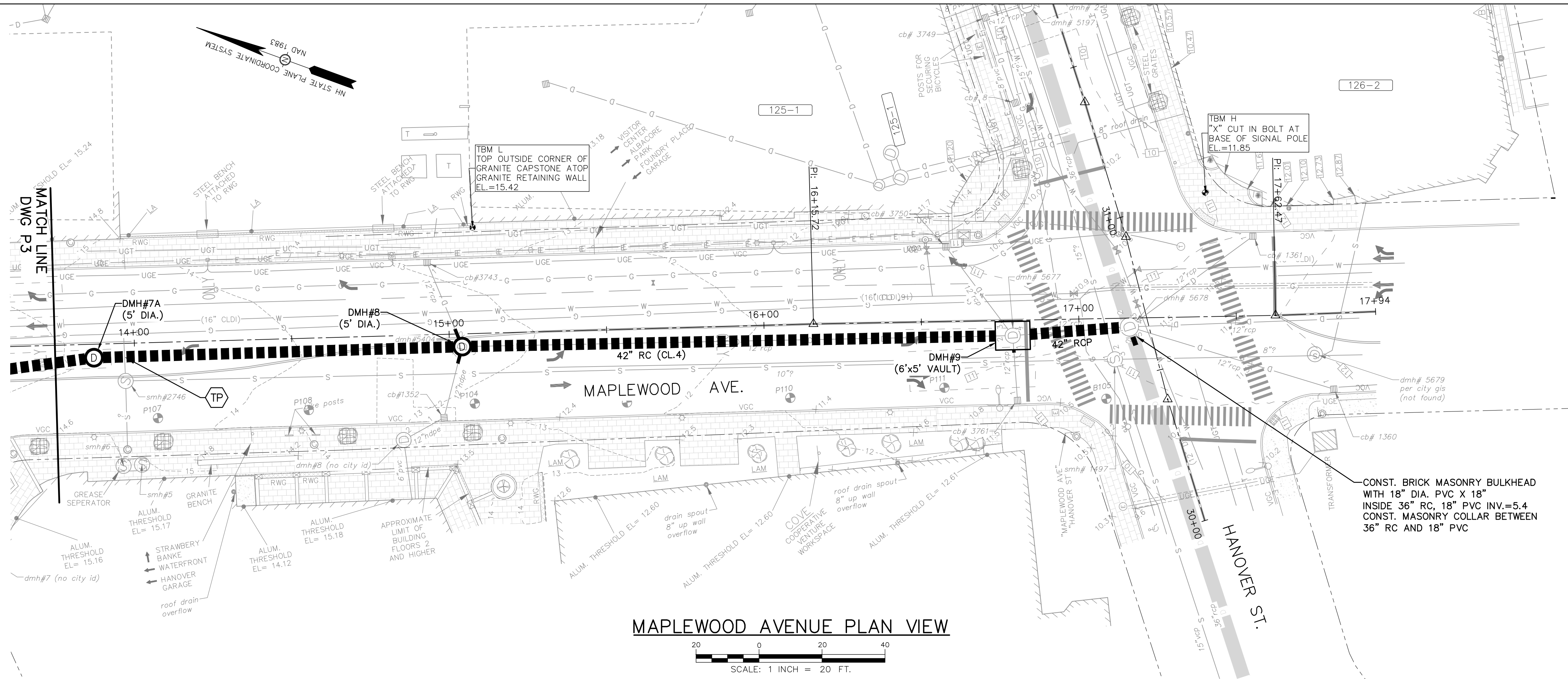
MAPLEWOOD AVENUE  
PIPE PLAN AND PROFILES

MAPLEWOOD AVE DRAINAGE IMPROVEMENTS

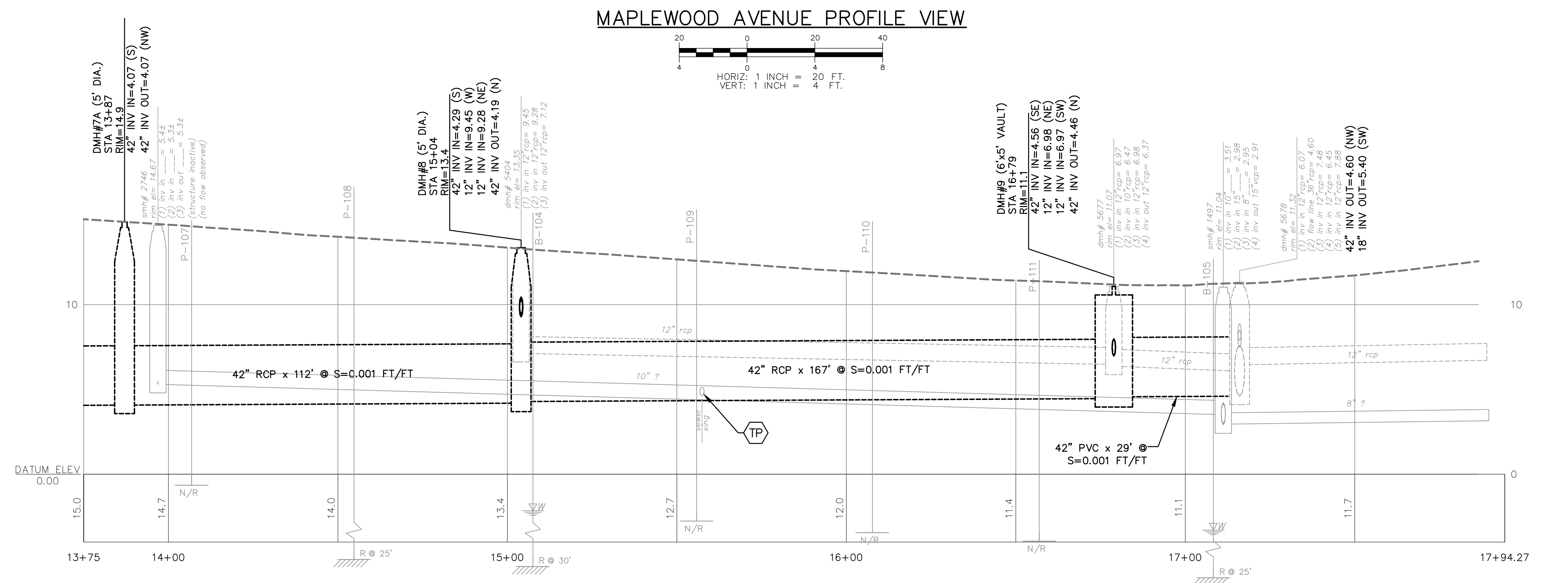
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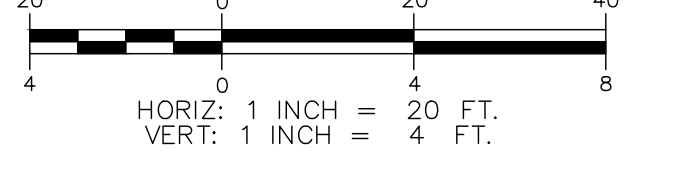
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7 OF 17



**MAPLEWOOD AVENUE PLAN VIEW**



**MAPLEWOOD AVENUE PROFILE VIEW**



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**MAPLEWOOD AVENUE  
PIPE PLAN AND PROFILES**

**MAPLEWOOD AVE DRAINAGE IMPROVEMENTS**

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| Approved    |            | By             |
| Date        | APRIL 2024 | CONSTRUCTION   |
| Book No.    |            | Date           |
| Project No. | 2542       | By             |
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REVISIONS

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DWG NO P4 SHEET 8 OF 17

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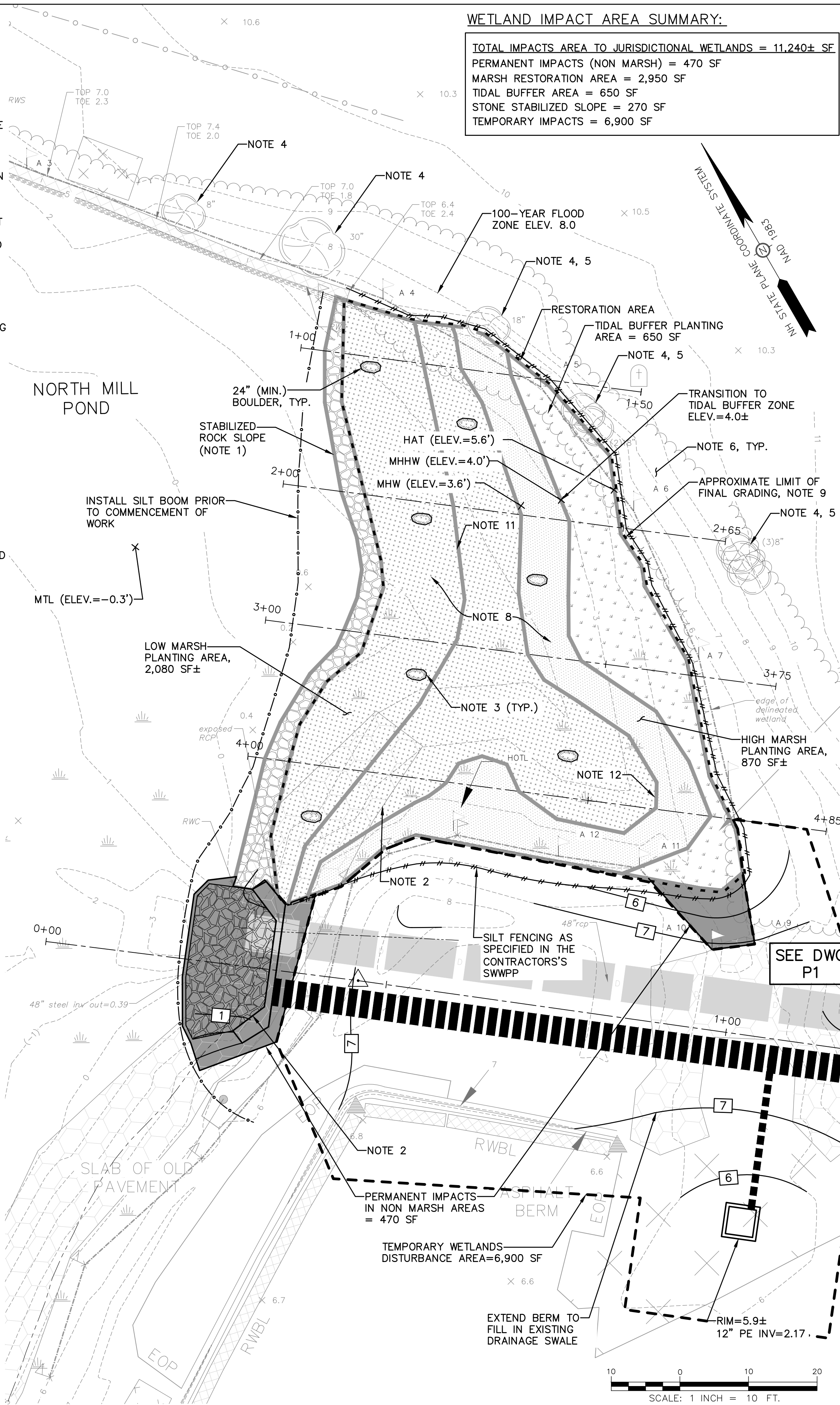
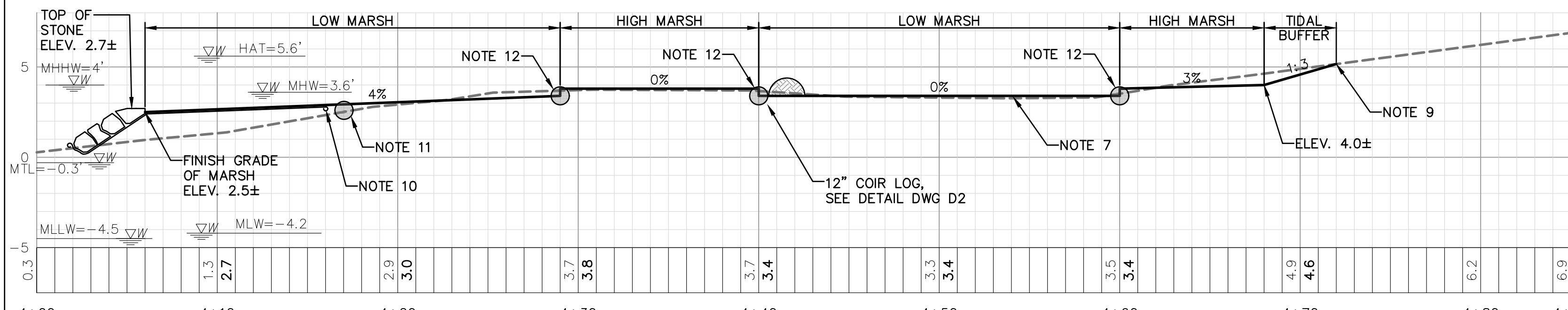
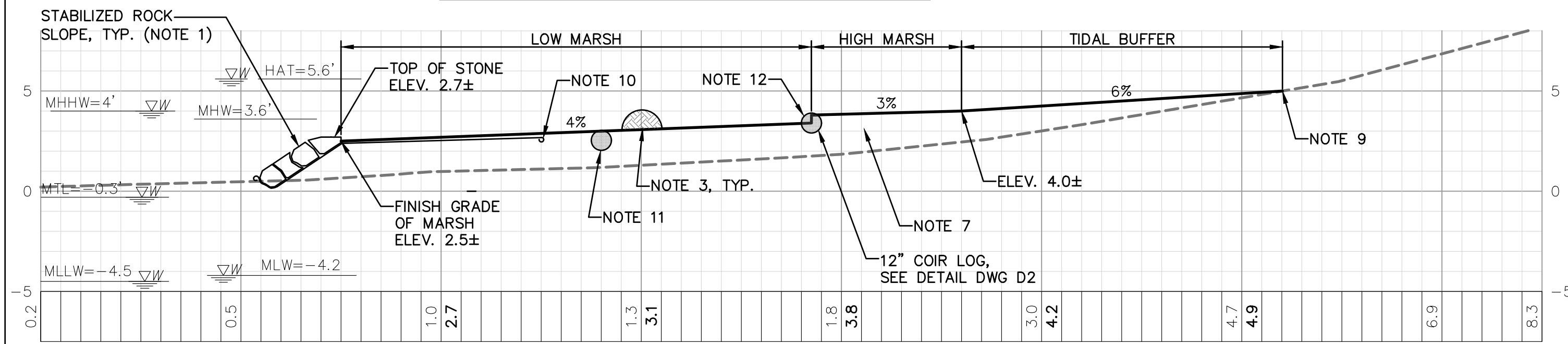
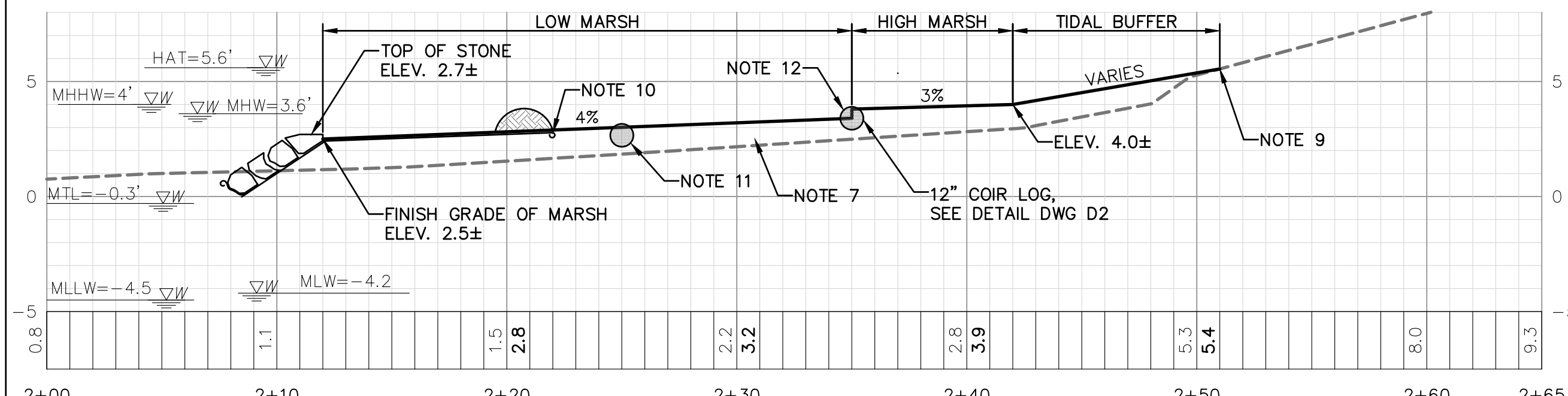
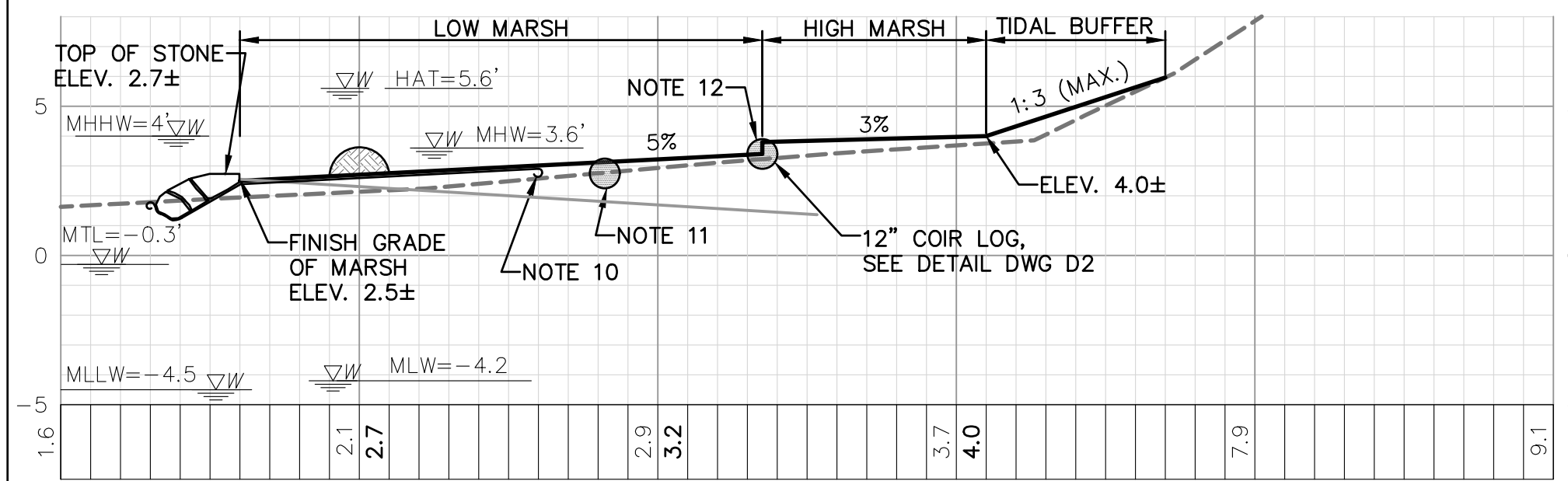
**NOTES:**

- CONSTRUCT ROCK STABILIZED 1.5:1 SLOPE. CONTRACTOR SHALL GRADE SLOPE TO THE APPROXIMATE GRADES SHOWN AND PLACE NHDOT CLASS C STONE FILL (18" THICKNESS MIN) ON TOP OF COIR BLANKET (900 GRAM WEIGHT, DOUBLE THICKNESS). CONTRACTOR SHALL USE STOCKPILED STONE FROM SITE TO THE GREATEST EXTENT PRACTICAL, SEE NOTE 2.
- CONTRACTOR SHALL PRESERVE AND STOCKPILE EXISTING STONE FOUND ON-SITE, AND PREVIOUSLY EXPOSED TO TIDAL ACTION, TO BE USED FOR STONE STABILIZATION AND BOULDERS WHERE SPECIFIED. ON-SITE SOURCES OF STONE ARE THE RANDOM STONES FOUND IN THE MARSH AREA, AND THE EXISTING STONE EMBANKMENT TO THE NORTH OF THE EXISTING OUTFALL.
- CONTRACTOR SHALL PLACE BOULDERS (24" MIN) IN THE PROPOSED MARSH AREA FOR THE PURPOSE OF BREAKING UP SHEET ICE IN THE WINTER TIME. PLACE BOULDERS RANDOMLY APPROXIMATELY 75' APART.
- ALL EXISTING TREES TO REMAIN.
- TRIM TREES TO RAISE THE LOWEST PORTION OF THE CANOPY APPROXIMATELY 20' ABOVE GROUND TO PROMOTE ADDITIONAL SUNLIGHT TO THE MARSH.
- ALL SHRUB VEGETATION TO REMAIN. PER THE FUNCTIONAL ASSESSMENT COMPLETED AS PART OF THE PERMITTING PROCESS, MUCH OF THIS VEGETATION IS INVASIVE AND SHOULD REMAIN IN PLACE. REMOVAL OF VEGETATION WILL ONLY BE PERMITTED WITH APPROVAL OF THE ENGINEER AND THE CITY ARBORIST. ANY REMOVAL OF INVASIVE SPECIES SHALL BE COMPLETED IN ACCORDANCE TO ALL LOCAL, STATE, AND FEDERAL GUIDELINES.
- CONTRACTOR SHALL ENDEAVOR TO INCORPORATE AS MUCH SURPLUS SOIL FROM THE OUTFALL IMPROVEMENTS AS POSSIBLE. IMPORTED SOIL USED FOR MARSH GRADING SHALL MEET THE FOLLOWING:
 

| SIZE (mm) | PASSING |
|-----------|---------|
| 12.5      | 100%    |
| 2         | 90%     |
| 0.5       | 80%     |
| 0.1       | 20%     |
- PLANTING WITHIN THE PROPOSED MARSH SHALL BE WITH SPECIES NATIVE TO THE AREA. ALL PLANTINGS SHALL BE NURSERY GROWN, BARE ROOT SEEDLINGS. SEEDING OF THE SITE WILL NOT BE PERMITTED. LOW MARSH AREA SHALL BE PLANTED WITH SMOOTH CORDGRASS (SPARTINA ALTERNIFLORA) AT A RATE OF TWO (2) SEEDLINGS PER SQ. FT. HIGH MARSH AREA SHALL BE PLANTED WITH SALTEADOW CORDGRASS (SPARTINA PATENS) AT A RATE OF TWO (2) SEEDLINGS PER SQ. FT. INCREASE DIVERSITY IN THE HIGH MARSH ZONE BY PLANTING SPIKE GRASS (DISTICHLIS SPICATA), BLACK GRASS (JUNCUS GERARDII), AND SEA LAVENDER (LIMONIUM) AT RANDOM AT A RATE OF ONE PLANT PER 80 SQ. FT. THE TIDAL BUFFER ZONE SHALL BE PLANTED WITH BAYBERRY (MYRICA PENNSYLVANICA), SHADBUSH (AMELANCHIER CANADENSIS), SWITCHGRASS (PANICUM VIRGATUM), SWEET-FERN (COMPTONIA PEREGRINA), AND SWEET PEPPERBUSH (CLETHRA ALNIFOLIA) AT RANDOM, AT A RATE OF ONE PLANT PER 80 SQ. FT. CERTIFICATION THAT SEEDLING STOCK IS OF SPECIFIED SPECIES SHALL BE PROVIDED BY THE NURSERY OR QUALIFIED PROFESSIONAL. SEE NOTE 13 FOR PLANTING ZONES.
- LIMIT OF FINAL GRADING WILL BE REVIEWED IN THE FIELD PRIOR TO COMMENCEMENT OF WORK. ACTUAL FINAL LIMIT OF GRADING WILL BE DEPENDANT ON ACTUAL CONDITIONS FOUND ON-SITE AND IMPACTS TO EXISTING VEGETATION AND THE NEED FOR INVASIVE SPECIES REMOVAL.
- EXTEND COIR BLANKET (SINGLE THICKNESS) 10' ONTO SURFACE OF MARSH IMMEDIATELY FOLLOWING COMPLETION OF GRADING AND PRIOR TO SEEDING.
- INSTALL 12" COIR LOG BURIED APPROXIMATELY 9" TO SERVE AS AN EROSION BARRIER AND TO AREA FOR ROUTINE INSPECTIONS OF MARSH AREA. SET COIR LOG APPROXIMATELY LEVEL ACROSS A CONTOUR TO PREVENT CONCENTRATION OF WATER. TOP OF LOG ELEVATION = 3.2'±.
- INSTALL 12" COIR LOG MARSH TRANSITION, TOP OF LOG = ELEV 3.9'±. ELEVATION OF LOW MARSH SHALL BE 3.4'± AND ELEVATION OF HIGH MARSH SHALL BE 3.8'±.
- PLANTING ZONES SHALL GENERALLY AS FOLLOWS:
  - LOW MARSH PLANTS BELOW ELEVATION 3.6' (BELOW MHW)
  - HIGH MARSH PLANTS BETWEEN ELEVATIONS 3.6' AND 4.0' (BETWEEN MHW AND MHHW)
  - TIDAL BUFFER PLANTINGS ABOVE ELEVATION 4.0' (ABOVE MHHW)
- FOLLOWING COMPLETION OF MARSH RESTORATION AND PLANTINGS, INSTALL CONSTRUCTION FENCING AROUND THE ENTIRE PERIMETER TO DISCOURAGE WILDLIFE AND PEDESTRIANS FROM ENTERING THE MARSH.
- CONTRACTOR SHALL FURNISH AND INSTALL AN 18" X 24" METAL BACKED SIGN IDENTIFYING THE RESTORATION AREA. REQUIRED TEXT WILL BE PROVIDED AT THE TIME OF CONSTRUCTION AND THE SIGN SHALL BE PLACED IN A LOCATION IDENTIFIED BY THE OWNER.

**WETLAND IMPACT AREA SUMMARY:**

|  |
|--|
| TOTAL IMPACTS AREA TO JURISDICTIONAL WETLANDS = 11,240± SF |
| PERMANENT IMPACTS (NON MARSH) = 470 SF                     |
| MARSH RESTORATION AREA = 2,950 SF                          |
| TIDAL BUFFER AREA = 650 SF                                 |
| STONE STABILIZED SLOPE = 270 SF                            |
| TEMPORARY IMPACTS = 6,900 SF                               |



|                |    |      |
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| BIDDING        |    |      |
| CONSTRUCTION   |    |      |
| RECORD DRAWING |    |      |

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| Drawn/Chk   | RMG         | FDIM |
| Designed    |             |      |
| Checked     |             |      |
| Approved    | APRIL 2024  |      |
| Date        |             |      |
| Book No.    | 2542        |      |
| Project No. | 2542        |      |
| Dwg. ID     | 2542_p005_M |      |
| Scale       |             |      |

**UNDERWOOD** engineers

25 Vaughan Mall, Portsmouth, N.H. 03801  
Tel. 603-436-6192 Fax. 603-431-4733

**NORTH MILL POND RESTORATION AREA PLAN AND PROFILES**

MAPLEWOOD AVE DRAINAGE IMPROVEMENTS

CITY OF PORTSMOUTH  
PORTSMOUTH, NEW HAMPSHIRE

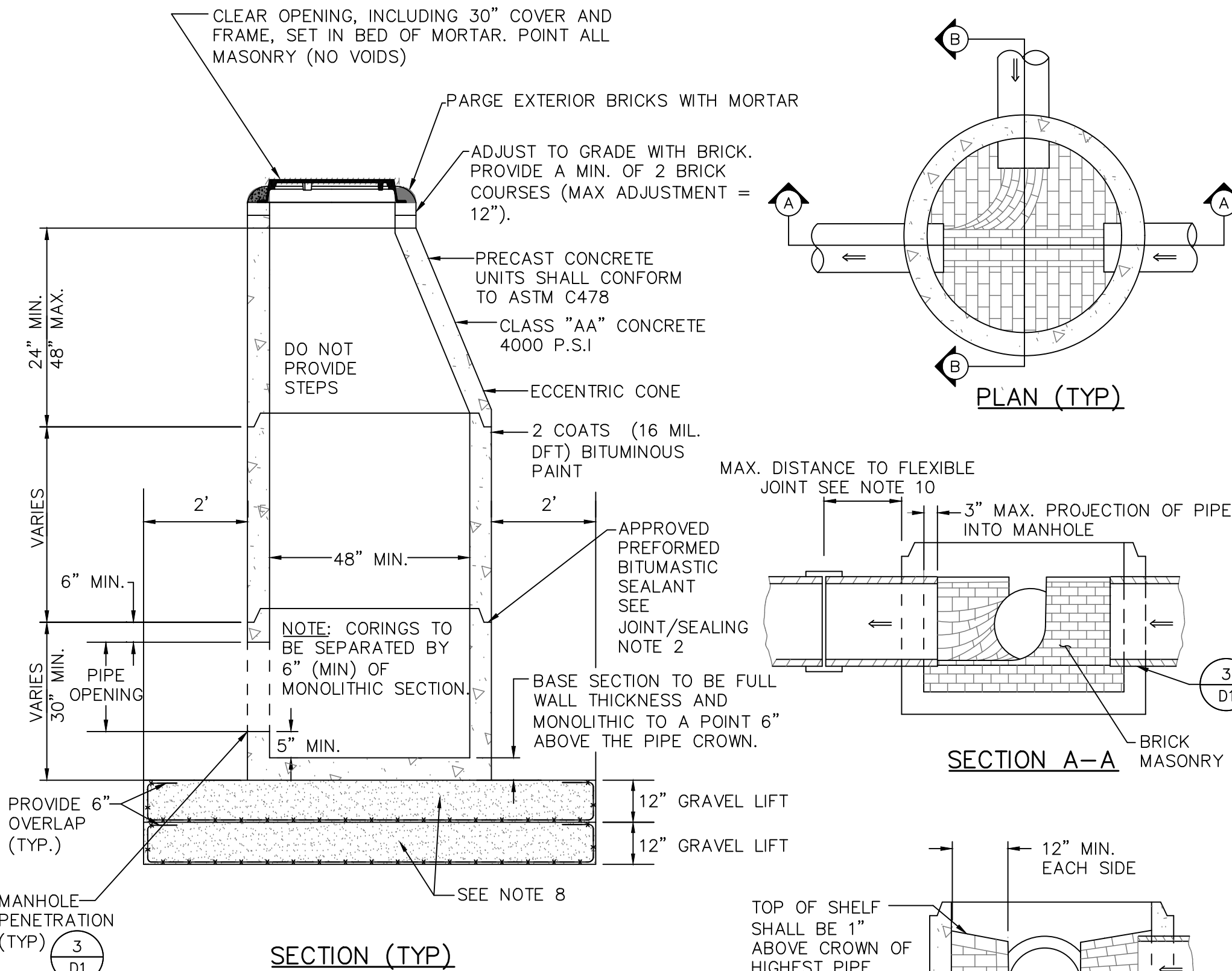
DWG NO P5 SHEET 9 OF 17

SCALE: 1 INCH = 5 FT.

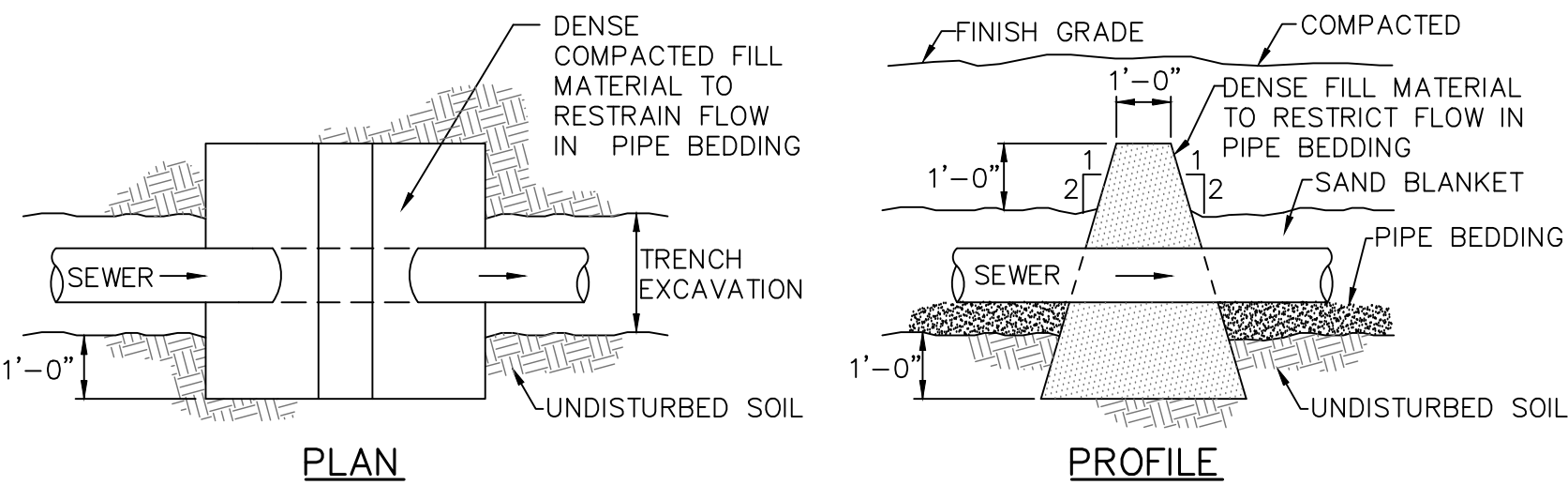
SCALE: 1 INCH = 10 FT.

**STANDARD MANHOLE NOTES:**

- GENERAL:** SEWER MANHOLES, INCLUDING ALL COMPONENT PARTS, SHALL BE ASSEMBLED OF PRECAST SECTIONS, WITH STEEL REINFORCEMENT. IN ANY APPROVED MANHOLE, THE COMPLETE STRUCTURE SHALL BE OF SUCH MATERIAL AND QUALITY AS TO WITHSTAND LOADS OF 8 TONS (H2O LOADING) WITHOUT FAILURE, AND TO PREVENT LEAKAGE IN EXCESS OF ONE GALLON PER DAY PER VERTICAL FOOT OF MANHOLE, CONTINUOUSLY FOR THE LIFE OF THE STRUCTURE. A PERIOD GENERALLY IN EXCESS OF 25 YEARS IS TO BE UNDERSTOOD IN BOTH CASES.
- BARRELS AND CONE SECTIONS:** SHALL BE PRECAST REINFORCED CONCRETE.
- PRECAST CONCRETE:** BARREL SECTIONS, CONES, AND BASES SHALL CONFORM TO ASTM C478.
- LEAKAGE TEST:** SHALL BE PERFORMED IN ACCORDANCE WITH THE SPECIFICATIONS. INVERT AND SHELF TO BE PRIOR TO BACKFILL PLACED AFTER TESTING.
- INVERTS AND SHELVES:** MANHOLES SHALL HAVE A BRICK PAVED SHELF AND INVERT, CONSTRUCTED TO CONFORM TO THE SIZE OF PIPE AND FLOW. CARE SHALL BE TAKEN TO INSURE THAT THE BRICK INVERT IS A SMOOTH CONTINUATION OF THE SEWER INVERT. INVERT BRICKS SHALL BE LAID ON EDGE. AT CHANGES IN DIRECTION, THE INVERTS SHALL BE LAID OUT IN CURVES OF THE LONGEST POSSIBLE TANGENT TO THE CENTER LINE OF THE SEWER PIPES. SHELVES SHALL BE CONSTRUCTED TO AN ELEVATION OF 1" ABOVE THE HIGHEST PIPE CROWN AND SLOPE TO DRAIN TOWARD THE FLOWING THROUGH CHANNEL. UNDERLAYMENT OF INVERT AND SHELF SHALL CONSIST OF BRICK MASONRY.
- FRAMES AND COVERS:** MANHOLE FRAMES AND COVERS SHALL BE CITY OF PORTSMOUTH STANDARD AND SHALL BE PICKED UP BY THE CONTRACTOR AT PORTSMOUTH DPW.
- BEDDING:** SCREENED GRAVEL AND/OR CRUSHED STONE FREE FROM CLAY, LOAM, ORGANIC MATTER AND MEETING ASTM C33. STONE SIZE NO. 67.  
100% PASSING 1" INCH SCREEN  
90-100% PASSING 3/4" INCH SCREEN  
20-55% PASSING 3/8" INCH SCREEN  
0-10% PASSING #4 SIEVE  
0-5% PASSING #8 SIEVE
- WHERE THE MATERIAL BELOW MANHOLE STRUCTURE IS SOFT OR YIELDING, AND WHERE DIRECTED BY THE ENGINEER, INSTALL DOUBLE LAYER OF GEOGRID (TENSAR TX160 OR EQUAL). PAY AS ITEM 1.8B (Lfx2).
- SHALLOW MANHOLE:** IN LIEU OF A CONE SECTION, WHEN MANHOLE IS LESS THAN 6 FEET, A REINFORCED CONCRETE SLAB COVER HAVING AN ECCENTRIC ENTRANCE AND CAPABLE OF SUPPORTING H=20 LOADS MAY BE USED.
- FLEXIBLE JOINT:** A FLEXIBLE JOINT SHALL BE PROVIDED WITHIN THE FOLLOWING DISTANCES:  
RCP AND CI PIPE - ALL SIZES - 48"  
AC AND VC PIPE - UP THROUGH 12" DIA. - 18"  
AC AND VC PIPE - LARGER THAN 12" DIA. - 36"  
DI PIPE - NONE REQUIRED  
PVC - UP THROUGH 15" DIA. - NONE REQUIRED  
PVC - LARGER THAN 15" DIA. - 48"/60"  
ABS (ASTM D2680) - ALL SIZES - SAME AS VC ABOVE.
- SPECIFICATIONS:** ADDITIONAL CONSTRUCTION SPECIFICATIONS ARE INCLUDED IN THE CONTRACT DOCUMENTS. THESE STANDARD MANHOLE DRAWINGS ARE NOT COMPLETE WITHOUT THESE SPECIFICATIONS.



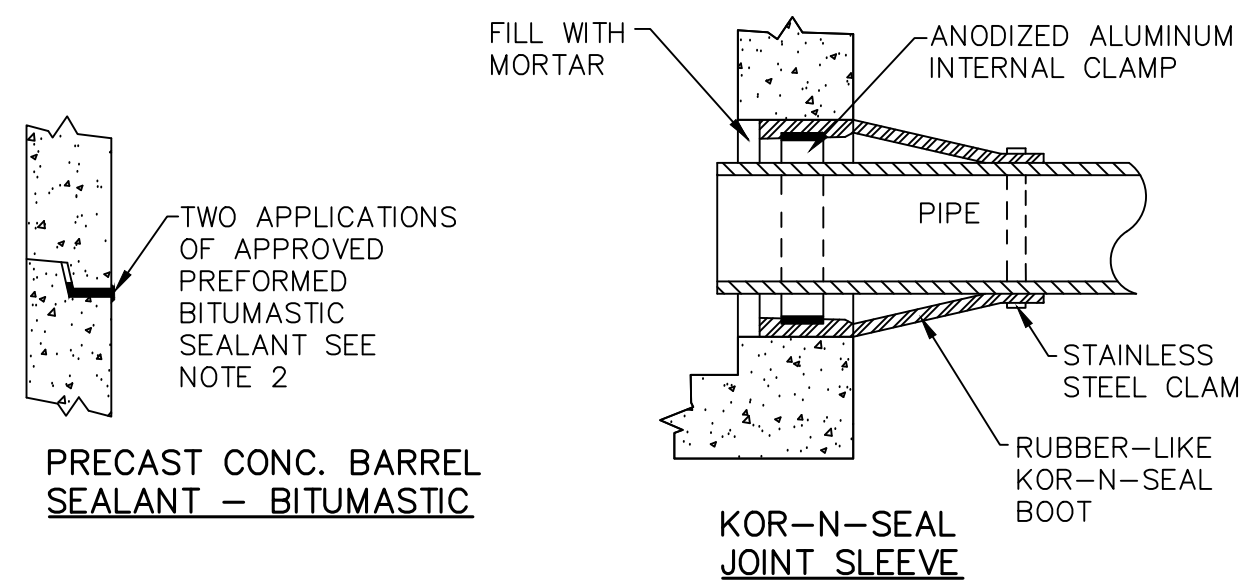
**1 SEWER MANHOLE**  
D1 NOT TO SCALE



**4 TRENCH DAM**  
D1 NOT TO SCALE

**JOINTING AND SEALING NOTES**

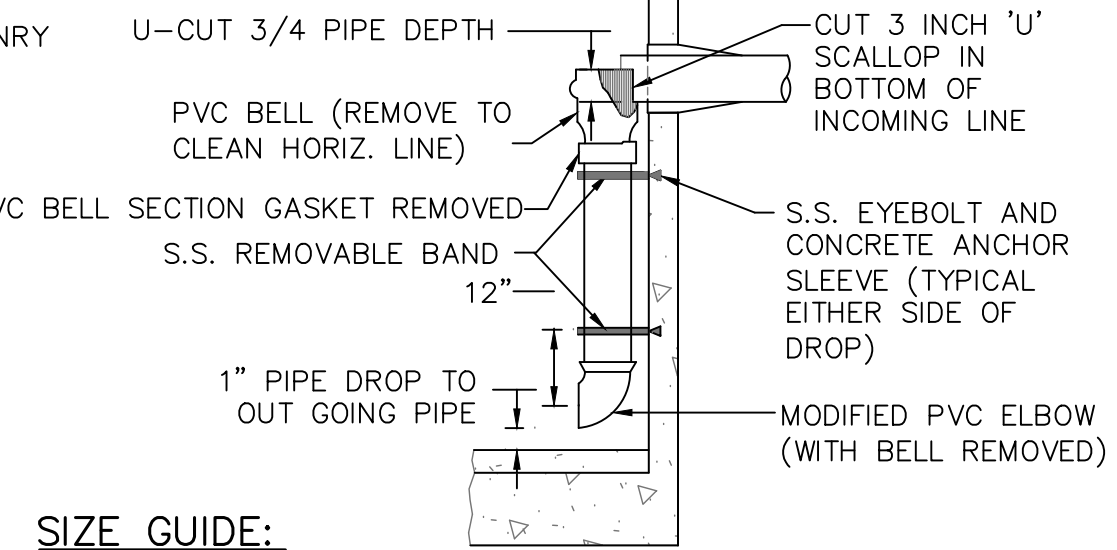
- PIPE TO MANHOLE JOINTS SHALL BE ONLY AS APPROVED BY THE ENGINEER AND IN GENERAL, WILL DEPEND UPON AN ELASTOMERIC SEALANT FOR WATERTIGHTNESS.
- FOR BITUMASTIC TYPE JOINTS THE AMOUNT OF SEALANT SHALL BE SUFFICIENT TO FILL AT LEAST 75% OF THE JOINT CAVITY. APPROVED BITUMASTIC SEALANTS: RAM-NEK E Z KENT SEAL NO.2
- ALL GASKETS, SEALANTS, MORTAR, ETC., SHALL BE INSTALLED IN ACCORDANCE WITH MANUFACTURERS WRITTEN INSTRUCTIONS.



**3 MANHOLE PENETRATIONS**  
D1 NOT TO SCALE

**GRAVITY SEWER TRENCH NOTES:**

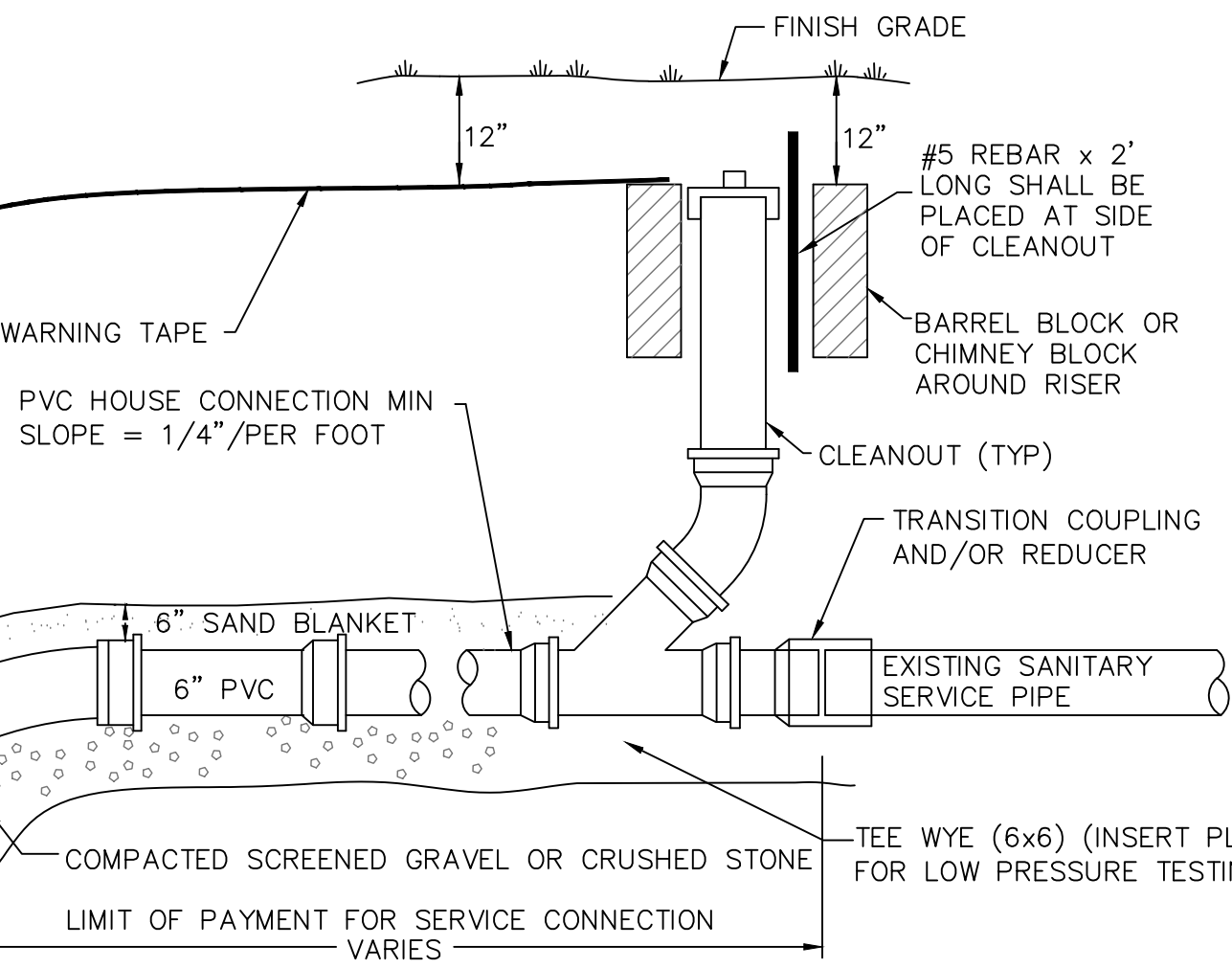
- ORDERED EXCAVATION OF UNSUITABLE MATERIAL BELOW GRADE:** BACKFILL AS STATED IN THE TECHNICAL SPECIFICATIONS OR AS SHOWN ON THE DRAWINGS.
- BEDDING:** SEE NOTE 7 OF STANDARD MANHOLE NOTES. WHERE ORDERED BY THE ENGINEER TO STABILIZE THE TRENCH BASE, GRADED SCREENED GRAVEL OR CRUSHED STONE 1/2 INCH TO 1-1/2 INCH AND/OR THE USE OF GEOGRID FABRIC (ITEM 1.8B) MAY BE REQUIRED.
- SAND BLANKET:** CLEAN SAND FREE FROM ORGANIC MATTER, SO GRADED THAT 90-100% PASSES A 1/2 INCH SIEVE AND NOT MORE THAN 15% WILL PASS A #200 SIEVE. BLANKET MAY BE OMITTED FOR CAST-IRON, DUCTILE IRON, AND REINFORCED CONCRETE PIPE PROVIDED HOWEVER, THAT NO STONE LARGER THAN 2" IS IN CONTACT WITH THE PIPE.
- SUITABLE MATERIAL:** IN ROADS, ROAD SHOULDERS, WALKWAYS AND TRAVELED WAYS, SUITABLE MATERIAL FOR TRENCH BACKFILL SHALL BE THE NATURAL MATERIAL EXCAVATED DURING THE COURSE OF CONSTRUCTION, BUT SHALL EXCLUDE DEBRIS, PIECES OF PAVEMENT; ORGANIC MATTER; TOP SOIL; ALL WET OR SOFT MUCK, PEAT, OR SOFT CLAY; ALL EXCAVATED LEDGE MATERIAL; ALL ROCKS OVER 6 INCHES IN LARGEST DIMENSION; AND ANY MATERIAL WHICH, AS DETERMINED BY THE ENGINEER, WILL NOT PROVIDE SUFFICIENT SUPPORT OR MAINTAIN THE COMPLETED CONSTRUCTION IN A STABLE CONDITION. IN CROSS-COUNTRY CONSTRUCTION, SUITABLE MATERIAL SHALL BE AS DESCRIBED ABOVE, EXCEPT THAT THE ENGINEER MAY PERMIT THE USE OF TOP SOIL, LOAM, MUCK, OR PEAT, IF HE IS SATISFIED THAT THE COMPLETED CONSTRUCTION WILL BE ENTIRELY STABLE AND PROVIDED THAT EASY ACCESS TO THE SEWER, FOR MAINTENANCE AND POSSIBLY RECONSTRUCTION, WILL BE PRESERVED.
- BASE COURSE AND PAVEMENT** SHALL MEET THE REQUIREMENTS OF THE NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION'S LATEST EDITION OF THE STANDARD SPECIFICATIONS FOR HIGHWAYS AND BRIDGES - DIVISIONS 300 AND 400 RESPECTIVELY.
- W = MAXIMUM ALLOWABLE TRENCH PAYMENT WIDTH** FOR ROCK EXCAVATION, FOR ORDERED EXCAVATION BELOW GRADE AND HANDLING OF EXCAVATED CONTAMINATED SOILS. FOR PIPES 15 INCHES NOMINAL DIAMETER OR LESS, W SHALL BE NO MORE THAN 36 INCHES. FOR PIPES GREATER THAN 15 INCHES IN NOMINAL DIAMETER, W SHALL BE 24 INCHES PLUS PIPE OUTSIDE DIAMETER (O.D.)
- FOR CROSS COUNTRY CONSTRUCTION, BACKFILL OR FILL SHALL BE MOUNDING TO A HEIGHT OF 6 INCHES ABOVE THE ORIGINAL GROUND SURFACE.
- WHERE TRENCH BOTTOM IS SOFT OR YIELDING, AND WHERE DIRECTED BY THE ENGINEER, INSTALL SINGLE LAYER OF GEOGRID (TX160 OR EQUAL) ACROSS THE ENTIRE WIDTH OF TRENCH BOTTOM. PAY AS ITEM 1.8A (L.F.).



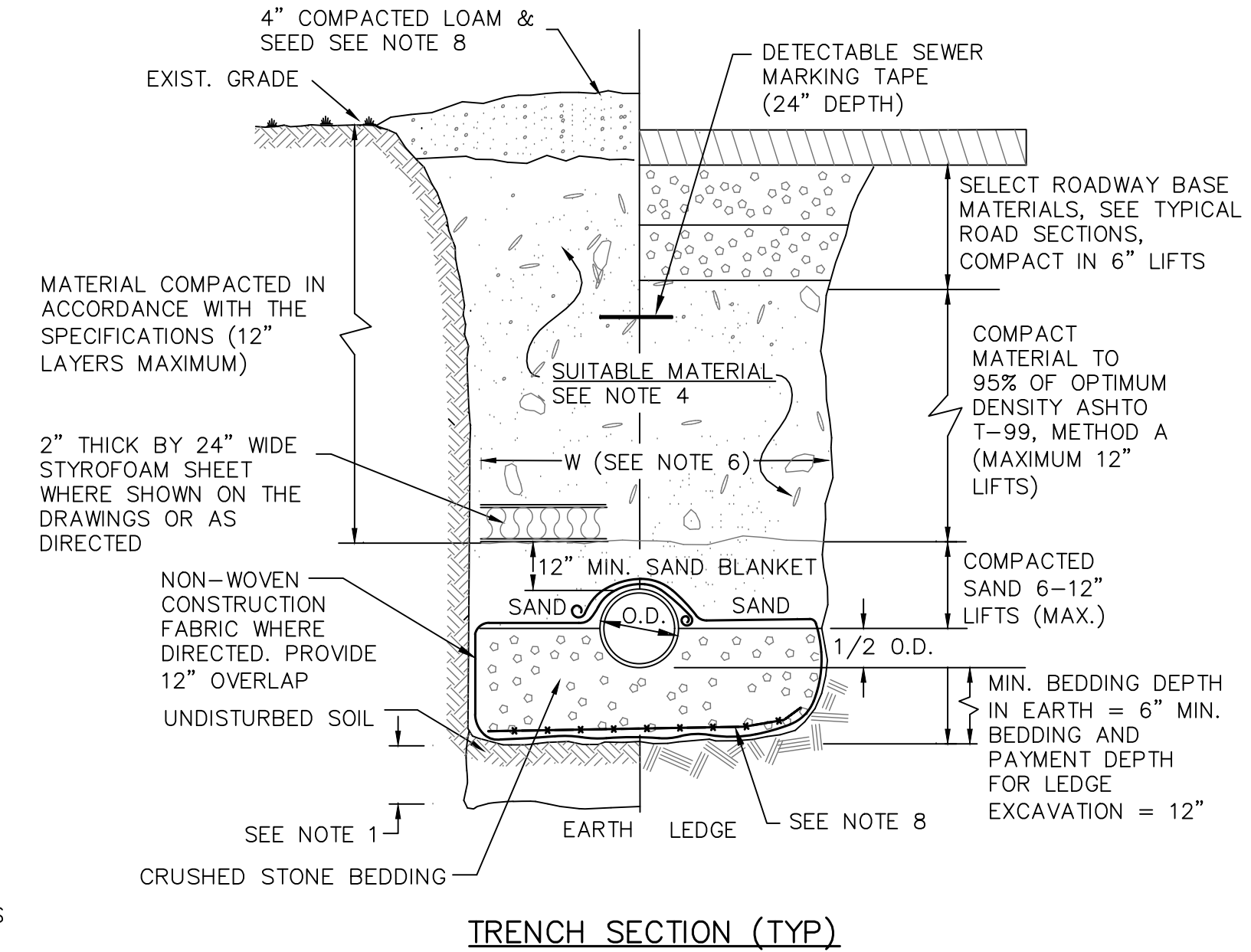
**5 DROP MANHOLE**  
D1 NOT TO SCALE

**SIZE GUIDE:**

- 1-8" OR 10" DROP: 4'-0" DIA. M.H.
- 2-8" OR 10" DROP: 5'-0" DIA. M.H.
- 1-12" DROP: 5'-0" DIA. M.H.
- 1-15" DROP: 5'-0" DIA. M.H.

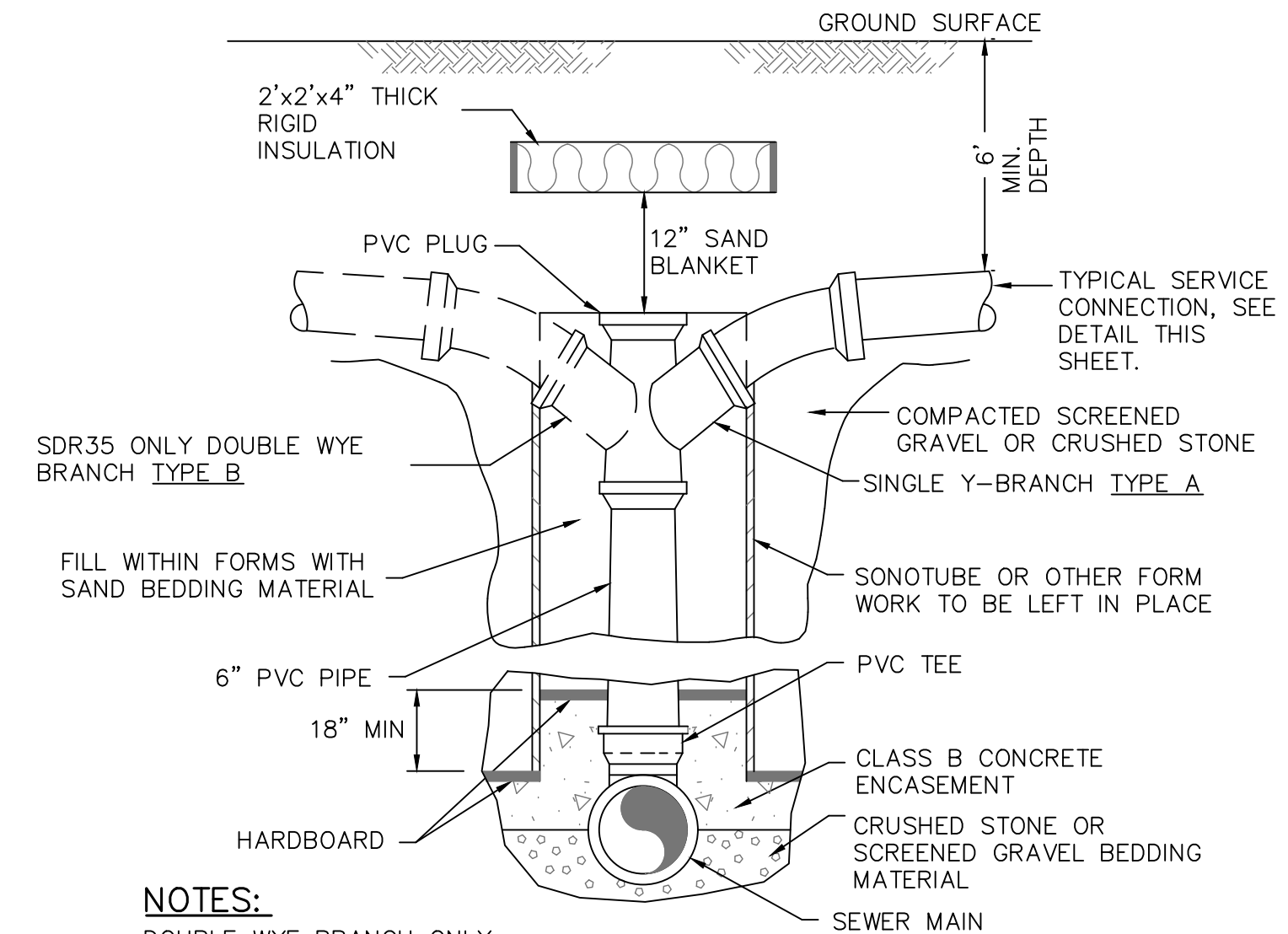


**6 SERVICE CONNECTION**  
D1 NOT TO SCALE



**TRENCH SECTION (TYP)**

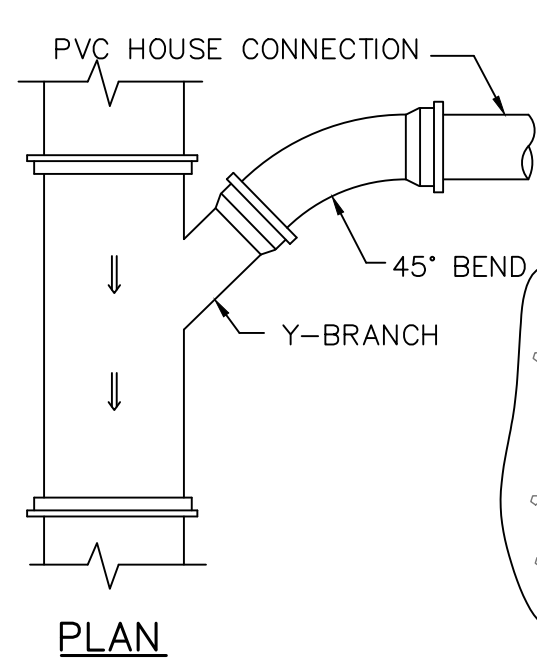
**2 TRENCH - GRAVITY SEWER**  
D1 NOT TO SCALE



**7 PVC SEWER SERVICE CHIMNEY WITH WYE**  
D1 NOT TO SCALE

**SERVICE CONNECTION NOTES:**

- SEE DETAILS FOR SERVICE CONNECTION REQUIREMENTS.
- SERVICE CONNECTION SHALL BE INSTALLED BELOW WATER MAIN WHERE POSSIBLE.
- CLEANOUTS SHALL BE INSTALLED AT EACH SERVICE CONNECTION.
- REBAR SHALL BE PLACED AT SIDE OF CLEANOUT.
- CLEANOUT SHALL BE USED TO PLUG AND TEST ALL NEW LATERALS WITH MINIMAL INTERRUPTION TO OPERATION OF HOMEOWNER SANITARY SYSTEM.
- CLEANOUT RISER PIPE AND FITTINGS SHALL BE INCIDENTAL AND SHALL NOT BE CONSIDERED FOR PAYMENT.



**6 SERVICE CONNECTION**  
D1 NOT TO SCALE

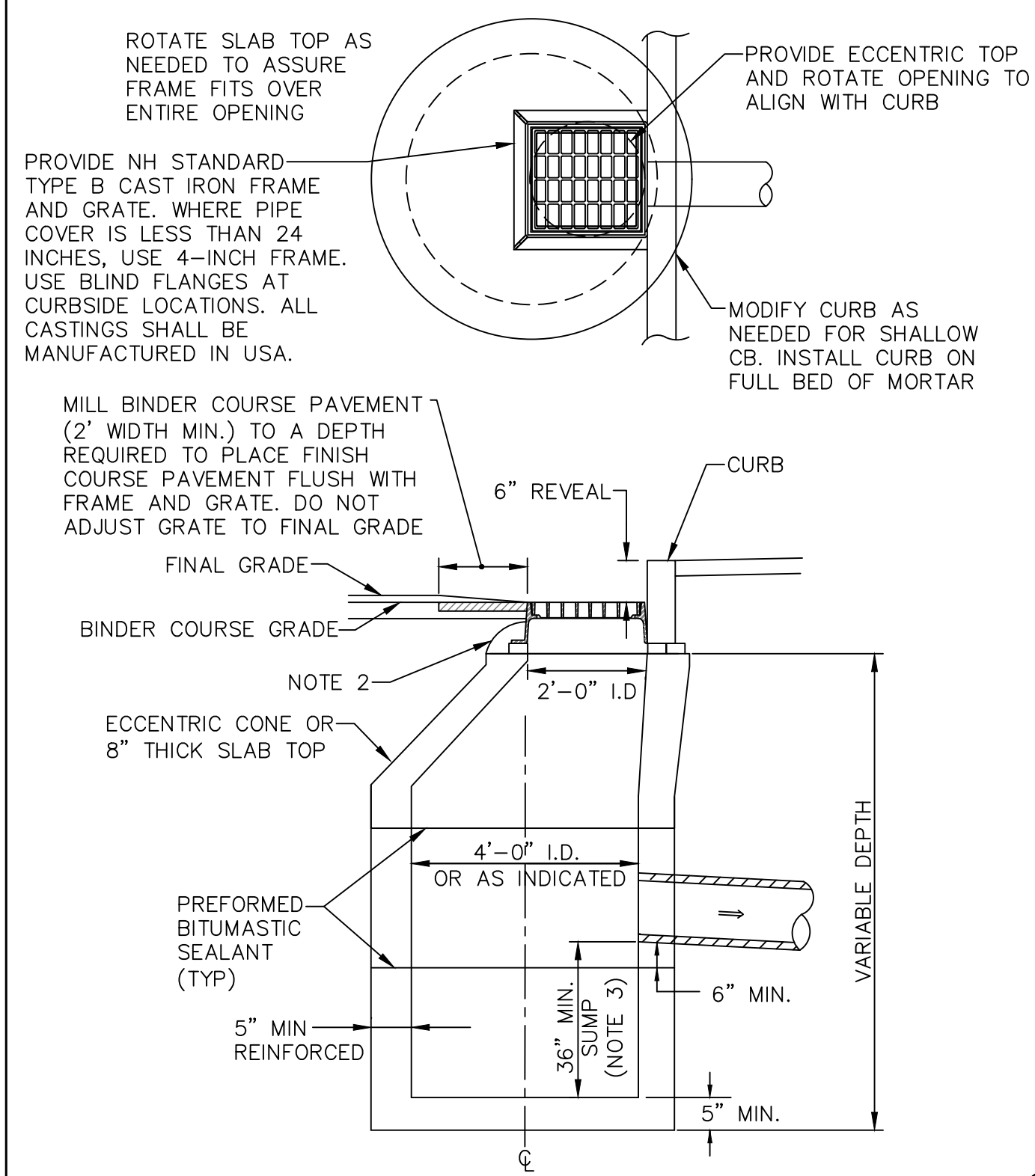
- NOTES:**
- MAINTAIN 18" SEPARATION BETWEEN NEW SEWER SERVICE AND NEW OR EXISTING WATER MAIN (WATER SHALL BE OVER SEWER).

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| Drawn/Chk.  | RMG |            |              |    |      |                |    |      |
| Designed    |     |            |              |    |      |                |    |      |
| Checked     |     |            |              |    |      |                |    |      |
| Approved    |     | APRIL 2024 |              |    |      |                |    |      |
| Date        |     |            |              |    |      |                |    |      |
| Book No.    |     |            |              |    |      |                |    |      |
| Project No. |     | 2552       |              |    |      |                |    |      |
| Dwg. ID     |     | 2542.dwg   |              |    |      |                |    |      |
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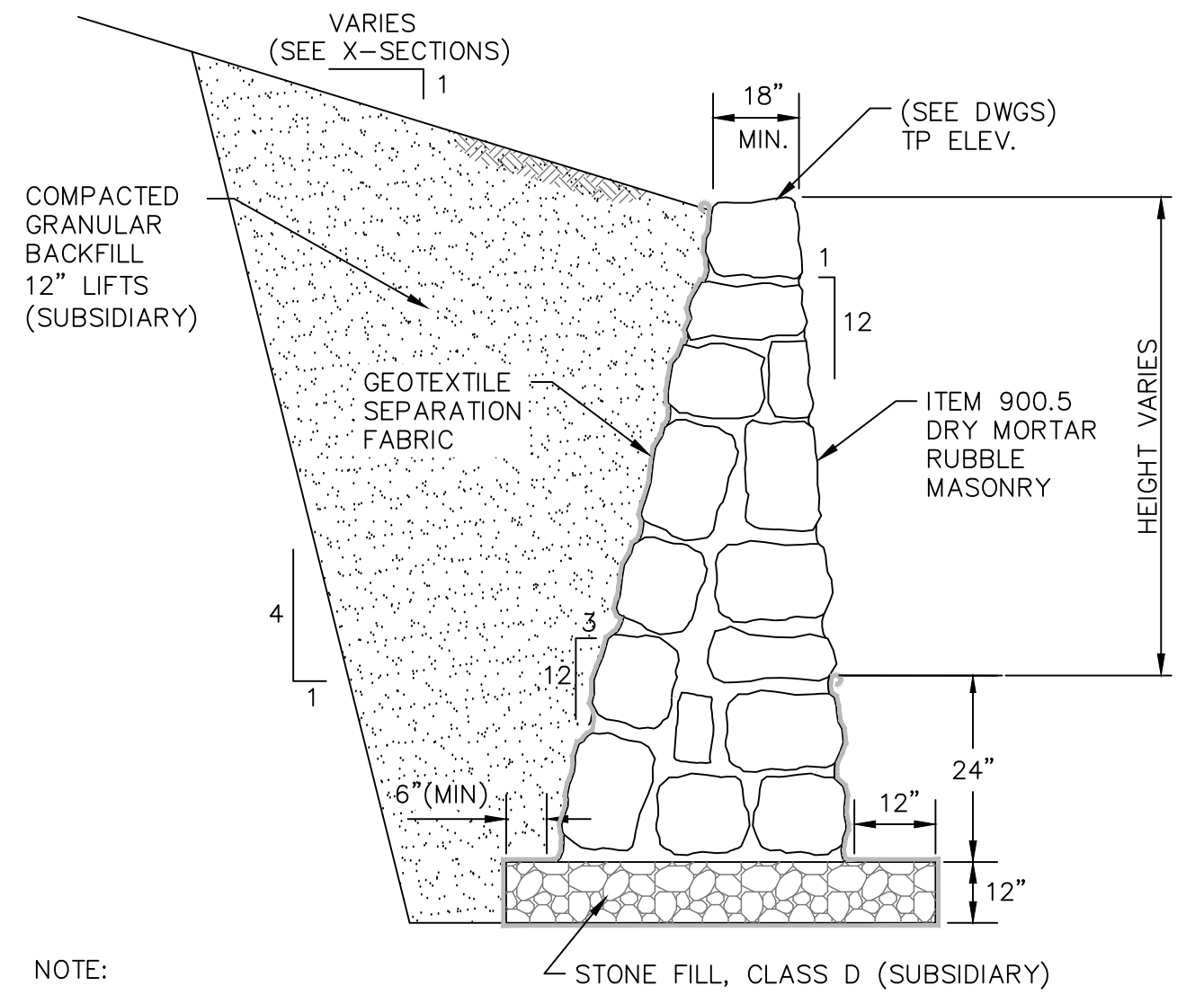
**SEWER DETAILS**  
**MAPLEWOOD AVE DRAINAGE IMPROVEMENTS**  
**CITY OF PORTSMOUTH**  
**PORTSMOUTH, NEW HAMPSHIRE**



**1 CATCH BASIN DETAIL**  
D2 NOT TO SCALE

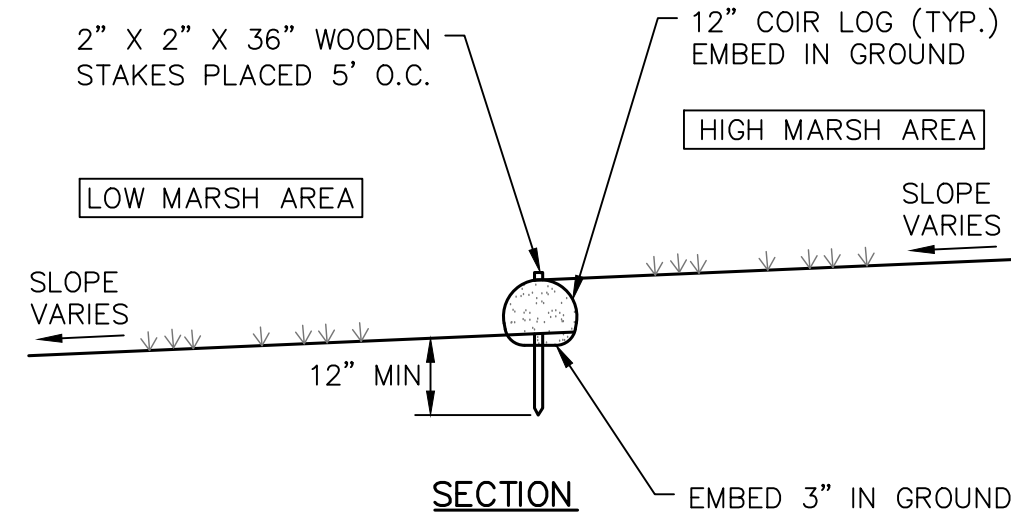
**CATCH BASIN NOTES:**

- ENTIRE STRUCTURE SHALL BE CAPABLE OF WITHSTANDING AN H - 20 LOAD DETAILS OF REINFORCEMENT TO BE FURNISHED BY MANUFACTURER.
- ADJUST FRAME AND GRATE TO BINDER COURSE ELEVATION, WITH BRICK SET IN A FULL BED OF MORTAR. POINT ALL MASONRY (NO VOIDS) AND PARGE EXTERIOR BRICK WITH MORTAR.
- WHERE SUMP IS OMITTED PROVIDE MASONRY INVERT PER DETAIL **4**

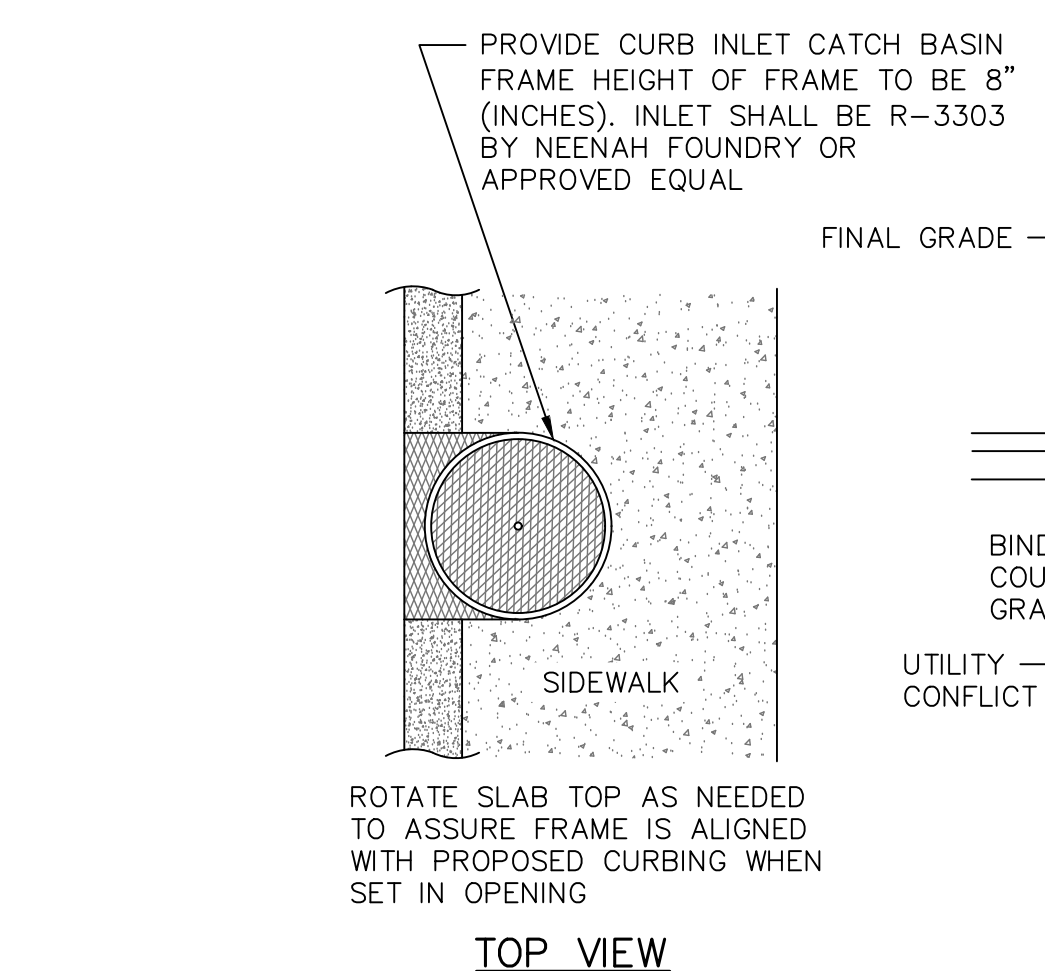


- NOTE:**
- THE CONTRACTOR MAY REUSE GRANITE FROM EXISTING HEAD WALL. RETAIN STABLE SECTIONS OF EXISTING HEADWALLS REVIEW RE-CONSTRUCTION LIMITS WITH THE ENGINEER BEFORE COMMENCING WITH THE WORK.
  - UNSUITABLE MATERIAL SHALL BE REMOVED AND REPLACED WITH STRUCTURAL FILL.
  - IF GROUNDWATER IS ENCOUNTERED, DEWATERING MEASURES WILL BE NECESSARY TO PREVENT DISRUPTANCE OF THE BEARING SOILS. PUMPING EQUIPMENT AND SUMP AREAS SHOULD BE LOCATED OUTSIDE. PUMP DISCHARGE SHALL BE PROPERLY FILTERED TO PREVENT THE DISCHARGE OF SILT TO WETLANDS.
  - WALLS SHALL BLEND INTO EXISTING SLOPES.

**2 MORTAR RUBBLE MASONRY RETAINING DETAIL**  
D2 NOT TO SCALE

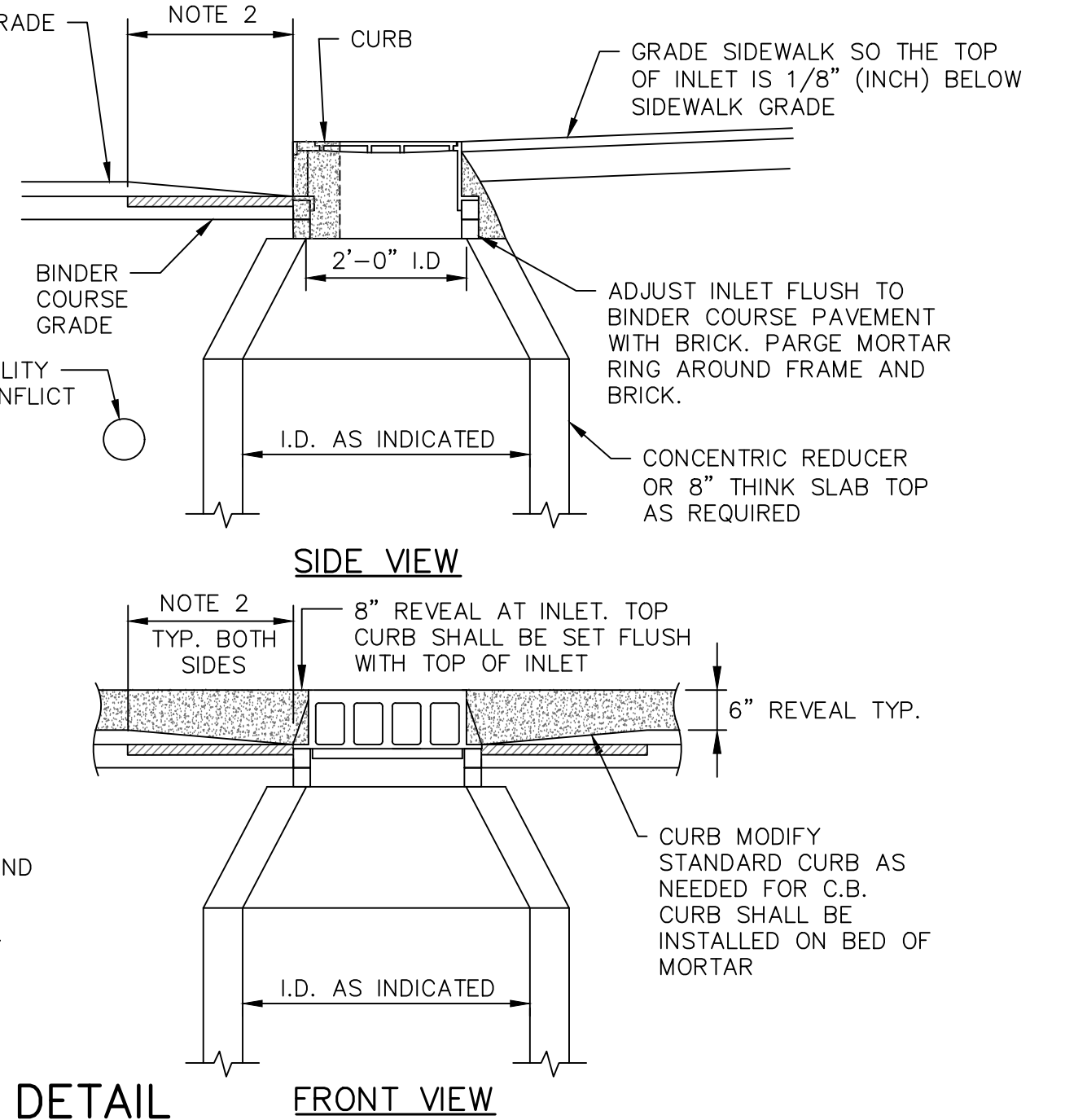


**7 COIR LOG DETAIL**  
D2 NOT TO SCALE



**5 INLET CATCH BASIN FRAME DETAIL**  
D2 NOT TO SCALE

- NOTES:**
- ENTIRE STRUCTURE SHALL BE CAPABLE OF WITHSTANDING AN H-20 LOAD DETAILS OF REINFORCEMENT TO BE FURNISHED BY MANUFACTURER.
  - MILL BINDER COURSE PAVEMENT IN FRONT AND TO EACH SIDE OF INLET (2' WIDTH MIN.) TO A DEPTH REQUIRED TO PLACE FINISH COURSE PAVEMENT SO THAT CURB INLET AND CURBING (AT THE INLET) HAS AN 8" REVEAL.
  - DETAIL TO BE USED WHERE NECESSARY TO AVOID UTILITY CONFLICTS OR WHERE DIRECTED.

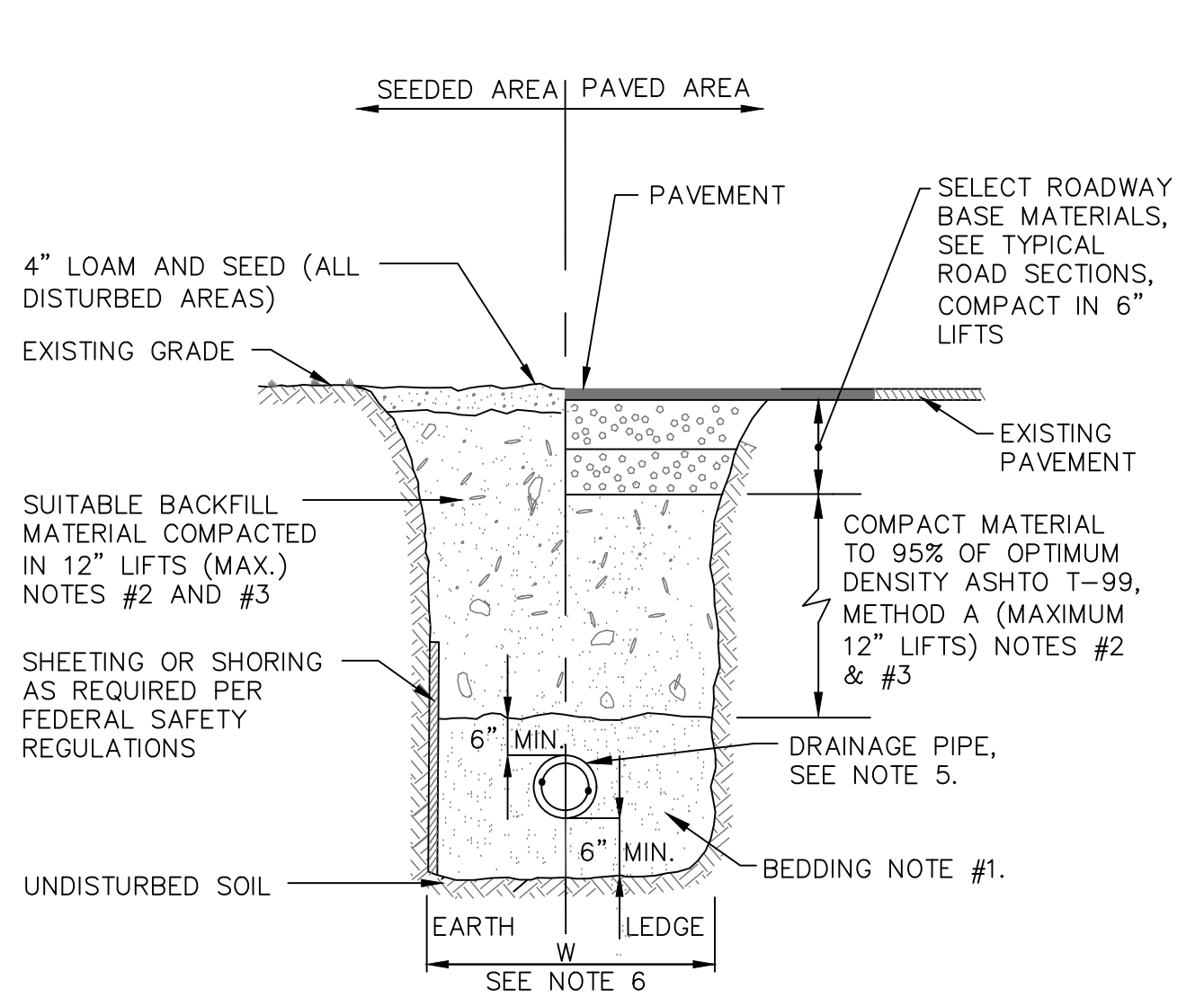


- NOTES:**
- SERVICE LATERALS WILL BE PROVIDED AT EACH DOWNSPOUT AS WELL AS A SEPARATE CLEANOUT FOR EACH PROPERTY TO FACILITATE PRIVATE SUMP PUMP /DRAIN SERVICE CONNECTIONS. CLEANOUTS SHALL BE INSTALLED AT THE PROPERTY LINE FOR EACH SERVICE LATERAL.
  - REBAR OR 2X4 SHALL BE PLACED AT SIDE OF CLEANOUT.
  - CLEANOUT RISER PIPE AND FITTINGS ARE INCIDENTAL AND WILL NOT BE CONSIDERED FOR PAYMENT.
  - SERVICES SHALL BE ORIENTED @ 10:30 OR 1:30 (TYP). UNDER NO CIRCUMSTANCES SHALL SERVICES BE LOCATED BETWEEN 3:00 AND 9:00.
  - LOCATE ROOF LEADER CONNECTIONS AT ADJACENT BUILDING CORNERS, TWO DOWNSPOUTS MAY BE CONNECTED TO ONE LATERAL USING APPROPRIATE WYE (AND OTHER) FITTING(S).

**6 DRAIN LATERAL & ROOF LEADER CONNECTION**  
D2 NOT TO SCALE

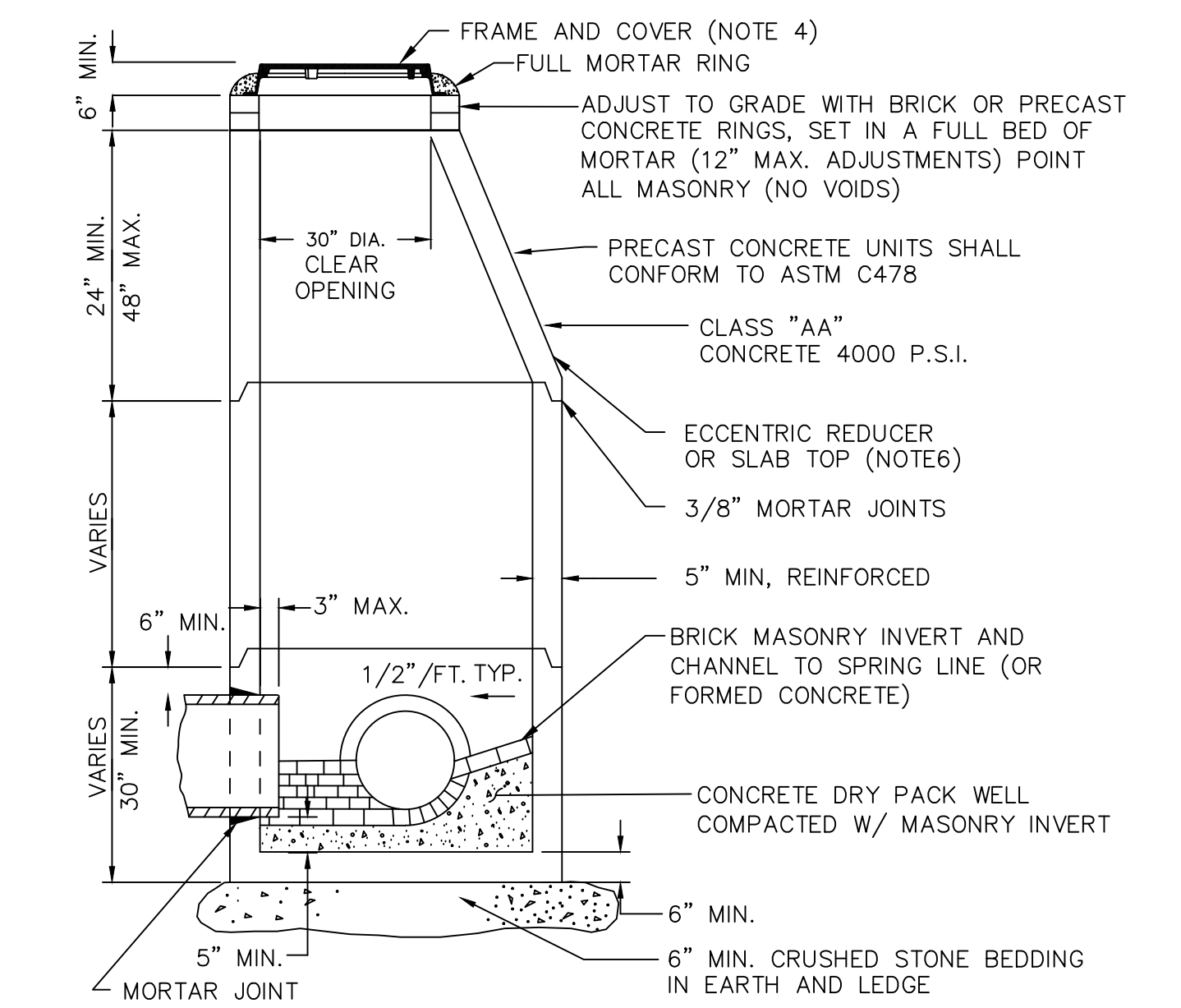
**3 TRENCH DETAIL - STORM DRAIN**  
D2 NOT TO SCALE

- TRENCH NOTES - STORM DRAIN**
- BEDDING:** BEDDING FOR PIPES SHALL CONSIST OF PREPARING THE BOTTOM OF THE TRENCH TO SUPPORT THE ENTIRE LENGTH OF THE PIPE AT A UNIFORM SLOPE AND ALIGNMENT. CRUSHED GRAVEL (NHDOT ITEM 304.3) OR CRUSHED STONE SHALL BE USED TO BED THE PIPE TO THE ELEVATION SHOWN ON THE DRAWINGS.
  - COMPACTION:** ALL BACKFILL SHALL BE COMPACTED AT OR NEAR OPTIMUM MOISTURE CONTENT BY PNEUMATIC TAMPERS, VIBRATORY COMPACTORS OR OTHER APPROVED MEANS. BACKFILL BENEATH PAVED SURFACES SHALL BE COMPACTED TO NOT LESS THAN 95 PERCENT OF AASHTO T99, METHOD C.
  - SUITABLE MATERIAL:** IN ROADS, ROAD SHOULDERS, WALKWAYS AND TRAVELED WAYS, SUITABLE MATERIAL FOR TRENCH BACKFILL SHALL BE THE NATURAL MATERIAL EXCAVATED DURING THE COURSE OF CONSTRUCTION, BUT SHALL EXCLUDE DEBRIS; PIECES OF PAVEMENT; ORGANIC MATTER; TOP SOIL; ALL WET OR SOFT MUCK, PEAT, OR CLAY; ALL EXCAVATED LEDGE MATERIAL; ROCKS OVER 6 INCHES IN LARGEST DIMENSION; FROZEN EARTH AND ANY MATERIAL WHICH, AS DETERMINED BY THE ENGINEER, WILL NOT PROVIDE SUFFICIENT SUPPORT OR MAINTAIN THE COMPLETED CONSTRUCTION IN A STABLE CONDITION. IN SEEDED AREAS, SUITABLE MATERIAL SHALL BE AS DESCRIBED ABOVE, EXCEPT THAT THE ENGINEER MAY PERMIT THE USE OF TOP SOIL, LOAM, ROCKS UNDER 12", FROZEN EARTH OR CLAY, IF HE/SHE IS SATISFIED THAT THE COMPLETED CONSTRUCTION WILL BE ENTIRELY STABLE AND PROVIDED THAT EASY ACCESS TO THE PIPE WILL BE PRESERVED.
  - BASE COURSE AND PAVEMENT:** SHALL MEET THE REQUIREMENTS OF THE NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION'S LATEST EDITION OF THE STANDARD SPECIFICATIONS FOR HIGHWAYS AND BRIDGES - DIVISIONS 300 AND 400 RESPECTIVELY.
  - DRAINAGE PIPE:** PIPE MATERIALS SHALL BE EITHER PVC SDR 35 OR POLYETHYLENE (PE).
  - W=MAXIMUM ALLOWABLE TRENCH WIDTH:** FOR ROCK EXCAVATION, FOR ORDERED EXCAVATION BELOW GRADE AND HANDLING OF EXCAVATED CONTAMINATED SOILS. FOR PIPES 15 INCHES NOMINAL DIAMETER OR LESS, W SHALL BE NO MORE THAN 36 INCHES. FOR PIPES GREATER THAN 15 INCHES IN NOMINAL DIAMETER, W SHALL BE 24 INCHES PLUS PIPE OUTSIDE DIAMETER (O.D.)

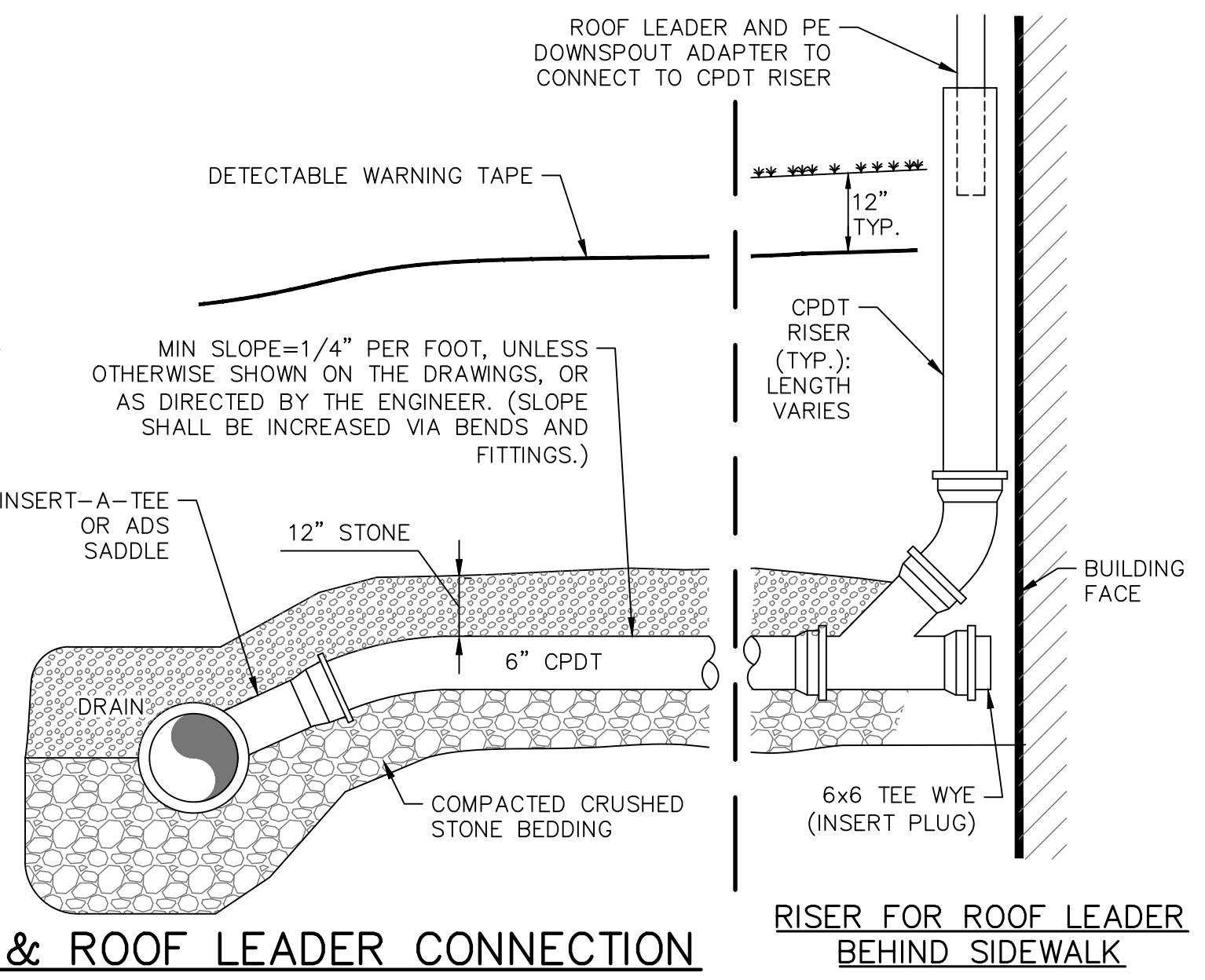


**4 TYPICAL DRAINAGE MANHOLE**  
D2 NOT TO SCALE

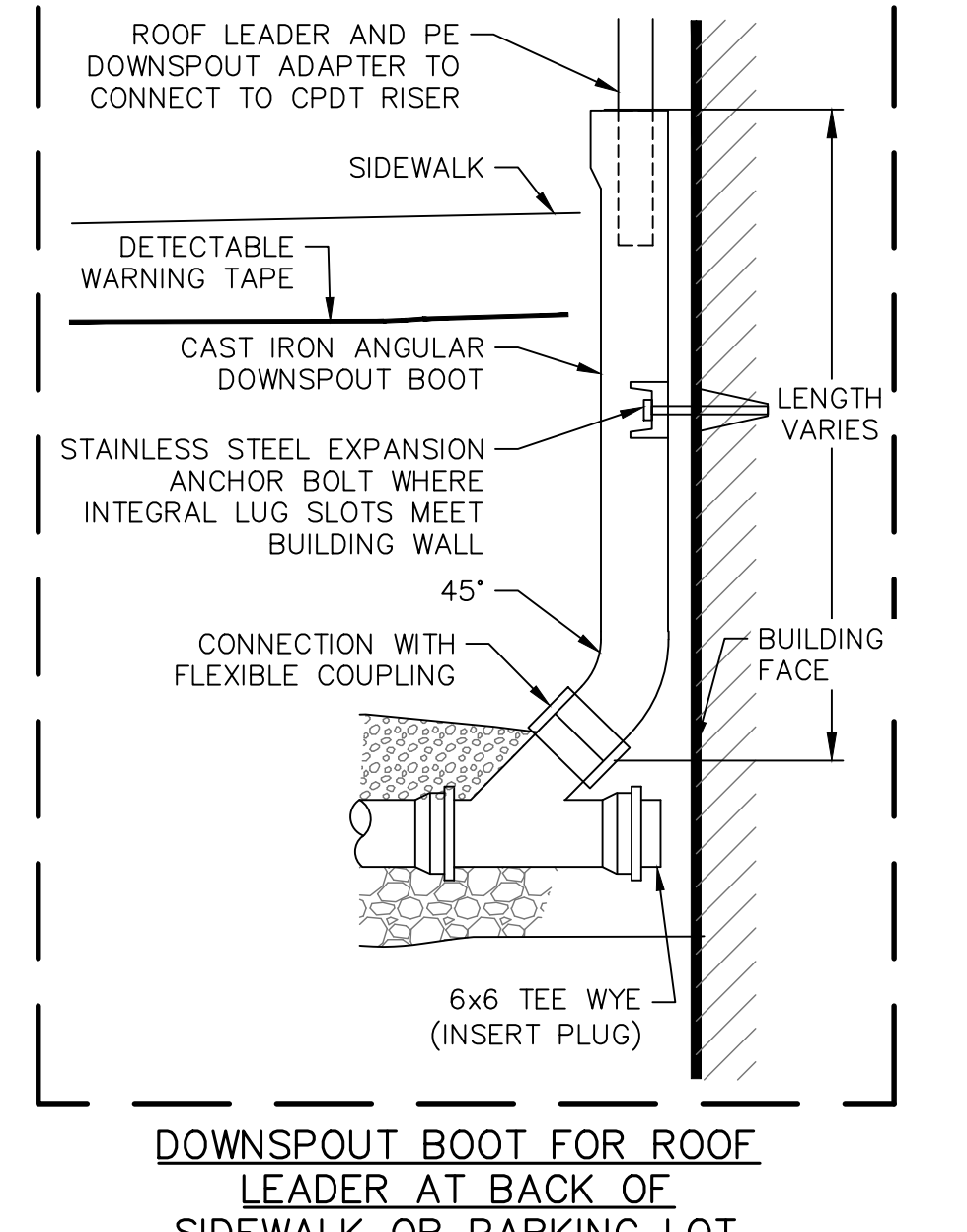
- DRAIN MANHOLE NOTES:**
- BARRELS AND CONE SECTIONS SHALL BE PRECAST REINFORCED CONCRETE.
  - PRECAST CONCRETE BARREL SECTIONS, CONES, AND BASES SHALL CONFORM TO ASTM C478.
  - INVERTS AND SHELVES: MANHOLES SHALL HAVE A BRICK PAVED SHELF AND INVERT (OR FORMED CONCRETE), CONSTRUCTED TO CONFORM TO THE SIZE OF PIPE AND FLOW. CARE SHALL BE TAKEN TO INSURE THAT THE BRICK INVERT IS A SMOOTH CONTINUATION OF THE INVERT. INVERT BRICKS SHALL BE LAID ON EDGE. AT CHANGES IN DIRECTION, THE INVERTS SHALL BE LAID OUT IN CURVES OF THE LONGEST POSSIBLE TANGENT TO THE CENTER LINE OF THE PIPES. SHELVES SHALL BE CONSTRUCTED TO AN ELEVATION OF 1/2 THE PIPE DIA. AND SLOPE TO DRAIN TOWARD THE FLOWING THROUGH CHANNEL.
  - FRAMES AND COVERS: MANHOLE FRAMES AND COVERS SHALL BE HINGED, ERGO XL BY EAST JORDON IRON WORKS, AND PROVIDE A 30-INCH (MIN.) CLEAR OPENING. THE WORD "DRAIN" IN 3-INCH LETTERS SHALL BE PLAINLY CAST INTO THE CENTER OF EACH COVER.
  - BEDDING:** SCREENED GRAVEL AND/OR CRUSHED STONE FREE FROM CLAY, LOAM, ORGANIC MATTER AND MEETING ASTM C33. STONE SIZE NO. 67.



- 100% PASSING 1 INCH SCREEN  
 90-100% PASSING 3/4 INCH SCREEN  
 20- 55% PASSING 3/8 INCH SCREEN  
 0-10% PASSING #4 SIEVE  
 0- 5% PASSING #8 SIEVE
- WHERE ORDERED BY THE ENGINEER TO STABILIZE THE BASE, SCREENED GRAVEL OR CRUSHED STONE 1-1/2 INCH TO 1/2 INCH OR USE OF GEOGRID FABRIC (ITEM 1.8B) MAY BE REQUIRED.
6. SLAB TOP COVERS: MAY BE APPROVED IN LIEU OF A CONE SECTION, WHEN MANHOLE IS LESS THAN 5 FEET AND FOR LARGE DIAMETER MANHOLES. SLAB TOP COVERS SHALL BE REINFORCED CONCRETE HAVING AN ECCENTRIC ENTRANCE AND CAPABLE OF SUPPORTING H=20 LOADS.



**RISER FOR ROOF LEADER BEHIND SIDEWALK**



**DOWNSPOUT BOOT FOR ROOF LEADER AT BACK OF SIDEWALK OR PARKING LOT**

|                   |    |      |              |    |      |                |    |      |
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| ISSUE FOR BIDDING | By | Date | CONSTRUCTION | By | Date | RECORD DRAWING | By | Date |
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| Drawn/Chk.        |    |      |              |    |      |                |    |      |
| RMG               |    |      |              |    |      |                |    |      |
| APRIL 2024        |    |      |              |    |      |                |    |      |

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 Tel. 603-436-6192 Fax. 603-431-4733

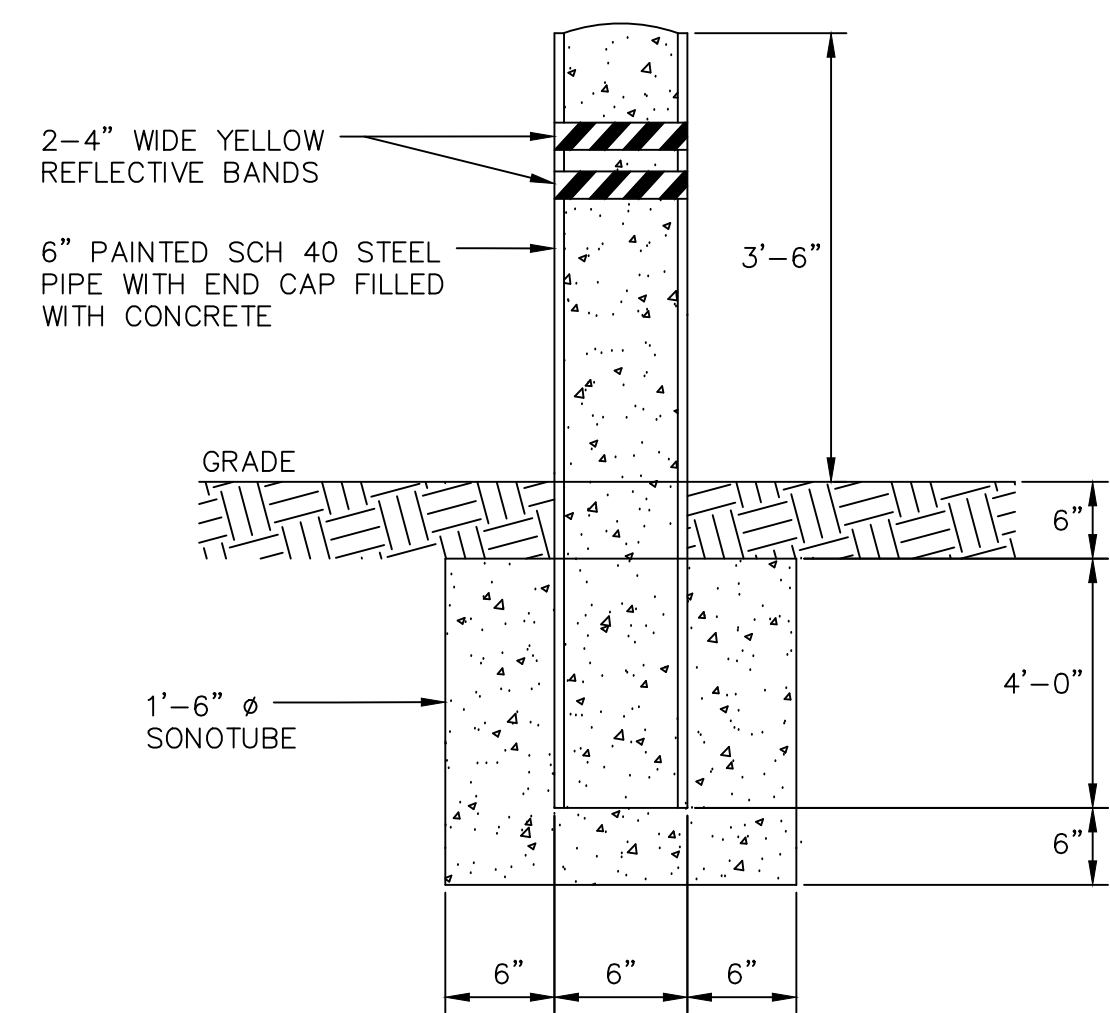
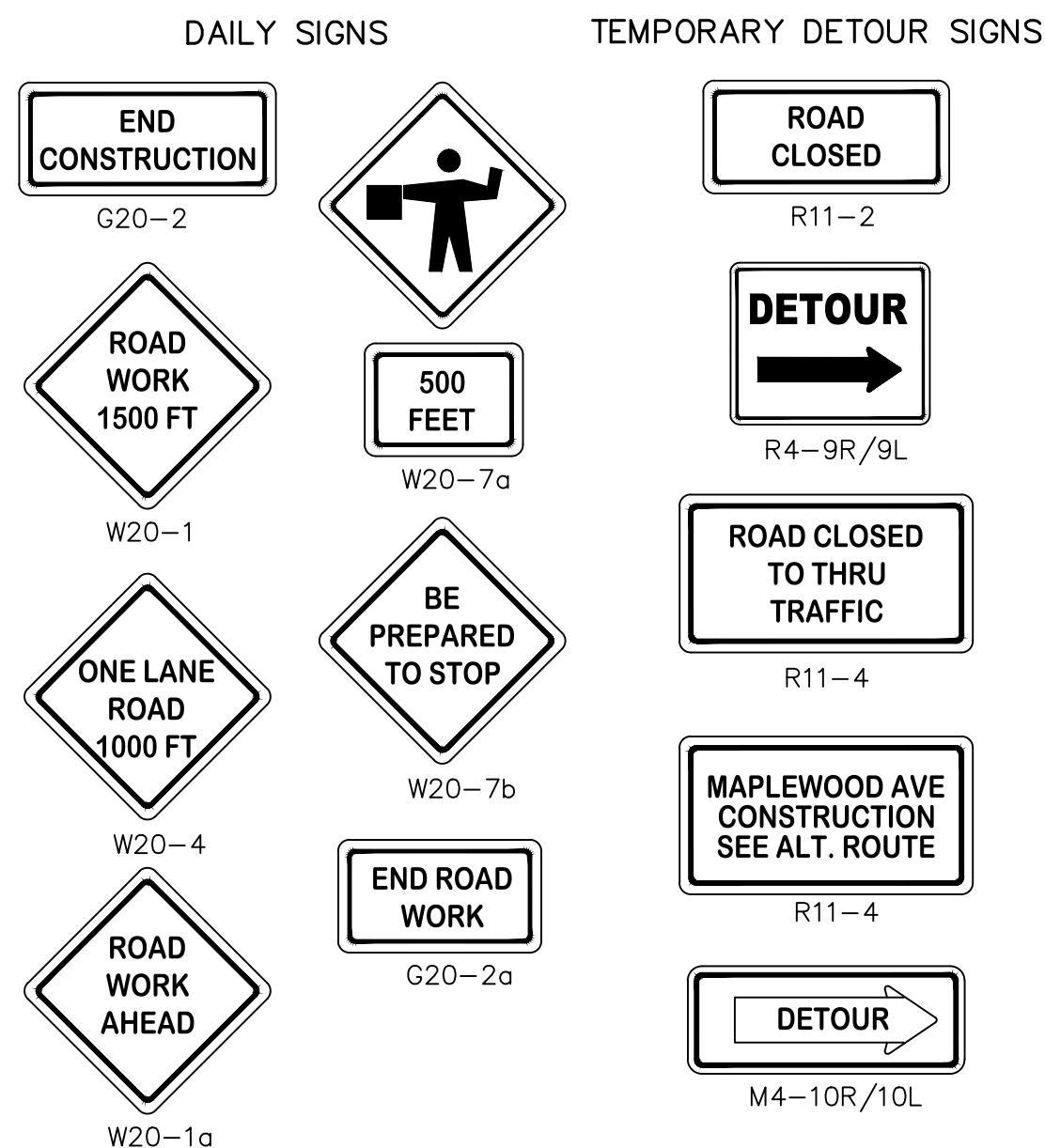
**DRAINAGE DETAILS**  
**MAPLEWOOD AVE DRAINAGE IMPROVEMENTS**  
**CITY OF PORTSMOUTH**  
**PORTSMOUTH, NEW HAMPSHIRE**

DWG NO: D2  
 SHEET: 11 OF 17



**TRAFFIC CONTROL NOTES:**

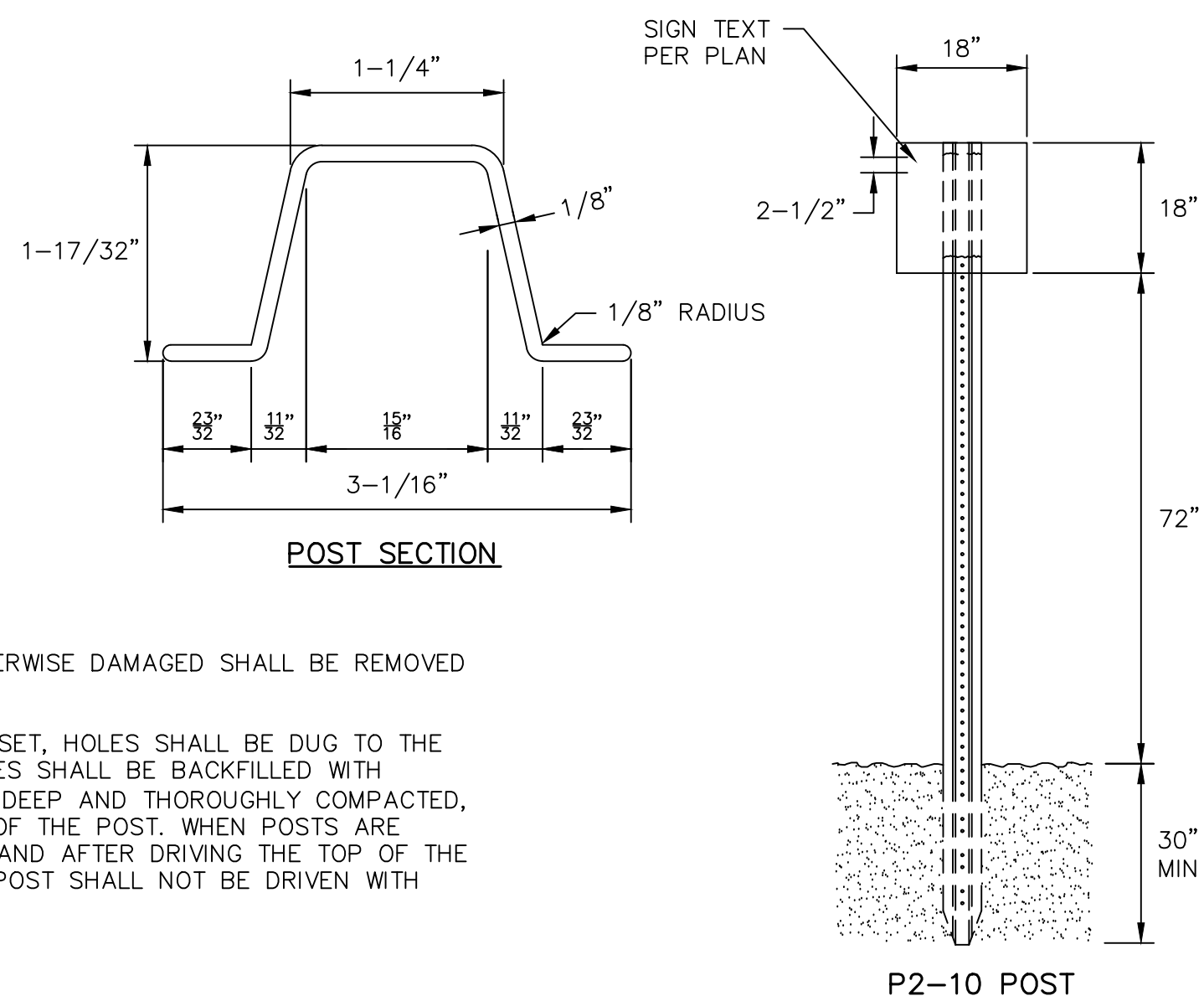
1. TYPICAL SIGN DETAILS ARE BASED ON THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (MUTCD) AND IS NOT INTENDED AS AN ALL-INCLUSIVE LIST. ALL SIGNAGE AND OTHER TRAFFIC CONTROL DEVICES SHALL CONFORM TO THE MUTCD (LATEST EDITION) AND NHDOT REQUIREMENTS.
2. CONTRACTOR IS RESPONSIBLE FOR IMPLEMENTING THE TRAFFIC CONTROL PLAN AS SHOWN. ANY MODIFICATIONS MUST BE SUBMITTED IN WRITING FOR APPROVAL BY THE ENGINEER, CITY OF PORTSMOUTH AND THE NHDOT. SEE PROJECT MANUAL FOR ADDITIONAL REQUIREMENTS.
3. CONTRACTOR SHALL ERECT ALL DAILY USE SIGNS IN THE MORNING PRIOR TO WORK BEGINNING AND REMOVE ALL DAILY USE SIGNS AT THE END OF EACH DAY.
4. DAILY SIGNS SHALL INCLUDE SIGNAGE NECESSARY TO ENSURE THE SAFETY OF THE PUBLIC (I.E. ROAD CLOSED, FLAGGER AHEAD, ONE LANE TRAFFIC, ETC).
5. DETOUR SIGNS ARE TO BE USED WITH PHASE I CONSTRUCTION (CULVERT INSTALLATION) ONLY. REFER TO PROSECUTION OF WORK ON SHEET G-1)
6. ALL SIGNS SHALL BE ERECTED AND PLACED IN ACCORDANCE WITH MUTCD (LATEST EDITION).



**3 STEEL BOLLARD DETAIL**  
D4 NOT TO SCALE

**1 TRAFFIC CONTROL SIGNS**  
D4 NOT TO SCALE

LENGTH (P2-10): 10'-0"  
WEIGHT PER LINEAR FOOT: 2.00 LBS  
HOLES: 3/8" DIA., 1" C-C FULL LENGTH  
STEEL: SHALL CONFORM TO ASTM A-499 (AISI C1060)  
FINISH: SHALL BE PAINTED WITH TWO COATS OF AN APPROVED MED. GREEN, BAKED PAINT OR AIR DRIED, PAINT OF WEATHER-RESISTANT QUALITY, ALL FABRICATION SHALL BE COMPLETED BEFORE PAINTING.

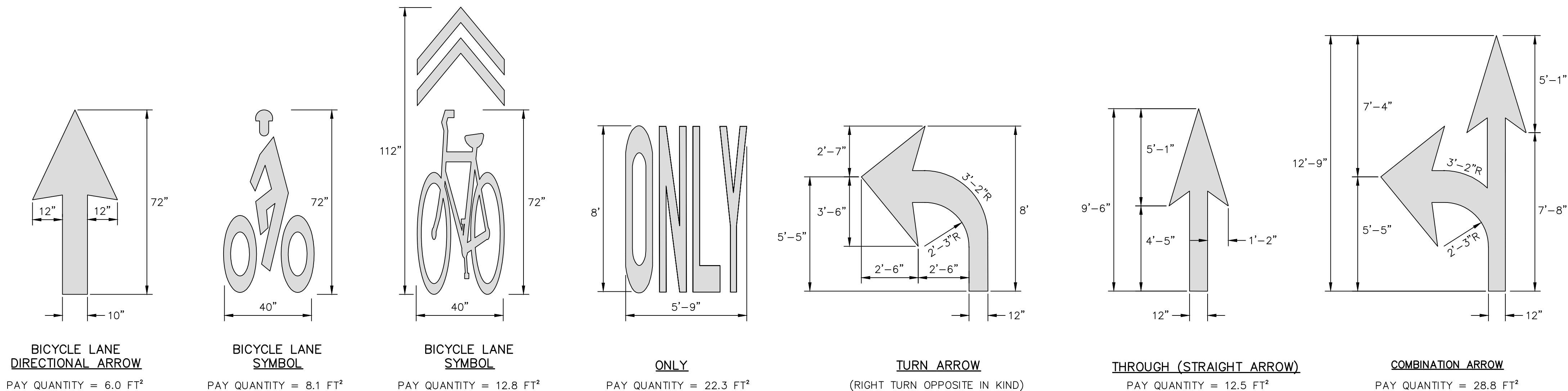


- NOTES:**
1. POSTS SHALL BE P2-10 AS REQUIRED.
  2. POSTS SHALL BE PLUMB; ANY POST BENT OR OTHERWISE DAMAGED SHALL BE REMOVED AND PROPERLY PLACED.
  3. POSTS MAY BE SET OR DRIVEN. WHEN POSTS ARE SET, HOLES SHALL BE DUG TO THE PROPER DEPTH; AFTER INSERTING POSTS, THE HOLES SHALL BE BACKFILLED WITH SUITABLE MATERIAL IN LAYERS NOT TO EXCEED 6" DEEP AND THOROUGHLY COMPACTED, CARE BEING TAKEN TO PRESERVE THE ALIGNMENT OF THE POST. WHEN POSTS ARE DRIVEN, A SUITABLE DRIVING CAP SHALL BE USED AND AFTER DRIVING THE TOP OF THE POST; BATTERING HEADS WILL NOT BE ACCEPTED. POST SHALL NOT BE DRIVEN WITH THE SIGN ATTACHED TO THE POST.

**2 SIGN DETAIL**  
D4 NOT TO SCALE

**GENERAL NOTES:**

1. ALL WORDS AND SYMBOLS SHALL BE RETROREFLECTIVE WHITE AND SHALL CONFORM TO THE LATEST VERSION OF THE MUTCD.
2. MULTI-WORD MESSAGES SHALL READ "UP"; THAT IS, THE FIRST WORD SHALL BE NEAREST THE APPROACHING DRIVER.
3. THE WORD "ONLY" SHALL NOT BE USED WITH THROUGH OR COMBINATION ARROWS, AND SHALL NOT BE USED ADJACENT TO A BROKEN LANE LINE. A WORD/SYMBOL SHALL PRECEDED THE WORD "ONLY".
4. PREFORMED WORDS AND SYMBOLS SHALL BE PRE-CUT BY THE MANUFACTURER.
5. WRONG-WAY ARROWS SHALL NOT BE SUBSTITUTED FOR THROUGH ARROWS.
6. ALL STOP BARS, WORDS, SYMBOLS AND ARROWS SHALL BE THERMOPLASTIC.



**4 PAVEMENT MARKING - WORD AND SYMBOLS**  
D4 NOT TO SCALE

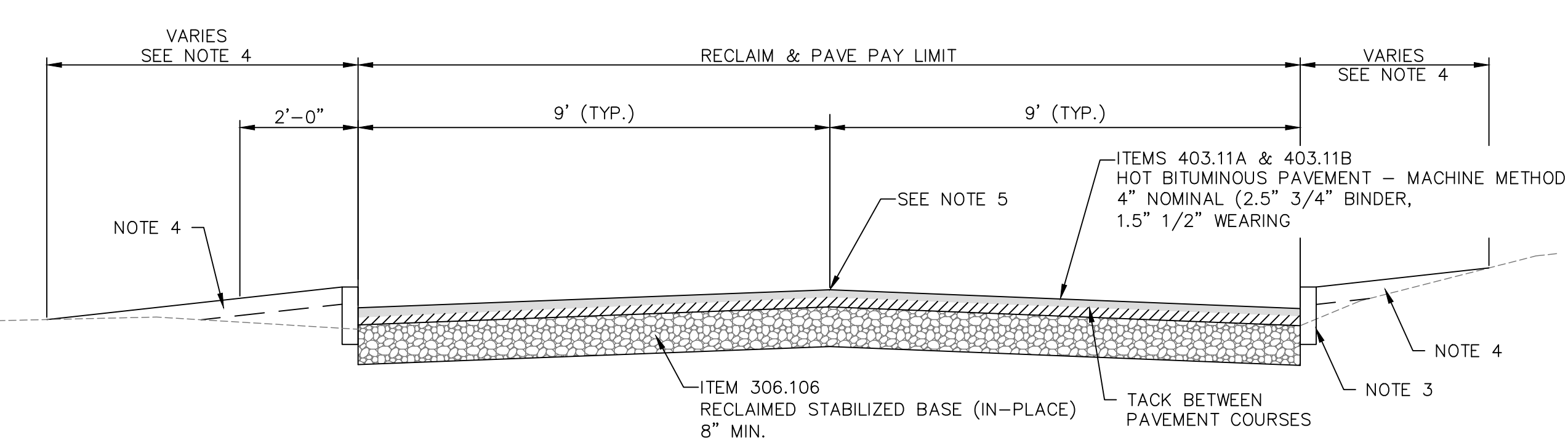
ITEM 632.32

|                |               |            |           |       |
|----------------|---------------|------------|-----------|-------|
| ISSUE FOR      | By            | Date       | REVISIONS | APP'D |
| BIDDING        |               |            |           |       |
| CONSTRUCTION   |               |            |           |       |
| RECORD DRAWING |               |            |           |       |
| Drawn/Chk.     | RMG           |            |           |       |
| Designed       | PDM           |            |           |       |
| Checked        |               |            |           |       |
| Approved       |               | APRIL 2024 |           |       |
| Book No.       |               |            |           |       |
| Project No.    | 2552          |            |           |       |
| Dwg. ID        | 252_details_M |            |           |       |
| Scale          |               |            |           |       |

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**TRAFFIC CONTROL SIGNS & PAVEMENT MARKINGS**  
MAPLEWOOD AVE DRAINAGE IMPROVEMENTS  
CITY OF PORTSMOUTH  
PORTSMOUTH, NEW HAMPSHIRE

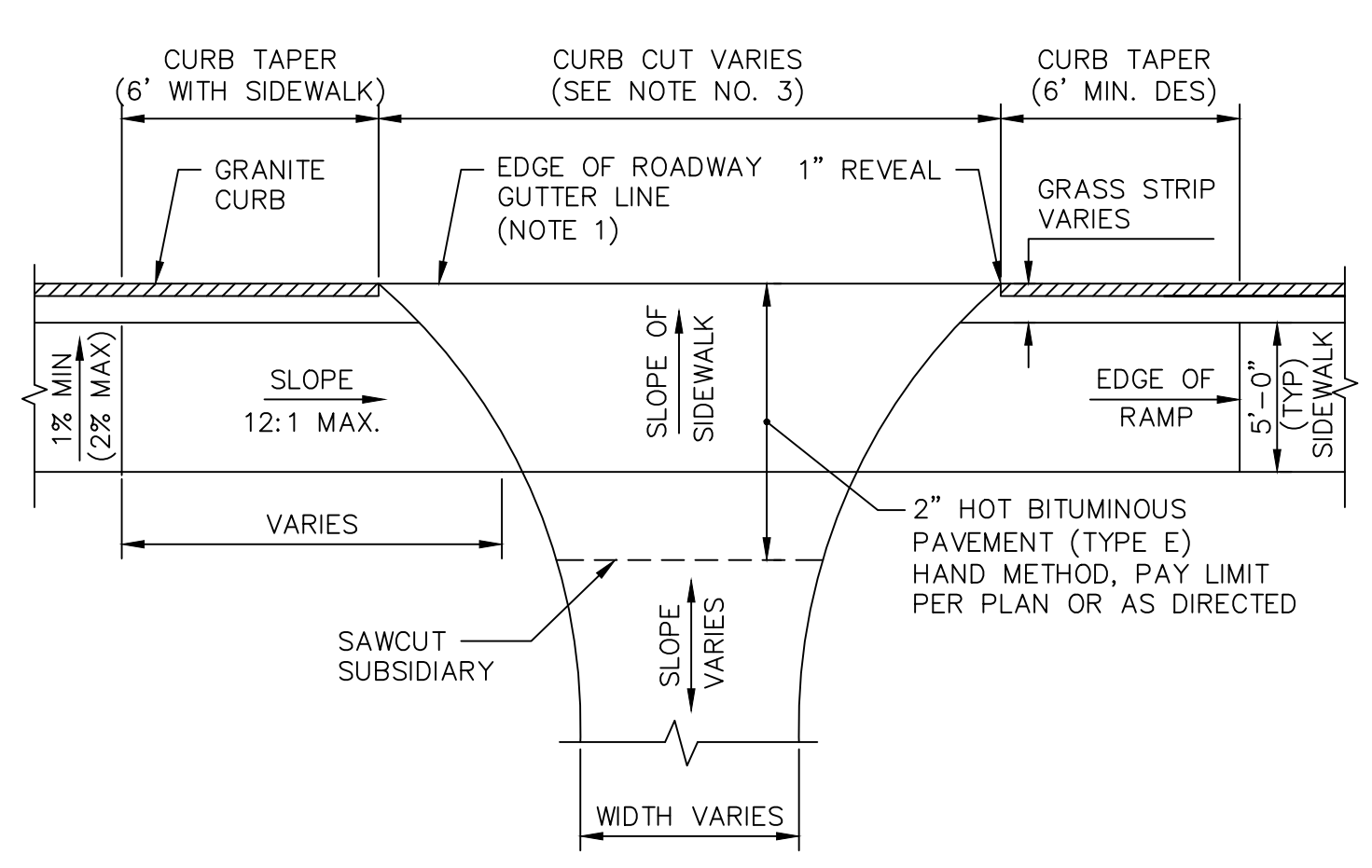
|        |          |
|--------|----------|
| DWG NO | SHEET    |
| D4     | 13 OF 17 |



**ROAD RE-CONSTRUCTION NOTES:**

1. SAWCUT DRIVEWAYS AND CONSTRUCT DRIVEWAY APRON FOLLOWING CONSTRUCTION OF PAVEMENT BINDER COURSE (SEE DRIVEWAY APRON DETAILS, THIS DRAWING).
2. GRADE RECLAIM (UNIFORMLY) TO MINIMIZE IMPACTS TO DRIVEWAYS AND SIDE SLOPES. REVIEW GRADING WITH ENGINEER IN ADVANCE OF RECLAIM. RECLAIM AT 10" DEPTH, REMOVE AND DISPOSE OF SURPLUS RECLAIM WHERE DIRECTED TO MINIMIZE GRADING IMPACTS, SUBSIDIARY. TYPICAL CROSS SLOPE = 3% UNLESS DIRECTED OTHERWISE.T. SUBSIDIARY.
3. INSTALL GRANITE CURB (WHERE DIRECTED), ITEM 609.01. SEE DETAIL (6 D5).
4. LOAM, SEED & MULCH ROADSIDE SLOPES, PAY AS ITEM 912.
5. ALL SEAMS AND JOINTS SHALL BE RAKED AND LUTED PRIOR TO COMPACTION AND ROLLING.

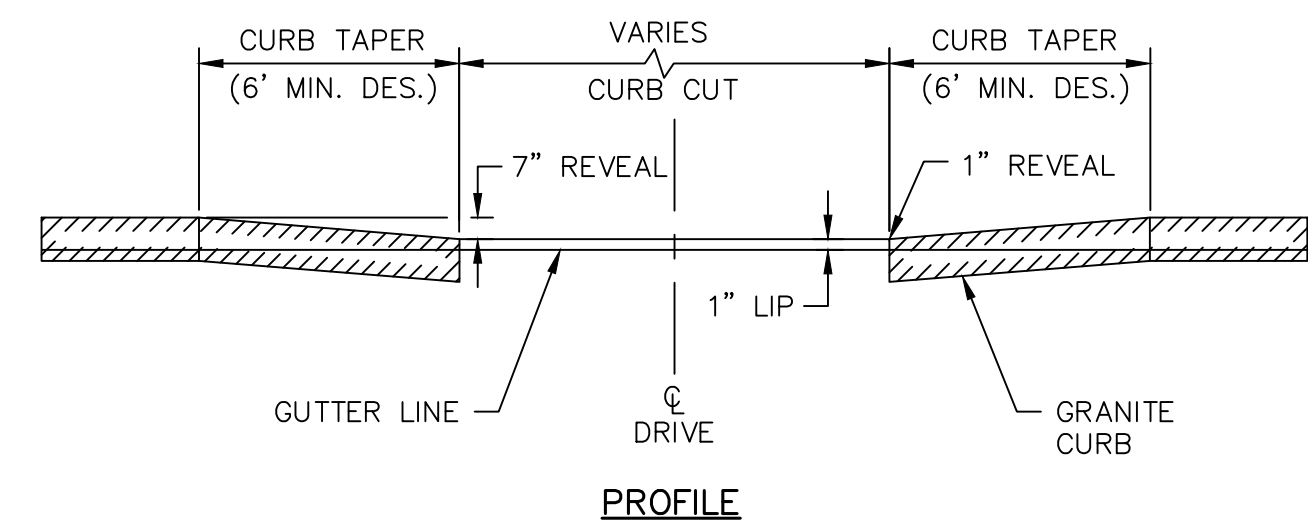
**1 D5 TYPICAL ROADWAY SECTION - RAILROAD EASEMENT AREA**  
NOT TO SCALE



**PLAN VIEW WITH SIDEWALK RAMP**

**NOTES:**

1. ALL PAVEMENT MATCHES AT DRIVEWAY SHALL BE SAWCUT AND KEYED FOR SMOOTH TRANSITION (SUBSIDIARY)

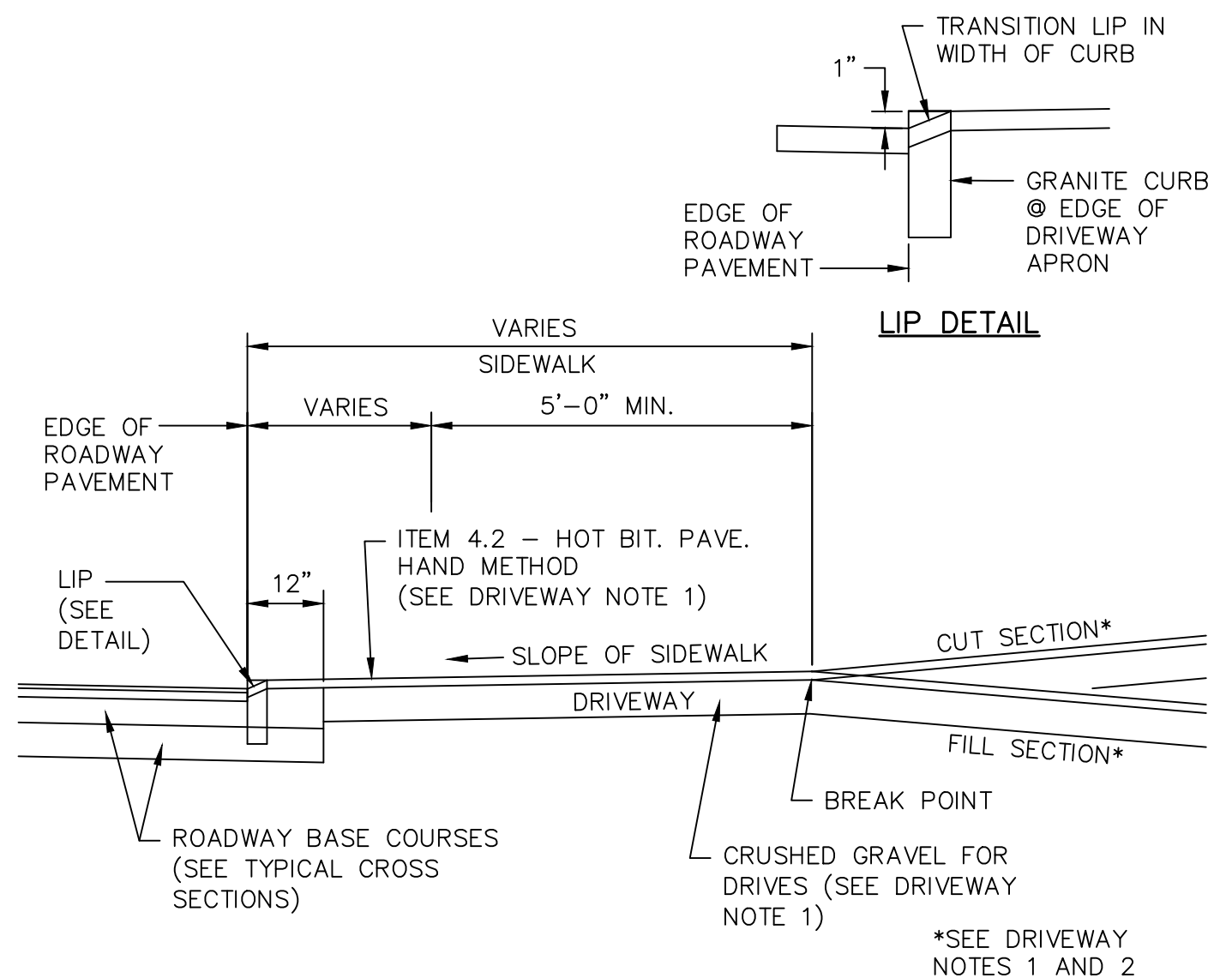


**PROFILE**

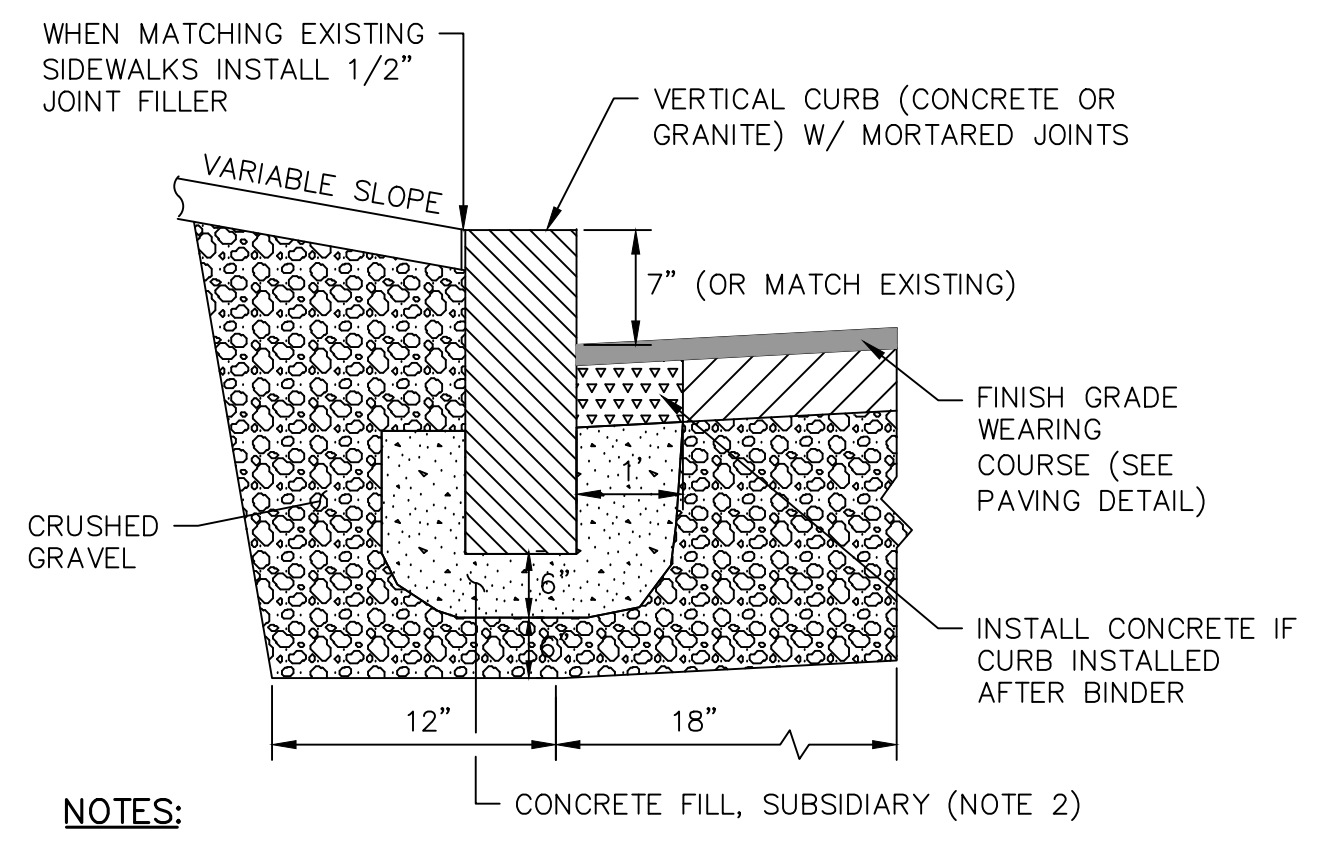
**DRIVEWAY NOTES:**

1. PAVEMENT & GRAVEL DEPTHS FOR RESIDENTIAL DRIVES SHALL BE 8" CRUSHED GRAVEL WITH 2" H.B.P. (HAND METHOD) SINGLE COURSE.
2. CURBING CAN BE FLARED TO FIT DRIVE RADII IF APPROPRIATE OR ENDED AS DETAILED ABOVE.
3. DRIVEWAY CURB CUTS SHALL MATCH EXISTING APRON WIDTHS UNLESS OTHERWISE DIRECTED.
4. FOR UNPAVED DRIVES, THE PAVED APRON NORMALLY ENDS AT THE RADIUS TANGENT POINT OR BACK OF SIDEWALK, WHICHEVER IS GREATER.

**4 D5 DRIVEWAY APRON/CURB CUT (FINAL GRADING PLAN)**  
NOT TO SCALE



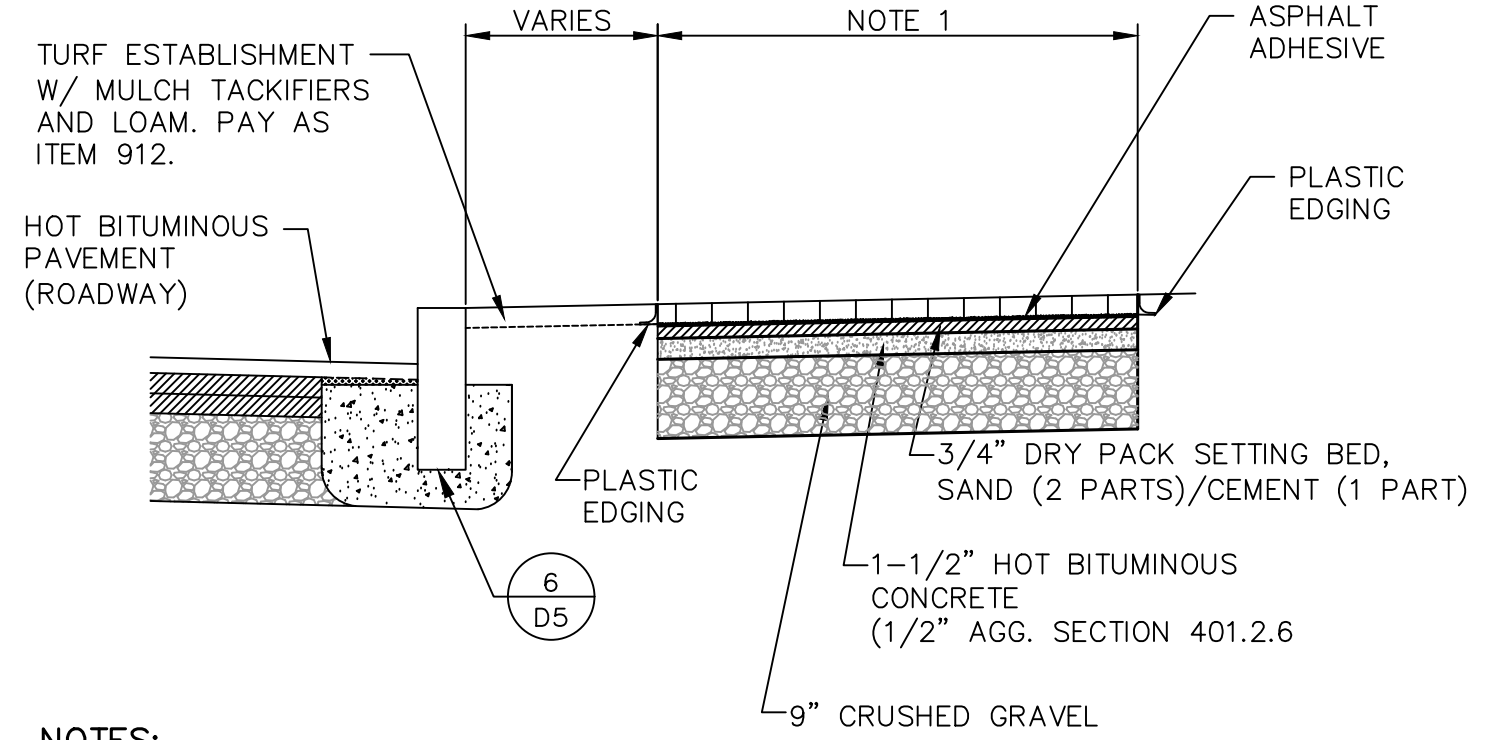
**5 D5 TYPICAL URBAN CURBED DRIVE IN CUT/FILL SECTION**  
NOT TO SCALE



**NOTES:**

1. DAMAGED OR IMPACTED CURB (WHETHER GRANITE OR CONCRETE) IS TO BE REPLACED AT THE CONTRACTOR'S OWN EXPENSIVE, UNLESS OTHERWISE NOTED ON PLAN.
2. CLASS AA CONCRETE FILL SHALL BE PLACED IN VOIDS IN FRONT, BEHIND, AND BELOW CURBING PRIOR TO INSTALLATION OF GRAVEL BACKING AND FINISH GRADE WEARING COURSE PAVEMENT.

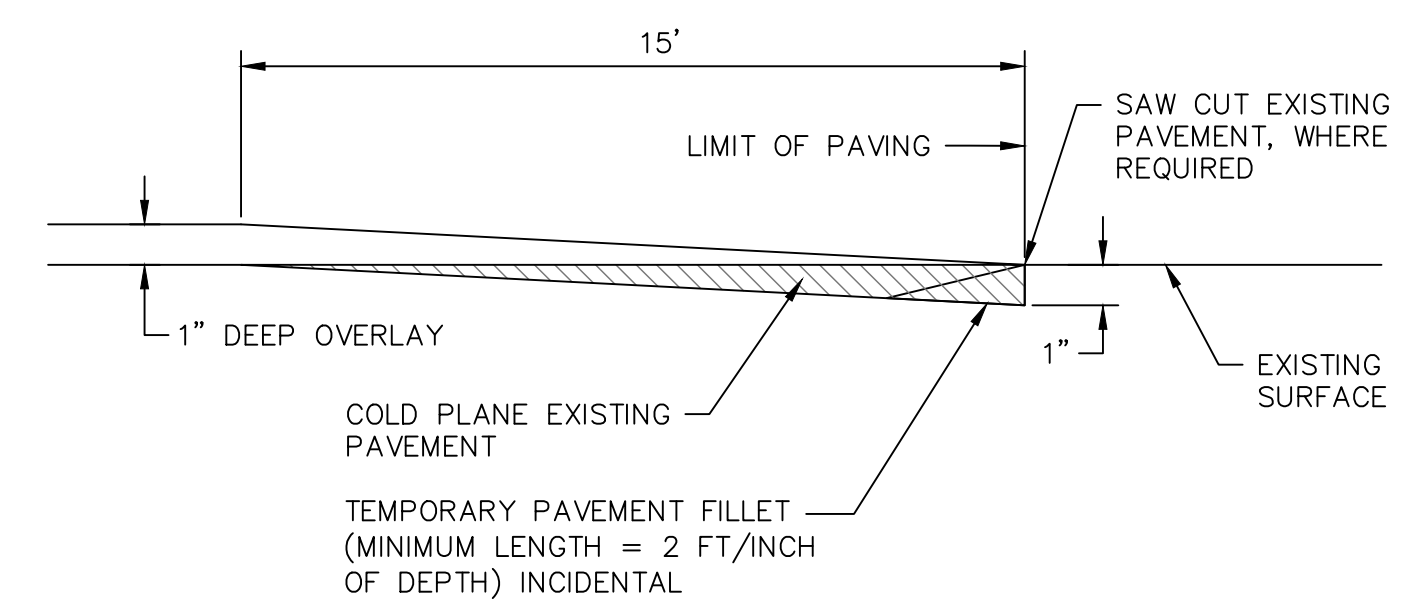
**6 D5 VERTICAL CURB (NEW OR RESET) (GRANITE OR CONCRETE)**  
NOT TO SCALE



**NOTES:**

1. RE-CONSTRUCT CURB AND SIDEWALKS IMPACTED FROM CONSTRUCTION OR WHERE DIRECTED. CURB AND SIDEWALKS DAMAGED OUTSIDE TRENCH LIMITS (THREE-FOOT FROM OUTSIDE OF PIPE) SHALL BE RESTORED AT CONTRACTOR'S COST AND WILL NOT BE MEASURED FOR PAYMENT.

**7 D5 BRICK SIDEWALK DETAIL (NEW OR RECONSTRUCT)**  
NOT TO SCALE



**NOTES:**

- THE LENGTH OF THE TAPER MAY BE ADJUSTED AS ORDERED TO PROVIDE FOR VARYING FIELD CONDITIONS OR CHANGES IN SINGLE COURSE DEPTH.

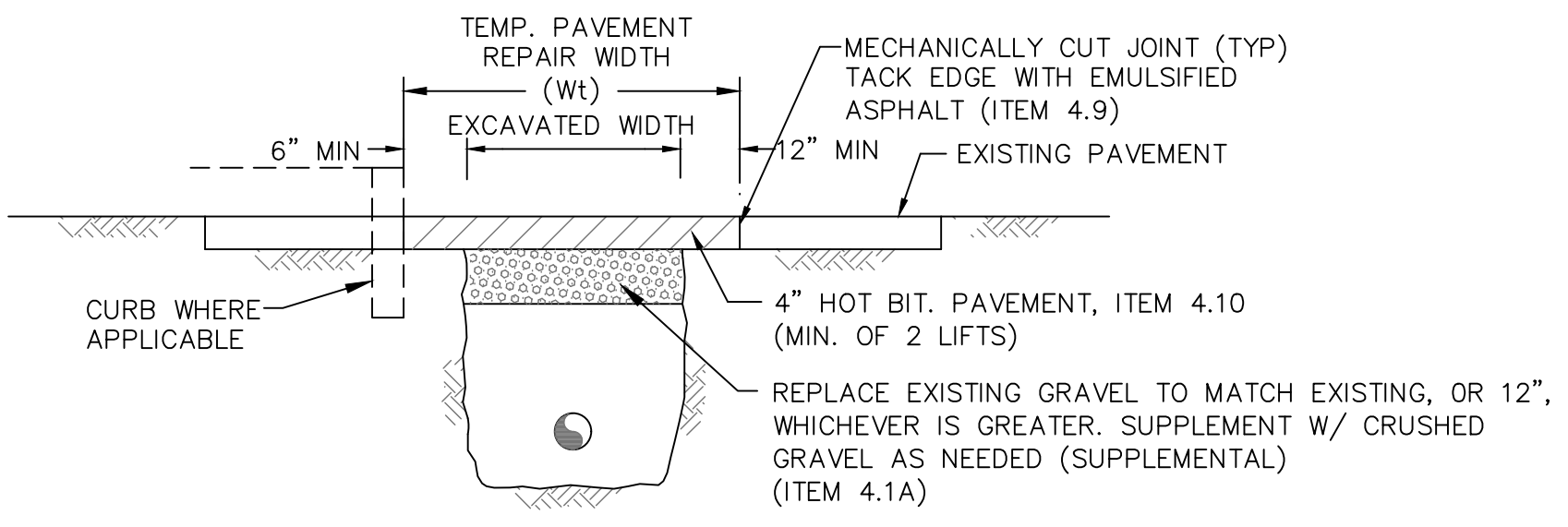
**8 D5 OVERLAY PAVEMENT MATCH**  
NOT TO SCALE

**MINIMUM TRENCH PAVEMENT WIDTHS**

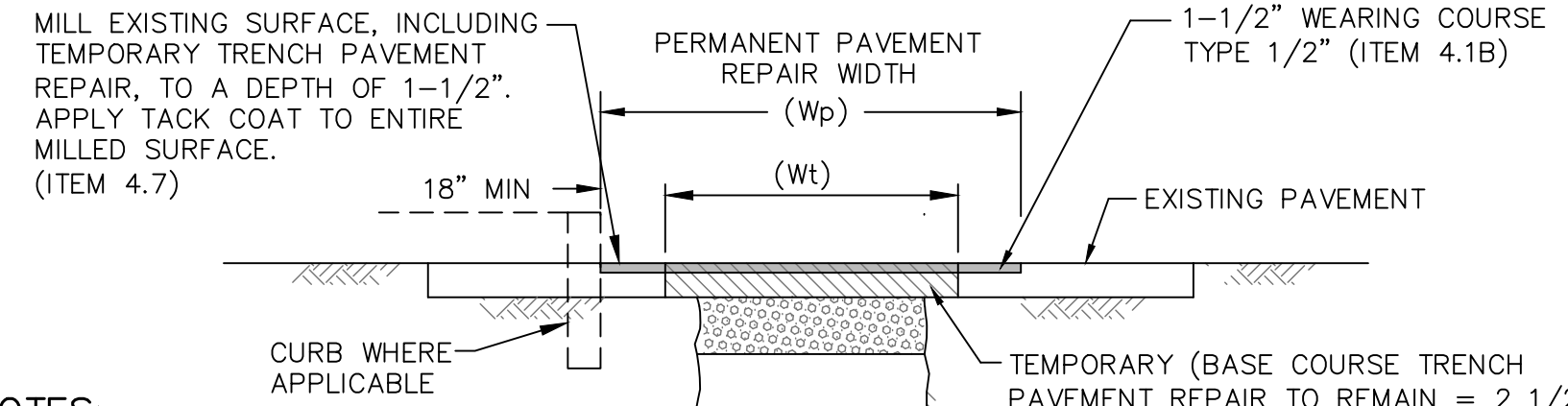
| PIPE I.D.    | Wt (INCHES) | Wp (INCHES) |
|--------------|-------------|-------------|
| 1-21 INCHES  | 84          | 108         |
| 24-30 INCHES | 96          | 120         |
| > 30 INCHES  | 108         | 132         |

**NOTE:**

THE DIMENSIONS SHOWN SHALL BE CONSIDERED MAXIMUM PAVEMENT PAYMENT WIDTHS FOR 0-10' DEEP CONSTRUCTION. Wt AND Wp SHALL BE INCREASED BY 4'-0" FOR TRENCHES 10' TO 15' AND BY 8'-0" FOR TRENCHES 15' TO 20' IN DEPTH.



**2 D-5 TEMPORARY TRENCH PAVEMENT REPAIR**  
NOT TO SCALE



**NOTES:**

1. ALL PAVEMENT REMOVAL SHALL BE PRECEDED BY MACHINE CUTTING.
2. ALL TEMPORARY, DAMAGED OR DEFECTIVE PAVEMENT SHALL BE REMOVED PRIOR TO PLACEMENT OF PERMANENT TRENCH REPAIRS.
3. SEE TABLE IN "TEMPORARY TRENCH PAVEMENT REPAIRS" FOR MINIMUM TRENCH WIDTHS.

**3 D-5 PERMANENT TRENCH PAVEMENT REPAIR**  
NOT TO SCALE

|                   |                  |                  |
|-------------------|------------------|------------------|
| ISSUE FOR BIDDING | By               | Date             |
| CONSTRUCTION      | By               | Date             |
| RECORD DRAWING    | By               | Date             |
| REVISIONS         | APP'D            |                  |
| NO.               |                  |                  |
| Drawn/Chk. RMG    | Designed PDM     | Checked          |
| Approved          | Date APRIL 2024  | Project No. 2552 |
| Book No.          | Dwg. ID 2542.dwg | Scale            |

**UNDERWOOD engineers**

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Tel. 603-436-6192 Fax. 603-431-4733

**ROADWAY AND SIDEWALK DETAILS**

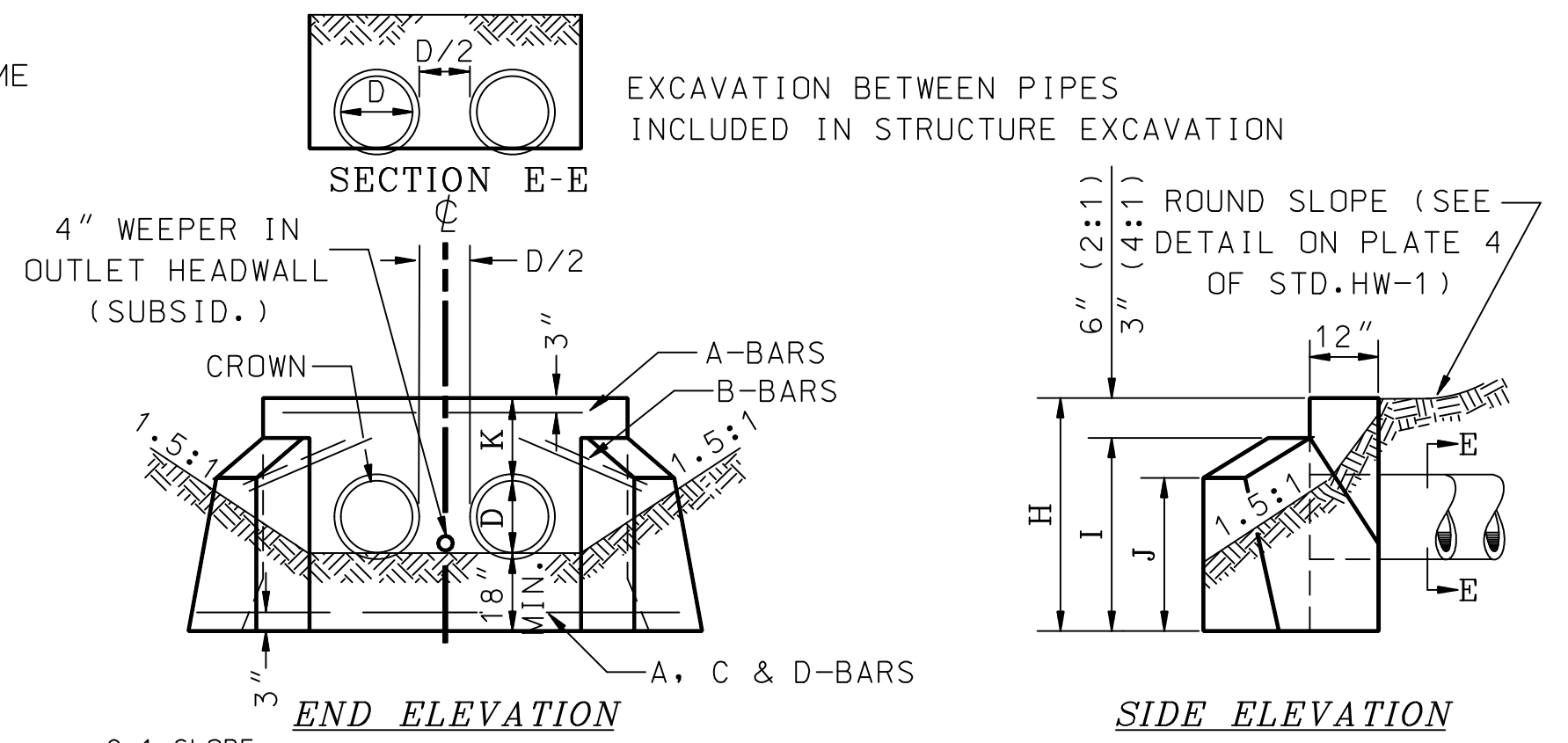
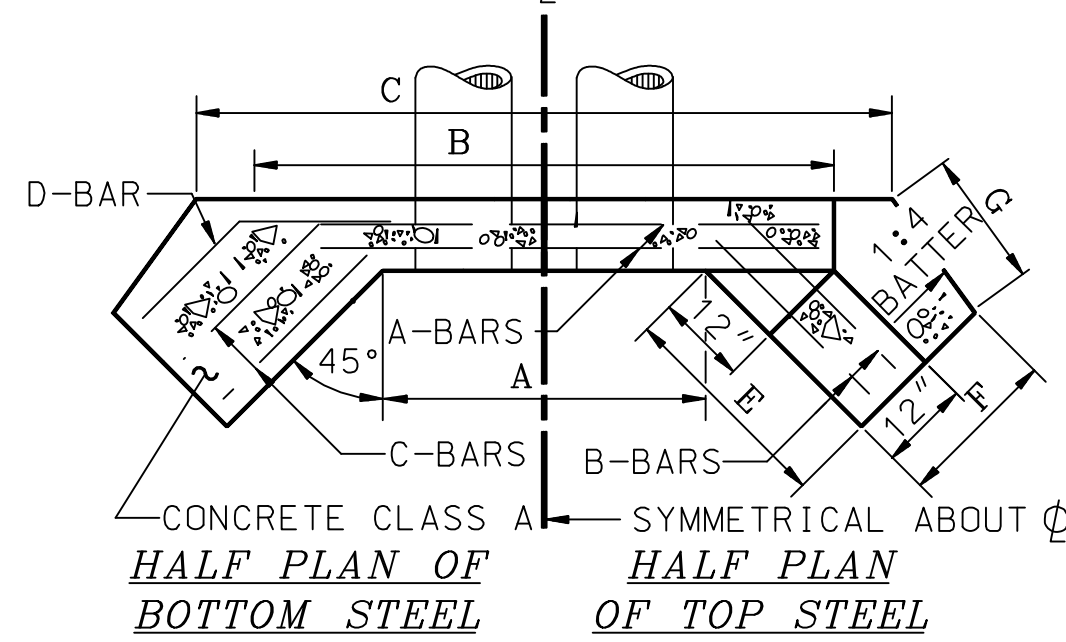
**MAPLEWOOD AVE DRAINAGE IMPROVEMENTS**

**CITY OF PORTSMOUTH**

**PORTSMOUTH, NEW HAMPSHIRE**

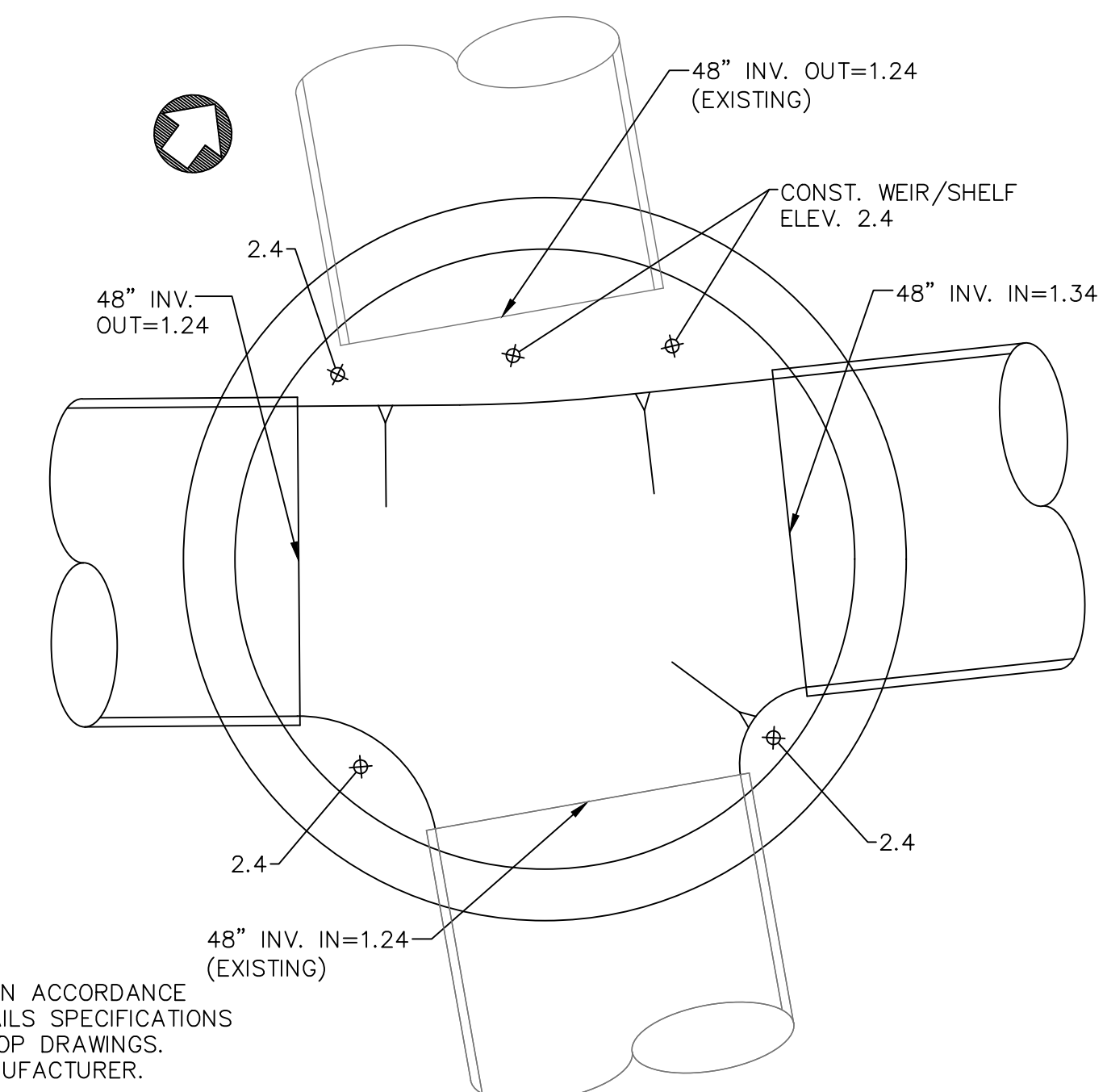
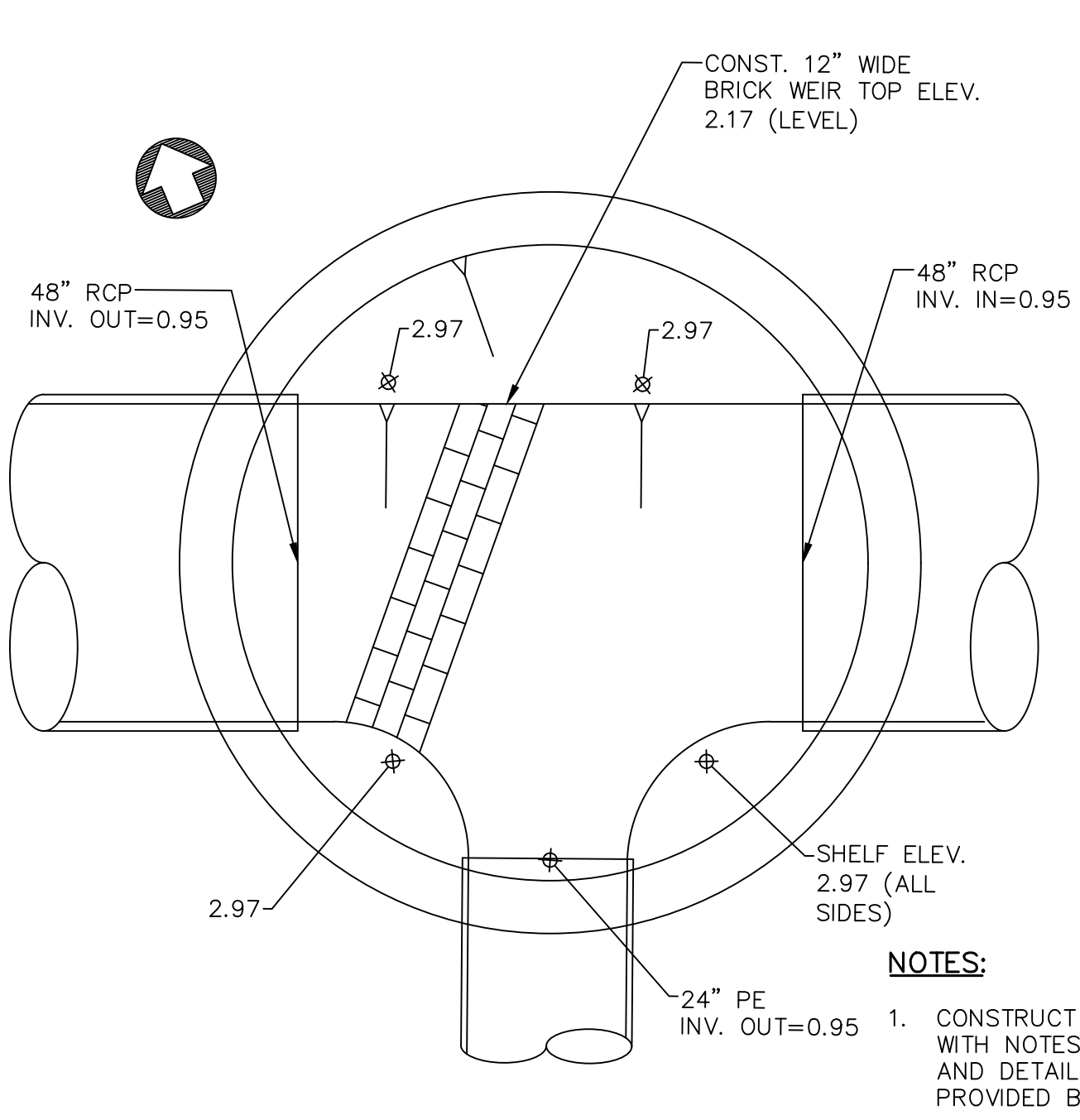
|        |          |
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| DWG NO | SHEET    |
| D5     | 14 OF 17 |

NOTE:  
ALL LIKE BARS IN EACH HEADWALL ARE THE SAME SIZE. EACH STD. HEADER HAS 4 A, B & C-BARS, AND 2 D-BARS.



| DIA. D INCHES | QUANTITIES PER HEADER |           |                           | DIMENSIONS |        |        |       |        |       |       |       |        |       |       | REINFORCING STEEL |        |        |        |        |            |       |   |   |  |  |
|---------------|-----------------------|-----------|---------------------------|------------|--------|--------|-------|--------|-------|-------|-------|--------|-------|-------|-------------------|--------|--------|--------|--------|------------|-------|---|---|--|--|
|               | CONC. CU. YD.         | STEEL LB. | EXC. FOR 1' DEPTH CU. YD. | A          | B      | C      | E     | F      | G     | H     | I     | J      | K     | D/2   | SIZE              | LENGTH |        |        |        | D-BARS, D1 |       |   |   |  |  |
|               |                       |           |                           | 8'-0"      | 8'-10" | 10'-0" | 3'-0" | 1'-11" | 2'-3" | 5'-0" | 4'-6" | 3'-10" | 1'-6" | 1'-0" |                   | #4     | A BARS | B BARS | C BARS | D BARS     | a     | b | c |  |  |
| 24            | 2.44                  | 46        | 1.96                      | 6'-0"      | 8'-10" | 10'-0" | 3'-0" | 1'-11" | 2'-3" | 5'-0" | 4'-6" | 3'-10" | 1'-6" | 1'-0" | #4                | 8'-6"  | 3'-2"  | 3'-0"  | 4'-8"  | 2'-5"      | 2'-3" |   |   |  |  |
| 30            | 3.18                  | 53        | 2.28                      | 7-5        | 10-3   | 11-9   | 3-7   | 2-0    | 2-9   | 5-6   | 5-0   | 4-1    | 1-6   | 1-3   | #4                | 9-11   | 3-9    | 3-7    | 5-3    | 2-6        | 2-9   |   |   |  |  |
| 36            | 3.99                  | 61        | 2.69                      | 8-10       | 11-8   | 13-7   | 4-2   | 2-1    | 3-3   | 6-0   | 5-6   | 4-4    | 1-6   | 1-6   | #4                | 11-4   | 4-3    | 4-1    | 5-10   | 2-8        | 3-2   |   |   |  |  |
| 42            | 5.43                  | 161       | 3.22                      | 10-3       | 13-1   | 15-6   | 5-1   | 2-2    | 4-0   | 6-9   | 6-3   | 4-10   | 1-9   | 1-9   | #6                | 12-9   | 5-3    | 4-11   | 7-10   | 3-10       | 4-0   |   |   |  |  |
| 48            | 6.53                  | 180       | 3.64                      | 11-8       | 14-6   | 17-3   | 5-9   | 2-3    | 4-6   | 7-3   | 6-9   | 5-1    | 1-9   | 2-0   | #6                | 14-2   | 5-11   | 5-7    | 8-5    | 3-10       | 4-7   |   |   |  |  |
| 54            | 7.76                  | 197       | 4.00                      | 13-1       | 15-11  | 19-1   | 6-4   | 2-4    | 5-0   | 7-9   | 7-3   | 5-4    | 1-9   | 2-3   | #6                | 15-7   | 6-7    | 6-1    | 9-2    | 4-1        | 5-1   |   |   |  |  |
| 60            | 9.10                  | 214       | 4.45                      | 14-6       | 17-4   | 20-10  | 6-11  | 2-5    | 5-6   | 8-3   | 7-9   | 5-8    | 1-9   | 2-6   | #6                | 17-0   | 7-1    | 6-8    | 9-9    | 4-1        | 5-8   |   |   |  |  |
| 66            | 10.56                 | 232       | 4.84                      | 15-11      | 18-9   | 22-5   | 7-6   | 2-6    | 6-0   | 8-9   | 8-3   | 5-11   | 1-9   | 2-9   | #6                | 18-5   | 7-8    | 7-3    | 10-5   | 4-2        | 6-3   |   |   |  |  |
| 72            | 12.28                 | 249       | 5.25                      | 17-4       | 20-2   | 24-2   | 8-2   | 2-7    | 6-6   | 9-3   | 8-9   | 6-3    | 1-9   | 3-0   | #6                | 19-10  | 8-3    | 7-10   | 11-0   | 4-3        | 6-9   |   |   |  |  |

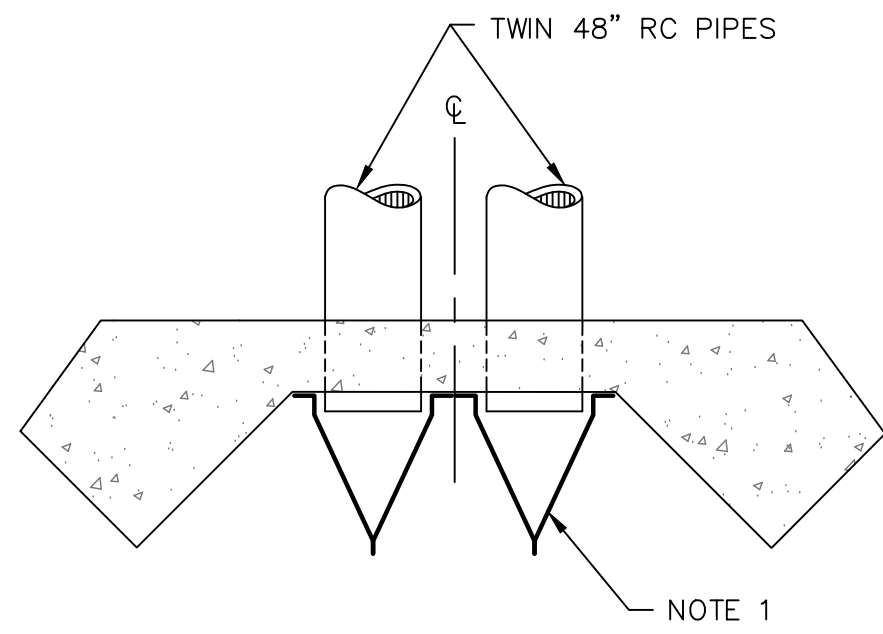
| DIA. D INCHES | QUANTITIES PER HEADER |           |                           | DIMENSIONS |        |        |        |        |       |       |       |       |       |       | REINFORCING STEEL |         |         |        |        |            |       |   |   |  |  |
|---------------|-----------------------|-----------|---------------------------|------------|--------|--------|--------|--------|-------|-------|-------|-------|-------|-------|-------------------|---------|---------|--------|--------|------------|-------|---|---|--|--|
|               | CONC. CU. YD.         | STEEL LB. | EXC. FOR 1' DEPTH CU. YD. | A          | B      | C      | E      | F      | G     | H     | I     | J     | K     | D/2   | SIZE              | LENGTH  |         |        |        | D-BARS, D1 |       |   |   |  |  |
|               |                       |           |                           | 8'-0"      | 8'-10" | 10'-0" | 3'-11" | 2'-1"  | 3'-2" | 5'-0" | 4'-9" | 4'-3" | 1'-6" | 1'-0" |                   | #4      | A BARS  | B BARS | C BARS | D BARS     | a     | b | c |  |  |
| 24            | 3.05                  | 53        | 2.29                      | 6'-0"      | 8'-10" | 10'-0" | 3'-11" | 2'-1"  | 3'-2" | 5'-0" | 4'-9" | 4'-3" | 1'-6" | 1'-0" | #4                | 8'-6"   | 4'-3"   | 4'-0"  | 5'-6"  | 2'-6"      | 3'-0" |   |   |  |  |
| 30            | 3.92                  | 61        | 2.70                      | 7-5        | 10-3   | 11-9   | 4-8    | 2-2    | 3-9   | 5-6   | 5-3   | 4-7   | 1-6   | 1-3   | #4                | 9-11    | 5-0     | 4-8    | 6-3    | 2-8        | 3-7   |   |   |  |  |
| 36            | 5.09                  | 70        | 3.15                      | 8-10       | 11-8   | 13-7   | 5-5    | 2-3    | 4-5   | 6-0   | 5-9   | 5-0   | 1-6   | 1-6   | #4                | 11-4    | 5-9     | 5-4    | 7-1    | 2-10       | 4-3   |   |   |  |  |
| 42            | 6.97                  | 185       | 3.78                      | 10-3       | 13-1   | 15-6   | 6-7    | 2-5    | 5-4   | 6-9   | 6-6   | 5-6   | 1-9   | 1-9   | #6                | 12-9    | 6-11    | 6-5    | 9-3    | 4-0        | 5-3   |   |   |  |  |
| 48            | 8.44                  | 204       | 4.24                      | 11-8       | 14-6   | 17-3   | 7-4    | 2-6    | 6-0   | 7-3   | 7-0   | 5-11  | 1-9   | 2-0   | #6                | 14-2    | 7-8     | 7-1    | 10-1   | 4-2        | 5-11  |   |   |  |  |
| 54            | 10.13                 | 225       | 4.74                      | 13-1       | 15-11  | 19-1   | 8-2    | 2-7    | 6-9   | 7-9   | 7-6   | 6-3   | 1-9   | 2-3   | #6                | 15-7    | 8-6     | 7-10   | 10-11  | 4-3        | 6-8   |   |   |  |  |
| 60            | 11.90                 | 245       | 5.23                      | 14-6       | 17-4   | 20-10  | 8-11   | 2-8    | 7-4   | 8-3   | 8-0   | 6-7   | 1-9   | 2-6   | #6                | 17-0    | 9-3     | 8-8    | 11-9   | 4-4        | 7-5   |   |   |  |  |
| 66            | 13.87                 | 266       | 5.75                      | 15-11      | 18-9   | 22-5   | 9-8    | 2-9    | 8-0   | 8-9   | 8-6   | 7-0   | 1-9   | 2-9   | #6                | 18-5    | 10-0    | 9-5    | 12-8   | 4-7        | 8-1   |   |   |  |  |
| 72            | 16.13                 | 283       | 6.29                      | 17-4       | 20-2   | 24-2   | 10'-6" | 2'-10" | 8'-8" | 9'-3" | 9'-0" | 7'-4" | 1'-9" | 3'-0" | #6                | 19'-10" | 10'-10" | 9'-9"  | 13'-5" | 4'-8"      | 8'-9" |   |   |  |  |



NOTES:

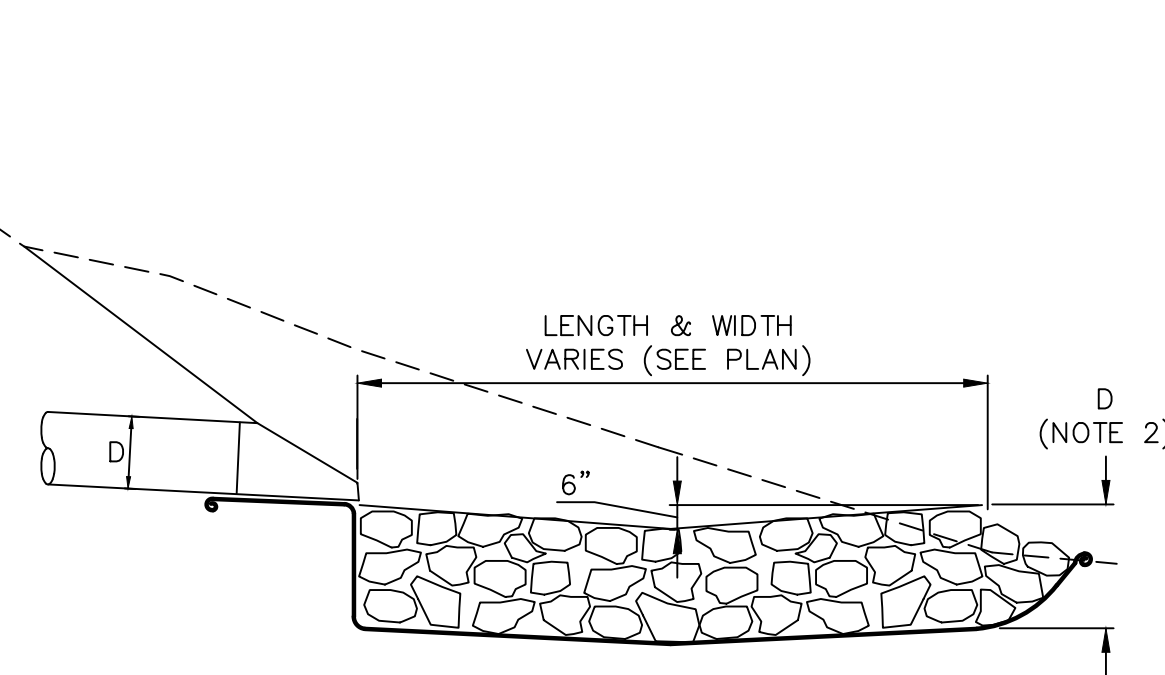
- CONSTRUCT DMH IN ACCORDANCE WITH NOTES, DETAILS SPECIFICATIONS AND DETAILED SHOP DRAWINGS. PROVIDED BY MANUFACTURER.
- FORM BRICK CHANNEL TO SPRING LINE AND CONSTRUCT SHELF TO ELEVATIONS PROVIDED.
- CONST. BRICK WEIR OR REMOVABLE PLATE WEIR TO ELEVATION PROVIDED.

1 CONCRETE HEADWALLS WITH 45° WINGS FOR TWIN R.C. PIPE (48" DIA. W/4:1 SLOPE) NOT TO SCALE



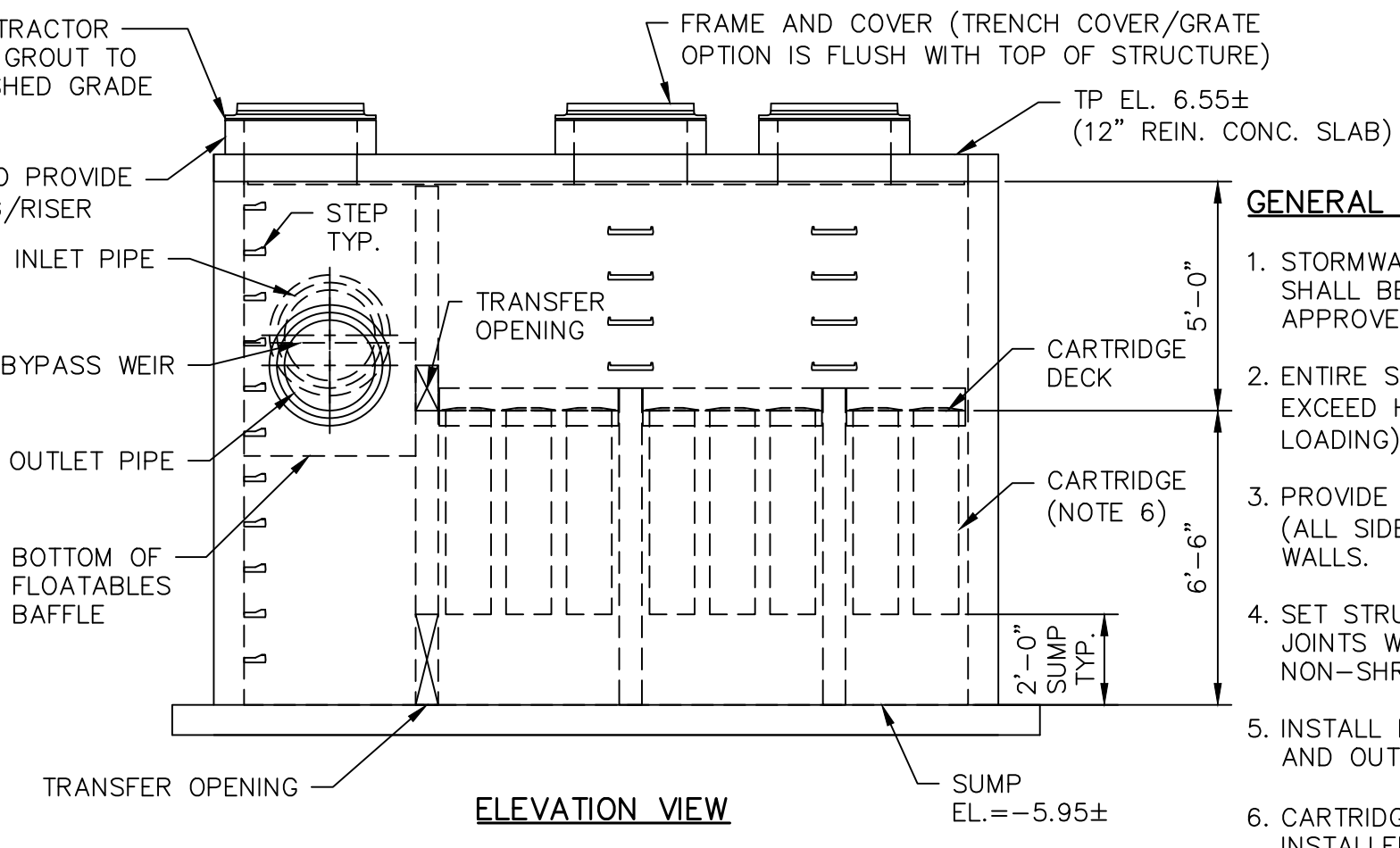
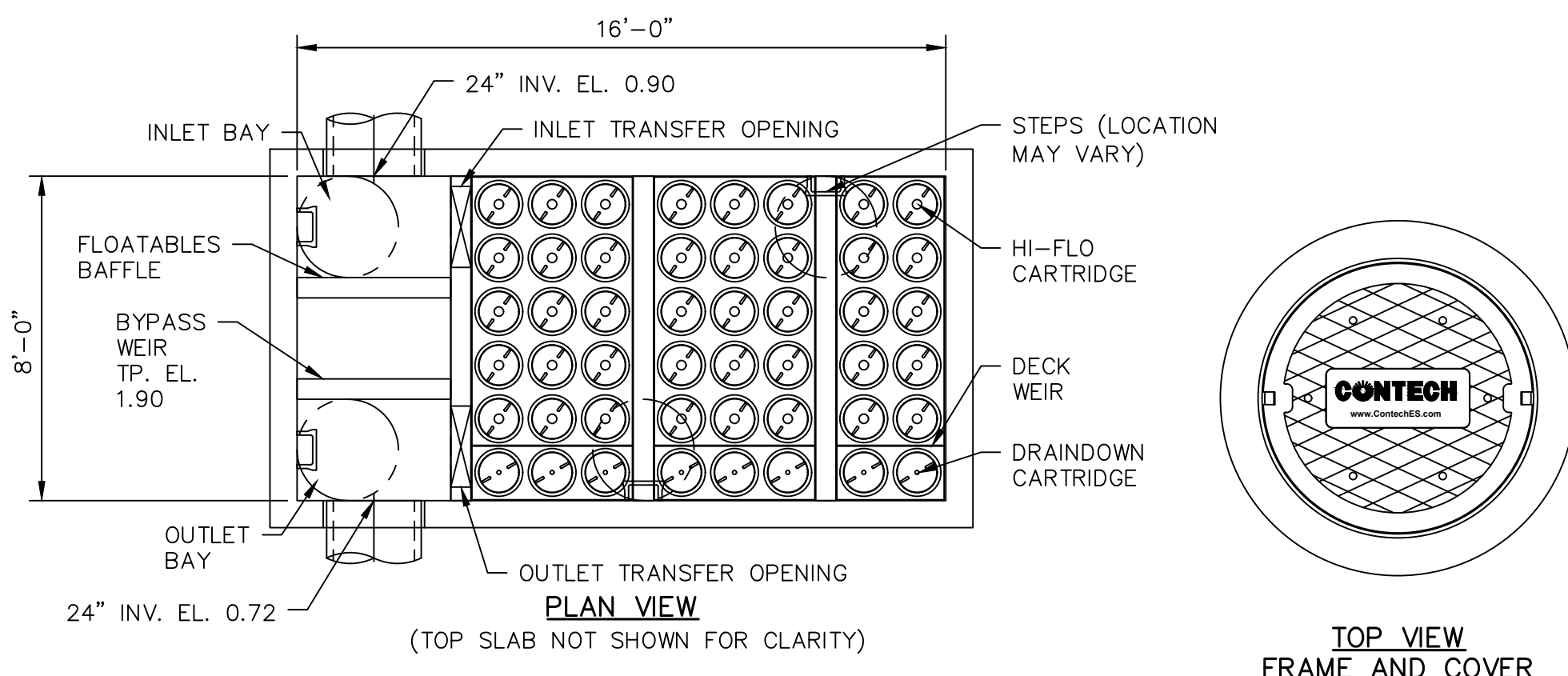
- NOTES:
- TIDE VALVES SHALL BE TIDE FLEX TF-1 OR APPROVED EQUAL. ATTACH DIRECTLY TO HEADWALL USING THIMBLE PLATE IN ACCORDANCE WITH MANUFACTURERS SPECIFICATIONS. PROVIDE THIMBLE PLATE INSTALLATION DETAILS OR RECOMMENDED ALTERNATIVE. THE TIDE VALVES WILL BE MOUNTED TO THE HEADWALL

2 TIDE VALVE DETAIL NOT TO SCALE

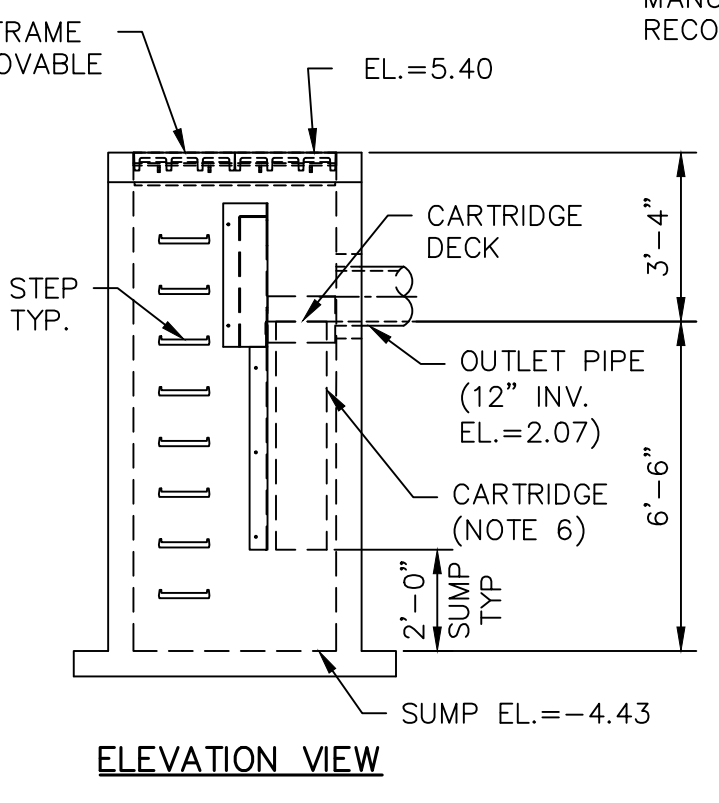
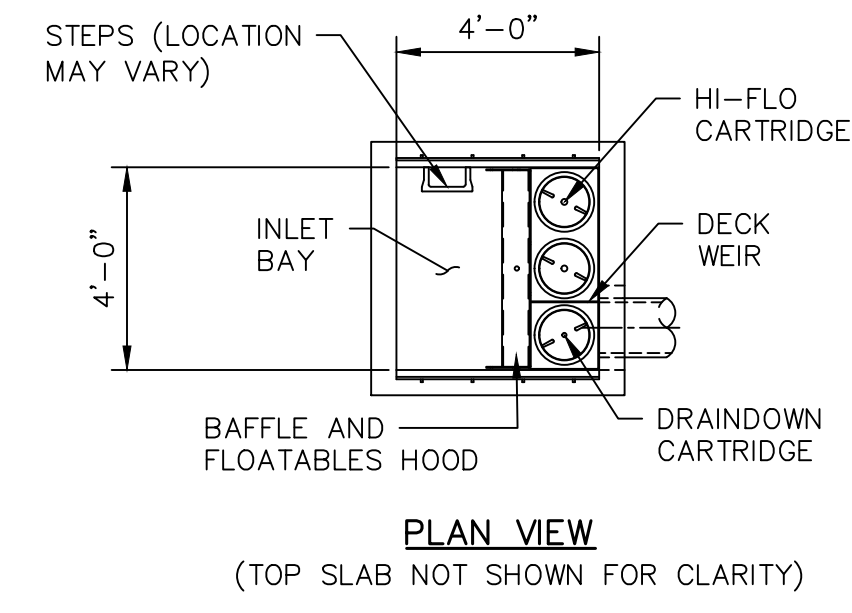


- CONSTRUCTION SPECIFICATIONS:
- THE SUBGRADE FOR THE GEOTEXTILE FABRIC AND STONE FILL SHALL BE PREPARED TO LINES AND GRADES SHOWN ON THE PLANS.
  - GRADATION: CLASS B STONE CONFORMING TO 585.2.1.2 SHALL BE USED. DEPTH OF STONE SHALL BE 18".
  - GEOTEXTILE FABRICS SHALL BE PROTECTED FROM PUNCTURE OR TEARING DURING THE PLACEMENT OF THE RIPRAP. DAMAGED AREAS IN THE FABRIC SHALL BE REPAIRED BY PLACING A PIECE OF FABRIC OVER THE DAMAGED AREA OR BY COMPLETE REPLACEMENT OF THE FABRIC. ALL OVERLAPS REQUIRED FOR REPAIRS OR JOINING TWO PIECES OF FABRIC SHALL BE A MINIMUM OF 18 INCHES.
  - THE RIPRAP MAY BE PLACED BY EQUIPMENT AND SHALL BE CONSTRUCTED TO THE FULL LAYER THICKNESS IN ONE OPERATION AND IN SUCH A MANNER AS TO PREVENT SEGREGATION OF THE STONE SIZES.
  - CONSTRUCT FLARED END SECTIONS (OR HEADWALLS) AS SHOWN ON THE PLANS. MATERIALS AND SIZES SHALL BE CONSISTENT WITH NHDOT STANDARD DETAILS.

6 STABILIZED DRAIN OUTLET NOT TO SCALE



4 JELLYFISH (JFPD0816) DETAILS NOT TO SCALE



7 JELLYFISH (JFSI0404) DETAILS NOT TO SCALE

- GENERAL NOTES:
- STORMWATER TREATMENT STRUCTURE SHALL BE PROVIDED BY CONTECH OR APPROVED EQUIVALENT.
  - ENTIRE STRUCTURE SHALL MEET OR EXCEED HS-20 RATING (HEAVY LOADING).
  - PROVIDE ANTI-FLOTATION COLLARS (ALL SIDES), TO EXTEND 12" BEYOND WALLS.
  - SET STRUCTURE LEVEL. SEAL ALL JOINTS WITH APPROVED SEALANT OR NON-SHRINK GROUT.
  - INSTALL FLEXIBLE BOOT AT INLET AND OUTLET.
  - CARTRIDGE LENGTH SHALL BE 54", INSTALLED IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS.

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|                |       |      |
|----------------|-------|------|
| ISSUE FOR      | By    | Date |
| BIDDING        |       |      |
| CONSTRUCTION   |       |      |
| RECORD DRAWING |       |      |
| REVISIONS      |       |      |
| NO.            | APP'D |      |

Drawn/Chk. RMG  
Designed PDM  
Checked  
Approved  
Date APRIL 2024

Book No. 2552  
Project No. 2552  
Dwg. ID 252\_details\_M  
Scale

**UNDERWOOD** engineers  
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**DRAINAGE OUTFALL DETAILS**  
**MAPLEWOOD AVE DRAINAGE IMPROVEMENTS**  
**CITY OF PORTSMOUTH**  
**PORTSMOUTH, NEW HAMPSHIRE**

DWG NO D6 SHEET 15 OF 17







