85 Devonshire Street, 3rd Floor, Boston, MA 02109
Tel: 617.412.4480

Wayland- Loker Conservation and Recreation Area
WSE Project No. 2180076.C.2

August 16, 2018

Wayland Conservation Commission
41 Cochituate Road
Wayland, MA 01778

*Re: Response to Comments*
*Loker Conservation and Recreation Area NOI*
*Wayland, MA*

Dear Members of the Commission:

On August 3, 2018, the Wayland Conservation Commission held a public meeting to discuss the Loker Conservation and Recreation Area Notice of Intent (NOI) submittal. This letter is in response to questions/comments posed by the Conservation Commission and received via email prior to the meeting and received during the meeting itself. Each comment is provided below, with a response.

Comment 1: Commission's plan as discussed at last meeting was to have site visit before considering Loker application. What happened to/when is site visit?

Weston & Sampson Response: The site visit occurred on August 1, 2018.

Comment 2: Why is there only an NOI and Chapter 193 application but no Chapter 194 application? On p. 1 of NOI submittal Weston & Sampson states that what is submitted complies with Wayland requirements? Commission requires a completed/signed c 194 application.

Weston & Sampson Response: The Chapter 194 application has been provided.

Comment 3: At June 23? site visit with Weston and Sampson, Gene said he would stake conservation land closest to field. He also said he would look into previous dumping by Dow in area of expanded parking lot. Will/has this been done?

Weston & Sampson Response: The limits of the field were flagged as they relate to the adjacent Conservation Land prior to the June 23, 2018 site visit. Weston & Sampson also investigated the previous dumping areas by Dow (located outside the work area) and performed an Environmental Assessment Report dated April 4, 2018 which noted there are apparent no conflicts or impacts as it relates to the proposed project.

Comment 4: How does this wetland delineation compare with previous one?

Weston & Sampson Response: Weston & Sampson is not in possession of the previous wetland delineation plans or reports for this site. We are assuming the Conservation Commission will be comparing the wetland delineation boundaries to determine any variations between current delineations and prior delineations completed by others.

Comment 5: Re this wetland delineation should the Commission determine whether the streams are intermittent as stated or perennial? Would the project be affected if the stream(s) are perennial under the bylaw? (If there's a

bylaw application there are required procedures under c 194 for the Applicant to rebut the presumption that the stream is perennial.) (page 192 of submittal)

**Weston & Sampson Response:** The underground culvert system that serves as an outlet from North Pond and daylights in the uphill gradient of South Pond is greater than 200 feet in length. Per 310 CMR 10.58(2) "Where a river runs through a culvert more than 200 feet in length, the riverfront area stops at a perpendicular line at the upstream end of the culvert and resumes at the downstream end." As such, this waterbody within the culvert does not have a 200-foot riverfront area associated with it.

**Comment 6:** These boring reports are labelled WHS Athletic Facilities as are some of the plans! This needs to be corrected (pages 43-59 of submittal). Loker and the WHS are obviously separate projects.

**Weston & Sampson Response:** The boring report has been updated to reference the Loker project. An updated report has been provided in Appendix.

**Comment 7:** Are borings acceptable if done in March?

**Weston & Sampson Response:** Yes.

**Comment 8:** What does auger refusal due to possible bedrock (granite) at various depths - starting at 4.8' (TP-4) - mean for groundwater/stormwater? Isn't this why drilling private irrigation well at Loker was contraindicated?

**Weston & Sampson Response:** Proposed improvements are anticipated to be above the identified auger refusal depths. The stormwater system design below the field and parking area considered and accounted for the refusal depths.

The athletic field has an expansive stormwater collection system located below the field itself with an engineered drainage stone stormwater storage "zone", including perforated lateral flat drains and a perforated perimeter collection pipe system. The purpose of the drainage stone and subsurface drains and pipes is to collect and retain stormwater that infiltrates through the field surface, depending on the size of the storm event prior to infiltrating in a natural manner into the subsurface materials below the field. The lateral drains and collector pipe serve as a controlled "relief valve" to the natural infiltration of the stormwater should the stormwater not be allowed to infiltrate due to refusal. The lateral drains and collector pipes will allow for the water to be collected within the stone drainage area with a controlled release at an adjacent outlet structure.

The proposed stormwater design below the parking area is a chamber system that serves as an underground stormwater retention system. The chamber system will collect and hold the water of a stormwater event while infiltrating into the natural ground surface below. Should the storm event exceed the capacity of the chambers or there be refusal that does not allow for natural infiltration, there is an outlet from the chamber system that will divert the stormwater into a drain manhole and the overall piped stormwater system.

**Comment 9:** What is "grassed/landscaped areas" (on one plan in blue) cutting through 50' Conservation land from Rice Rd? Also, on permitting plans although plans do not indicate its conservation land. This intrusion onto/through conservation land needs to be clarified.

**Weston & Sampson Response:** The work identified as grassed/landscaped areas on the plans, particularly within the 50' Conservation Area adjacent to Rice Road represents the ground area to be restored following the removal of the existing asphalt drive. The Permitting Plans identify the Conservation Land 50' Buffer Zone on Sheet L1.00 with the label "LIMITS OF PROPERTY DESIGNATED FOR RECREATIONAL USE".

Comment 10: The "Town" will be responsible for implementing Stormwater O&M (Attachment F) - who specifically? Is it "Municipal Services Department" - DPW? - noted in Attachment H, O&M Plan? Or Ben Keefe, NOI Applicant?

Weston & Sampson Response: The Town of Wayland DPW is responsible for implementing the Stormwater O&M Plan as they maintain the Loker property currently.

Comment 11: "Salt" or calcium chloride for de-icing? (Attachment F)

Weston & Sampson Response: As related to the O&M plan of the paved and parking areas, Weston & Sampson has been made aware that the Town of Wayland DPW currently does not maintain the Loker property in the winter months which includes any time following a snow fall event. Therefore, the expectation is that there will not be a need for "salt" or calcium chloride for de-icing. The anticipated recreational activity schedule aligns with this expectation as no activities will be programmed during winter months typically. Weston & Sampson has updated Attachment F accordingly.

Comment 12: Under what conditions can engineer approve work in undisturbed wetland area (Attachment G, Section 2.1)?

Weston & Sampson Response: No unauthorized work in the wetland resource area will be allowed without specific approval from the Conservation Commission.

Comment 13: Allowing storage of excavated materials within buffer - 50' of wetlands? (Attachment G, Section 2.4)

Weston & Sampson Response: Should it be necessary to store excavated materials between the 30 foot No Disturb Zone (NDZ) and the 100' wetland buffer zone, approved erosion controls methods (i.e. compost filter tubes or approved equal) will be put in place to protect resource areas and all storage areas will be fully restored to conditions called for on the plans.

Comment 14: Daily monitoring SHALL not SHOULD be conducted (Attachment G, Section 2.7).

Weston & Sampson Response: Attachment G, Section 2.7 the word should has been changed to shall.

Comment 15: Regular fueling and service of the equipment SHALL NOT be performed...Repair of equipment SHALL NOT be allowed in any event within 100' of wetlands (Attachment G, Section 2.10).

Weston & Sampson Response: Attachment G, Section 2.7 has been amended to include: "Regular fueling and service of the equipment shall not be performed.

Comment 16: Sediment SHALL be removed pursuant to DEP guidelines not whenever "Engineer deems it necessary" (Attachment G, Section 7).

Weston & Sampson Response: Attachment G, Section 7 has been amended to indicate that "sediment shall be removed pursuant of DEP guidelines".

Comment 17: Is street sweeping (Attachment H, Section 4.1) "monthly" or "primarily in the spring and fall" (page 1 of checklist)?

Weston & Sampson Response: Street sweeping is primarily on a spring and fall season schedule per the Town of Wayland DPW.

Comment 18: Chambers SHALL not SHOULD be inspected every six months (page 3 of checklist)

**Weston & Sampson Response:** Page 3 of checklist has been amended to reflect the word "SHALL" in lieu of "SHOULD".

**Comment 19:** Part 3-EXECUTION, Section 3.04, page 01570-2, Contractor SHALL NOT not SHALL MAKE EVERY EFFORT to minimize disturbance... (page 152 of submittal)

**Weston & Sampson Response:** Part 3-EXECUTION, Section 3.04, page 01570-2 has been amended to include the word "SHALL" minimize disturbance.

**Comment 20:** Part 3-EXECUTION, Section 3.07, page 01570-3, if damaged trees are removed will they be replaced? (page 153 of submittal)

**Weston & Sampson Response:** Any tree that is damaged and that is not intended to be removed as part of the construction of the project will be replaced at the contractor's own expense.

**Comment 21:** How will use of calcium chloride for dust control be restricted in resource areas?

**Weston & Sampson Response:** Calcium chloride use shall not be allowed for dust control within restricted resource areas.

**Comment 22:** Part 2, section 2.02 FERTILIZER, page 02677-2, is 10-6-8 fertilizer appropriate near resource areas? (page 159 of submittal)

**Weston & Sampson Response:** Part 2, Section 2.02 FERTILIZER, Page 02677-2 has been deleted from the O&M manual as the seeding of any "lawn" or grassed areas within the project area will be an approved wetland seed mix and it will therefor be recommended that no fertilizer be used. We have noted that the project area falls within the Charles River Watershed and no fertilizer is applied under current conditions.

**Comment 23:** Part 3, section 3.03 PLANTING SCHEDULE page 02677-6, there is required tree caliper in replanting schedule NOT saplings (page 163 of submittal). Also 310 F (page 165 of submittal).

**Weston & Sampson Response:** Any tree replacement or planting shall meet the Town of Wayland Conservation Commission's requirements included within Chapter 193 and Chapter 194. The Town of Wayland Recreation Department is seeking relief on the total number of trees that may be required by the Town bylaws.

**Comment 24:** Part 3, section 3.06 PLANTING SCHEDULE page 02677-6, what is the "moisture enhancer"? (page 164 of submittal).

**Weston & Sampson Response:** Moisture enhancer is organic material suitable within planting areas to assist in promoting growth of new plant material. Natural moisture enhancers include organic compost, peat moss, humus and manure.

**Comment 25:** Attachment A: Inventory -Buffer Area -Pursuant to Commission replacement schedule, tree removal of 24" and greater dbh trees is TBD by Commission (note 1 pinus strobus at 24.8" is in this category in addition to others noted). Are 7 new trees/1 removed tree of this size reasonable as proposed? (pages 9 and 181 of submittal).

**Weston & Sampson Response:** The quantity of 7 new trees is an assumption made by Weston & Sampson for any tree over 24-inches in diameter as the previous quantity required for the tree caliper less than 24" DBH is 5 new trees. This topic is open for discussion.

**Comment 26:** How was (inconsistent) proposed replacement of trees in Attachment B: Inventory-Wetland Upland Areas arrived at? (page 183-190 of submittal).

**Weston & Sampson Response:** Weston & Sampson, using the Town's guidelines for tree replacement and quality as determined by our certified arborist, followed similar guidelines and assumptions as described above in Comment 25. This topic is open for discussion and final decision by the Wayland Conservation Commission.

**Comment 27:** How high is proposed segmental block retaining wall around portions of field?

**Weston & Sampson Response:** The segmental block wall varied in height from a flush (0'-0") height to a maximum of two and half feet (2'-6").

**Comment 28**: How much fill is required for field construction?

**Weston & Sampson Response:** We anticipate a net cut (export) of material of 449 C.Y and anticipate this volume to remain on site for general infill. This overage is within an acceptable assumption volume as we anticipate having to fill voids from tree removal and the removal of other materials such as ledge or organic materials not suitable for construction purposes below pavements.

We thank you for your consideration of these matters.

Very truly yours,
WESTON & SAMPSON

Brandon Kunkel, RLA
Team Leader

Attachments
Revised Loker Stormwater Report
Revised Specification Section 01570, Environmental Protection

# Stormwater Report

Conservation Commission
Wayland, Massachusetts

## Loker Field Improvements

**Notice of Intent**
**Massachusetts Wetland Protection Act**
**M.G.L. c. 131 § 40**

July 11, 2018
*Revised August 2, 2018*

JOB NO: 2180076

Weston & Sampson
5 Centennial Drive
Peabody, MA 01960
www.westonandsampson.com
Tel: 978-532-1900 Fax: 978-977-0100

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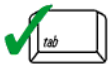
**Massachusetts Department of Environmental Protection**
Bureau of Resource Protection - Wetlands Program

# Checklist for Stormwater Report

## A. Introduction

**Important:** When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.





A Stormwater Report must be submitted with the Notice of Intent permit application to document compliance with the Stormwater Management Standards. The following checklist is NOT a substitute for the Stormwater Report (which should provide more substantive and detailed information) but is offered here as a tool to help the applicant organize their Stormwater Management documentation for their Report and for the reviewer to assess this information in a consistent format. As noted in the Checklist, the Stormwater Report must contain the engineering computations and supporting information set forth in Volume 3 of the Massachusetts Stormwater Handbook. The Stormwater Report must be prepared and certified by a Registered Professional Engineer (RPE) licensed in the Commonwealth.

The Stormwater Report must include:

- The Stormwater Checklist completed and stamped by a Registered Professional Engineer (see page 2) that certifies that the Stormwater Report contains all required submittals.[1] This Checklist is to be used as the cover for the completed Stormwater Report.
- Applicant/Project Name
- Project Address
- Name of Firm and Registered Professional Engineer that prepared the Report
- Long-Term Pollution Prevention Plan required by Standards 4-6
- Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan required by Standard 8[2]
- Operation and Maintenance Plan required by Standard 9

In addition to all plans and supporting information, the Stormwater Report must include a brief narrative describing stormwater management practices, including environmentally sensitive site design and LID techniques, along with a diagram depicting runoff through the proposed BMP treatment train. Plans are required to show existing and proposed conditions, identify all wetland resource areas, NRCS soil types, critical areas, Land Uses with Higher Potential Pollutant Loads (LUHPPL), and any areas on the site where infiltration rate is greater than 2.4 inches per hour. The Plans shall identify the drainage areas for both existing and proposed conditions at a scale that enables verification of supporting calculations.

As noted in the Checklist, the Stormwater Management Report shall document compliance with each of the Stormwater Management Standards as provided in the Massachusetts Stormwater Handbook. The soils evaluation and calculations shall be done using the methodologies set forth in Volume 3 of the Massachusetts Stormwater Handbook.

To ensure that the Stormwater Report is complete, applicants are required to fill in the Stormwater Report Checklist by checking the box to indicate that the specified information has been included in the Stormwater Report. If any of the information specified in the checklist has not been submitted, the applicant must provide an explanation. The completed Stormwater Report Checklist and Certification must be submitted with the Stormwater Report.

[1] The Stormwater Report may also include the Illicit Discharge Compliance Statement required by Standard 10. If not included in the Stormwater Report, the Illicit Discharge Compliance Statement must be submitted prior to the discharge of stormwater runoff to the post-construction best management practices.

[2] For some complex projects, it may not be possible to include the Construction Period Erosion and Sedimentation Control Plan in the Stormwater Report. In that event, the issuing authority has the discretion to issue an Order of Conditions that approves the project and includes a condition requiring the proponent to submit the Construction Period Erosion and Sedimentation Control Plan before commencing any land disturbance activity on the site.

**Massachusetts Department of Environmental Protection**
Bureau of Resource Protection - Wetlands Program

# Checklist for Stormwater Report

## B. Stormwater Checklist and Certification

The following checklist is intended to serve as a guide for applicants as to the elements that ordinarily need to be addressed in a complete Stormwater Report. The checklist is also intended to provide conservation commissions and other reviewing authorities with a summary of the components necessary for a comprehensive Stormwater Report that addresses the ten Stormwater Standards.

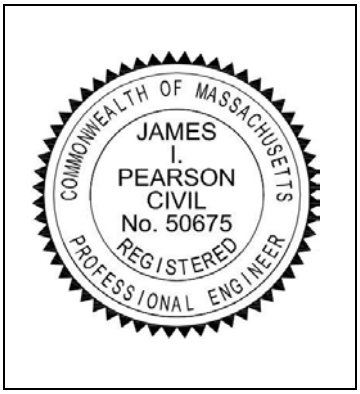
*Note:* Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the item is not applicable (N.A.) and provide the reasons for that determination.

A complete checklist must include the Certification set forth below signed by the Registered Professional Engineer who prepared the Stormwater Report.

## Registered Professional Engineer's Certification

I have reviewed the Stormwater Report, including the soil evaluation, computations, Long-term Pollution Prevention Plan, the Construction Period Erosion and Sedimentation Control Plan (if included), the Long-term Post-Construction Operation and Maintenance Plan, the Illicit Discharge Compliance Statement (if included) and the plans showing the stormwater management system, and have determined that they have been prepared in accordance with the requirements of the Stormwater Management Standards as further elaborated by the Massachusetts Stormwater Handbook. I have also determined that the information presented in the Stormwater Checklist is accurate and that the information presented in the Stormwater Report accurately reflects conditions at the site as of the date of this permit application.

Registered Professional Engineer Block and Signature




8/2/2018

Signature and Date

## Checklist

**Project Type:** Is the application for new development, redevelopment, or a mix of new and redevelopment?

☐ New development

☐ Redevelopment

☒ Mix of New Development and Redevelopment

# Checklist for Stormwater Report

## Checklist (continued)

**LID Measures:** Stormwater Standards require LID measures to be considered. Document what environmentally sensitive design and LID Techniques were considered during the planning and design of the project:

☒ No disturbance to any Wetland Resource Areas

☐ Site Design Practices (e.g. clustered development, reduced frontage setbacks)

☐ Reduced Impervious Area (Redevelopment Only)

☐ Minimizing disturbance to existing trees and shrubs

☐ LID Site Design Credit Requested:

- ☐ Credit 1
- ☐ Credit 2
- ☐ Credit 3

☐ Use of "country drainage" versus curb and gutter conveyance and pipe

☐ Bioretention Cells (includes Rain Gardens)

☐ Constructed Stormwater Wetlands (includes Gravel Wetlands designs)

☐ Treebox Filter

☐ Water Quality Swale

☐ Grass Channel

☐ Green Roof

☐ Other (describe): _____

**Standard 1: No New Untreated Discharges**

☐ No new untreated discharges

☐ Outlets have been designed so there is no erosion or scour to wetlands and waters of the Commonwealth

☒ Supporting calculations specified in Volume 3 of the Massachusetts Stormwater Handbook included.

# Checklist for Stormwater Report

## Checklist (continued)

**Standard 2: Peak Rate Attenuation**

☐ Standard 2 waiver requested because the project is located in land subject to coastal storm flowage and stormwater discharge is to a wetland subject to coastal flooding.

☐ Evaluation provided to determine whether off-site flooding increases during the 100-year 24-hour storm.

☒ Calculations provided to show that post-development peak discharge rates do not exceed pre-development rates for the 2-year and 10-year 24-hour storms. If evaluation shows that off-site flooding increases during the 100-year 24-hour storm, calculations are also provided to show that post-development peak discharge rates do not exceed pre-development rates for the 100-year 24-hour storm.

**Standard 3: Recharge**

☐ Soil Analysis provided.

☒ Required Recharge Volume calculation provided.

☐ Required Recharge volume reduced through use of the LID site Design Credits.

☒ Sizing the infiltration, BMPs is based on the following method: Check the method used.

☐ Static ☒ Simple Dynamic ☐ Dynamic Field[1]

☒ Runoff from all impervious areas at the site discharging to the infiltration BMP.

☐ Runoff from all impervious areas at the site is *not* discharging to the infiltration BMP and calculations are provided showing that the drainage area contributing runoff to the infiltration BMPs is sufficient to generate the required recharge volume.

☒ Recharge BMPs have been sized to infiltrate the Required Recharge Volume.

☐ Recharge BMPs have been sized to infiltrate the Required Recharge Volume *only* to the maximum extent practicable for the following reason:

- ☐ Site is comprised solely of C and D soils and/or bedrock at the land surface
- ☐ M.G.L. c. 21E sites pursuant to 310 CMR 40.0000
- ☐ Solid Waste Landfill pursuant to 310 CMR 19.000
- ☐ Project is otherwise subject to Stormwater Management Standards only to the maximum extent practicable.

☒ Calculations showing that the infiltration BMPs will drain in 72 hours are provided.

☐ Property includes a M.G.L. c. 21E site or a solid waste landfill and a mounding analysis is included.

[1] 80% TSS removal is required prior to discharge to infiltration BMP if Dynamic Field method is used.

# Checklist for Stormwater Report

## Checklist (continued)

**Standard 3: Recharge** (continued)

☐ The infiltration BMP is used to attenuate peak flows during storms greater than or equal to the 10-year 24-hour storm and separation to seasonal high groundwater is less than 4 feet and a mounding analysis is provided.

☐ Documentation is provided showing that infiltration BMPs do not adversely impact nearby wetland resource areas.

**Standard 4: Water Quality**

The Long-Term Pollution Prevention Plan typically includes the following:

- Good housekeeping practices;
- Provisions for storing materials and waste products inside or under cover;
- Vehicle washing controls;
- Requirements for routine inspections and maintenance of stormwater BMPs;
- Spill prevention and response plans;
- Provisions for maintenance of lawns, gardens, and other landscaped areas;
- Requirements for storage and use of fertilizers, herbicides, and pesticides;
- Pet waste management provisions;
- Provisions for operation and management of septic systems;
- Provisions for solid waste management;
- Snow disposal and plowing plans relative to Wetland Resource Areas;
- Winter Road Salt and/or Sand Use and Storage restrictions;
- Street sweeping schedules;
- Provisions for prevention of illicit discharges to the stormwater management system;
- Documentation that Stormwater BMPs are designed to provide for shutdown and containment in the event of a spill or discharges to or near critical areas or from LUHPPL;
- Training for staff or personnel involved with implementing Long-Term Pollution Prevention Plan;
- List of Emergency contacts for implementing Long-Term Pollution Prevention Plan.

☒ A Long-Term Pollution Prevention Plan is attached to Stormwater Report and is included as an attachment to the Wetlands Notice of Intent.

☒ Treatment BMPs subject to the 44% TSS removal pretreatment requirement and the one inch rule for calculating the water quality volume are included, and discharge:

- ☐ is within the Zone II or Interim Wellhead Protection Area
- ☐ is near or to other critical areas
- ☒ is within soils with a rapid infiltration rate (greater than 2.4 inches per hour)
- ☐ involves runoff from land uses with higher potential pollutant loads.

☐ The Required Water Quality Volume is reduced through use of the LID site Design Credits.

☒ Calculations documenting that the treatment train meets the 80% TSS removal requirement and, if applicable, the 44% TSS removal pretreatment requirement, are provided.

# Checklist for Stormwater Report

## Checklist (continued)

**Standard 4: Water Quality** (continued)

☒ The BMP is sized (and calculations provided) based on:

- ☒ The ½" or 1" Water Quality Volume or
- ☐ The equivalent flow rate associated with the Water Quality Volume and documentation is provided showing that the BMP treats the required water quality volume.

☐ The applicant proposes to use proprietary BMPs, and documentation supporting use of proprietary BMP and proposed TSS removal rate is provided. This documentation may be in the form of the propriety BMP checklist found in Volume 2, Chapter 4 of the Massachusetts Stormwater Handbook and submitting copies of the TARP Report, STEP Report, and/or other third party studies verifying performance of the proprietary BMPs.

☐ A TMDL exists that indicates a need to reduce pollutants other than TSS and documentation showing that the BMPs selected are consistent with the TMDL is provided.

**Standard 5: Land Uses With Higher Potential Pollutant Loads (LUHPPLs)**

☐ The NPDES Multi-Sector General Permit covers the land use and the Stormwater Pollution Prevention Plan (SWPPP) has been included with the Stormwater Report.

☒ The NPDES Multi-Sector General Permit covers the land use and the SWPPP will be submitted ***prior to*** the discharge of stormwater to the post-construction stormwater BMPs.

☐ The NPDES Multi-Sector General Permit does ***not*** cover the land use.

☐ LUHPPLs are located at the site and industry specific source control and pollution prevention measures have been proposed to reduce or eliminate the exposure of LUHPPLs to rain, snow, snow melt and runoff, and been included in the long term Pollution Prevention Plan.

☐ All exposure has been eliminated.

☐ All exposure has ***not*** been eliminated and all BMPs selected are on MassDEP LUHPPL list.

☐ The LUHPPL has the potential to generate runoff with moderate to higher concentrations of oil and grease (e.g. all parking lots with >1000 vehicle trips per day) and the treatment train includes an oil grit separator, a filtering bioretention area, a sand filter or equivalent.

**Standard 6: Critical Areas**

☐ The discharge is near or to a critical area and the treatment train includes only BMPs that MassDEP has approved for stormwater discharges to or near that particular class of critical area.

☐ Critical areas and BMPs are identified in the Stormwater Report.

# Checklist for Stormwater Report

## Checklist (continued)

**Standard 7: Redevelopments and Other Projects Subject to the Standards only to the maximum extent practicable**

☐ The project is subject to the Stormwater Management Standards only to the maximum Extent Practicable as a:

- ☐ Limited Project
- ☐ Small Residential Projects: 5-9 single family houses or 5-9 units in a multi-family development provided there is no discharge that may potentially affect a critical area.
- ☐ Small Residential Projects: 2-4 single family houses or 2-4 units in a multi-family development with a discharge to a critical area
- ☐ Marina and/or boatyard provided the hull painting, service and maintenance areas are protected from exposure to rain, snow, snow melt and runoff
- ☐ Bike Path and/or Foot Path
- ☐ Redevelopment Project
- ☐ Redevelopment portion of mix of new and redevelopment.

☐ Certain standards are not fully met (Standard No. 1, 8, 9, and 10 must always be fully met) and an explanation of why these standards are not met is contained in the Stormwater Report.

☐ The project involves redevelopment and a description of all measures that have been taken to improve existing conditions is provided in the Stormwater Report. The redevelopment checklist found in Volume 2 Chapter 3 of the Massachusetts Stormwater Handbook may be used to document that the proposed stormwater management system (a) complies with Standards 2, 3 and the pretreatment and structural BMP requirements of Standards 4-6 to the maximum extent practicable and (b) improves existing conditions.

**Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control**

A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan must include the following information:

- Narrative;
- Construction Period Operation and Maintenance Plan;
- Names of Persons or Entity Responsible for Plan Compliance;
- Construction Period Pollution Prevention Measures;
- Erosion and Sedimentation Control Plan Drawings;
- Detail drawings and specifications for erosion control BMPs, including sizing calculations;
- Vegetation Planning;
- Site Development Plan;
- Construction Sequencing Plan;
- Sequencing of Erosion and Sedimentation Controls;
- Operation and Maintenance of Erosion and Sedimentation Controls;
- Inspection Schedule;
- Maintenance Schedule;
- Inspection and Maintenance Log Form.

☒ A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan containing the information set forth above has been included in the Stormwater Report.

# Checklist for Stormwater Report

## Checklist (continued)

**Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control** (continued)

☐ The project is highly complex and information is included in the Stormwater Report that explains why it is not possible to submit the Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan with the application. A Construction Period Pollution Prevention and Erosion and Sedimentation Control has ***not*** been included in the Stormwater Report but will be submitted ***before*** land disturbance begins.

☐ The project is ***not*** covered by a NPDES Construction General Permit.

☐ The project is covered by a NPDES Construction General Permit and a copy of the SWPPP is in the Stormwater Report.

☒ The project is covered by a NPDES Construction General Permit but no SWPPP been submitted. The SWPPP will be submitted BEFORE land disturbance begins.

**Standard 9: Operation and Maintenance Plan**

☒ The Post Construction Operation and Maintenance Plan is included in the Stormwater Report and includes the following information:

- ☒ Name of the stormwater management system owners;
- ☒ Party responsible for operation and maintenance;
- ☒ Schedule for implementation of routine and non-routine maintenance tasks;
- ☐ Plan showing the location of all stormwater BMPs maintenance access areas;
- ☒ Description and delineation of public safety features;
- ☒ Estimated operation and maintenance budget; and
- ☒ Operation and Maintenance Log Form.

☐ The responsible party is ***not*** the owner of the parcel where the BMP is located and the Stormwater Report includes the following submissions:

- ☐ A copy of the legal instrument (deed, homeowner's association, utility trust or other legal entity) that establishes the terms of and legal responsibility for the operation and maintenance of the project site stormwater BMPs;
- ☐ A plan and easement deed that allows site access for the legal entity to operate and maintain BMP functions.

**Standard 10: Prohibition of Illicit Discharges**

☐ The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges;

☒ An Illicit Discharge Compliance Statement is attached;

☐ NO Illicit Discharge Compliance Statement is attached but will be submitted ***prior to*** the discharge of any stormwater to post-construction BMPs.

# Stormwater Report

To Be Submitted with the Notice of Intent

***Revised 8/2/2018***

Applicant/Project Name: Town of Wayland – Loker Field Improvements

Project Address: Commonwealth Road, Wayland MA

Application Prepared by:

Firm: Weston & Sampson, Inc.

Registered PE: James Pearson

Below is an explanation concerning Standards 1-10 as they apply to the Town of Wayland Loker Field Imprvement project, located on Commonwealth Road:

***General***:

Due to the increased need for town athletic facilities, the Town of Wayland is proposing the installation of a multi-purpose athletic field within the Loker Conservation and Recreation Area. The project includes field installation, field lighting, parking, trail improvements, and the addition of a stormwater management system. There would also be improvements to the existing emergency access road and parking area. The goal of this project is to utilize the Loker Conservation and Recreation Area to provide the Town of Wayland with a multi-purpose athletic field. Currently there is existing open field space on the property. By expanding this open space there will be room for the new athletic field. There is also an existing parking lot that will also be expanded on to allow for additional parking. In addition to the field and parking lot, new lighting will be added to allow for field use after daylight hours. The existing emergency access road will also be improved upon to allow for easier use, and miscellaneous paved areas in various locations of the site will be removed and converted to grassed space.

**Standard 1: No New Untreated Discharges**

The proposed project will create no new untreated discharges. Total impervious area post-development will increase by approximately 6% within the proposed limit of work.

**Standard 2: Peak Rate Attenuation**

Both existing and proposed conditions were modeled using HydroCAD computer software. The results of this analysis are presented in Table 1.

Table 1: Total Peak Runoff Rate

| Point of Interest | Storm Frequency | Storm Depth (in) | Peak Flow (cfs) Pre-Development | Peak Flow (cfs) Post-Development |
|---|---|---|---|---|
| P1 | | | | |
| | 2 Year | 3.00 | 0.32 | 0.16 |
| | 10 Year | 4.60 | 0.51 | 0.25 |
| | 25 Year | 5.30 | 0.65 | 0.35 |
| | 100 Year | 6.50 | 1.03 | 0.75 |
| P2 | | | | |
| | 2 Year | 3.00 | 3.48 | 2.09 |
| | 10 Year | 4.60 | 5.50 | 3.30 |
| | 25 Year | 5.30 | 6.84 | 4.37 |
| | 100 Year | 6.50 | 10.02 | 9.89 |

The proposed design is such that peak runoff rates do not exceed rates of runoff under existing conditions even in the 100-year storm scenario. For regulatory purposes the existing site condition serves as the benchmark for peak discharges that must not be exceeded under the re-developed condition. Peak discharges are mitigated by using the proposed underground chambers to provide stormwater detention benefit. Please refer to existing and proposed conditions in HydroCAD model printouts included in Attachment D for additional details.

To ensure that the work incorporates the performance standards recommended in the DEP's Stormwater Management Policy, necessary erosion and sedimentation control measures will be utilized during construction. These measures will include compost filter tubes, catch basin protection, and a stabilized construction entrance, as depicted on the site plans.

**Standard 3: Recharge**

Overall, the site is being redeveloped such that the increase in impervious area under proposed conditions will be minimal in comparison with existing conditions as the site is redeveloped. As such, stormwater recharge has been provided to the maximum extent practicable. Recharge Volume (Appendix E) has been calculated based on the amount of impervious area contributing runoff to the underground chambers.

**Standard 4: Water Quality**

As discussed under Standard 3, this is a redevelopment project. Stormwater Quality treatment is being provide to the maximum extent practicable. Treatment will be provided for the improved parking lot area, which is where the increased impervious area occurs. Runoff from the existing parking lot area does not presently undergo treatment, but under proposed conditions runoff from this area will be directed through deep sump hooded catch basins and into the underground stormwater chambers. All of the stormwater from impervious areas on the site will undergo treatment to bring TSS levels within regulated limits (>80% removal). During construction of the project, appropriate temporary stormwater BMPs will be used to minimize sedimentation and soil erosion.

**Standard 5: Land Uses with Higher Potential Pollutant Loads (LUHPPLs)**

This project will not create a land use with higher potential pollutant load.

**Standard 6: Critical Areas**

There will be no new discharge to critical areas.

**Standard 7: Redevelopments and Other Projects Subject to the Standards Only to the Maximum Extent Practicable**

The project is a mix of new development and redevelopment. Certain standards for redeveloped areas have been met to the maximum extent practicable as described herein.

**Standard 8: Construction Period Pollution Prevention and Erosion and Sediment Control**

A detailed Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan is included in Attachment G. To ensure that the work incorporates the performance standards recommended in the DEP's Stormwater Management Policy, necessary erosion and sedimentation control measures will be utilized during construction. These measures will include compost filter tubes, silt fence, catch basin protection, and a stabilized construction entrance.

**Standard 9: Operation and Maintenance Plan**

An operations and maintenance plan is included in Attachment H.

**Standard 10: Prohibition of Illicit Discharges**

An illicit discharge compliance statement has been included in Attachment I.

**Registered Professional Engineer's Certification**

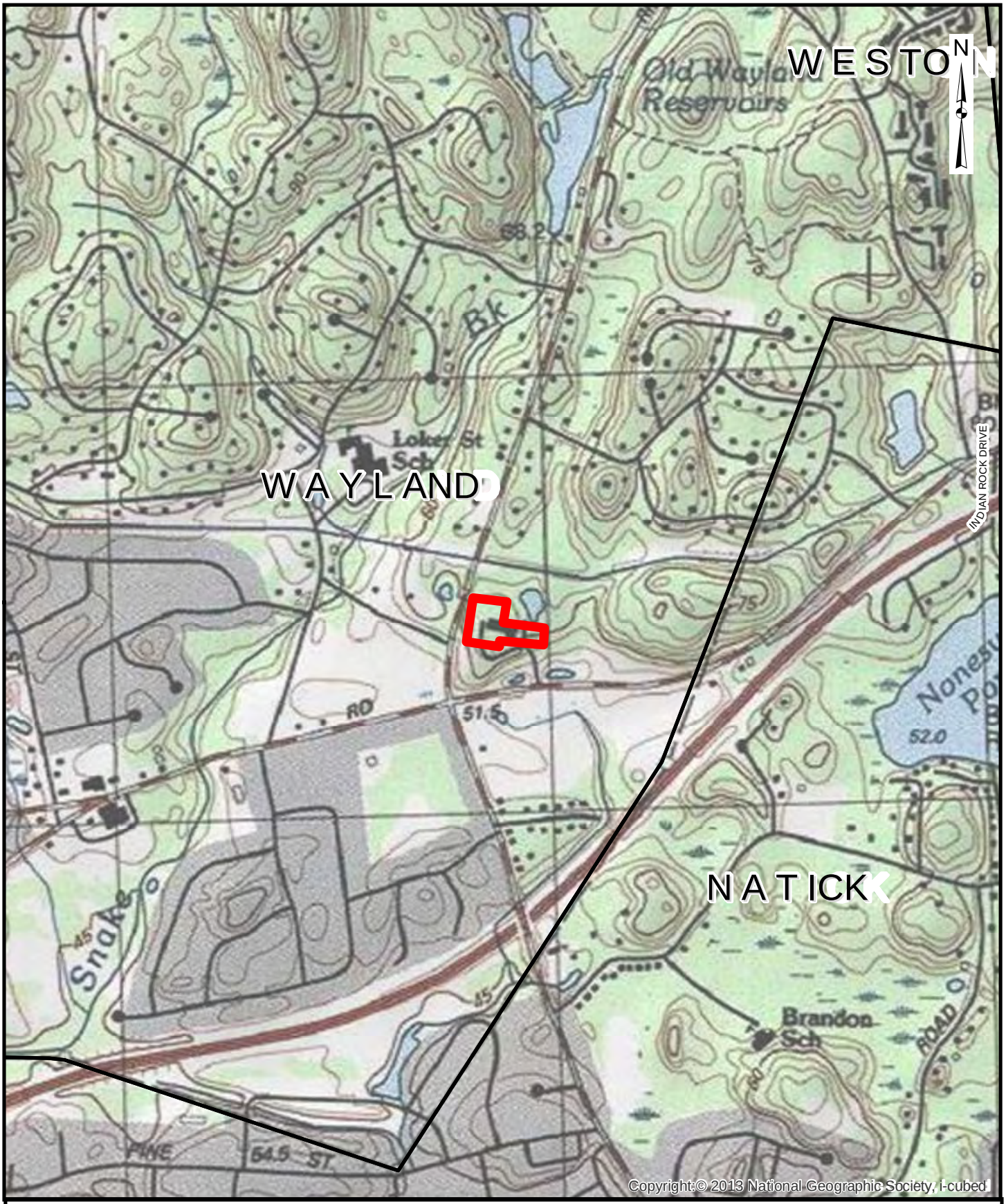
I have reviewed the Stormwater Report, including any relevant soil evaluations, computations, Long-term Pollution Prevention Plan, the Construction Period Erosion and Sedimentation Control Plan, the Long-term Post-Construction Operation and Maintenance Plan, the Illicit Discharge Compliance Statement and the plans showing the stormwater management system, and have determined that they have been prepared in accordance with the requirements of the Stormwater Management Standards as further elaborated by the Massachusetts Stormwater Handbook. I have also determined that the information presented in the Stormwater Checklist is accurate and that the information presented in the Stormwater Report accurately reflects conditions at the site as of the date of this permit application.

Registered Professional Engineer Block and Signature


8/2/2018

Signature and Date

# Attachment A - Locus Map




**Attachment A**
**Loker Conservation & Recreation Area**
**Wayland, Massachusetts**

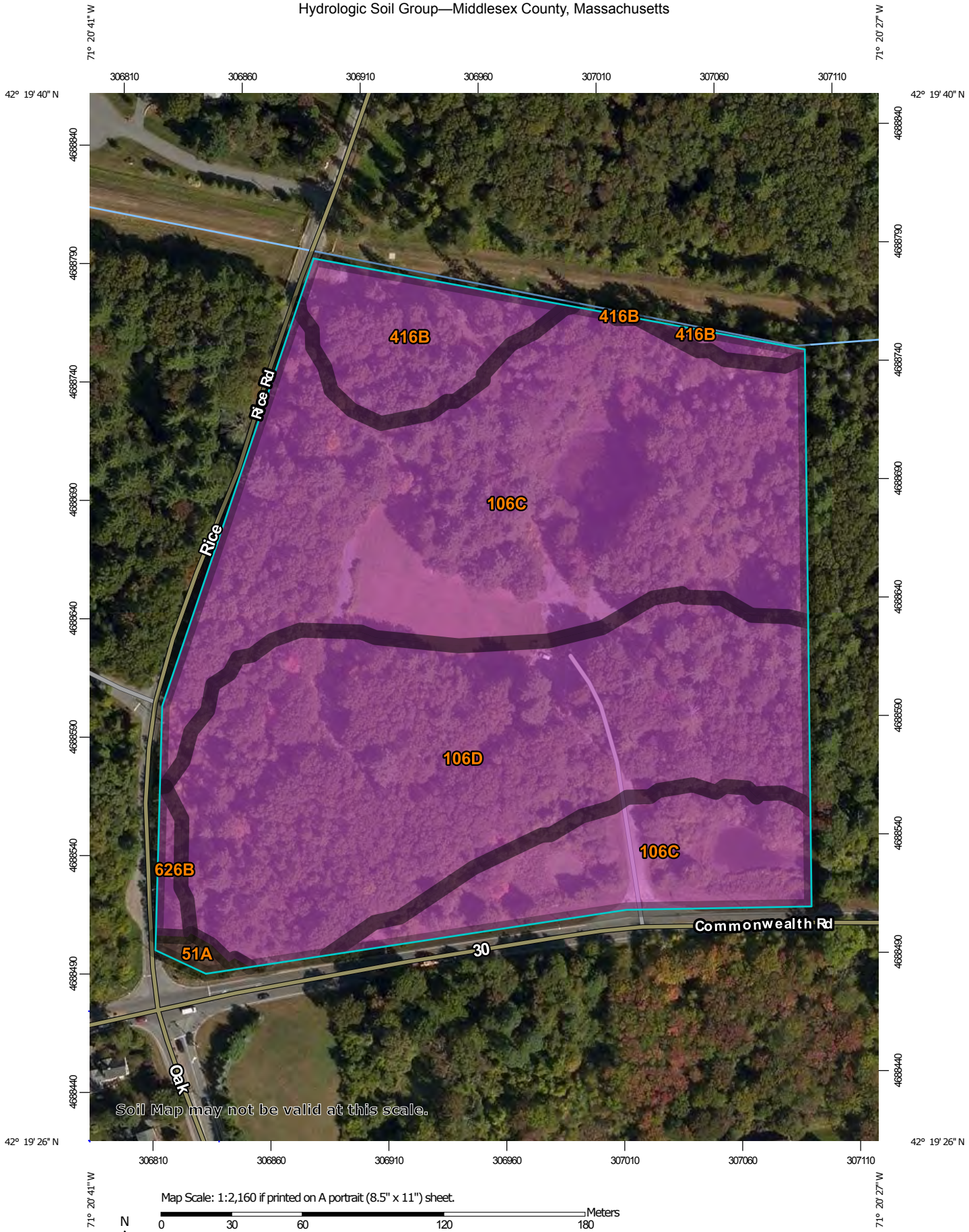
## Locus Map

Work Area

600 0 600
Scale In Feet

Weston & Sampson

# Attachment B - NRCS Soils Map, Soils Report, and HSG Classifications




Map Scale: 1:2,160 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 30 60 120 180

Feet: 0 100 200 400 600

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 19N WGS84

## MAP LEGEND

**Area of Interest (AOI)**

Area of Interest (AOI)

**Soils**

**Soil Rating Polygons**

A
A/D
B
B/D
C
C/D
D
Not rated or not available

**Soil Rating Lines**

A
A/D
B
B/D
C
C/D
D
Not rated or not available

**Soil Rating Points**

A
A/D
B
B/D
C
C/D
D
Not rated or not available

**Water Features**

Streams and Canals

**Transportation**

Rails
Interstate Highways
US Routes
Major Roads
Local Roads

**Background**

Aerial Photography

## MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:25,000.

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

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

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

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

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

Soil Survey Area: Middlesex County, Massachusetts
Survey Area Data: Version 17, Oct 6, 2017

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

Date(s) aerial images were photographed: Sep 12, 2014—Sep 28, 2014

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

# Hydrologic Soil Group

| Map unit symbol | Map unit name | Rating | Acres in AOI | Percent of AOI |
|---|---|---|---|---|
| 51A | Swansea muck, 0 to 1 percent slopes | B/D | 0.1 | 0.5% |
| 106C | Narragansett-Hollis-Rock outcrop complex, 3 to 15 percent slopes | A | 8.9 | 52.4% |
| 106D | Narragansett-Hollis-Rock outcrop complex, 15 to 25 percent slopes | A | 6.5 | 38.5% |
| 416B | Narragansett silt loam, 3 to 8 percent slopes, very stony | A | 1.3 | 7.6% |
| 626B | Merrimac-Urban land complex, 0 to 8 percent slopes | A | 0.2 | 0.9% |
| **Totals for Area of Interest** | | | **16.9** | **100.0%** |

## Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

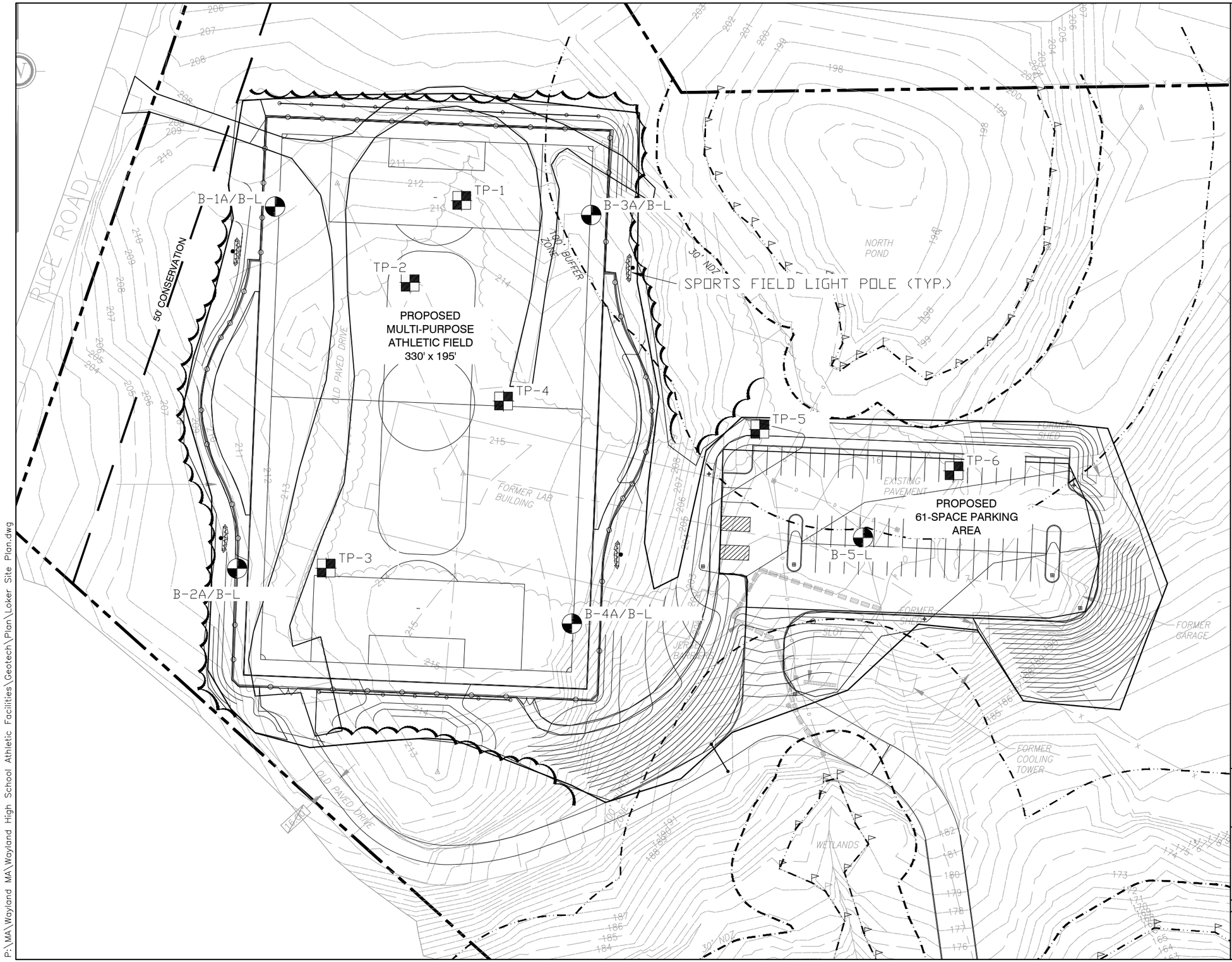
## Rating Options

*Aggregation Method:* Dominant Condition

*Component Percent Cutoff: None Specified*

*Tie-break Rule:* Higher

# Attachment C - Test Pit Summary and Logs




NOTES:

1. THIS FIGURE IS BASED ON AN EXISTING AND PROPOSED CONDITIONS SURVEY PLAN PREPARED BY WESTON & SAMPSON ENGINEERS, INC. DATED MARCH 2018.
2. ELEVATIONS REFERENCE THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88).
3. BORINGS WERE COMPLETED BY TECHNICAL DRILLING SERVICES, INC. OF STERLING, MA AND OBSERVED BY WESTON & SAMPSON ENGINEERS, INC. ON MARCH 12, 2018.
4. TEST PITS WERE COMPLETED BY THE TOWN OF WAYLAND AND OBSERVED BY WESTON & SAMPSON ENGINEERS, INC. ON MARCH 21, 2018.
5. BORING LOCATIONS SHOWN ARE APPROXIMATE AND WERE LOCATED IN THE FIELD BY WESTON & SAMPSON ENGINEERS, INC. USING A HANDHELD GPS DEVICE.
6. LOCATIONS OF UNDERGROUND UTILITIES AND STRUCTURES SHOWN HAVE BEEN COMPILED, IN PART, FROM RECORD MAPPING AND OTHER DATA SUPPLIED BY THE RESPECTIVE UTILITY COMPANIES AND/OR OTHER SOURCES. THESE LOCATIONS MUST BE CONSIDERED APPROXIMATE.

LEGEND:

B-1-L — BORING DESIGNATION AND APPROXIMATE LOCATION.

TP-1 — TEST PIT DESIGNATION AND APPROXIMATE LOCATION.

60 30 0 60 120

SCALE: 1"=60'

# FIGURE 1
# LOKER SITE PLAN

WAYLAND HIGH SCHOOL ATHLETIC FACILITIES
WAYLAND, MA

| DESIGNED BY: MJZ | CHECKED BY: | DATE: APRIL 2018 |
|---|---|---|

Weston & Sampson

P:\MA\Wayland MA\Wayland High School Athletic Facilities\Geotech\Plan\Loker Site Plan.dwg

Weston & Sampson

# BORING NUMBER: **B-1A-L**



**CLIENT:** Town of Wayland
**PROJECT NUMBER:** 2180076
**PROJECT NAME:** Improvements to Loker Conservation & Recreation Area
**PROJECT LOCATION:** Wayland, Massachusetts

**DRILLER:** Brett Balyk - Technical Drilling Services
**LOGGED / CHECKED BY:** M. Zanchi, EIT /
**RIG TYPE / DRILLING METHODS:** ATV / hollow-stem auger (HSA)
**CASING DIAMETER:** 4-1/4" ID
**SAMPLING METHODS:** Standard penetration test (SPT)
**SAMPLER TYPE:** Standard 24" long x 2" OD (1-3/8" ID) split-spoon
**SAMPLER HAMMER:** 140-lb. automatic hammer
**OTHER:**

**BORING LOCATION:** See attached plan.
**GROUND ELEVATION:** Not available **DATUM:** Unknown
**DRILLING START DATE:** 3/12/2018 **END DATE:** 3/12/2018

**GROUNDWATER OBSERVATIONS**

| DATE | DEPTH | COMMENTS |
|---|---|---|
| 3/12/2018 | Not observed | |
| | | |
| | | |

| DEPTH (ft.) *Elevation* | SAMPLE INFORMATION: TYPE - NO. | DEPTH (ft.) | REC./PEN. (in.) | SPT BLOWS/6" | SPT N-VALUE | % MOISTURE | % FINES (P200) | GRAPHIC LOG | STRATA NAME | MATERIAL DESCRIPTION | COMMENTS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | S-1 | 0.0 | 11/24 | 2<br>4<br>4<br>11 | 8 | | | | FILL | 6" Organics (Wood, leaves, pine needles, roots); moist.<br>Loose, light brown, fine to coarse SAND, some fine to coarse gravel, little silt; moist. [FILL] | P.I.D. - 0.8 ppm |
| | S-2 | 2.0 | 13/14 | 14<br>36<br>120/2" | | | | | SAND & GRAVEL | Very dense, tan, gravelly fine to coarse SAND, little silt; moist. | P.I.D. - 0.1 ppm<br>- Auger grinding at approximately 2 ft. |
| 5 | S-3 | 4.0 | 6/11 | 27<br>120/5" | | | | | | Very dense, gray, fine to coarse GRAVEL, some fine to coarse sand, little silt; moist. | P.I.D. - 0.4 ppm<br>- Heavy auger grinding and rig chatter at approximately 5 - 7 ft. |

Auger refusal at 7 ft. End of boring at 7 ft. Offset boring approximately 5 ft. west to B-1B-L and re-attempt.

**MATERIAL DESCRIPTION**
(see guide below for soil classification based on constituent percentage)

| Mineral Soil | Organic Soil |
|---|---|
| GRAVEL, SAND, SILT, CLAY: >50% | PEAT: 50-100% |
| gravelly, sandy, silty, clayey: 35-50% | organic (soil): 15-50% |
| some: 20-35% | with some organics: 5-15% |
| little: 10-20% | |
| trace: 0-10% | |

| SAMPLE | | GRANULAR SOILS | | COHESIVE SOILS | |
|---|---|---|---|---|---|
| SYMBOL | TYPE | N-Value | Density | N-VALUE | CONSISTENCY |
| S | Split spoon | 0-4 | Very Loose | < 2 | Very Soft |
| ST | Shelby tube | 4-10 | Loose | 2-4 | Soft |
| AG | Auger grab | 10-30 | Med. Dense | 4-8 | Med. Stiff |
| NX | Rock core | 30-50 | Dense | 8-15 | Stiff |
| GP | Direct push | > 50 | Very Dense | 15-30 | Very Stiff |
| | | | | > 30 | Hard |

**GENERAL NOTES:**

1. The stratification lines represent the approximate boundary between soil types; actual transitions may be gradual.

2. Water level readings have been made in the drill holes at the times and conditions stated on the boring log. Fluctuations in the level of groundwater may occur due to other factors than those presented at the time measurements are made.

Weston & Sampson

# BORING NUMBER: **B-1B-L**



**CLIENT:** Town of Wayland
**PROJECT NUMBER:** 2180076
**PROJECT NAME:** Improvements to Loker Conservation & Recreation Area
**PROJECT LOCATION:** Wayland, Massachusetts

**DRILLER:** Brett Balyk - Technical Drilling Services
**LOGGED / CHECKED BY:** M. Zanchi, EIT /
**RIG TYPE / DRILLING METHODS:** ATV / hollow-stem auger (HSA)
**CASING DIAMETER:** 4-1/4" ID
**SAMPLING METHODS:** Standard penetration test (SPT)
**SAMPLER TYPE:** Standard 24" long x 2" OD (1-3/8" ID) split-spoon
**SAMPLER HAMMER:** 140-lb. automatic hammer
**OTHER:**

**BORING LOCATION:** See attached plan.
**GROUND ELEVATION:** Not available **DATUM:** Unknown
**DRILLING START DATE:** 3/12/2018 **END DATE:** 3/12/2018

**GROUNDWATER OBSERVATIONS**

| DATE | DEPTH | COMMENTS |
|---|---|---|
| 3/12/2018 | Not observed | |
| | | |
| | | |

| DEPTH (ft.) *Elevation* | SAMPLE INFORMATION: TYPE - NO. | DEPTH (ft.) | REC./PEN. (in.) | SPT BLOWS/6" | SPT N-VALUE | % MOISTURE | % FINES (P200) | GRAPHIC LOG | STRATA NAME | MATERIAL DESCRIPTION | COMMENTS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | | See log for B-1A-L for soil descriptions. | B-1B is offset approximately 5 ft. west of B-1A-L. |
| 5 | | | | | | | | | | | |

Auger refusal at 7 ft. End of boring at 7 ft.

**MATERIAL DESCRIPTION**
(see guide below for soil classification based on constituent percentage)

| Mineral Soil | Organic Soil |
|---|---|
| GRAVEL, SAND, SILT, CLAY: >50% | PEAT: 50-100% |
| gravelly, sandy, silty, clayey: 35-50% | organic (soil): 15-50% |
| some: 20-35% | with some organics: 5-15% |
| little: 10-20% | |
| trace: 0-10% | |

| SAMPLE | | GRANULAR SOILS | | COHESIVE SOILS | |
|---|---|---|---|---|---|
| SYMBOL | TYPE | N-Value | Density | N-VALUE | CONSISTENCY |
| S | Split spoon | 0-4 | Very Loose | < 2 | Very Soft |
| ST | Shelby tube | 4-10 | Loose | 2-4 | Soft |
| AG | Auger grab | 10-30 | Med. Dense | 4-8 | Med. Stiff |
| NX | Rock core | 30-50 | Dense | 8-15 | Stiff |
| GP | Direct push | > 50 | Very Dense | 15-30 | Very Stiff |
| | | | | > 30 | Hard |

**GENERAL NOTES:**

1. The stratification lines represent the approximate boundary between soil types; actual transitions may be gradual.

2. Water level readings have been made in the drill holes at the times and conditions stated on the boring log. Fluctuations in the level of groundwater may occur due to other factors than those presented at the time measurements are made.

Weston & Sampson

# BORING NUMBER: **B-2A-L**



**CLIENT:** Town of Wayland
**PROJECT NUMBER:** 2180076
**PROJECT NAME:** Improvements to Loker Conservation & Recreation Area
**PROJECT LOCATION:** Wayland, Massachusetts

**DRILLER:** Brett Balyk - Technical Drilling Services
**LOGGED / CHECKED BY:** M. Zanchi, EIT /
**RIG TYPE / DRILLING METHODS:** ATV / hollow-stem auger (HSA)
**CASING DIAMETER:** 4-1/4" ID
**SAMPLING METHODS:** Standard penetration test (SPT)
**SAMPLER TYPE:** Standard 24" long x 2" OD (1-3/8" ID) split-spoon
**SAMPLER HAMMER:** 140-lb. automatic hammer
**OTHER:**

**BORING LOCATION:** See attached plan.
**GROUND ELEVATION:** Not available **DATUM:** Unknown
**DRILLING START DATE:** 3/12/2018 **END DATE:** 3/12/2018

**GROUNDWATER OBSERVATIONS**

| DATE | DEPTH | COMMENTS |
|---|---|---|
| 3/12/2018 | Not observed | |
| | | |
| | | |

| DEPTH (ft.) *Elevation* | SAMPLE INFORMATION: TYPE - NO. | DEPTH (ft.) | REC./PEN. (in.) | SPT BLOWS/6" | SPT N-VALUE | % MOISTURE | % FINES (P200) | GRAPHIC LOG | STRATA NAME | MATERIAL DESCRIPTION | COMMENTS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | S-1 | 0.0 | 3/24 | 2<br>3<br>4<br>8 | 7 | | | | FILL | Loose, brown, coarse GRAVEL, little silt, little fine to coarse sand, little organics (roots, leaves); moist. [FILL] | - Coarse gravel fragment in tip of spoon. |
| | S-2 | 2.0 | 12/14 | 28<br>35<br>120/2" | | | | | SAND & GRAVEL | Very dense, light brown, gravelly fine to coarse SAND, trace silt; moist. | P.I.D. - 0.1 ppm |
| 5 | S-3 | 4.0 | 12/12 | 55<br>33<br>120/0" | | | | | | Very dense, gray-brown, fine to coarse GRAVEL, little fine to medium sand, trace silt; moist. | P.I.D. - 0.9 ppm |

Auger refusal at 5 ft. End of boring at 5 ft. Offset boring approximately 2 ft. northwest to B-2B-L and re-attempt.

**MATERIAL DESCRIPTION** (see guide below for soil classification based on constituent percentage)

| Mineral Soil | Organic Soil |
|---|---|
| GRAVEL, SAND, SILT, CLAY: >50% | PEAT: 50-100% |
| gravelly, sandy, silty, clayey: 35-50% | organic (soil): 15-50% |
| some: 20-35% | with some organics: 5-15% |
| little: 10-20% | |
| trace: 0-10% | |

| SAMPLE | | GRANULAR SOILS | | COHESIVE SOILS | |
|---|---|---|---|---|---|
| SYMBOL | TYPE | N-Value | Density | N-VALUE | CONSISTENCY |
| S | Split spoon | 0-4 | Very Loose | < 2 | Very Soft |
| ST | Shelby tube | 4-10 | Loose | 2-4 | Soft |
| AG | Auger grab | 10-30 | Med. Dense | 4-8 | Med. Stiff |
| NX | Rock core | 30-50 | Dense | 8-15 | Stiff |
| GP | Direct push | > 50 | Very Dense | 15-30 | Very Stiff |
| | | | | > 30 | Hard |

**GENERAL NOTES:**

1. The stratification lines represent the approximate boundary between soil types; actual transitions may be gradual.

2. Water level readings have been made in the drill holes at the times and conditions stated on the boring log. Fluctuations in the level of groundwater may occur due to other factors than those presented at the time measurements are made.

Weston & Sampson

# BORING NUMBER: **B-2B-L**



**CLIENT:** Town of Wayland
**PROJECT NUMBER:** 2180076
**PROJECT NAME:** Improvements to Loker Conservation & Recreation Area
**PROJECT LOCATION:** Wayland, Massachusetts

**DRILLER:** Brett Balyk - Technical Drilling Services
**LOGGED / CHECKED BY:** M. Zanchi, EIT /
**RIG TYPE / DRILLING METHODS:** ATV / hollow-stem auger (HSA)
**CASING DIAMETER:** 4-1/4" ID
**SAMPLING METHODS:** Standard penetration test (SPT)
**SAMPLER TYPE:** Standard 24" long x 2" OD (1-3/8" ID) split-spoon
**SAMPLER HAMMER:** 140-lb. automatic hammer
**OTHER:**

**BORING LOCATION:** See attached plan.
**GROUND ELEVATION:** Not available **DATUM:** Unknown
**DRILLING START DATE:** 3/12/2018 **END DATE:** 3/12/2018

**GROUNDWATER OBSERVATIONS**

| DATE | DEPTH | COMMENTS |
|---|---|---|
| 3/12/2018 | Not observed | |
| | | |
| | | |

| DEPTH (ft.) *Elevation* | SAMPLE INFORMATION: TYPE - NO. | DEPTH (ft.) | REC./PEN. (in.) | SPT BLOWS/6" | SPT N-VALUE | % MOISTURE | % FINES (P200) | GRAPHIC LOG | STRATA NAME | MATERIAL DESCRIPTION | COMMENTS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | | (see guide below for soil classification based on constituent percentage)<br>Mineral Soil: GRAVEL, SAND, SILT, CLAY: >50%; gravelly, sandy, silty, clayey: 35-50%; some: 20-35%; little: 10-20%; trace: 0-10%<br>Organic Soil: PEAT: 50-100%; organic (soil): 15-50%; with some organics: 5-15% | |
| 5 | | | | | | | | | | See log for B-2A-L for soil descriptions. | B-2B-L is offset approximately 5 ft. northwest of B-2A-L. |

Auger refusal at 5 ft. End of boring at 5 ft.

| SAMPLE | | GRANULAR SOILS | | COHESIVE SOILS | | GENERAL NOTES: |
|---|---|---|---|---|---|---|
| SYMBOL | TYPE | N-Value | Density | N-VALUE | CONSISTENCY | 1. The stratification lines represent the approximate boundary between soil types; actual transitions may be gradual. |
| S | Split spoon | 0-4 | Very Loose | < 2 | Very Soft | |
| ST | Shelby tube | 4-10 | Loose | 2-4 | Soft | |
| AG | Auger grab | 10-30 | Med. Dense | 4-8 | Med. Stiff | 2. Water level readings have been made in the drill holes at the times and conditions stated on the boring log. Fluctuations in the level of groundwater may occur due to other factors than those presented at the time measurements are made. |
| NX | Rock core | 30-50 | Dense | 8-15 | Stiff | |
| GP | Direct push | > 50 | Very Dense | 15-30 | Very Stiff | |
| | | | | > 30 | Hard | |

Weston & Sampson

# BORING NUMBER: **B-3A-L**



**CLIENT:** Town of Wayland
**PROJECT NUMBER:** 2180076
**PROJECT NAME:** Improvements to Loker Conservation & Recreation Area
**PROJECT LOCATION:** Wayland, Massachusetts

**DRILLER:** Brett Balyk - Technical Drilling Services
**LOGGED / CHECKED BY:** M. Zanchi, EIT /
**RIG TYPE / DRILLING METHODS:** ATV / hollow-stem auger (HSA)
**CASING DIAMETER:** 4-1/4" ID
**SAMPLING METHODS:** Standard penetration test (SPT)
**SAMPLER TYPE:** Standard 24" long x 2" OD (1-3/8" ID) split-spoon
**SAMPLER HAMMER:** 140-lb. automatic hammer
**OTHER:**

**BORING LOCATION:** See attached plan.
**GROUND ELEVATION:** Not available **DATUM:** Unknown
**DRILLING START DATE:** 3/12/2018 **END DATE:** 3/12/2018

**GROUNDWATER OBSERVATIONS**

| DATE | DEPTH | COMMENTS |
|---|---|---|
| 3/12/2018 | Not observed | |
| | | |
| | | |

| DEPTH (ft.) / Elevation | SAMPLE INFORMATION: TYPE - NO. | DEPTH (ft.) | REC./PEN. (in.) | SPT BLOWS/6" | SPT N-VALUE | % MOISTURE | % FINES (P200) | GRAPHIC LOG | STRATA NAME | MATERIAL DESCRIPTION | COMMENTS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | S-1 | 0.0 | 18/24 | 1<br>5<br>11<br>12 | 16 | | | | FILL | 5" Topsoil<br>Very stiff, orange-brown, sandy SILT, little fine to coarse gravel, trace roots; moist. [FILL] | P.I.D. - 6.2 ppm |
| | S-2 | 2.0 | 7/8 | 25<br>120/2" | | | | | SAND & GRAVEL | Very dense, gray-brown, gravelly fine to coarse SAND, little silt; moist. | P.I.D. - 4.3 ppm<br>- Auger grinding approximately 2 - 4 ft. |
| 5 | S-3 | 4.0 | 8/9 | 25<br>120/3" | | | | | | Very dense, gray, fine to coarse GRAVEL, some fine to coarse sand, little silt; moist. | - Heavy auger grinding and rig chatter at approximately 4 - 7 ft. Auger cuttings are primarily gray gravel from approximately 4 - 7 ft. |

Auger refusal at 7 ft. End of boring at 7 ft. Offset boring approximately 2.7 ft. east to B-3B-L and re-attempt.

**MATERIAL DESCRIPTION**
(see guide below for soil classification based on constituent percentage)

Mineral Soil
GRAVEL, SAND, SILT, CLAY: >50%
gravelly, sandy, silty, clayey: 35-50%
some: 20-35%
little: 10-20%
trace: 0-10%

Organic Soil
PEAT: 50-100%
organic (soil): 15-50%
with some organics: 5-15%

| SAMPLE | | GRANULAR SOILS | | COHESIVE SOILS | |
|---|---|---|---|---|---|
| SYMBOL | TYPE | N-Value | Density | N-VALUE | CONSISTENCY |
| S | Split spoon | 0-4 | Very Loose | < 2 | Very Soft |
| ST | Shelby tube | 4-10 | Loose | 2-4 | Soft |
| AG | Auger grab | 10-30 | Med. Dense | 4-8 | Med. Stiff |
| NX | Rock core | 30-50 | Dense | 8-15 | Stiff |
| GP | Direct push | > 50 | Very Dense | 15-30 | Very Stiff |
| | | | | > 30 | Hard |

**GENERAL NOTES:**

1. The stratification lines represent the approximate boundary between soil types; actual transitions may be gradual.

2. Water level readings have been made in the drill holes at the times and conditions stated on the boring log. Fluctuations in the level of groundwater may occur due to other factors than those presented at the time measurements are made.

Weston & Sampson

# BORING NUMBER: **B-3B-L**



**CLIENT:** Town of Wayland
**PROJECT NUMBER:** 2180076
**PROJECT NAME:** Improvements to Loker Conservation & Recreation Area
**PROJECT LOCATION:** Wayland, Massachusetts

**DRILLER:** Brett Balyk - Technical Drilling Services
**LOGGED / CHECKED BY:** M. Zanchi, EIT /
**RIG TYPE / DRILLING METHODS:** ATV / hollow-stem auger (HSA)
**CASING DIAMETER:** 4-1/4" ID
**SAMPLING METHODS:** Standard penetration test (SPT)
**SAMPLER TYPE:** Standard 24" long x 2" OD (1-3/8" ID) split-spoon
**SAMPLER HAMMER:** 140-lb. automatic hammer
**OTHER:**

**BORING LOCATION:** See attached plan.
**GROUND ELEVATION:** Not available **DATUM:** Unknown
**DRILLING START DATE:** 3/12/2018 **END DATE:** 3/12/2018

**GROUNDWATER OBSERVATIONS**

| DATE | DEPTH | COMMENTS |
|---|---|---|
| 3/12/2018 | Not observed | |
| | | |
| | | |

| DEPTH (ft.) *Elevation* | SAMPLE INFORMATION: TYPE - NO. | DEPTH (ft.) | REC./PEN. (in.) | SPT BLOWS/6" | SPT N-VALUE | % MOISTURE | % FINES (P200) | GRAPHIC LOG | STRATA NAME | MATERIAL DESCRIPTION | COMMENTS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | | (see guide below for soil classification based on constituent percentage)<br>Mineral Soil: GRAVEL, SAND, SILT, CLAY: >50%; gravelly, sandy, silty, clayey: 35-50%; some: 20-35%; little: 10-20%; trace: 0-10%<br>Organic Soil: PEAT: 50-100%; organic (soil): 15-50%; with some organics: 5-15% | |
| 5 | | | | | | | | | | | B-3B-L is offset approximately 2.7 ft. east of B-3A-L. See log for B-3A-L for soil descriptions.<br>- Auger grinding and rig chatter at approximately 2 - 6.5 ft.<br>- Auger cuttings are primarily gray gravel from approximately 4 - 7 ft. |

Auger refusal at 6.5 ft. End of boring at 6.5 ft.

| SAMPLE | | GRANULAR SOILS | | COHESIVE SOILS | | GENERAL NOTES: |
|---|---|---|---|---|---|---|
| SYMBOL | TYPE | N-Value | Density | N-VALUE | CONSISTENCY | 1. The stratification lines represent the approximate boundary between soil types; actual transitions may be gradual. |
| S | Split spoon | 0-4 | Very Loose | < 2 | Very Soft | |
| ST | Shelby tube | 4-10 | Loose | 2-4 | Soft | |
| AG | Auger grab | 10-30 | Med. Dense | 4-8 | Med. Stiff | 2. Water level readings have been made in the drill holes at the times and conditions stated on the boring log. Fluctuations in the level of groundwater may occur due to other factors than those presented at the time measurements are made. |
| NX | Rock core | 30-50 | Dense | 8-15 | Stiff | |
| GP | Direct push | > 50 | Very Dense | 15-30 | Very Stiff | |
| | | | | > 30 | Hard | |

Weston & Sampson

# BORING NUMBER: **B-4A-L**



**CLIENT:** Town of Wayland
**PROJECT NUMBER:** 2180076
**PROJECT NAME:** Improvements to Loker Conservation & Recreation Area
**PROJECT LOCATION:** Wayland, Massachusetts

**DRILLER:** Brett Balyk - Technical Drilling Services
**LOGGED / CHECKED BY:** M. Zanchi, EIT /
**RIG TYPE / DRILLING METHODS:** ATV / hollow-stem auger (HSA)
**CASING DIAMETER:** 4-1/4" ID
**SAMPLING METHODS:** Standard penetration test (SPT)
**SAMPLER TYPE:** Standard 24" long x 2" OD (1-3/8" ID) split-spoon
**SAMPLER HAMMER:** 140-lb. automatic hammer
**OTHER:**

**BORING LOCATION:** See attached plan.
**GROUND ELEVATION:** Not available **DATUM:** Unknown
**DRILLING START DATE:** 3/12/2018 **END DATE:** 3/12/2018

**GROUNDWATER OBSERVATIONS**

| DATE | DEPTH | COMMENTS |
|---|---|---|
| 3/12/2018 | Not observed | |
| | | |
| | | |

| DEPTH (ft.) *Elevation* | SAMPLE INFORMATION: TYPE - NO. | DEPTH (ft.) | REC./PEN. (in.) | SPT BLOWS/6" | SPT N-VALUE | % MOISTURE | % FINES (P200) | GRAPHIC LOG | STRATA NAME | MATERIAL DESCRIPTION | COMMENTS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | | (see guide below for soil classification based on constituent percentage)<br>Mineral Soil: GRAVEL, SAND, SILT, CLAY: >50%; gravelly, sandy, silty, clayey: 35-50%; some: 20-35%; little: 10-20%; trace: 0-10%<br>Organic Soil: PEAT: 50-100%; organic (soil): 15-50%; with some organics: 5-15% | |
| | S-1 | 0.0 | 12/24 | 5<br>4<br>4<br>5 | 8 | | | | FILL | 3" Topsoil<br>Loose, light brown, fine to medium SAND, little fine to coarse gravel, trace silt; moist. [FILL] | |
| | S-2 | 2.0 | 7/24 | 6<br>5<br>6<br>6 | 11 | | | | | Medium dense, light brown, fine to medium SAND, little fine gravel, little silt; moist. [FILL] | |
| 5 | S-3 | 4.0 | 6/7 | 9<br>120/1" | | | | | SAND & GRAVEL | Very dense, gray-brown, fine to coarse SAND, some fine to coarse gravel, little silt; moist. | |

Auger refusal at 7 ft. End of boring at 7 ft. Offset boring approximately 5 ft. northeast to B-4B-L and re-attempt.

| SAMPLE | | GRANULAR SOILS | | COHESIVE SOILS | |
|---|---|---|---|---|---|
| SYMBOL | TYPE | N-Value | Density | N-VALUE | CONSISTENCY |
| S | Split spoon | 0-4 | Very Loose | < 2 | Very Soft |
| ST | Shelby tube | 4-10 | Loose | 2-4 | Soft |
| AG | Auger grab | 10-30 | Med. Dense | 4-8 | Med. Stiff |
| NX | Rock core | 30-50 | Dense | 8-15 | Stiff |
| GP | Direct push | > 50 | Very Dense | 15-30 | Very Stiff |
| | | | | > 30 | Hard |

**GENERAL NOTES:**

1. The stratification lines represent the approximate boundary between soil types; actual transitions may be gradual.

2. Water level readings have been made in the drill holes at the times and conditions stated on the boring log. Fluctuations in the level of groundwater may occur due to other factors than those presented at the time measurements are made.

Weston & Sampson

# BORING NUMBER: **B-4B-L**



**CLIENT:** Town of Wayland
**PROJECT NUMBER:** 2180076
**PROJECT NAME:** Improvements to Loker Conservation & Recreation Area
**PROJECT LOCATION:** Wayland, Massachusetts

**DRILLER:** Brett Balyk - Technical Drilling Services
**LOGGED / CHECKED BY:** M. Zanchi, EIT /
**RIG TYPE / DRILLING METHODS:** ATV / hollow-stem auger (HSA)
**CASING DIAMETER:** 4-1/4" ID
**SAMPLING METHODS:** Standard penetration test (SPT)
**SAMPLER TYPE:** Standard 24" long x 2" OD (1-3/8" ID) split-spoon
**SAMPLER HAMMER:** 140-lb. automatic hammer
**OTHER:**

**BORING LOCATION:** See attached plan.
**GROUND ELEVATION:** Not available **DATUM:** Unknown
**DRILLING START DATE:** 3/12/2018 **END DATE:** 3/12/2018

**GROUNDWATER OBSERVATIONS**

| DATE | DEPTH | COMMENTS |
|---|---|---|
| 3/12/2018 | Not observed | |
| | | |
| | | |

| DEPTH (ft.) *Elevation* | SAMPLE INFORMATION: TYPE - NO. | DEPTH (ft.) | REC./PEN. (in.) | SPT BLOWS/6" | SPT N-VALUE | % MOISTURE | % FINES (P200) | GRAPHIC LOG | STRATA NAME | MATERIAL DESCRIPTION | COMMENTS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | | (see guide below for soil classification based on constituent percentage)<br>Mineral Soil: GRAVEL, SAND, SILT, CLAY: >50%; gravelly, sandy, silty, clayey: 35-50%; some: 20-35%; little: 10-20%; trace: 0-10%<br>Organic Soil: PEAT: 50-100%; organic (soil): 15-50%; with some organics: 5-15% | B-4B-L is offset approximately 5 ft. northeast of B-4A-L. See log for B-4A-L for soil descriptions. |
| 5 | | | | | | | | | | | |

Auger refusal at 8 ft. End of boring at 8 ft.

| SAMPLE | | GRANULAR SOILS | | COHESIVE SOILS | | GENERAL NOTES: |
|---|---|---|---|---|---|---|
| SYMBOL | TYPE | N-Value | Density | N-VALUE | CONSISTENCY | 1. The stratification lines represent the approximate boundary between soil types; actual transitions may be gradual. |
| S | Split spoon | 0-4 | Very Loose | < 2 | Very Soft | |
| ST | Shelby tube | 4-10 | Loose | 2-4 | Soft | |
| AG | Auger grab | 10-30 | Med. Dense | 4-8 | Med. Stiff | 2. Water level readings have been made in the drill holes at the times and conditions stated on the boring log. Fluctuations in the level of groundwater may occur due to other factors than those presented at the time measurements are made. |
| NX | Rock core | 30-50 | Dense | 8-15 | Stiff | |
| GP | Direct push | > 50 | Very Dense | 15-30 | Very Stiff | |
| | | | | > 30 | Hard | |

Weston & Sampson

# BORING NUMBER: **B-5-L**



**CLIENT:** Town of Wayland
**PROJECT NUMBER:** 2180076
**PROJECT NAME:** Improvements to Loker Conservation & Recreation Area
**PROJECT LOCATION:** Wayland, Massachusetts

**DRILLER:** Brett Balyk - Technical Drilling Services
**LOGGED / CHECKED BY:** M. Zanchi, EIT /
**RIG TYPE / DRILLING METHODS:** ATV / hollow-stem auger (HSA)
**CASING DIAMETER:** 4-1/4" ID
**SAMPLING METHODS:** Standard penetration test (SPT)
**SAMPLER TYPE:** Standard 24" long x 2" OD (1-3/8" ID) split-spoon
**SAMPLER HAMMER:** 140-lb. automatic hammer
**OTHER:**

**BORING LOCATION:** See attached plan.
**GROUND ELEVATION:** Not available **DATUM:** Unknown
**DRILLING START DATE:** 3/12/2018 **END DATE:** 3/12/2018

**GROUNDWATER OBSERVATIONS**

| DATE | DEPTH | COMMENTS |
|---|---|---|
| 3/12/2018 | Not observed | |
| | | |
| | | |

| DEPTH (ft.) *Elevation* | SAMPLE INFORMATION: TYPE - NO. | DEPTH (ft.) | REC./PEN. (in.) | SPT BLOWS/6" | SPT N-VALUE | % MOISTURE | % FINES (P200) | GRAPHIC LOG | STRATA NAME | MATERIAL DESCRIPTION | COMMENTS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | S-1 | 0.0 | 9/24 | 4<br>7<br>13<br>12 | 20 | | | | FILL | 1" Topsoil<br>Medium dense, brown, fine to coarse SAND, little fine gravel, trace silt; moist. [FILL] | |
| | S-2 | 2.0 | 15/24 | 13<br>12<br>9<br>11 | 21 | | | | | Top 4" - Brown, fine to coarse SAND, little fine gravel, trace silt; moist. [FILL]<br>Bottom 11" - Medium dense, orange-brown, silty fine SAND, little fine to coarse gravel; moist. [FILL] | |
| 5 | S-3 | 4.0 | 10/24 | 9<br>17<br>18<br>30 | 35 | | | | SAND & GRAVEL | Dense, brown, sandy fine to coarse GRAVEL, trace silt; moist. | |

End of boring at 6 ft.

**MATERIAL DESCRIPTION**
(see guide below for soil classification based on constituent percentage)

| Mineral Soil | Organic Soil |
|---|---|
| GRAVEL, SAND, SILT, CLAY: >50% | PEAT: 50-100% |
| gravelly, sandy, silty, clayey: 35-50% | organic (soil): 15-50% |
| some: 20-35% | with some organics: 5-15% |
| little: 10-20% | |
| trace: 0-10% | |

| SAMPLE | | GRANULAR SOILS | | COHESIVE SOILS | |
|---|---|---|---|---|---|
| SYMBOL | TYPE | N-Value | Density | N-VALUE | CONSISTENCY |
| S | Split spoon | 0-4 | Very Loose | < 2 | Very Soft |
| ST | Shelby tube | 4-10 | Loose | 2-4 | Soft |
| AG | Auger grab | 10-30 | Med. Dense | 4-8 | Med. Stiff |
| NX | Rock core | 30-50 | Dense | 8-15 | Stiff |
| GP | Direct push | > 50 | Very Dense | 15-30 | Very Stiff |
| | | | | > 30 | Hard |

**GENERAL NOTES:**

1. The stratification lines represent the approximate boundary between soil types; actual transitions may be gradual.

2. Water level readings have been made in the drill holes at the times and conditions stated on the boring log. Fluctuations in the level of groundwater may occur due to other factors than those presented at the time measurements are made.

# TEST PIT LOG

| | | | | | |
|---|---|---|---|---|---|
| PROJECT NAME/NO. | Improvements to Loker Conservation & Recreation Area | | | **TEST PIT NUMBER** | |
| LOCATION | Wayland, Massachusetts | | | TP-1 | |
| CLIENT | Town of Wayland | | | GROUND SURFACE | |
| CONTRACTOR | Town of Wayland | FOREMAN: | Todd | ELEVATION | -- |
| OBSERVED BY | Sarah Rocklin | DATE | 3/21/18 | DEPTH TO GROUNDWATER | |
| CHECKED BY | | DATE | | | Not observed |

| DEPTH BELOW GROUND SURFACE (ft.) | SOIL DESCRIPTION | STRATUM DESCRIPTION |
|---|---|---|
| Surface | Grass at surface | |
| 1 | 0 - 1.3' - Dark brown, fine SAND, trace fine to coarse gravel, trace silt, trace organics; moist. [TOPSOIL] | **TOPSOIL** |
| 2 | 1.3' - 2.7' - Yellow-brown, fine to coarse SAND, some fine to coarse gravel, trace silt; moist. [FILL] | **FILL** |
| 3 | 2.7' - 5.0' - Coarse GRAVEL, sub-rounded; moist. [SEPTIC FIELD] | **SEPTIC FIELD [FILL]** |
| 4 | - 6" diameter broken clay pipe observed at approximately 3.0' | |
| 5 | | |
| 6 | 5.0' - 6.7' - Gray-brown, gravelly fine to coarse SAND, trace silt; moist. | **SAND & GRAVEL** |
| 7 | Possible bedrock (GRANITE) encountered at 6.7'. End of test pit at 6.7'. | **BEDROCK** |
| 8 | | |
| 9 | | |
| 10 | | |
| 11 | | |
| 12 | | |
| 13 | | |
| 14 | | |
| 15 | | |
| 16 | | |
| 17 | | |
| 18 | | |
| 19 | | |
| 20 | | |

**NOTES:** Coordinates: 42.3265 Lat., -71.3433 Long.

**TEST PIT NUMBER**
TP-1

Weston & Sampson

# TEST PIT LOG

| | | | | | |
|---|---|---|---|---|---|
| PROJECT NAME/NO. | Improvements to Loker Conservation & Recreation Area | | | **TEST PIT NUMBER** | |
| LOCATION | Wayland, Massachusetts | | | TP-2 | |
| CLIENT | Town of Wayland | | | GROUND SURFACE | |
| CONTRACTOR | Town of Wayland | FOREMAN: | Todd | ELEVATION | -- |
| OBSERVED BY | Sarah Rocklin | DATE | 3/21/18 | DEPTH TO GROUNDWATER | |
| CHECKED BY | | DATE | | | Not observed |

| DEPTH BELOW GROUND SURFACE (ft.) | SOIL DESCRIPTION | STRATUM DESCRIPTION |
|---|---|---|
| Surface | Grass at surface | |
| 1 | 0 - 1.3' - Dark brown, fine to medium SAND, trace fine to coarse gravel, trace silt, trace organics; moist. [TOPSOIL] | **TOPSOIL** |
| 2 | 1.3' - 2.7' - Brown, gravelly fine to coarse SAND, trace silt; moist. [FILL] | **FILL** |
| 3 | - Concrete wall at west corner of test pit at approximately 2.5' | |
| 4 | 2.7' - 5.0' - Coarse GRAVEL, sub-rounded; moist. [SEPTIC FIELD] - 6" diameter broken clay pipe observed at approximately 2.7' | **SEPTIC FIELD [FILL]** |
| 5 | | |
| 6 | 5.0' - 6.0' - Yellow-brown, fine to coarse SAND, some fine to coarse gravel, trace silt; moist. | **SAND & GRAVEL** |
| 7 | 6.0' - 7.6' - Gray-brown, fine to coarse SAND, some fine to coarse gravel, trace silt; moist. | |
| 8 | Possible bedrock (GRANITE) encountered at 7.6'. End of test pit at 7.6'. | **BEDROCK** |
| 9 | | |
| 10 | | |
| 11 | | |
| 12 | | |
| 13 | | |
| 14 | | |
| 15 | | |
| 16 | | |
| 17 | | |
| 18 | | |
| 19 | | |
| 20 | | |

**NOTES:** Coordinates: 42.3264 Lat., -71.3434 Long.

**TEST PIT NUMBER**
TP-2

Weston & Sampson

# TEST PIT LOG

| | | | | | |
|---|---|---|---|---|---|
| PROJECT NAME/NO. | Improvements to Loker Conservation & Recreation Area | | | **TEST PIT NUMBER** | |
| LOCATION | Wayland, Massachusetts | | | TP-3 | |
| CLIENT | Town of Wayland | | | GROUND SURFACE | |
| CONTRACTOR | Town of Wayland | FOREMAN: | Todd | ELEVATION | -- |
| OBSERVED BY | Sarah Rocklin | DATE | 3/21/18 | DEPTH TO GROUNDWATER | |
| CHECKED BY | | DATE | | | Not observed |

| DEPTH BELOW GROUND SURFACE (ft.) | SOIL DESCRIPTION | STRATUM DESCRIPTION |
|---|---|---|
| Surface | Grass at surface | |
| 1 | 0 - 0.7' - Dark brown, fine SAND, trace fine to coarse gravel, trace silt, trace organics; moist. [TOPSOIL] | **TOPSOIL** |
| 2 | 0.7' - 1.3' - Brown, fine to medium SAND, trace fine to coarse gravel, trace silt, trace organics; moist. [FILL] | **FILL** |
| 3 | - 1" diameter electrical conduit at 1.0'.<br>1.3' - 2.7' - Brown, fine to coarse SAND, some fine to coarse gravel, trace silt; moist. [FILL] | |
| 4 | 2.7' - 5.7' - Gray-brown, gravelly fine to coarse SAND, trace silt; moist. | **SAND & GRAVEL** |
| 5 | | |
| 6 | Possible bedrock (GRANITE) encountered at 5.7'. End of test pit at 5.7'. | **BEDROCK** |
| 7 | | |
| 8 | | |
| 9 | | |
| 10 | | |
| 11 | | |
| 12 | | |
| 13 | | |
| 14 | | |
| 15 | | |
| 16 | | |
| 17 | | |
| 18 | | |
| 19 | | |
| 20 | | |

**NOTES:** Coordinates: 42.3259 Lat., -71.3437 Long.

**TEST PIT NUMBER**
TP-3

Weston & Sampson

# TEST PIT LOG

| | | | | | |
|---|---|---|---|---|---|
| PROJECT NAME/NO. | Improvements to Loker Conservation & Recreation Area | | | **TEST PIT NUMBER** | |
| LOCATION | Wayland, Massachusetts | | | TP-4 | |
| CLIENT | Town of Wayland | | | GROUND SURFACE | |
| CONTRACTOR | Town of Wayland | FOREMAN: | Todd | ELEVATION | -- |
| OBSERVED BY | Sarah Rocklin | DATE | 3/21/18 | DEPTH TO GROUNDWATER | |
| CHECKED BY | | DATE | | | Not observed |

| DEPTH BELOW GROUND SURFACE (ft.) | SOIL DESCRIPTION | STRATUM DESCRIPTION |
|---|---|---|
| Surface | Grass at surface on pavement | |
| | 4" Asphalt Pavement | **PAVEMENT** |
| 1 | 0.3' - 1.3' - Dark brown, fine SAND, trace fine to coarse gravel, trace silt, trace organics (roots, grass); moist. [BURIED TOPSOIL] | **BURIED TOPSOIL** |
| 2 | 1.3' - 2.0' - Light brown, fine to coarse SAND, some fine to coarse gravel, trace silt; moist. [FILL] | **FILL** |
| 3 | 2.0' - 4.8' - Light brown, gravelly fine to coarse SAND, trace silt; moist. | **SAND & GRAVEL** |
| 4 | | |
| 5 | | |
| 6 | Possible bedrock (GRANITE) encountered at 4.8'. End of test pit at 4.8'. | **BEDROCK** |
| 7 | | |
| 8 | | |
| 9 | | |
| 10 | | |
| 11 | | |
| 12 | | |
| 13 | | |
| 14 | | |
| 15 | | |
| 16 | | |
| 17 | | |
| 18 | | |
| 19 | | |
| 20 | | |

**NOTES:** Coordinates: 42.3262 Lat., -71.3432 Long.

**TEST PIT NUMBER**
TP-4

Weston & Sampson

# TEST PIT LOG

| | | | | | |
|---|---|---|---|---|---|
| PROJECT NAME/NO. | Improvements to Loker Conservation & Recreation Area | | | **TEST PIT NUMBER** | |
| LOCATION | Wayland, Massachusetts | | | TP-5 | |
| CLIENT | Town of Wayland | | | GROUND SURFACE | |
| CONTRACTOR | Town of Wayland | FOREMAN: | Todd | ELEVATION | -- |
| OBSERVED BY | Sarah Rocklin | DATE | 3/21/18 | DEPTH TO GROUNDWATER | |
| CHECKED BY | | DATE | | | 5.0' |

| DEPTH BELOW GROUND SURFACE (ft.) | SOIL DESCRIPTION | STRATUM DESCRIPTION |
|---|---|---|
| Surface | Asphalt Pavement | |
| | 4" Asphalt Pavement | **PAVEMENT** |
| 1 | 0.3' - 1.3' - Brown, gravelly fine to coarse SAND, trace silt, trace organics; moist. [FILL] | **FILL** |
| 2 | 1.3' - 4.0' - Gray-brown, fine to coarse SAND, some gravel, trace silt; moist. | **SAND & GRAVEL** |
| 3 | | |
| 4 | | |
| 5 | 4.0' - 5.0' - Brown, gravelly fine to coarse SAND, some silt; moist to wet. | |
| 6 | End of test pit at 5.6'. | |
| 7 | | |
| 8 | | |
| 9 | | |
| 10 | | |
| 11 | | |
| 12 | | |
| 13 | | |
| 14 | | |
| 15 | | |
| 16 | | |
| 17 | | |
| 18 | | |
| 19 | | |
| 20 | | |

**NOTES:** Coordinates: 42.3262 Lat., -71.3427 Long.

**TEST PIT NUMBER**
TP-5

Weston & Sampson

# TEST PIT LOG

| | | | | | |
|---|---|---|---|---|---|
| PROJECT NAME/NO. | Improvements to Loker Conservation & Recreation Area | | | **TEST PIT NUMBER** | |
| LOCATION | Wayland, Massachusetts | | | TP-6 | |
| CLIENT | Town of Wayland | | | GROUND SURFACE | |
| CONTRACTOR | Town of Wayland | FOREMAN: | Todd | ELEVATION | -- |
| OBSERVED BY | Sarah Rocklin | DATE | 3/21/18 | DEPTH TO GROUNDWATER | |
| CHECKED BY | | DATE | | | Not observed |

| DEPTH BELOW GROUND SURFACE (ft.) | SOIL DESCRIPTION | STRATUM DESCRIPTION |
|---|---|---|
| Surface | Asphalt Pavement | |
| | 4" Asphalt Pavement | **PAVEMENT** |
| 1 | 0.3' - 1.3' - Brown, fine to medium SAND, trace silt; moist. [FILL] | **FILL** |
| 2 | 1.3' - 7.3' - Gray-brown, gravelly fine to coarse SAND, trace silt; moist. | **SAND & GRAVEL** |
| 3 | | |
| 4 | | |
| 5 | | |
| 6 | | |
| 7 | | |
| 8 | End of test pit at 7.3'. | |
| 9 | | |
| 10 | | |
| 11 | | |
| 12 | | |
| 13 | | |
| 14 | | |
| 15 | | |
| 16 | | |
| 17 | | |
| 18 | | |
| 19 | | |
| 20 | | |

**NOTES:** Coordinates: 42.3260 Lat., -71.3422 Long.

**TEST PIT NUMBER**
TP-6

Weston & Sampson

# Attachment D - Stormwater Modeling

LEGEND

- IMPERVIOUS
- WOODLAND
- GRASSED/LANDSCAPE AREAS

ANALYSIS POINT OF INTEREST (TYP.)


N

PLAN

SCALE: 1" = 100'

| FIGURE 1 | | |
|---|---|---|
| TOWN OF WAYLAND MA<br>LOKER RECREATION AREA | | |
| HYDROLOGY MAP<br>EXISTING CONDITIONS | | |
| DESIGNED BY: JIP | CHECKED BY: JIP | DATE: DECEMBER 21, 2017 |

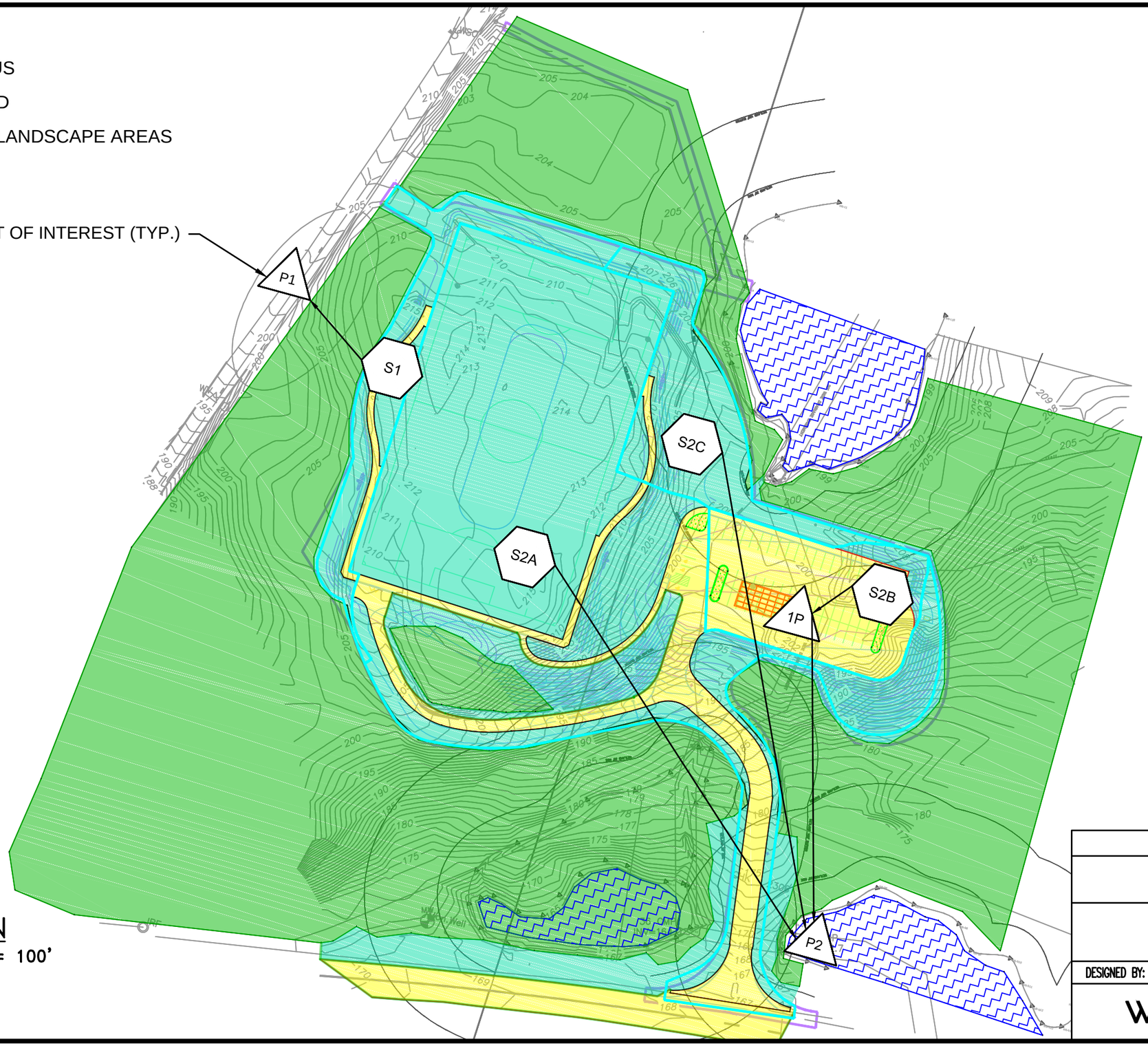
Weston & Sampson

\\wse03.local\WSE\Projects\MA\Wayland MA\Wayland High School Athletic Facilities\CAD\0_Current_LOKER\FIGURES\HydroCAD-EX.dwg

LEGEND

- IMPERVIOUS
- WOODLAND
- GRASSED/LANDSCAPE AREAS

ANALYSIS POINT OF INTEREST (TYP.)




PLAN
SCALE: 1" = 100'

FIGURE 2

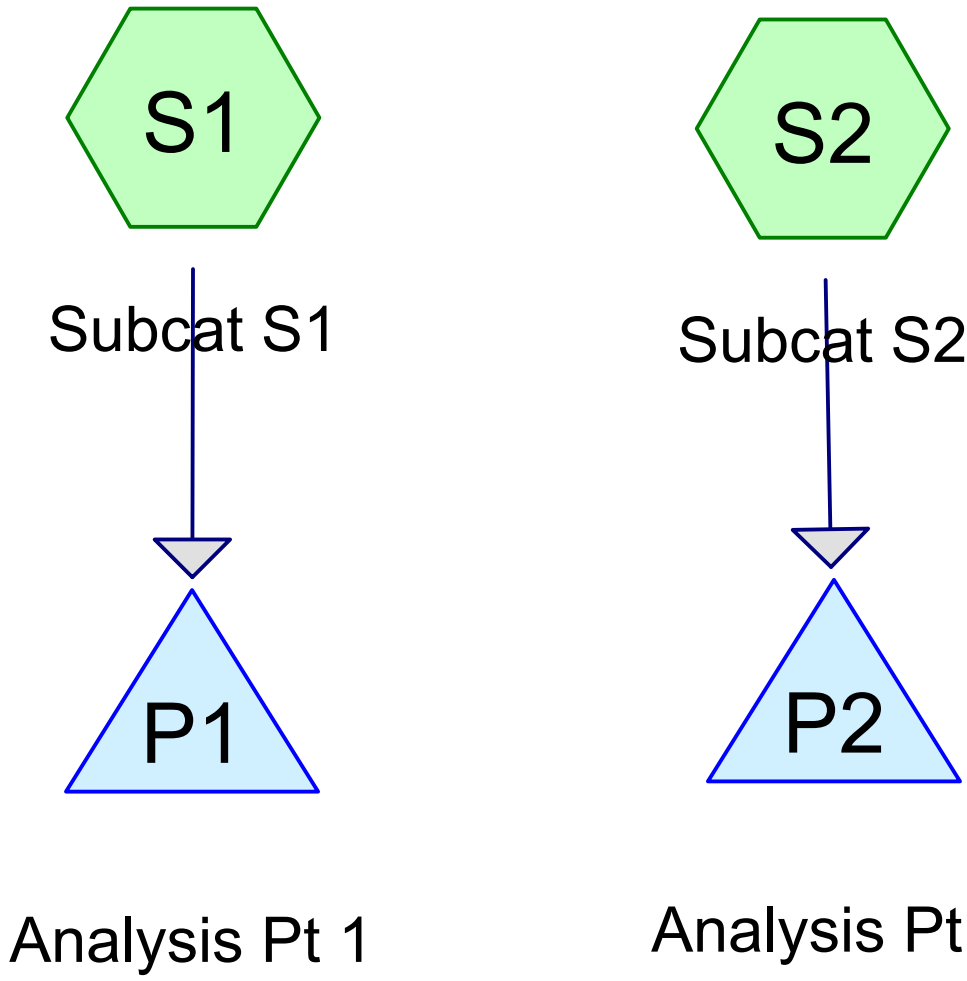
TOWN OF WAYLAND
LOKER RECREATION AREA

HYDROLOGY MAP
PROPOSED CONDITIONS

| DESIGNED BY: JIP | CHECKED BY: JIP | DATE: JULY 11, 2018 |
|---|---|---|

Weston & Sampson

\\wse03.local\WSE\Projects\MA\Wayland MA\Wayland High School Athletic Facilities\CAD\0_Current_LOKER\FIGURES\HydroCAD-PR.dwg




Subcat Reach Pond Link

**Routing Diagram for HydroCAD-EX**
Prepared by Hewlett-Packard Company, Printed 8/2/2018

## Area Listing (all nodes)

| Area (sq-ft) | CN | Description (subcatchment-numbers) |
|---|---|---|
| 67,140 | 39 | Pasture/grassland/range, Good, HSG A (S1, S2) |
| 45,517 | 98 | Paved parking, HSG A (S1, S2) |
| 101,413 | 30 | Woods, Good, HSG A (S1, S2) |
| **214,069** | **47** | **TOTAL AREA** |

## Soil Listing (all nodes)

| Area (sq-ft) | Soil Group | Subcatchment Numbers |
|---|---|---|
| 214,069 | HSG A | S1, S2 |
| 0 | HSG B | |
| 0 | HSG C | |
| 0 | HSG D | |
| 0 | Other | |
| **214,069** | | **TOTAL AREA** |

## Ground Covers (all nodes)

| HSG-A (sq-ft) | HSG-B (sq-ft) | HSG-C (sq-ft) | HSG-D (sq-ft) | Other (sq-ft) | Total (sq-ft) | Ground Cover |
|---|---|---|---|---|---|---|
| 67,140 | 0 | 0 | 0 | 0 | 67,140 | Pasture/grassland/range, Good |
| 45,517 | 0 | 0 | 0 | 0 | 45,517 | Paved parking |
| 101,413 | 0 | 0 | 0 | 0 | 101,413 | Woods, Good |
| **214,069** | **0** | **0** | **0** | **0** | **214,069** | **TOTAL AREA** |

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment S1: Subcat S1** Runoff Area=42,037 sf 10.31% Impervious Runoff Depth=0.32"
Tc=5.0 min CN=WQ Runoff=0.32 cfs 1,113 cf

**Subcatchment S2: Subcat S2** Runoff Area=172,032 sf 23.94% Impervious Runoff Depth=0.74"
Tc=0.0 min CN=WQ Runoff=3.48 cfs 10,570 cf

**Pond P1: Analysis Pt 1** Inflow=0.32 cfs 1,113 cf
Primary=0.32 cfs 1,113 cf

**Pond P2: Analysis Pt 2** Inflow=3.48 cfs 10,570 cf
Primary=3.48 cfs 10,570 cf

**Total Runoff Area = 214,069 sf Runoff Volume = 11,683 cf Average Runoff Depth = 0.65"**
**78.74% Pervious = 168,553 sf 21.26% Impervious = 45,517 sf**

## Summary for Subcatchment S1: Subcat S1

[49] Hint: Tc<2dt may require smaller dt

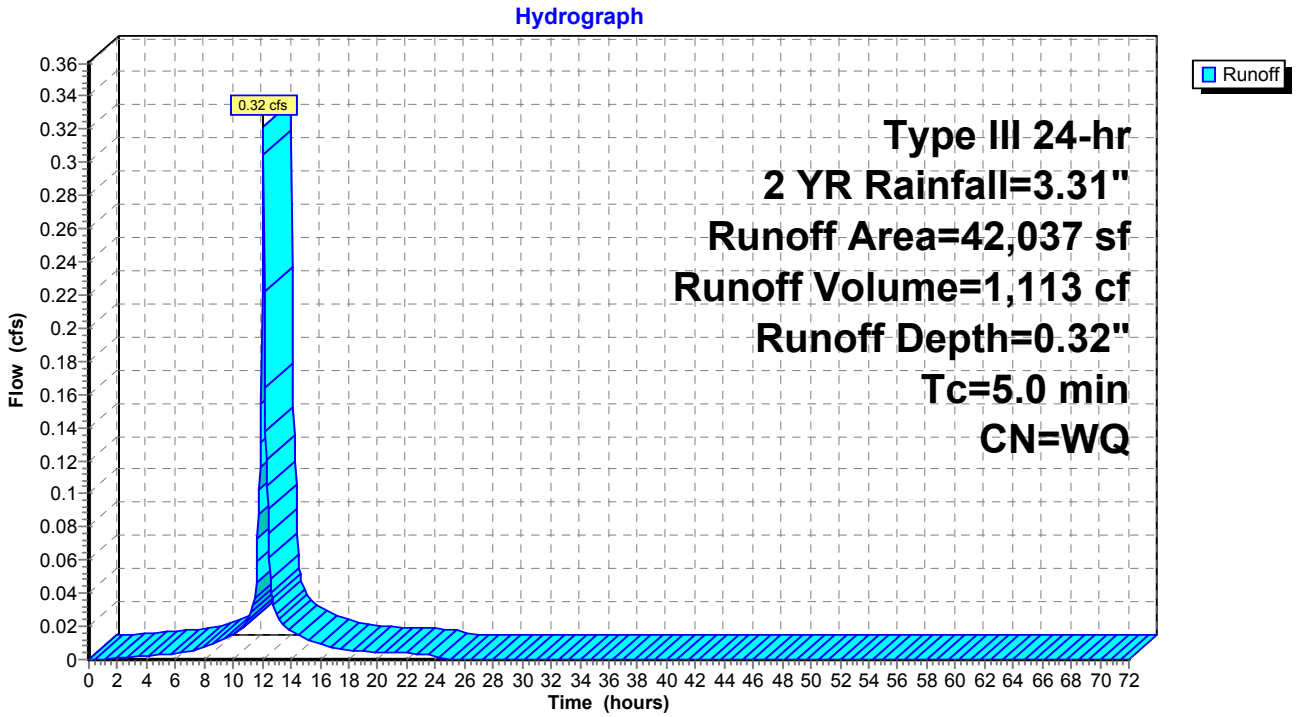
Runoff = 0.32 cfs @ 12.07 hrs, Volume= 1,113 cf, Depth= 0.32"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 YR Rainfall=3.31"

| Area (sf) | CN | Description |
|---|---|---|
| 3,126 | 39 | Pasture/grassland/range, Good, HSG A |
| 7,885 | 39 | Pasture/grassland/range, Good, HSG A |
| 3,872 | 30 | Woods, Good, HSG A |
| 3,391 | 30 | Woods, Good, HSG A |
| 19,431 | 30 | Woods, Good, HSG A |
| 4,333 | 98 | Paved parking, HSG A |
| 42,037 | | Weighted Average |
| 37,704 | 33 | 89.69% Pervious Area |
| 4,333 | 98 | 10.31% Impervious Area |

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

### Subcatchment S1: Subcat S1



## Summary for Subcatchment S2: Subcat S2

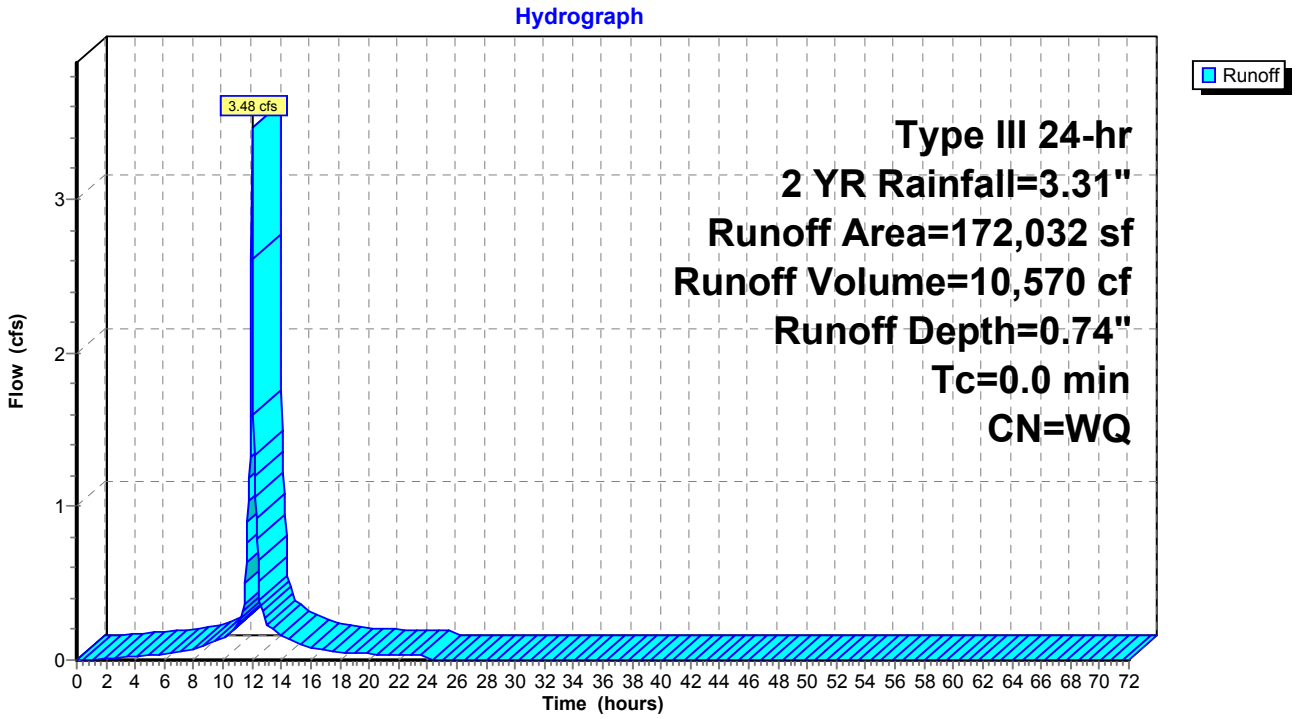
[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 3.48 cfs @ 12.00 hrs, Volume= 10,570 cf, Depth= 0.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 YR Rainfall=3.31"

| Area (sf) | CN | Description |
|---|---|---|
| 9 | 39 | Pasture/grassland/range, Good, HSG A |
| 4,136 | 39 | Pasture/grassland/range, Good, HSG A |
| 51,984 | 39 | Pasture/grassland/range, Good, HSG A |
| 19,333 | 30 | Woods, Good, HSG A |
| 2,869 | 30 | Woods, Good, HSG A |
| 16,428 | 30 | Woods, Good, HSG A |
| 2,840 | 30 | Woods, Good, HSG A |
| 360 | 30 | Woods, Good, HSG A |
| 32,889 | 30 | Woods, Good, HSG A |
| 52 | 98 | Paved parking, HSG A |
| 7,859 | 98 | Paved parking, HSG A |
| 33,272 | 98 | Paved parking, HSG A |
| 172,032 | | Weighted Average |
| 130,848 | 34 | 76.06% Pervious Area |
| 41,184 | 98 | 23.94% Impervious Area |

## Subcatchment S2: Subcat S2



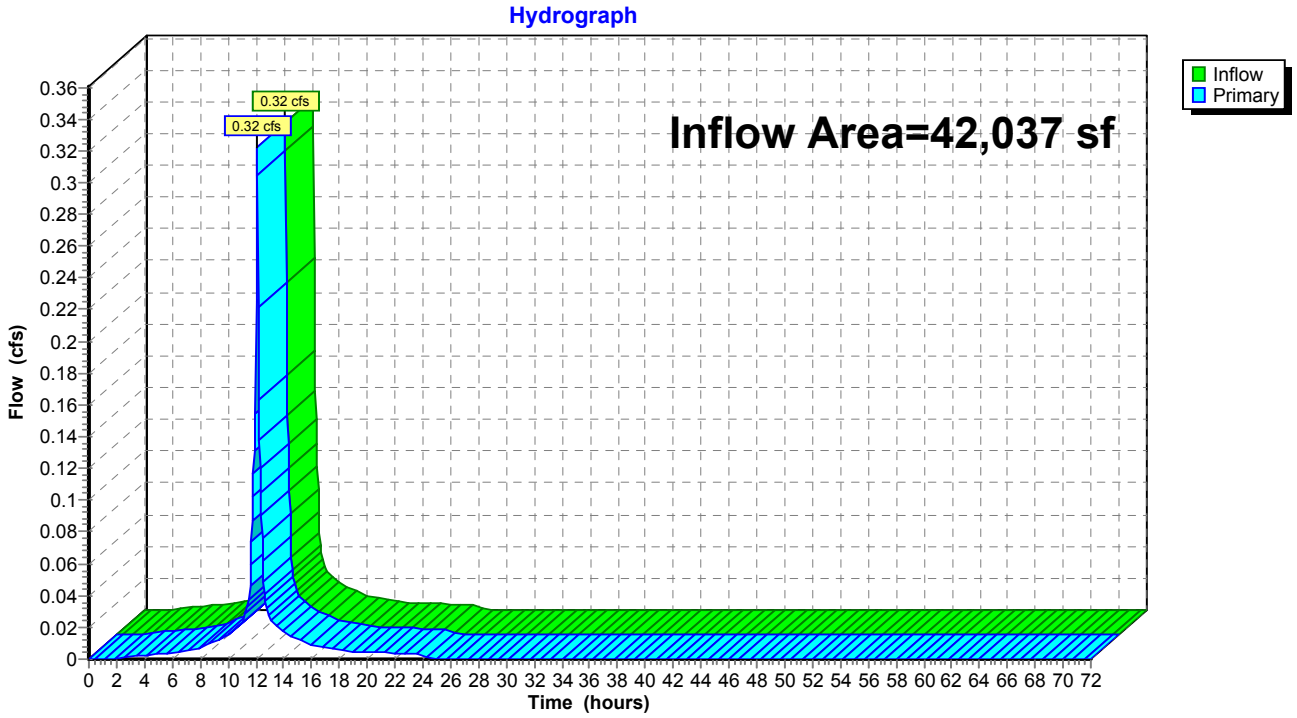
## Summary for Pond P1: Analysis Pt 1

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

Inflow Area = 42,037 sf, 10.31% Impervious, Inflow Depth = 0.32" for 2 YR event
Inflow = 0.32 cfs @ 12.07 hrs, Volume= 1,113 cf
Primary = 0.32 cfs @ 12.07 hrs, Volume= 1,113 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

### Pond P1: Analysis Pt 1



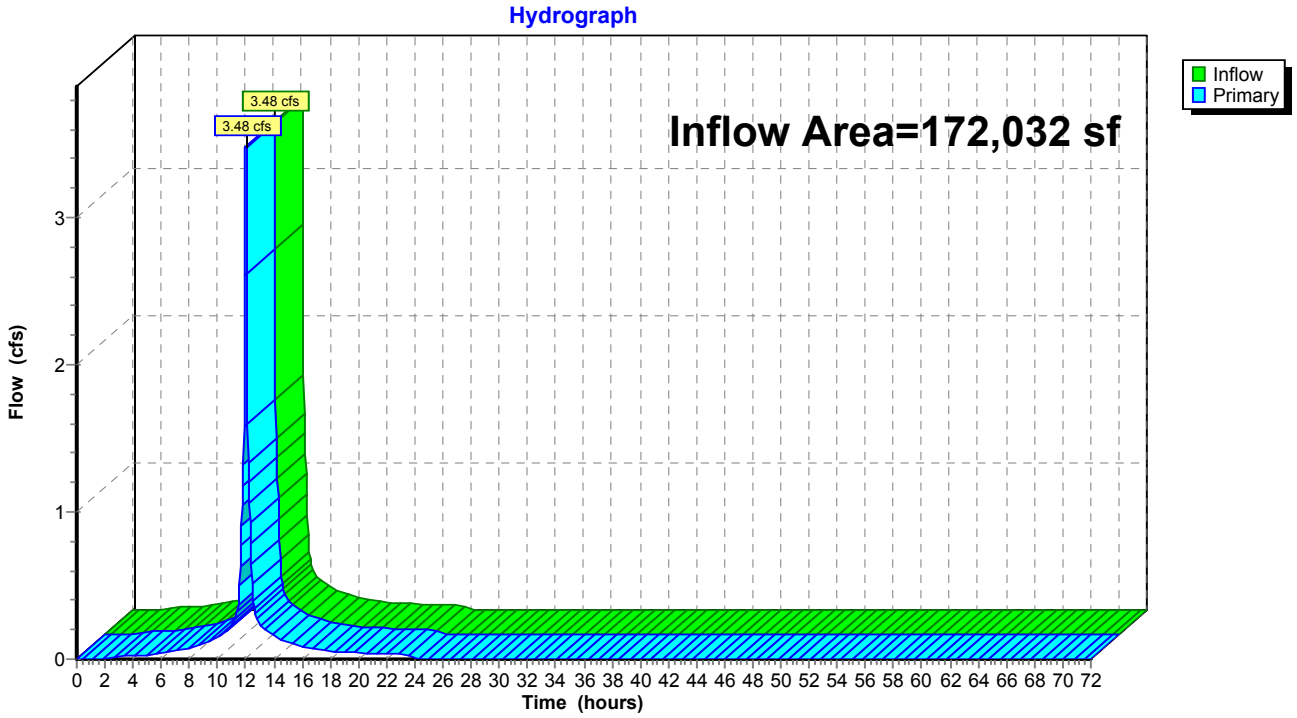
## Summary for Pond P2: Analysis Pt 2

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

Inflow Area = 172,032 sf, 23.94% Impervious, Inflow Depth = 0.74" for 2 YR event
Inflow = 3.48 cfs @ 12.00 hrs, Volume= 10,570 cf
Primary = 3.48 cfs @ 12.00 hrs, Volume= 10,570 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

### Pond P2: Analysis Pt 2



Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment S1: Subcat S1** Runoff Area=42,037 sf 10.31% Impervious Runoff Depth=0.58"
Tc=5.0 min CN=WQ Runoff=0.51 cfs 2,034 cf

**Subcatchment S2: Subcat S2** Runoff Area=172,032 sf 23.94% Impervious Runoff Depth=1.27"
Tc=0.0 min CN=WQ Runoff=5.50 cfs 18,193 cf

**Pond P1: Analysis Pt 1** Inflow=0.51 cfs 2,034 cf
Primary=0.51 cfs 2,034 cf

**Pond P2: Analysis Pt 2** Inflow=5.50 cfs 18,193 cf
Primary=5.50 cfs 18,193 cf

**Total Runoff Area = 214,069 sf Runoff Volume = 20,227 cf Average Runoff Depth = 1.13"**
**78.74% Pervious = 168,553 sf 21.26% Impervious = 45,517 sf**

## Summary for Subcatchment S1: Subcat S1

[49] Hint: Tc<2dt may require smaller dt

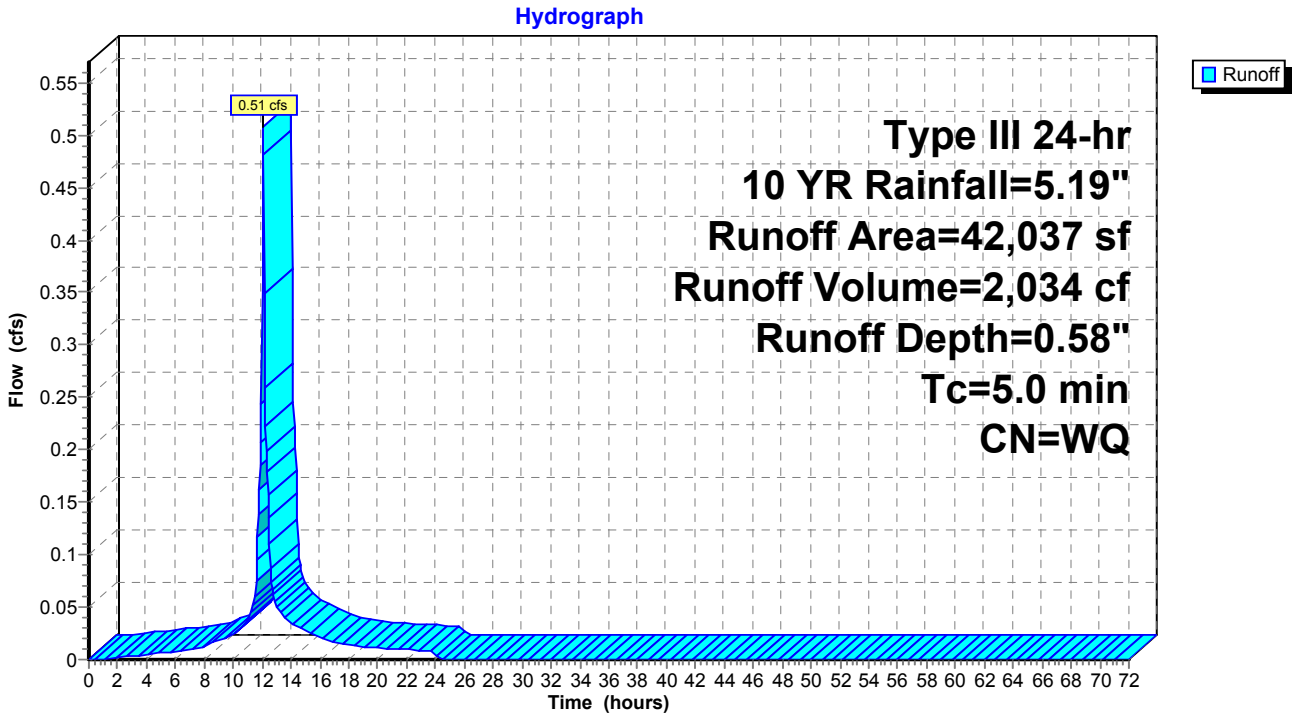
Runoff = 0.51 cfs @ 12.07 hrs, Volume= 2,034 cf, Depth= 0.58"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 YR Rainfall=5.19"

| Area (sf) | CN | Description |
|---|---|---|
| 3,126 | 39 | Pasture/grassland/range, Good, HSG A |
| 7,885 | 39 | Pasture/grassland/range, Good, HSG A |
| 3,872 | 30 | Woods, Good, HSG A |
| 3,391 | 30 | Woods, Good, HSG A |
| 19,431 | 30 | Woods, Good, HSG A |
| 4,333 | 98 | Paved parking, HSG A |
| 42,037 | | Weighted Average |
| 37,704 | 33 | 89.69% Pervious Area |
| 4,333 | 98 | 10.31% Impervious Area |

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

### Subcatchment S1: Subcat S1



## Summary for Subcatchment S2: Subcat S2

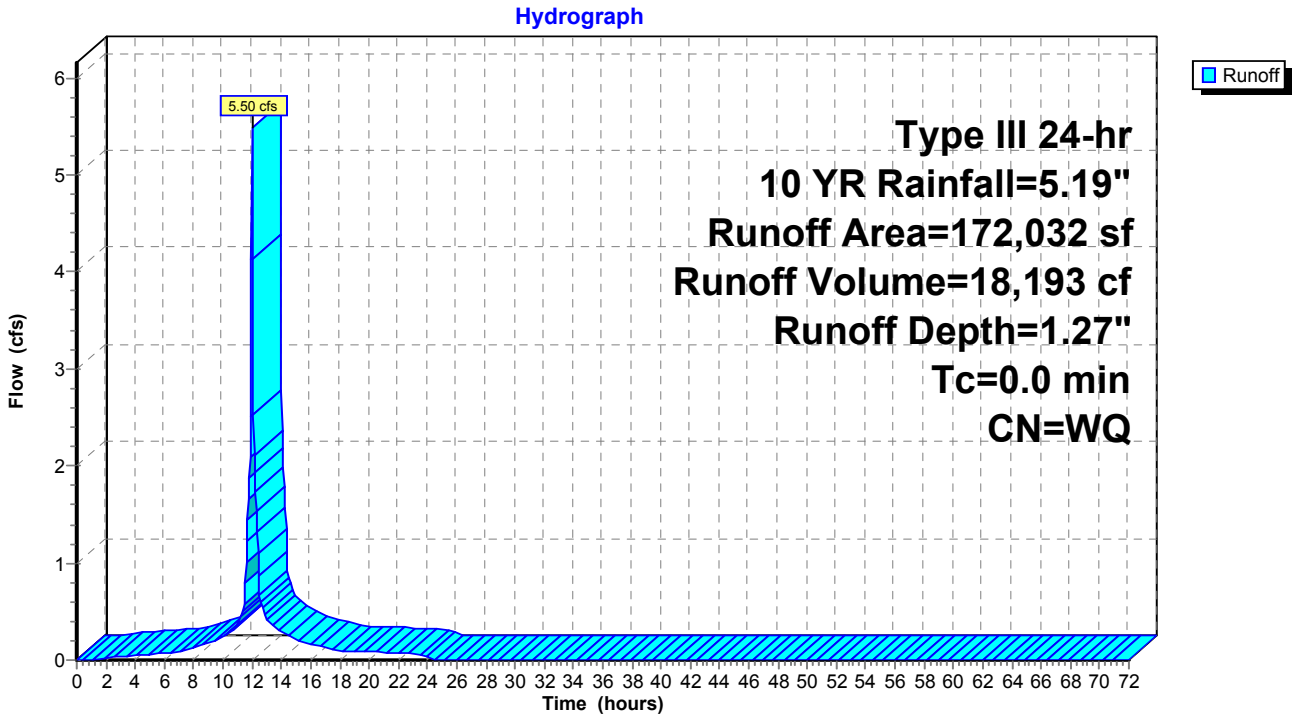
[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 5.50 cfs @ 12.00 hrs, Volume= 18,193 cf, Depth= 1.27"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 YR Rainfall=5.19"

| Area (sf) | CN | Description |
|---|---|---|
| 9 | 39 | Pasture/grassland/range, Good, HSG A |
| 4,136 | 39 | Pasture/grassland/range, Good, HSG A |
| 51,984 | 39 | Pasture/grassland/range, Good, HSG A |
| 19,333 | 30 | Woods, Good, HSG A |
| 2,869 | 30 | Woods, Good, HSG A |
| 16,428 | 30 | Woods, Good, HSG A |
| 2,840 | 30 | Woods, Good, HSG A |
| 360 | 30 | Woods, Good, HSG A |
| 32,889 | 30 | Woods, Good, HSG A |
| 52 | 98 | Paved parking, HSG A |
| 7,859 | 98 | Paved parking, HSG A |
| 33,272 | 98 | Paved parking, HSG A |
| 172,032 | | Weighted Average |
| 130,848 | 34 | 76.06% Pervious Area |
| 41,184 | 98 | 23.94% Impervious Area |

## Subcatchment S2: Subcat S2



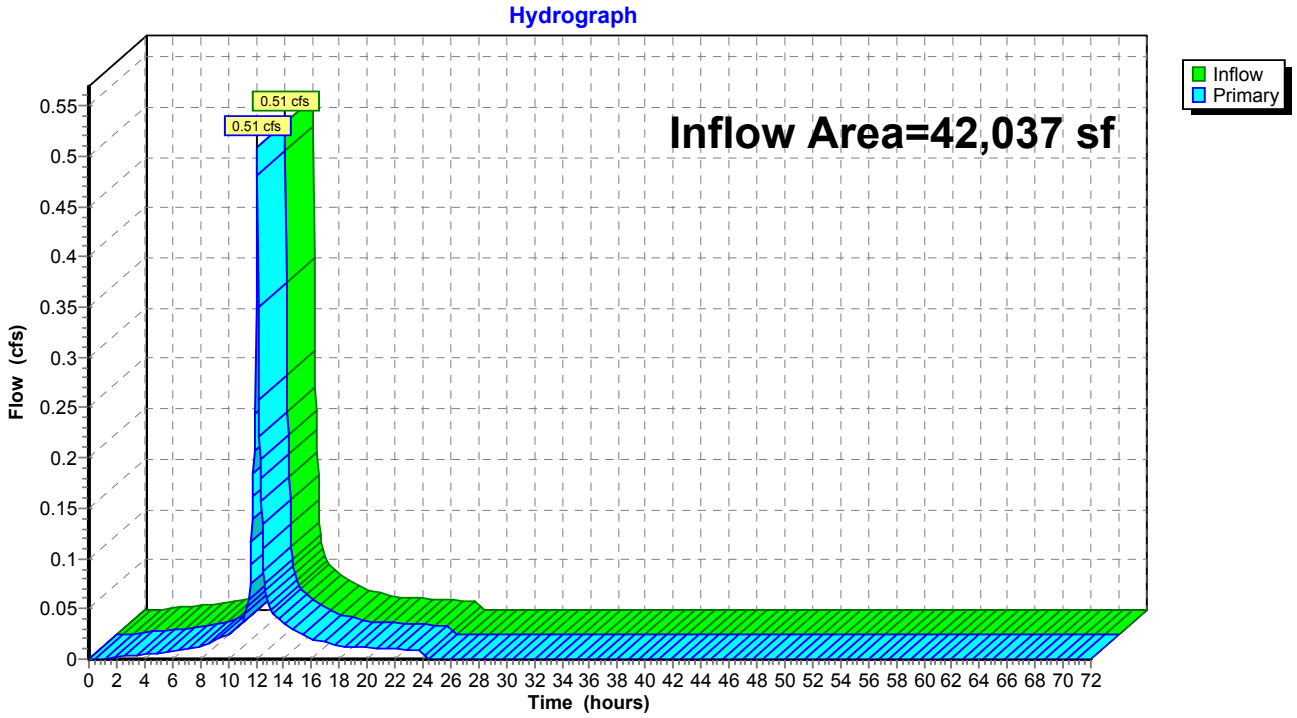
## Summary for Pond P1: Analysis Pt 1

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

Inflow Area = 42,037 sf, 10.31% Impervious, Inflow Depth = 0.58" for 10 YR event
Inflow = 0.51 cfs @ 12.07 hrs, Volume= 2,034 cf
Primary = 0.51 cfs @ 12.07 hrs, Volume= 2,034 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

### Pond P1: Analysis Pt 1



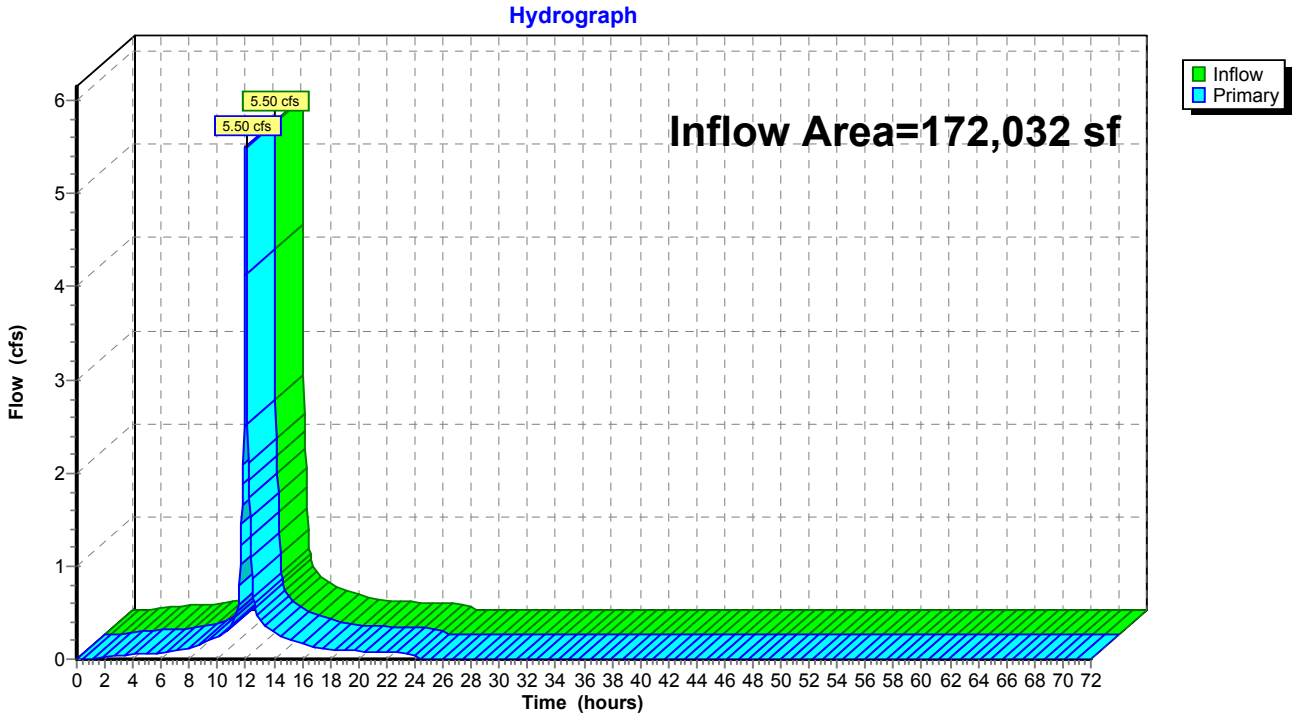
## Summary for Pond P2: Analysis Pt 2

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

Inflow Area = 172,032 sf, 23.94% Impervious, Inflow Depth = 1.27" for 10 YR event
Inflow = 5.50 cfs @ 12.00 hrs, Volume= 18,193 cf
Primary = 5.50 cfs @ 12.00 hrs, Volume= 18,193 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

### Pond P2: Analysis Pt 2



Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment S1: Subcat S1** Runoff Area=42,037 sf 10.31% Impervious Runoff Depth=0.85"
Tc=5.0 min CN=WQ Runoff=0.65 cfs 2,973 cf

**Subcatchment S2: Subcat S2** Runoff Area=172,032 sf 23.94% Impervious Runoff Depth=1.70"
Tc=0.0 min CN=WQ Runoff=6.84 cfs 24,311 cf

**Pond P1: Analysis Pt 1** Inflow=0.65 cfs 2,973 cf
Primary=0.65 cfs 2,973 cf

**Pond P2: Analysis Pt 2** Inflow=6.84 cfs 24,311 cf
Primary=6.84 cfs 24,311 cf

**Total Runoff Area = 214,069 sf Runoff Volume = 27,284 cf Average Runoff Depth = 1.53"**
**78.74% Pervious = 168,553 sf 21.26% Impervious = 45,517 sf**

## Summary for Subcatchment S1: Subcat S1

[49] Hint: Tc<2dt may require smaller dt

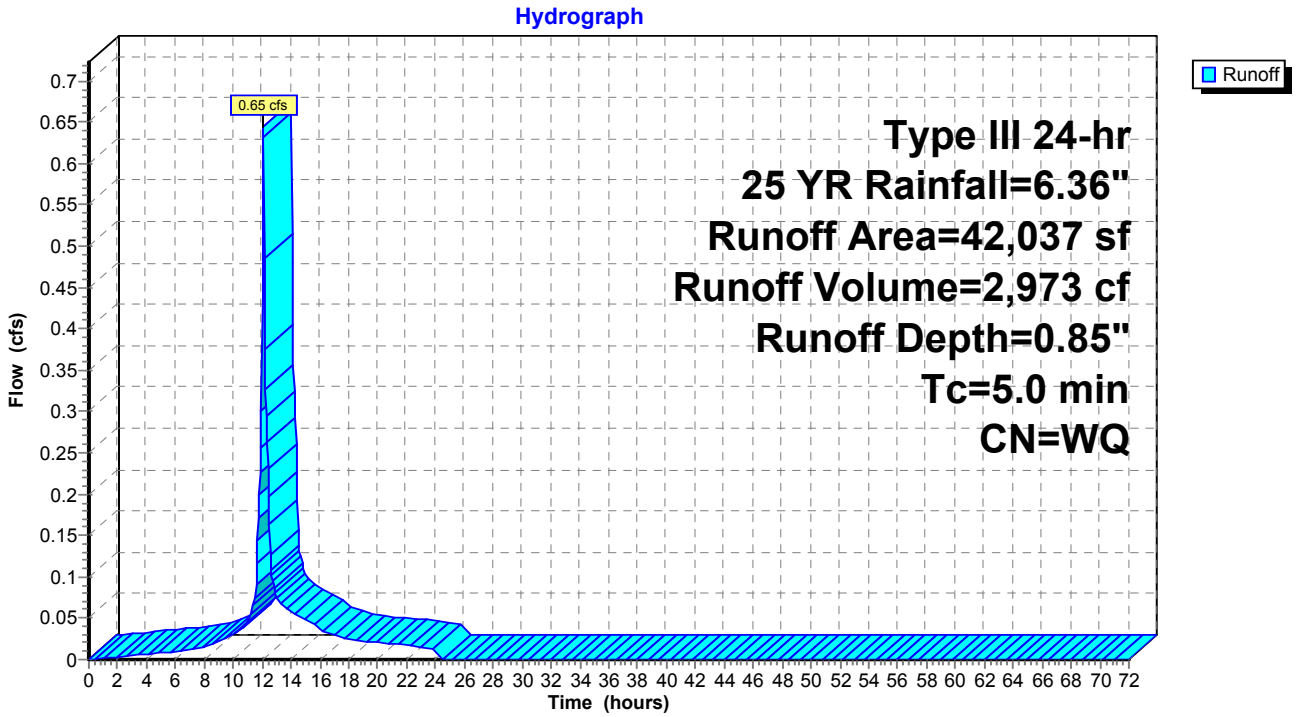
Runoff = 0.65 cfs @ 12.08 hrs, Volume= 2,973 cf, Depth= 0.85"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 YR Rainfall=6.36"

| Area (sf) | CN | Description |
|---|---|---|
| 3,126 | 39 | Pasture/grassland/range, Good, HSG A |
| 7,885 | 39 | Pasture/grassland/range, Good, HSG A |
| 3,872 | 30 | Woods, Good, HSG A |
| 3,391 | 30 | Woods, Good, HSG A |
| 19,431 | 30 | Woods, Good, HSG A |
| 4,333 | 98 | Paved parking, HSG A |
| 42,037 | | Weighted Average |
| 37,704 | 33 | 89.69% Pervious Area |
| 4,333 | 98 | 10.31% Impervious Area |

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

### Subcatchment S1: Subcat S1



## Summary for Subcatchment S2: Subcat S2

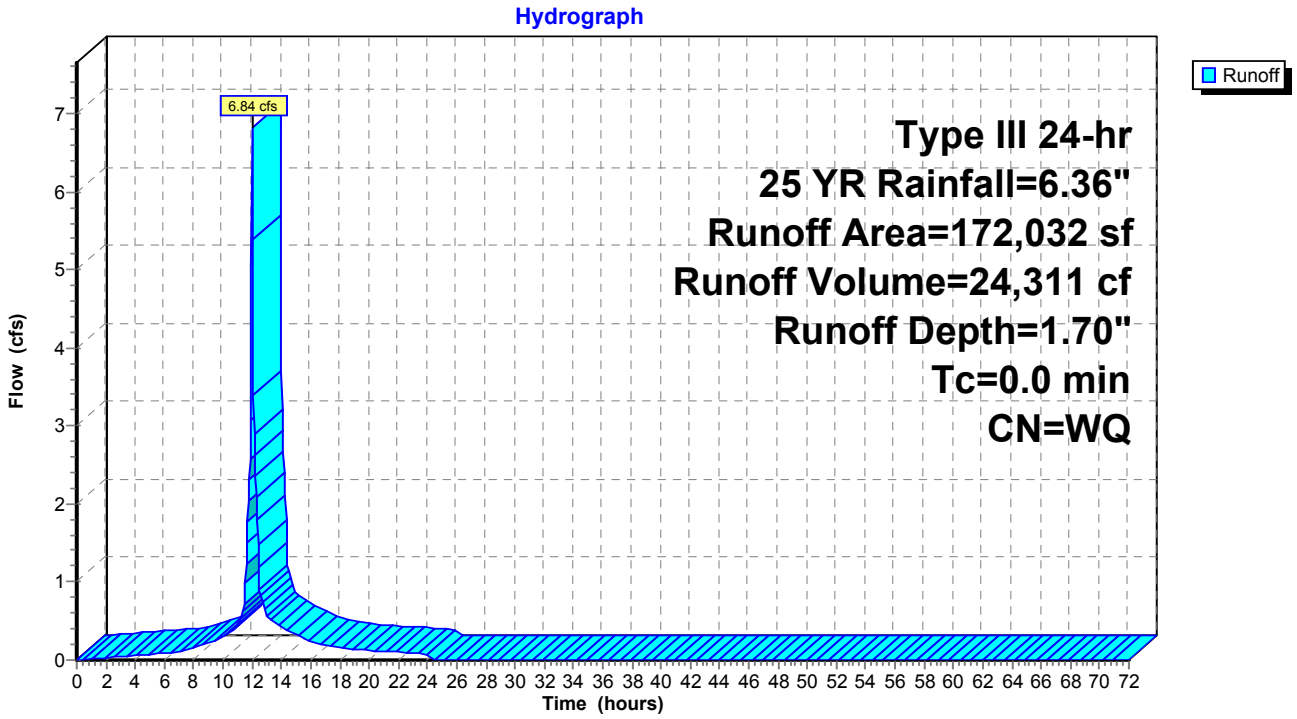
[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 6.84 cfs @ 12.00 hrs, Volume= 24,311 cf, Depth= 1.70"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 YR Rainfall=6.36"

| Area (sf) | CN | Description |
|---|---|---|
| 9 | 39 | Pasture/grassland/range, Good, HSG A |
| 4,136 | 39 | Pasture/grassland/range, Good, HSG A |
| 51,984 | 39 | Pasture/grassland/range, Good, HSG A |
| 19,333 | 30 | Woods, Good, HSG A |
| 2,869 | 30 | Woods, Good, HSG A |
| 16,428 | 30 | Woods, Good, HSG A |
| 2,840 | 30 | Woods, Good, HSG A |
| 360 | 30 | Woods, Good, HSG A |
| 32,889 | 30 | Woods, Good, HSG A |
| 52 | 98 | Paved parking, HSG A |
| 7,859 | 98 | Paved parking, HSG A |
| 33,272 | 98 | Paved parking, HSG A |
| 172,032 | | Weighted Average |
| 130,848 | 34 | 76.06% Pervious Area |
| 41,184 | 98 | 23.94% Impervious Area |

## Subcatchment S2: Subcat S2



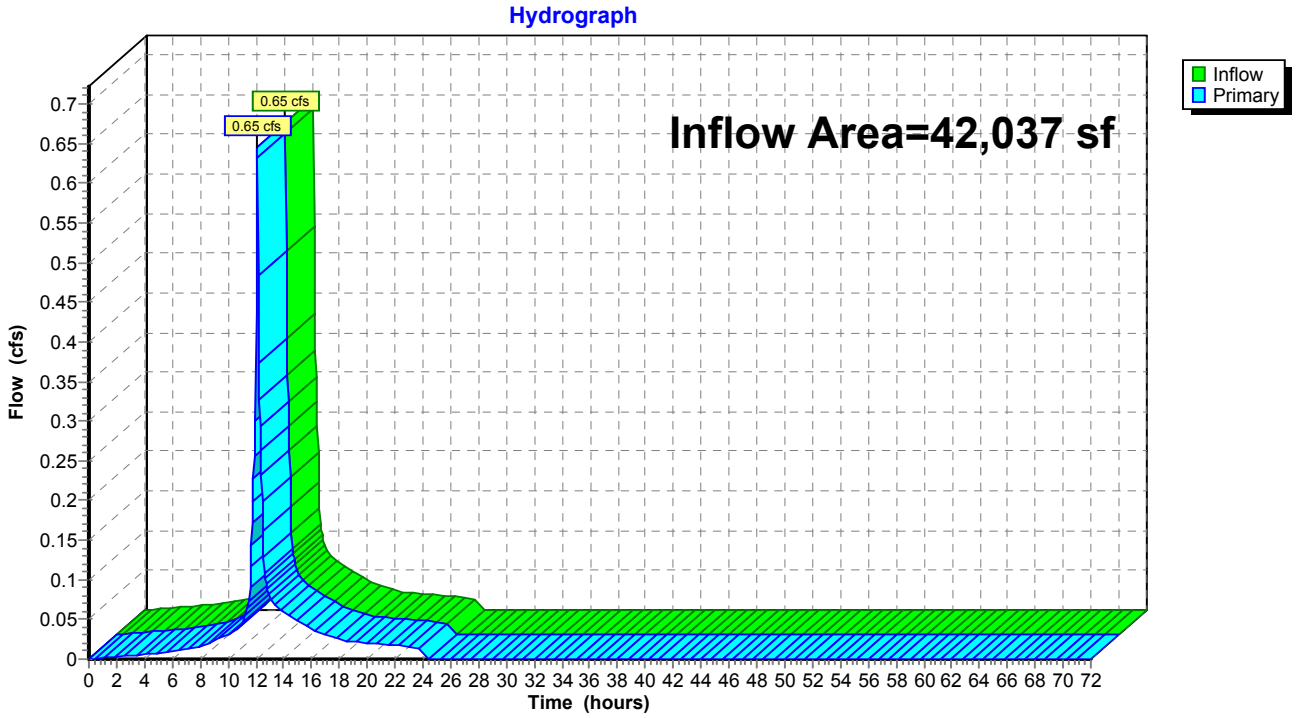
## Summary for Pond P1: Analysis Pt 1

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

Inflow Area = 42,037 sf, 10.31% Impervious, Inflow Depth = 0.85" for 25 YR event
Inflow = 0.65 cfs @ 12.08 hrs, Volume= 2,973 cf
Primary = 0.65 cfs @ 12.08 hrs, Volume= 2,973 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

### Pond P1: Analysis Pt 1



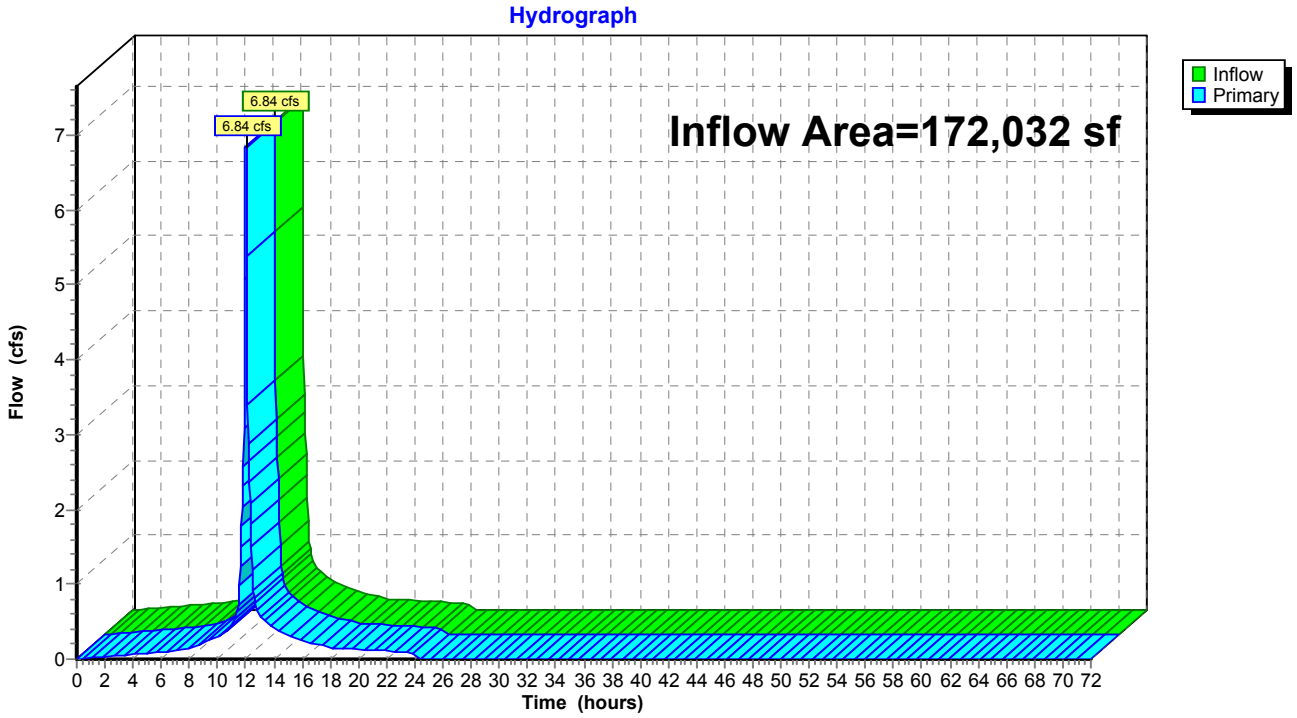
## Summary for Pond P2: Analysis Pt 2

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

Inflow Area = 172,032 sf, 23.94% Impervious, Inflow Depth = 1.70" for 25 YR event
Inflow = 6.84 cfs @ 12.00 hrs, Volume= 24,311 cf
Primary = 6.84 cfs @ 12.00 hrs, Volume= 24,311 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

### Pond P2: Analysis Pt 2



Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment S1: Subcat S1** Runoff Area=42,037 sf 10.31% Impervious Runoff Depth=1.43"
Tc=5.0 min CN=WQ Runoff=1.03 cfs 5,008 cf

**Subcatchment S2: Subcat S2** Runoff Area=172,032 sf 23.94% Impervious Runoff Depth=2.50"
Tc=0.0 min CN=WQ Runoff=10.02 cfs 35,812 cf

**Pond P1: Analysis Pt 1** Inflow=1.03 cfs 5,008 cf
Primary=1.03 cfs 5,008 cf

**Pond P2: Analysis Pt 2** Inflow=10.02 cfs 35,812 cf
Primary=10.02 cfs 35,812 cf

**Total Runoff Area = 214,069 sf Runoff Volume = 40,821 cf Average Runoff Depth = 2.29"**
**78.74% Pervious = 168,553 sf 21.26% Impervious = 45,517 sf**

## Summary for Subcatchment S1: Subcat S1

[49] Hint: Tc<2dt may require smaller dt

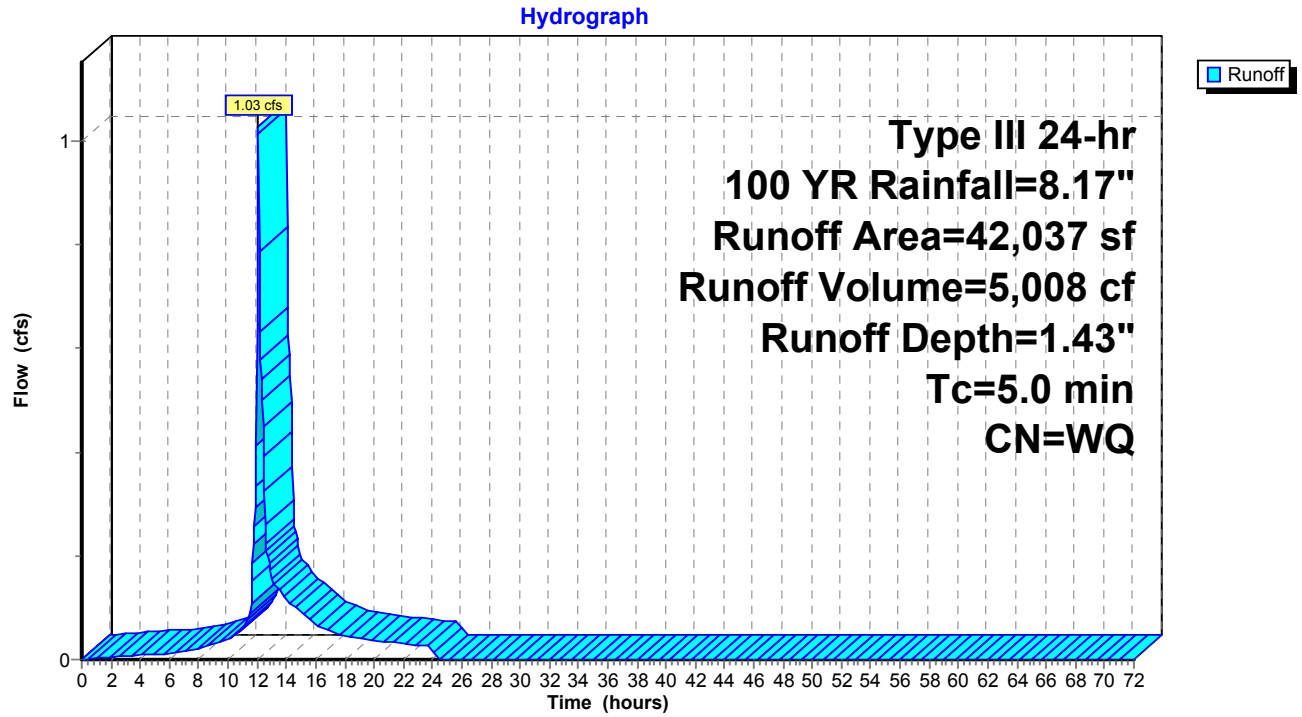
Runoff = 1.03 cfs @ 12.08 hrs, Volume= 5,008 cf, Depth= 1.43"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 YR Rainfall=8.17"

| Area (sf) | CN | Description |
|---|---|---|
| 3,126 | 39 | Pasture/grassland/range, Good, HSG A |
| 7,885 | 39 | Pasture/grassland/range, Good, HSG A |
| 3,872 | 30 | Woods, Good, HSG A |
| 3,391 | 30 | Woods, Good, HSG A |
| 19,431 | 30 | Woods, Good, HSG A |
| 4,333 | 98 | Paved parking, HSG A |
| 42,037 | | Weighted Average |
| 37,704 | 33 | 89.69% Pervious Area |
| 4,333 | 98 | 10.31% Impervious Area |

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

### Subcatchment S1: Subcat S1



## Summary for Subcatchment S2: Subcat S2

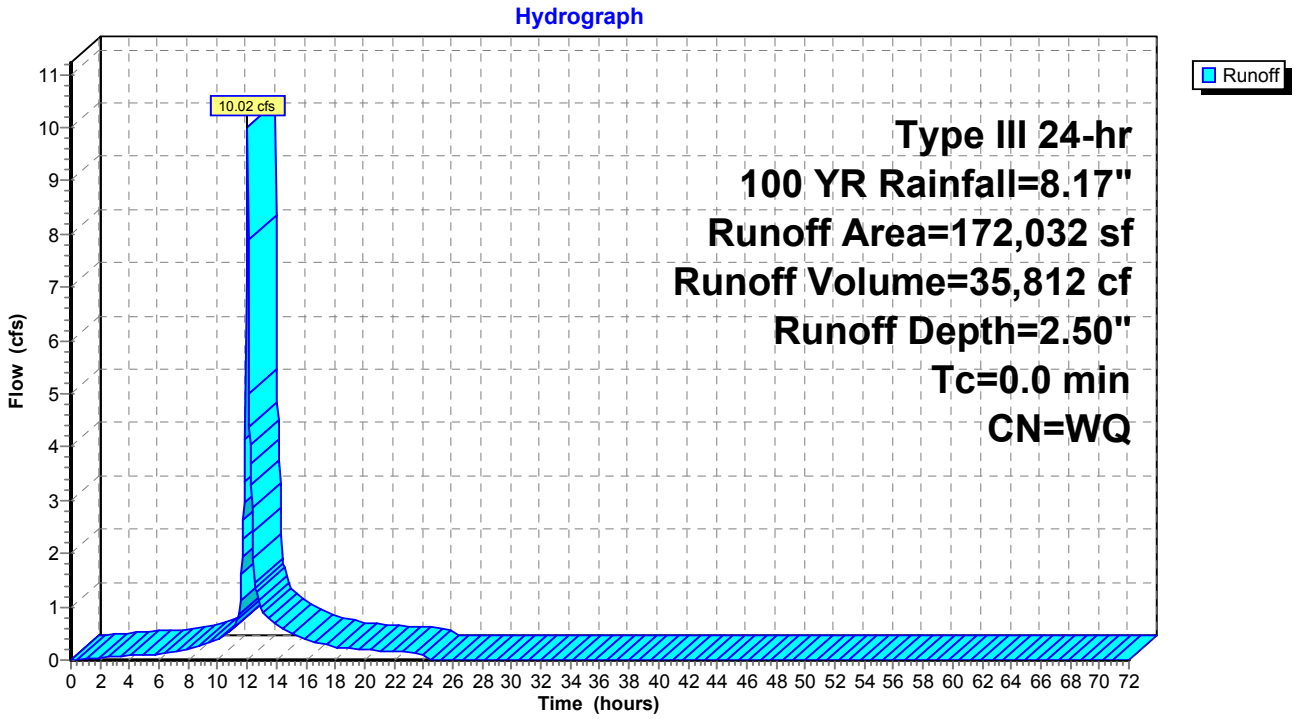
[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 10.02 cfs @ 12.00 hrs, Volume= 35,812 cf, Depth= 2.50"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 YR Rainfall=8.17"

| Area (sf) | CN | Description |
|---|---|---|
| 9 | 39 | Pasture/grassland/range, Good, HSG A |
| 4,136 | 39 | Pasture/grassland/range, Good, HSG A |
| 51,984 | 39 | Pasture/grassland/range, Good, HSG A |
| 19,333 | 30 | Woods, Good, HSG A |
| 2,869 | 30 | Woods, Good, HSG A |
| 16,428 | 30 | Woods, Good, HSG A |
| 2,840 | 30 | Woods, Good, HSG A |
| 360 | 30 | Woods, Good, HSG A |
| 32,889 | 30 | Woods, Good, HSG A |
| 52 | 98 | Paved parking, HSG A |
| 7,859 | 98 | Paved parking, HSG A |
| 33,272 | 98 | Paved parking, HSG A |
| 172,032 | | Weighted Average |
| 130,848 | 34 | 76.06% Pervious Area |
| 41,184 | 98 | 23.94% Impervious Area |

## Subcatchment S2: Subcat S2



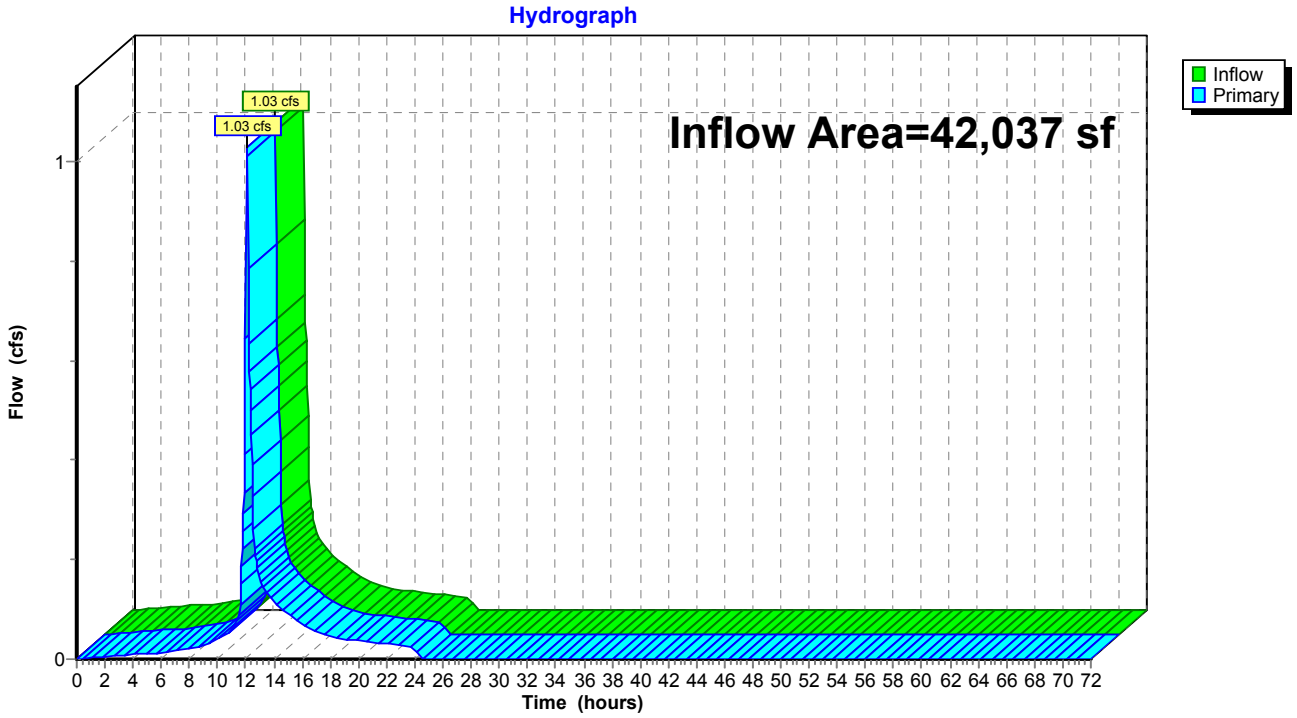
## Summary for Pond P1: Analysis Pt 1

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

Inflow Area = 42,037 sf, 10.31% Impervious, Inflow Depth = 1.43" for 100 YR event
Inflow = 1.03 cfs @ 12.08 hrs, Volume= 5,008 cf
Primary = 1.03 cfs @ 12.08 hrs, Volume= 5,008 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

### Pond P1: Analysis Pt 1



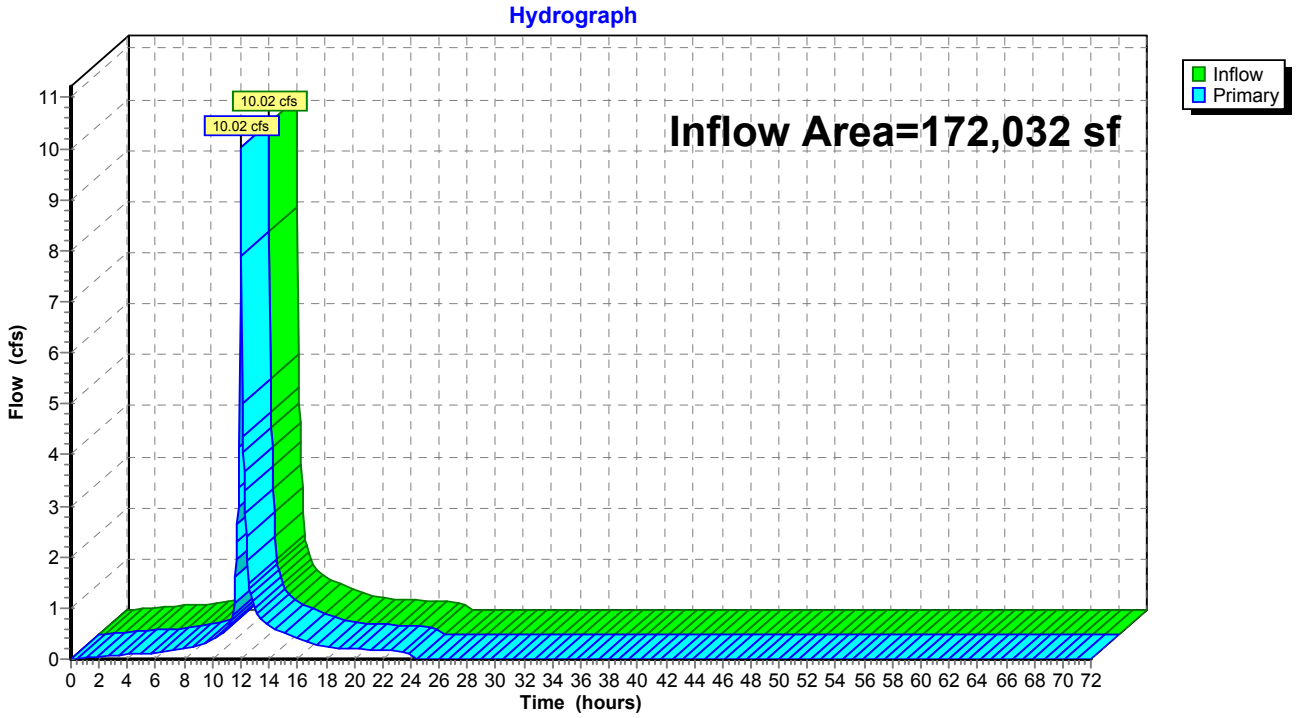
## Summary for Pond P2: Analysis Pt 2

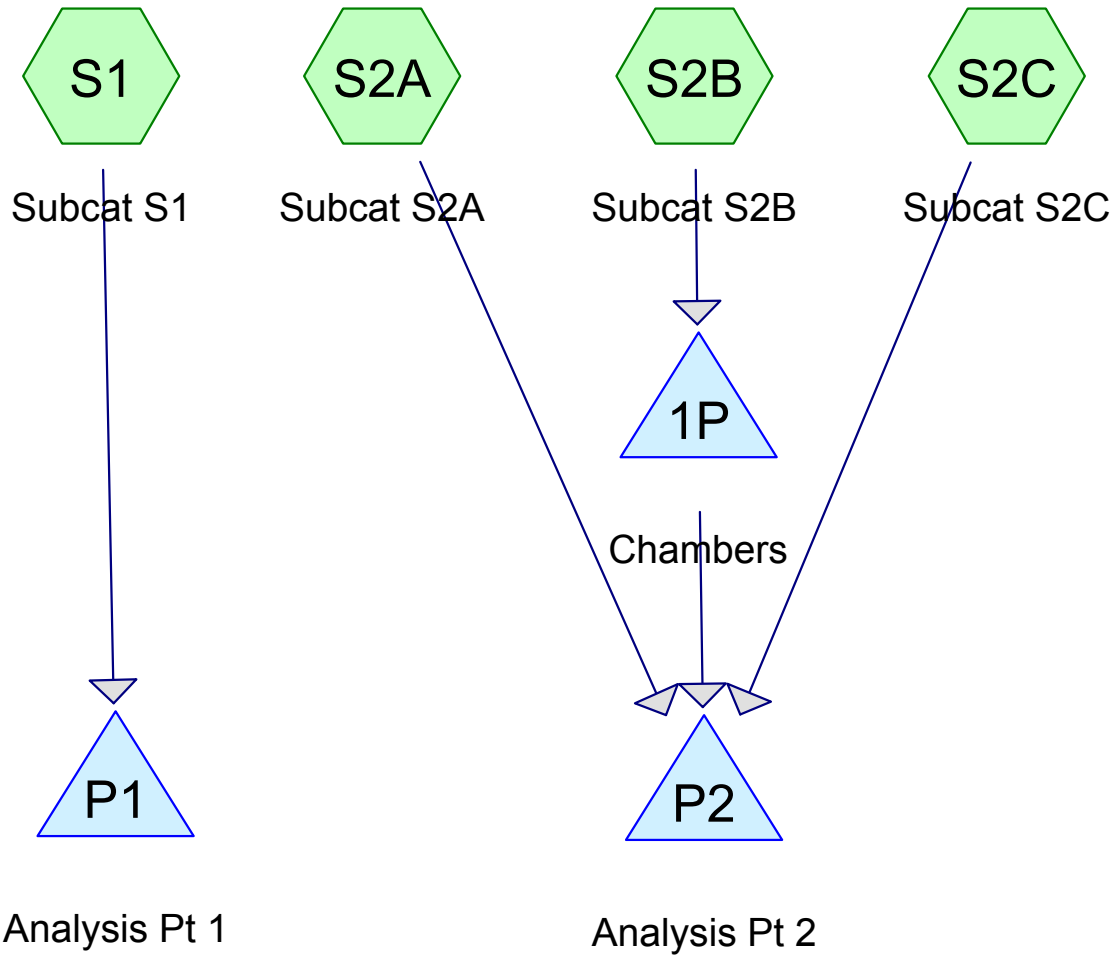
[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 172,032 sf, 23.94% Impervious, Inflow Depth = 2.50" for 100 YR event
Inflow = 10.02 cfs @ 12.00 hrs, Volume= 35,812 cf
Primary = 10.02 cfs @ 12.00 hrs, Volume= 35,812 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

### Pond P2: Analysis Pt 2






Subcat Reach Pond Link

**Routing Diagram for HydroCAD-PR**
Prepared by Hewlett-Packard Company, Printed 8/2/2018

## Area Listing (all nodes)

| Area (sq-ft) | CN | Description (subcatchment-numbers) |
|---|---|---|
| 157,990 | 39 | Pasture/grassland/range, Good, HSG A (S1, S2A, S2B, S2C) |
| 48,068 | 98 | Paved parking, HSG A (S1, S2A, S2B, S2C) |
| 8,011 | 30 | Woods, Good, HSG A (S1, S2A, S2C) |
| **214,069** | **52** | **TOTAL AREA** |

## Soil Listing (all nodes)

| Area (sq-ft) | Soil Group | Subcatchment Numbers |
|---|---|---|
| 214,069 | HSG A | S1, S2A, S2B, S2C |
| 0 | HSG B | |
| 0 | HSG C | |
| 0 | HSG D | |
| 0 | Other | |
| **214,069** | | **TOTAL AREA** |

## Ground Covers (all nodes)

| HSG-A (sq-ft) | HSG-B (sq-ft) | HSG-C (sq-ft) | HSG-D (sq-ft) | Other (sq-ft) | Total (sq-ft) | Ground Cover |
|---|---|---|---|---|---|---|
| 157,990 | 0 | 0 | 0 | 0 | 157,990 | Pasture/grassland/range, Good |
| 48,068 | 0 | 0 | 0 | 0 | 48,068 | Paved parking |
| 8,011 | 0 | 0 | 0 | 0 | 8,011 | Woods, Good |
| **214,069** | **0** | **0** | **0** | **0** | **214,069** | **TOTAL AREA** |

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment S1: Subcat S1** Runoff Area=18,284 sf 11.78% Impervious Runoff Depth=0.36"
Tc=5.0 min CN=WQ Runoff=0.16 cfs 555 cf

**Subcatchment S2A: Subcat S2A** Runoff Area=151,520 sf 15.85% Impervious Runoff Depth=0.49"
Tc=0.0 min CN=WQ Runoff=2.03 cfs 6,178 cf

**Subcatchment S2B: Subcat S2B** Runoff Area=23,735 sf 89.08% Impervious Runoff Depth=2.74"
Tc=0.0 min CN=WQ Runoff=1.79 cfs 5,422 cf

**Subcatchment S2C: Subcat S2C** Runoff Area=20,530 sf 3.69% Impervious Runoff Depth=0.12"
Tc=0.0 min CN=WQ Runoff=0.06 cfs 198 cf

**Pond 1P: Chambers** Peak Elev=195.01' Storage=2,091 cf Inflow=1.79 cfs 5,422 cf
Discarded=0.12 cfs 5,422 cf Primary=0.00 cfs 0 cf Outflow=0.12 cfs 5,422 cf

**Pond P1: Analysis Pt 1** Inflow=0.16 cfs 555 cf
Primary=0.16 cfs 555 cf

**Pond P2: Analysis Pt 2** Inflow=2.09 cfs 6,376 cf
Primary=2.09 cfs 6,376 cf

**Total Runoff Area = 214,069 sf Runoff Volume = 12,353 cf Average Runoff Depth = 0.69"**
**77.55% Pervious = 166,001 sf 22.45% Impervious = 48,068 sf**

## Summary for Subcatchment S1: Subcat S1

[49] Hint: Tc<2dt may require smaller dt

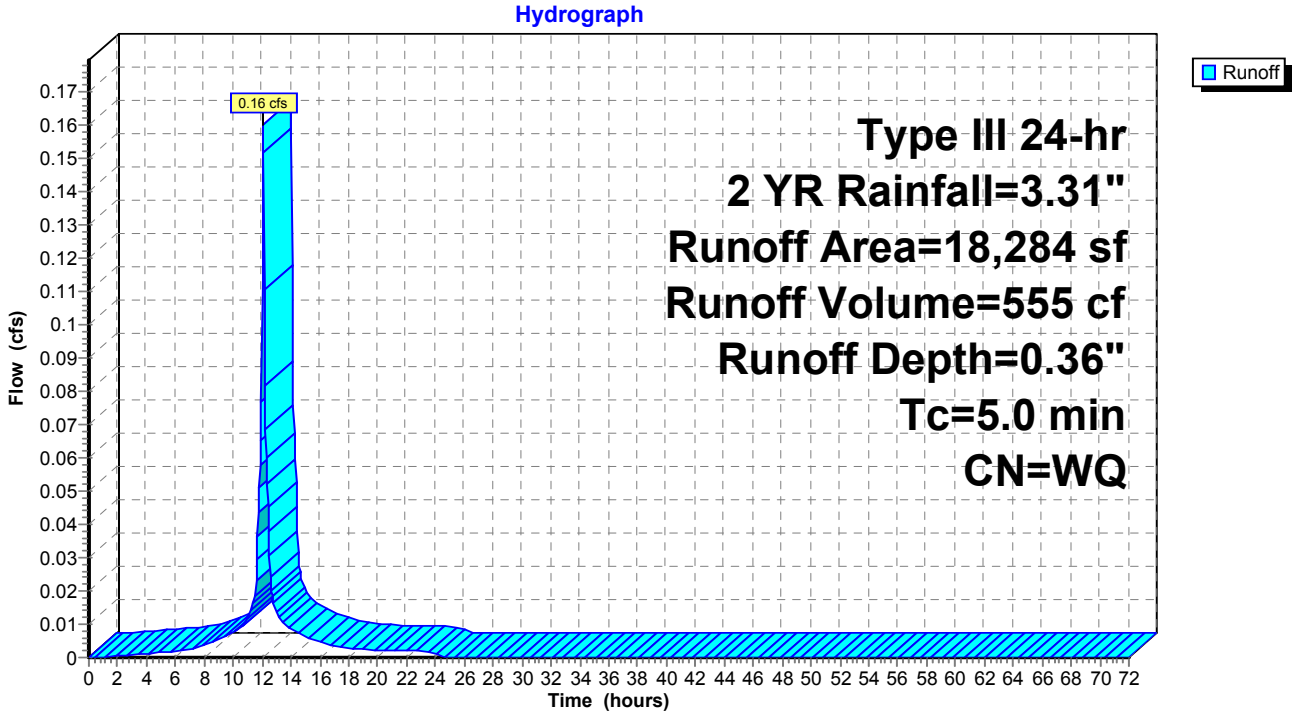
Runoff = 0.16 cfs @ 12.07 hrs, Volume= 555 cf, Depth= 0.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 YR Rainfall=3.31"

| Area (sf) | CN | Description |
|---|---|---|
| 13,672 | 39 | Pasture/grassland/range, Good, HSG A |
| 2,410 | 39 | Pasture/grassland/range, Good, HSG A |
| 48 | 30 | Woods, Good, HSG A |
| 2,154 | 98 | Paved parking, HSG A |
| 18,284 | | Weighted Average |
| 16,130 | | 88.22% Pervious Area |
| 2,154 | | 11.78% Impervious Area |

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

## Subcatchment S1: Subcat S1



## Summary for Subcatchment S2A: Subcat S2A

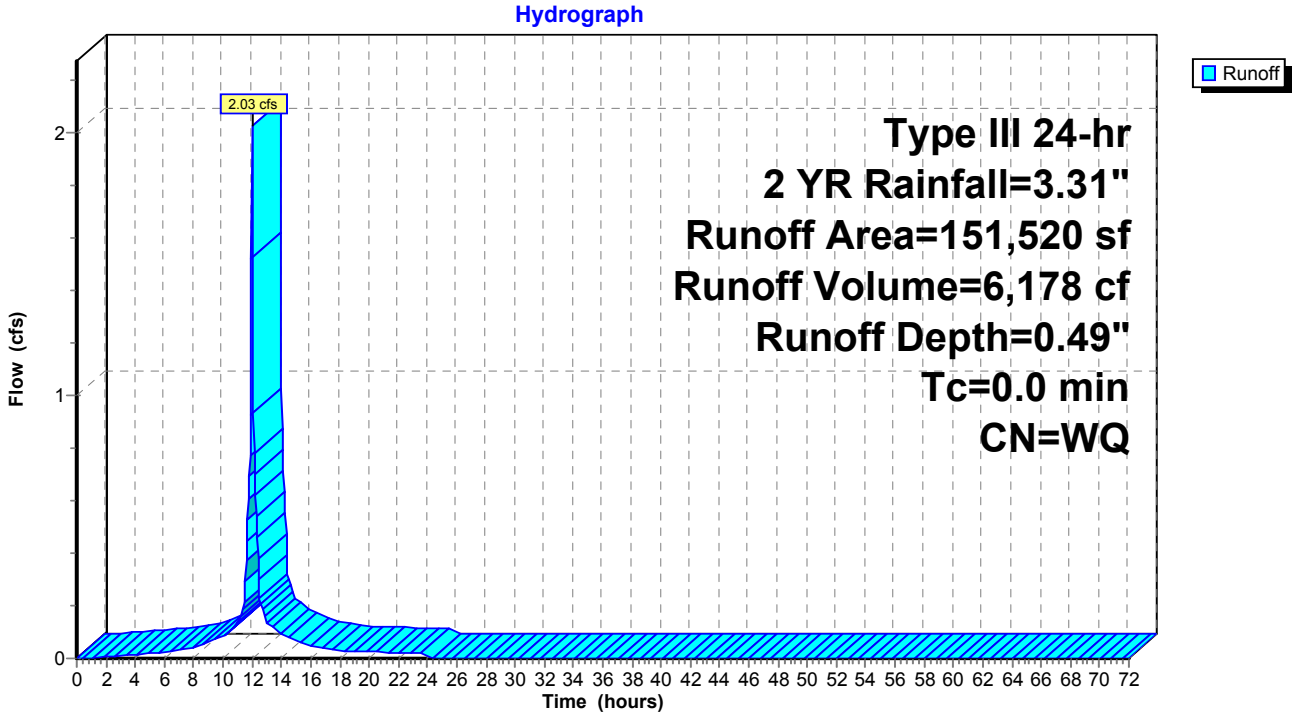
[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 2.03 cfs @ 12.00 hrs, Volume= 6,178 cf, Depth= 0.49"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 YR Rainfall=3.31"

| Area (sf) | CN | Description |
|---|---|---|
| 12,933 | 39 | Pasture/grassland/range, Good, HSG A |
| 8,306 | 39 | Pasture/grassland/range, Good, HSG A |
| 76,277 | 39 | Pasture/grassland/range, Good, HSG A |
| 9 | 39 | Pasture/grassland/range, Good, HSG A |
| 22,045 | 39 | Pasture/grassland/range, Good, HSG A |
| 149 | 30 | Woods, Good, HSG A |
| 360 | 30 | Woods, Good, HSG A |
| 7,184 | 30 | Woods, Good, HSG A |
| 24,012 | 98 | Paved parking, HSG A |
| 246 | 39 | Pasture/grassland/range, Good, HSG A |
| 151,520 | | Weighted Average |
| 127,508 | | 84.15% Pervious Area |
| 24,012 | | 15.85% Impervious Area |

## Subcatchment S2A: Subcat S2A



## Summary for Subcatchment S2B: Subcat S2B

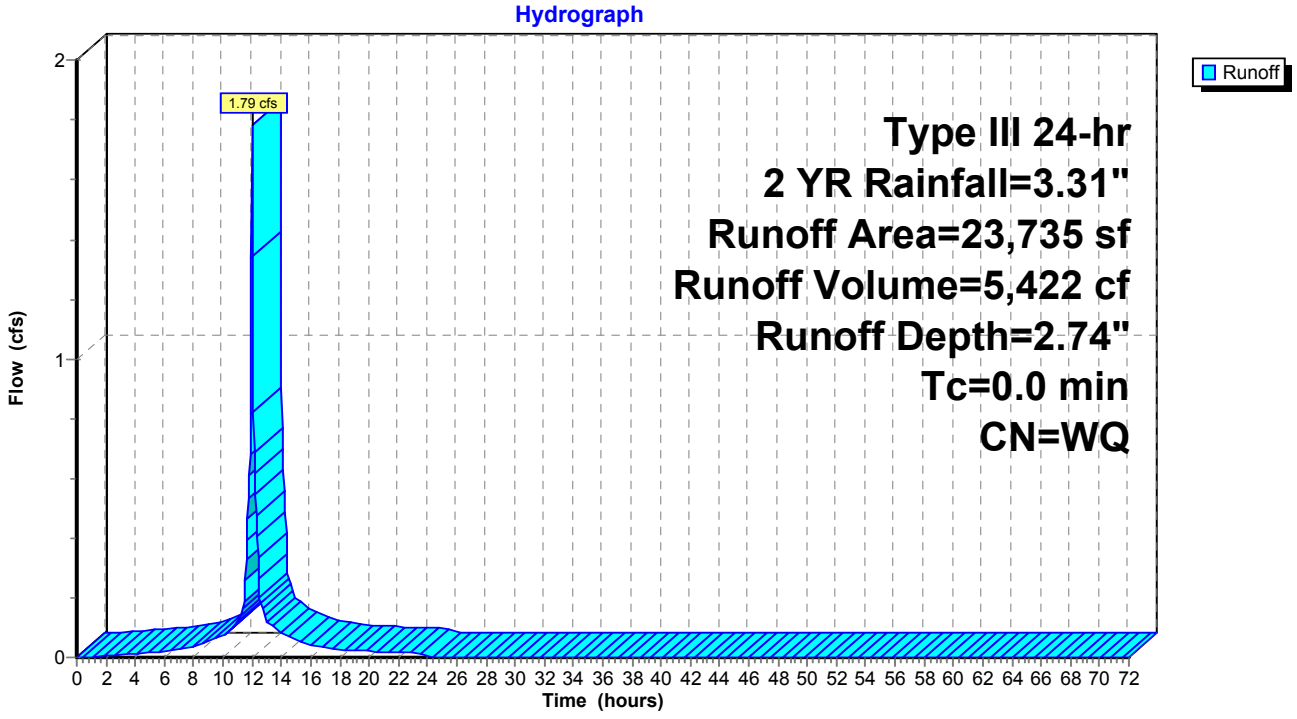
[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 1.79 cfs @ 12.00 hrs, Volume= 5,422 cf, Depth= 2.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 YR Rainfall=3.31"

| Area (sf) | CN | Description |
|---|---|---|
| 21,144 | 98 | Paved parking, HSG A |
| 266 | 39 | Pasture/grassland/range, Good, HSG A |
| 40 | 39 | Pasture/grassland/range, Good, HSG A |
| 266 | 39 | Pasture/grassland/range, Good, HSG A |
| 0 | 39 | Pasture/grassland/range, Good, HSG A |
| 2,018 | 39 | Pasture/grassland/range, Good, HSG A |
| 23,735 | | Weighted Average |
| 2,591 | | 10.92% Pervious Area |
| 21,144 | | 89.08% Impervious Area |

## Subcatchment S2B: Subcat S2B



## Summary for Subcatchment S2C: Subcat S2C

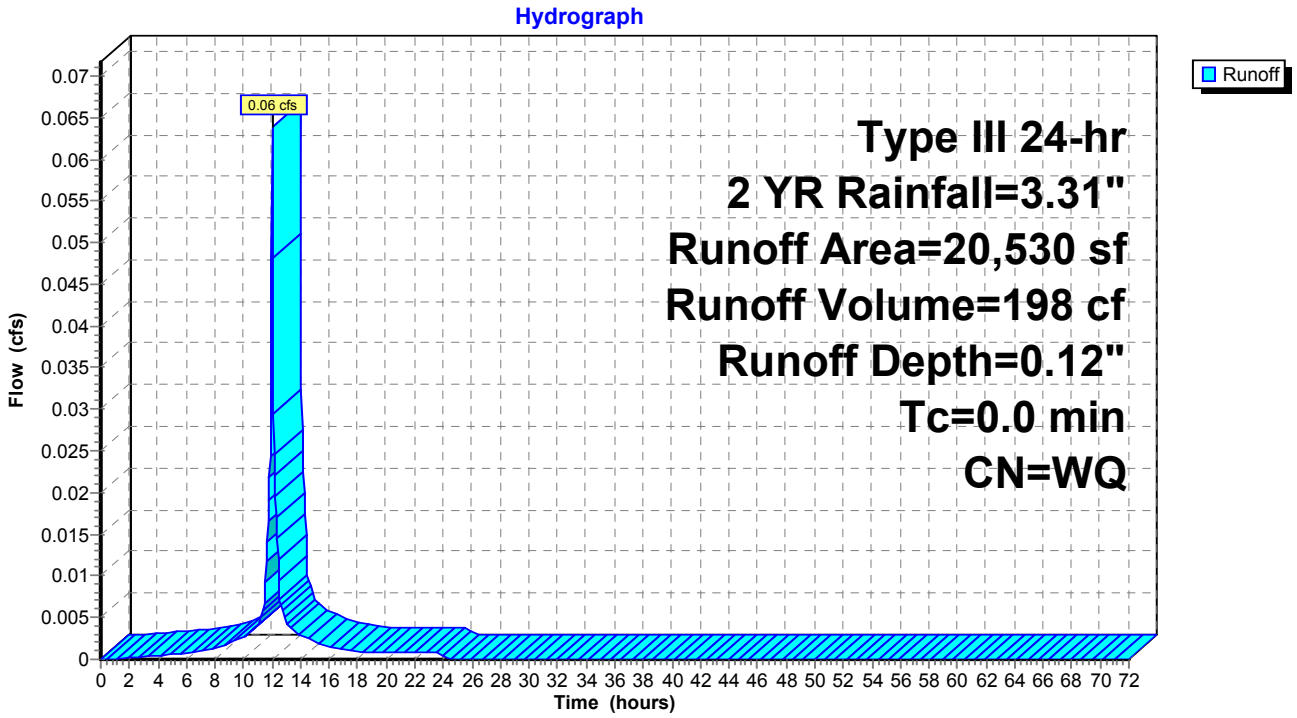
[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 0.06 cfs @ 12.00 hrs, Volume= 198 cf, Depth= 0.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 YR Rainfall=3.31"

| Area (sf) | CN | Description |
|---|---|---|
| 1,384 | 39 | Pasture/grassland/range, Good, HSG A |
| 18,118 | 39 | Pasture/grassland/range, Good, HSG A |
| 270 | 30 | Woods, Good, HSG A |
| 757 | 98 | Paved parking, HSG A |
| 20,530 | | Weighted Average |
| 19,772 | | 96.31% Pervious Area |
| 757 | | 3.69% Impervious Area |

## Subcatchment S2C: Subcat S2C



## Summary for Pond 1P: Chambers

Inflow Area = 23,735 sf, 89.08% Impervious, Inflow Depth = 2.74" for 2 YR event
Inflow = 1.79 cfs @ 12.00 hrs, Volume= 5,422 cf
Outflow = 0.12 cfs @ 13.06 hrs, Volume= 5,422 cf, Atten= 94%, Lag= 63.6 min
Discarded = 0.12 cfs @ 13.06 hrs, Volume= 5,422 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 195.01' @ 13.06 hrs Surf.Area= 2,052 sf Storage= 2,091 cf

Plug-Flow detention time= 137.6 min calculated for 5,422 cf (100% of inflow)
Center-of-Mass det. time= 137.6 min ( 887.8 - 750.2 )

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1A | 193.50' | 1,838 cf | **25.25'W x 80.76'L x 3.50'H Field A**<br>7,137 cf Overall - 2,541 cf Embedded = 4,596 cf x 40.0% Voids |
| #2A | 194.00' | 2,541 cf | **ADS_StormTech SC-740** x 55 Inside #1<br>Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf<br>Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap<br>Row Length Adjustment= +0.44' x 6.45 sf x 5 rows |
| #3 | 193.50' | 75 cf | **4.00'D x 6.00'H Vertical Cone/Cylinder** |
| | | 4,455 cf | Total Available Storage |

Storage Group A created with Chamber Wizard

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Discarded | 193.50' | **2.410 in/hr Exfiltration over Horizontal area**<br>Conductivity to Groundwater Elevation = 0.00' |
| #2 | Primary | 197.00' | **4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) |
| #3 | Primary | 195.50' | **8.0" Vert. Orifice/Grate** C= 0.600 |

**Discarded OutFlow** Max=0.12 cfs @ 13.06 hrs HW=195.01' (Free Discharge)
└**1=Exfiltration** ( Controls 0.12 cfs)

**Primary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=193.50' (Free Discharge)
├**2=Sharp-Crested Rectangular Weir** ( Controls 0.00 cfs)
└**3=Orifice/Grate** ( Controls 0.00 cfs)

## Pond 1P: Chambers - Chamber Wizard Field A

**Chamber Model = ADS_StormTechSC-740 (ADS StormTech® SC-740)**
Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf
Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap
Row Length Adjustment= +0.44' x 6.45 sf x 5 rows

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

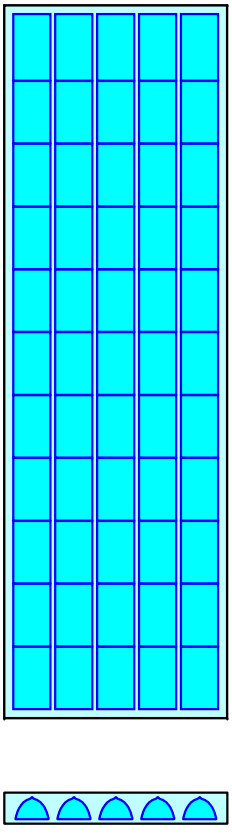
11 Chambers/Row x 7.12' Long +0.44' Row Adjustment = 78.76' Row Length +12.0" End Stone x 2 = 80.76' Base Length
5 Rows x 51.0" Wide + 6.0" Spacing x 4 + 12.0" Side Stone x 2 = 25.25' Base Width
6.0" Base + 30.0" Chamber Height + 6.0" Cover = 3.50' Field Height

55 Chambers x 45.9 cf +0.44' Row Adjustment x 6.45 sf x 5 Rows = 2,540.8 cf Chamber Storage

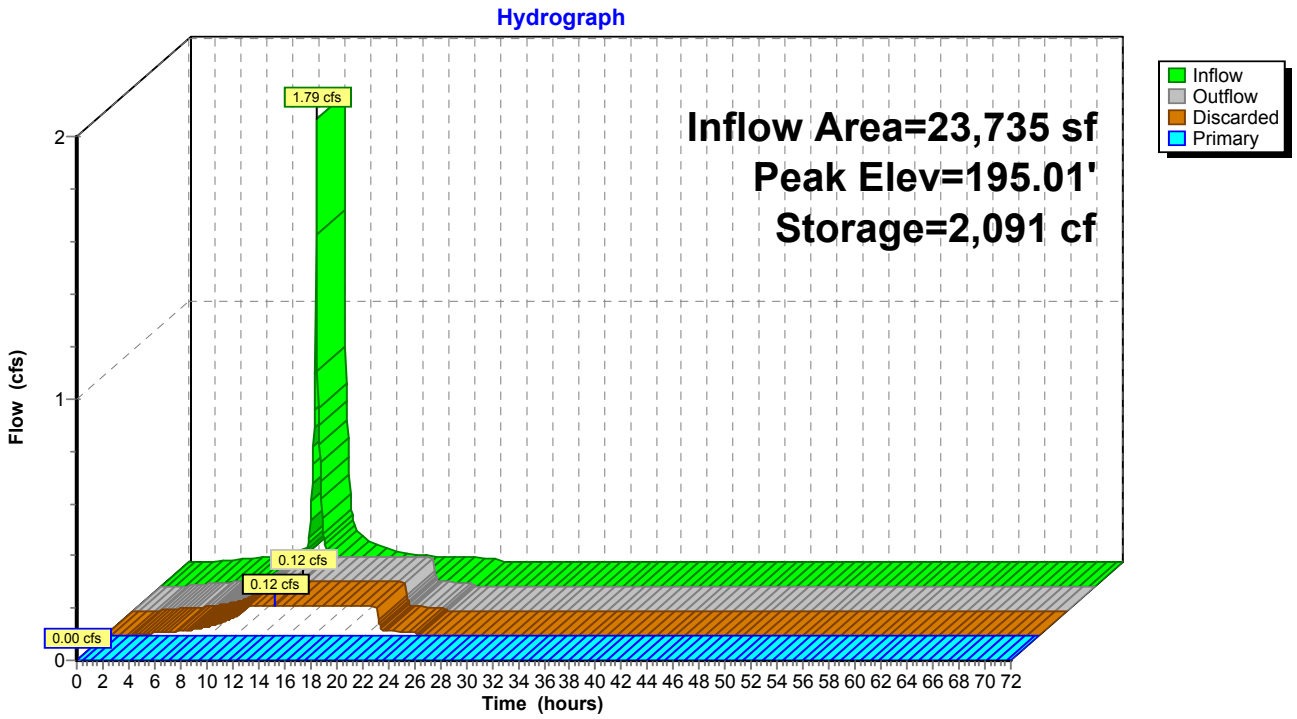
7,137.0 cf Field - 2,540.8 cf Chambers = 4,596.2 cf Stone x 40.0% Voids = 1,838.5 cf Stone Storage

Chamber Storage + Stone Storage = 4,379.3 cf = 0.101 af
Overall Storage Efficiency = 61.4%

55 Chambers
264.3 cy Field
170.2 cy Stone



## Pond 1P: Chambers



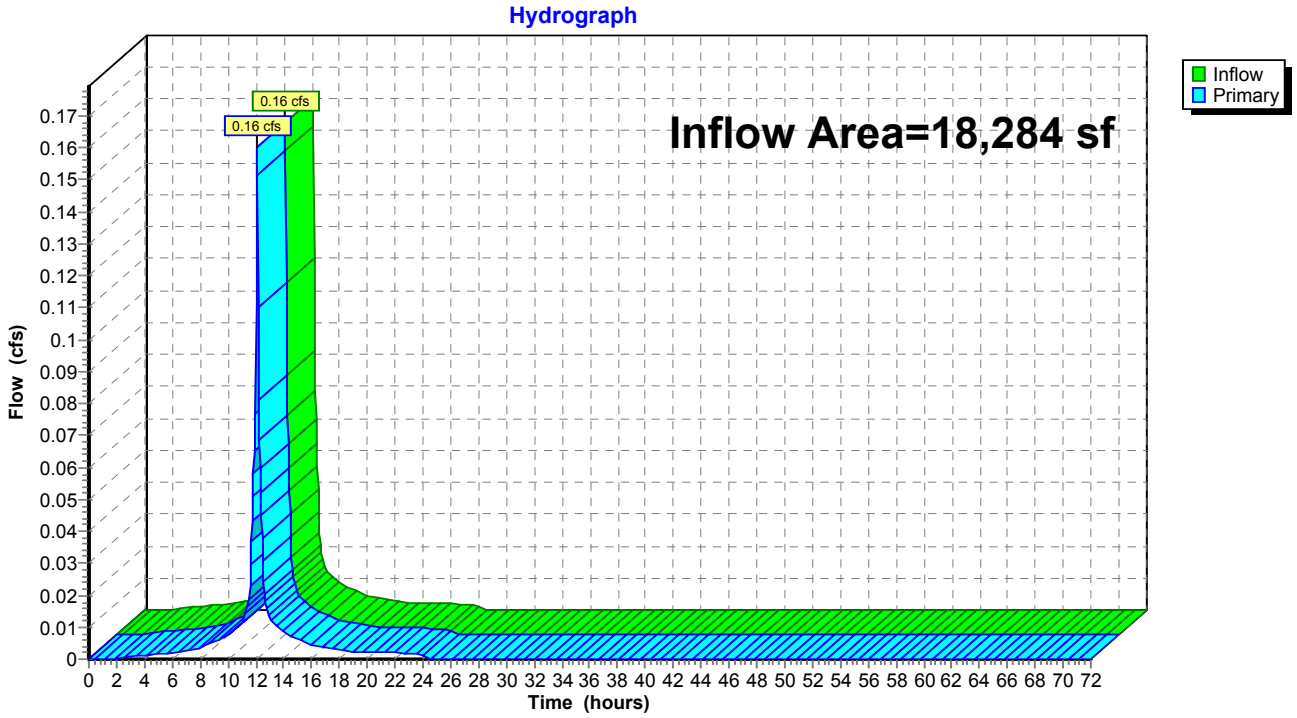
## Summary for Pond P1: Analysis Pt 1

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

Inflow Area = 18,284 sf, 11.78% Impervious, Inflow Depth = 0.36" for 2 YR event
Inflow = 0.16 cfs @ 12.07 hrs, Volume= 555 cf
Primary = 0.16 cfs @ 12.07 hrs, Volume= 555 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

### Pond P1: Analysis Pt 1



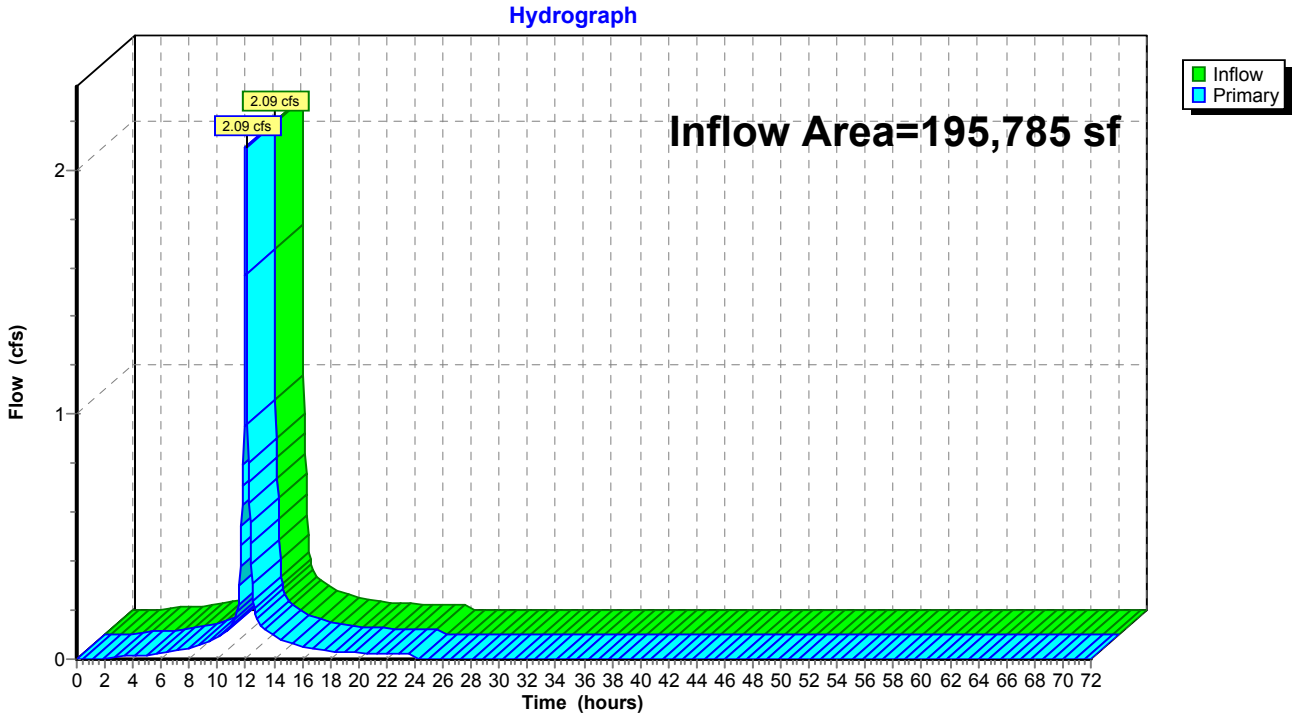
## Summary for Pond P2: Analysis Pt 2

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

Inflow Area = 195,785 sf, 23.45% Impervious, Inflow Depth = 0.39" for 2 YR event
Inflow = 2.09 cfs @ 12.00 hrs, Volume= 6,376 cf
Primary = 2.09 cfs @ 12.00 hrs, Volume= 6,376 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

### Pond P2: Analysis Pt 2



Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment S1: Subcat S1** Runoff Area=18,284 sf 11.78% Impervious Runoff Depth=0.79"
Tc=5.0 min CN=WQ Runoff=0.25 cfs 1,211 cf

**Subcatchment S2A: Subcat S2A** Runoff Area=151,520 sf 15.85% Impervious Runoff Depth=0.98"
Tc=0.0 min CN=WQ Runoff=3.20 cfs 12,316 cf

**Subcatchment S2B: Subcat S2B** Runoff Area=23,735 sf 89.08% Impervious Runoff Depth=4.44"
Tc=0.0 min CN=WQ Runoff=2.82 cfs 8,779 cf

**Subcatchment S2C: Subcat S2C** Runoff Area=20,530 sf 3.69% Impervious Runoff Depth=0.41"
Tc=0.0 min CN=WQ Runoff=0.10 cfs 703 cf

**Pond 1P: Chambers** Peak Elev=195.86' Storage=3,328 cf Inflow=2.82 cfs 8,779 cf
Discarded=0.12 cfs 7,625 cf Primary=0.40 cfs 1,154 cf Outflow=0.52 cfs 8,779 cf

**Pond P1: Analysis Pt 1** Inflow=0.25 cfs 1,211 cf
Primary=0.25 cfs 1,211 cf

**Pond P2: Analysis Pt 2** Inflow=3.30 cfs 14,173 cf
Primary=3.30 cfs 14,173 cf

**Total Runoff Area = 214,069 sf Runoff Volume = 23,009 cf Average Runoff Depth = 1.29"**
**77.55% Pervious = 166,001 sf 22.45% Impervious = 48,068 sf**

## Summary for Subcatchment S1: Subcat S1

[49] Hint: Tc<2dt may require smaller dt

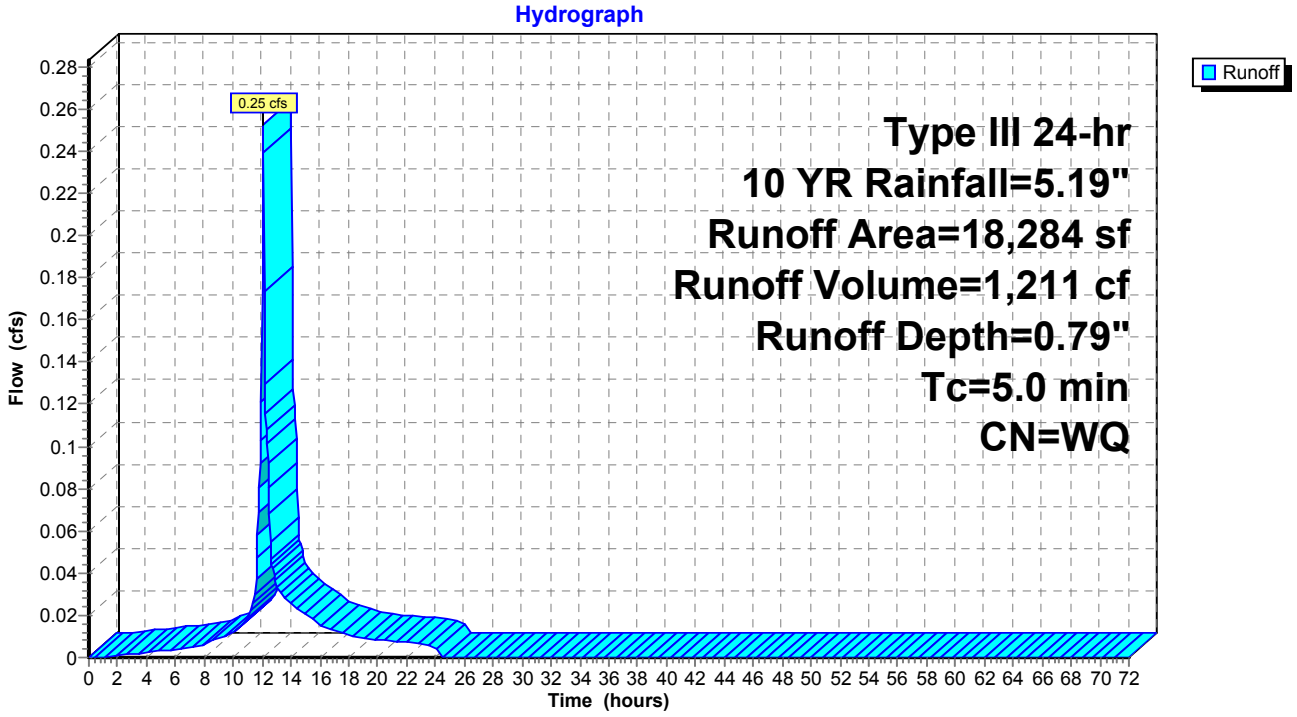
Runoff = 0.25 cfs @ 12.07 hrs, Volume= 1,211 cf, Depth= 0.79"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 YR Rainfall=5.19"

| Area (sf) | CN | Description |
|---|---|---|
| 13,672 | 39 | Pasture/grassland/range, Good, HSG A |
| 2,410 | 39 | Pasture/grassland/range, Good, HSG A |
| 48 | 30 | Woods, Good, HSG A |
| 2,154 | 98 | Paved parking, HSG A |
| 18,284 | | Weighted Average |
| 16,130 | | 88.22% Pervious Area |
| 2,154 | | 11.78% Impervious Area |

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

## Subcatchment S1: Subcat S1



## Summary for Subcatchment S2A: Subcat S2A

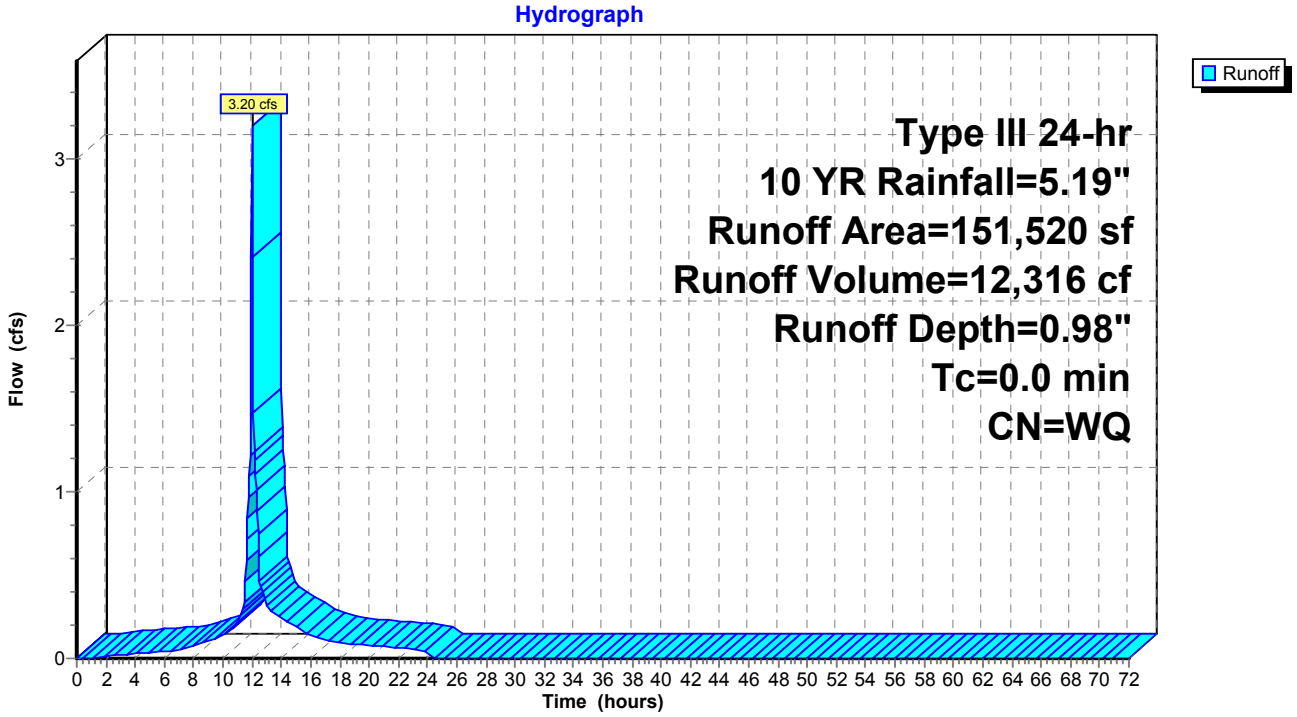
[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 3.20 cfs @ 12.00 hrs, Volume= 12,316 cf, Depth= 0.98"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 YR Rainfall=5.19"

| Area (sf) | CN | Description |
|---|---|---|
| 12,933 | 39 | Pasture/grassland/range, Good, HSG A |
| 8,306 | 39 | Pasture/grassland/range, Good, HSG A |
| 76,277 | 39 | Pasture/grassland/range, Good, HSG A |
| 9 | 39 | Pasture/grassland/range, Good, HSG A |
| 22,045 | 39 | Pasture/grassland/range, Good, HSG A |
| 149 | 30 | Woods, Good, HSG A |
| 360 | 30 | Woods, Good, HSG A |
| 7,184 | 30 | Woods, Good, HSG A |
| 24,012 | 98 | Paved parking, HSG A |
| 246 | 39 | Pasture/grassland/range, Good, HSG A |
| 151,520 | | Weighted Average |
| 127,508 | | 84.15% Pervious Area |
| 24,012 | | 15.85% Impervious Area |

## Subcatchment S2A: Subcat S2A



## Summary for Subcatchment S2B: Subcat S2B

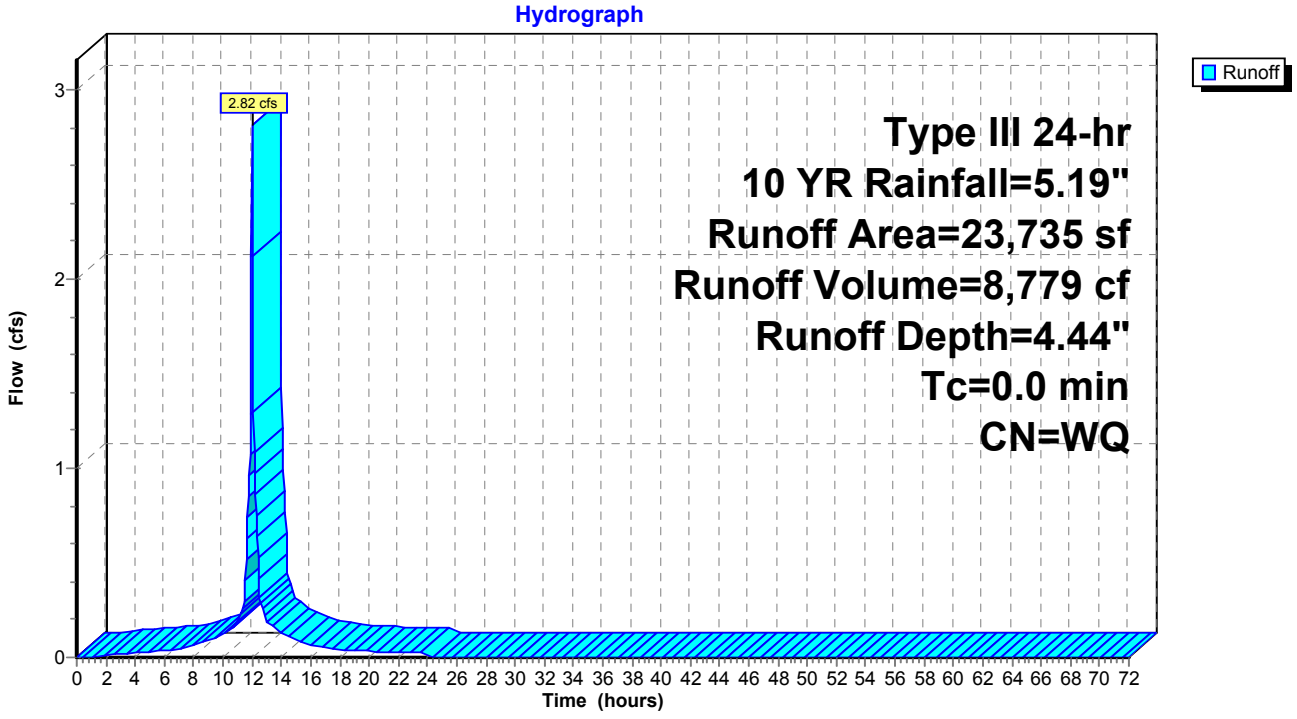
[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 2.82 cfs @ 12.00 hrs, Volume= 8,779 cf, Depth= 4.44"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 YR Rainfall=5.19"

| Area (sf) | CN | Description |
|---|---|---|
| 21,144 | 98 | Paved parking, HSG A |
| 266 | 39 | Pasture/grassland/range, Good, HSG A |
| 40 | 39 | Pasture/grassland/range, Good, HSG A |
| 266 | 39 | Pasture/grassland/range, Good, HSG A |
| 0 | 39 | Pasture/grassland/range, Good, HSG A |
| 2,018 | 39 | Pasture/grassland/range, Good, HSG A |
| 23,735 | | Weighted Average |
| 2,591 | | 10.92% Pervious Area |
| 21,144 | | 89.08% Impervious Area |

## Subcatchment S2B: Subcat S2B



## Summary for Subcatchment S2C: Subcat S2C

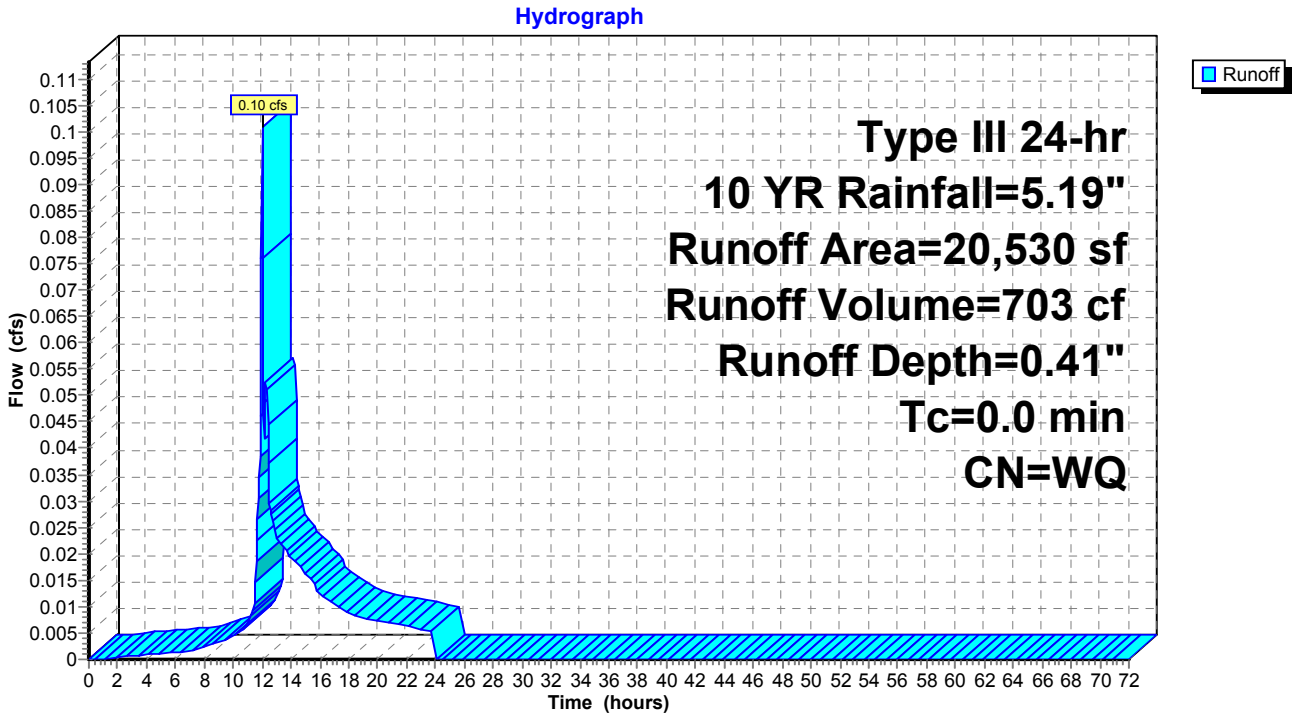
[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 0.10 cfs @ 12.00 hrs, Volume= 703 cf, Depth= 0.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 YR Rainfall=5.19"

| Area (sf) | CN | Description |
|---|---|---|
| 1,384 | 39 | Pasture/grassland/range, Good, HSG A |
| 18,118 | 39 | Pasture/grassland/range, Good, HSG A |
| 270 | 30 | Woods, Good, HSG A |
| 757 | 98 | Paved parking, HSG A |
| 20,530 | | Weighted Average |
| 19,772 | | 96.31% Pervious Area |
| 757 | | 3.69% Impervious Area |

## Subcatchment S2C: Subcat S2C



## Summary for Pond 1P: Chambers

Inflow Area = 23,735 sf, 89.08% Impervious, Inflow Depth = 4.44" for 10 YR event
Inflow = 2.82 cfs @ 12.00 hrs, Volume= 8,779 cf
Outflow = 0.52 cfs @ 12.41 hrs, Volume= 8,779 cf, Atten= 82%, Lag= 24.4 min
Discarded = 0.12 cfs @ 12.41 hrs, Volume= 7,625 cf
Primary = 0.40 cfs @ 12.41 hrs, Volume= 1,154 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 195.86' @ 12.41 hrs Surf.Area= 2,052 sf Storage= 3,328 cf

Plug-Flow detention time= 183.6 min calculated for 8,773 cf (100% of inflow)
Center-of-Mass det. time= 183.6 min ( 926.9 - 743.3 )

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1A | 193.50' | 1,838 cf | **25.25'W x 80.76'L x 3.50'H Field A**<br>7,137 cf Overall - 2,541 cf Embedded = 4,596 cf x 40.0% Voids |
| #2A | 194.00' | 2,541 cf | **ADS_StormTech SC-740** x 55 Inside #1<br>Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf<br>Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap<br>Row Length Adjustment= +0.44' x 6.45 sf x 5 rows |
| #3 | 193.50' | 75 cf | **4.00'D x 6.00'H Vertical Cone/Cylinder** |
| | | 4,455 cf | Total Available Storage |

Storage Group A created with Chamber Wizard

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Discarded | 193.50' | **2.410 in/hr Exfiltration over Horizontal area**<br>Conductivity to Groundwater Elevation = 0.00' |
| #2 | Primary | 197.00' | **4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) |
| #3 | Primary | 195.50' | **8.0" Vert. Orifice/Grate** C= 0.600 |

**Discarded OutFlow** Max=0.12 cfs @ 12.41 hrs HW=195.86' (Free Discharge)
└**1=Exfiltration** ( Controls 0.12 cfs)

**Primary OutFlow** Max=0.40 cfs @ 12.41 hrs HW=195.86' (Free Discharge)
├**2=Sharp-Crested Rectangular Weir** ( Controls 0.00 cfs)
└**3=Orifice/Grate** (Orifice Controls 0.40 cfs @ 2.05 fps)

## Pond 1P: Chambers - Chamber Wizard Field A

**Chamber Model = ADS_StormTechSC-740 (ADS StormTech® SC-740)**
Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf
Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap
Row Length Adjustment= +0.44' x 6.45 sf x 5 rows

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

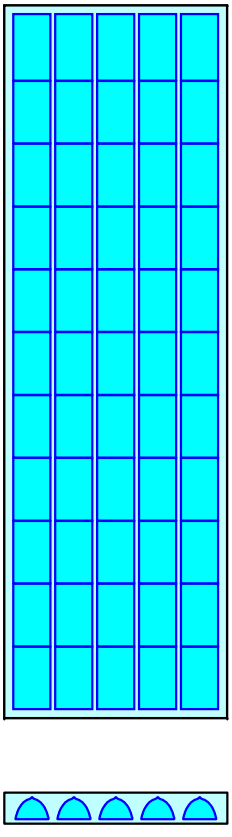
11 Chambers/Row x 7.12' Long +0.44' Row Adjustment = 78.76' Row Length +12.0" End Stone x 2 = 80.76' Base Length
5 Rows x 51.0" Wide + 6.0" Spacing x 4 + 12.0" Side Stone x 2 = 25.25' Base Width
6.0" Base + 30.0" Chamber Height + 6.0" Cover = 3.50' Field Height

55 Chambers x 45.9 cf +0.44' Row Adjustment x 6.45 sf x 5 Rows = 2,540.8 cf Chamber Storage

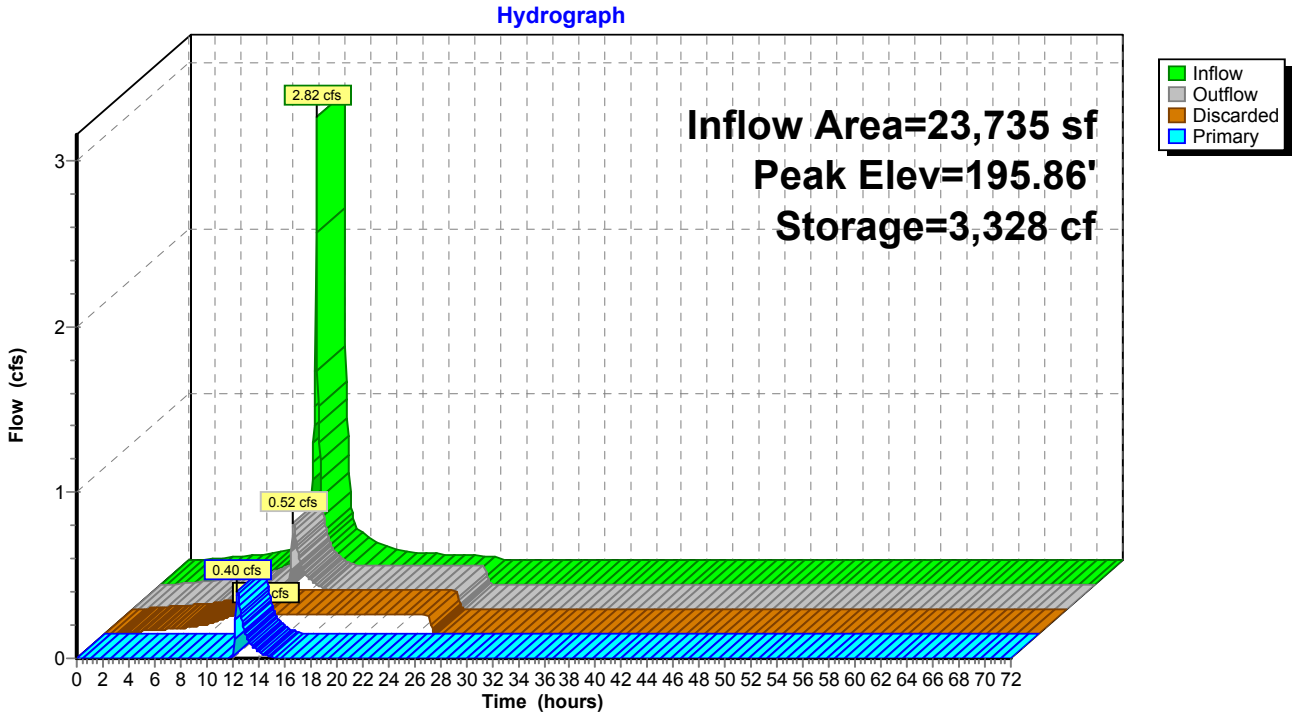
7,137.0 cf Field - 2,540.8 cf Chambers = 4,596.2 cf Stone x 40.0% Voids = 1,838.5 cf Stone Storage

Chamber Storage + Stone Storage = 4,379.3 cf = 0.101 af
Overall Storage Efficiency = 61.4%

55 Chambers
264.3 cy Field
170.2 cy Stone



## Pond 1P: Chambers



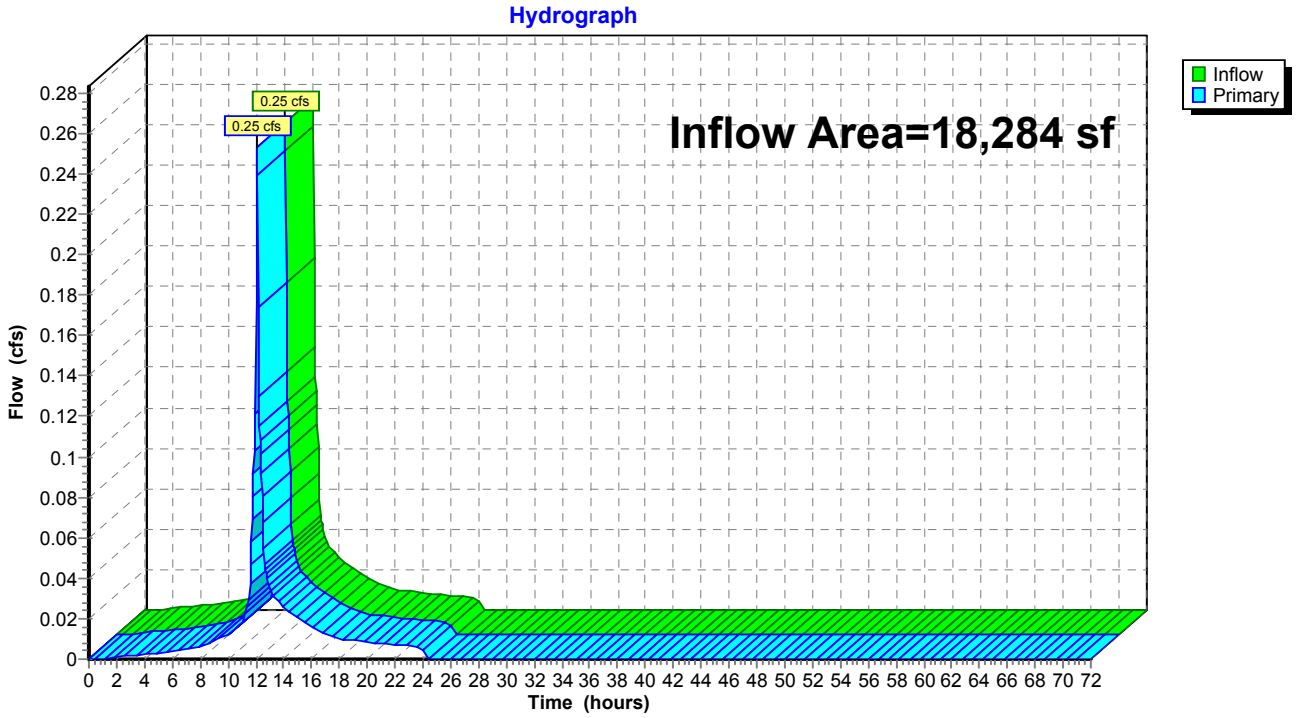
## Summary for Pond P1: Analysis Pt 1

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

Inflow Area = 18,284 sf, 11.78% Impervious, Inflow Depth = 0.79" for 10 YR event
Inflow = 0.25 cfs @ 12.07 hrs, Volume= 1,211 cf
Primary = 0.25 cfs @ 12.07 hrs, Volume= 1,211 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

### Pond P1: Analysis Pt 1



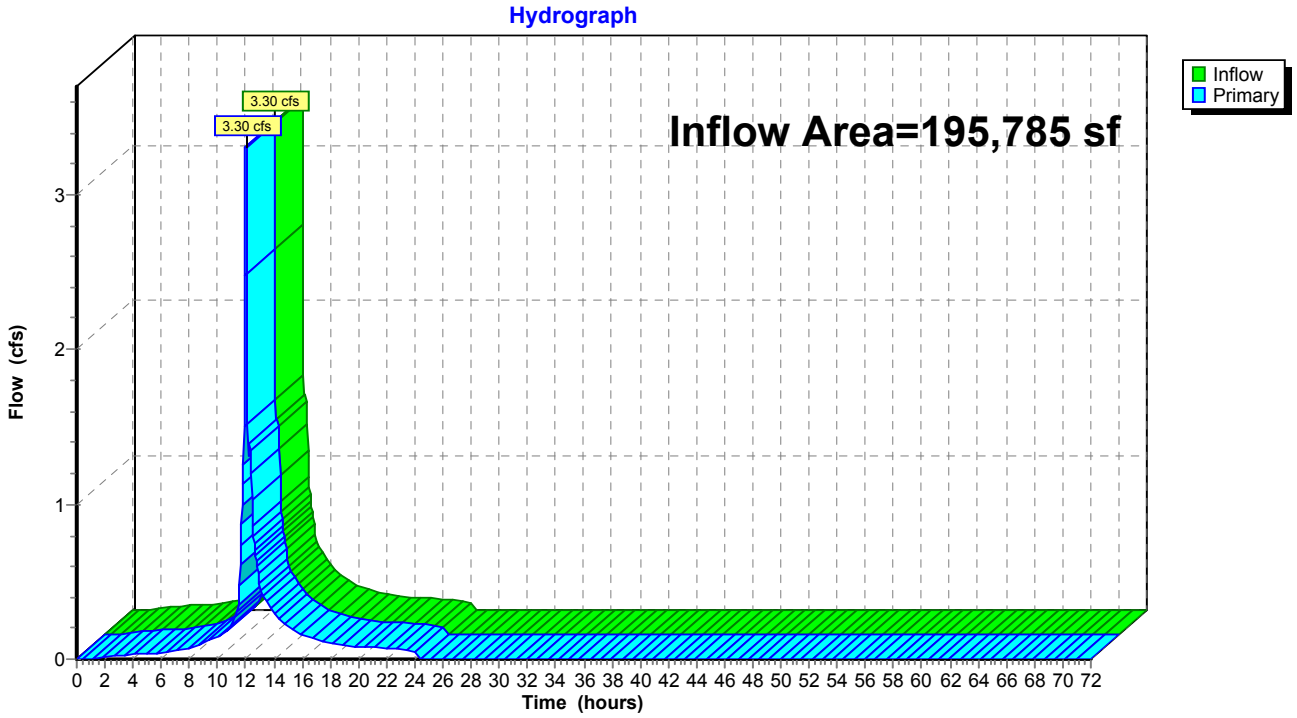
## Summary for Pond P2: Analysis Pt 2

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

Inflow Area = 195,785 sf, 23.45% Impervious, Inflow Depth = 0.87" for 10 YR event
Inflow = 3.30 cfs @ 12.00 hrs, Volume= 14,173 cf
Primary = 3.30 cfs @ 12.00 hrs, Volume= 14,173 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

### Pond P2: Analysis Pt 2



Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment S1: Subcat S1** Runoff Area=18,284 sf 11.78% Impervious Runoff Depth=1.21"
Tc=5.0 min CN=WQ Runoff=0.35 cfs 1,841 cf

**Subcatchment S2A: Subcat S2A** Runoff Area=151,520 sf 15.85% Impervious Runoff Depth=1.41"
Tc=0.0 min CN=WQ Runoff=4.15 cfs 17,848 cf

**Subcatchment S2B: Subcat S2B** Runoff Area=23,735 sf 89.08% Impervious Runoff Depth=5.51"
Tc=0.0 min CN=WQ Runoff=3.47 cfs 10,906 cf

**Subcatchment S2C: Subcat S2C** Runoff Area=20,530 sf 3.69% Impervious Runoff Depth=0.75"
Tc=0.0 min CN=WQ Runoff=0.20 cfs 1,288 cf

**Pond 1P: Chambers** Peak Elev=196.15' Storage=3,675 cf Inflow=3.47 cfs 10,906 cf
Discarded=0.12 cfs 8,296 cf Primary=0.95 cfs 2,609 cf Outflow=1.06 cfs 10,906 cf

**Pond P1: Analysis Pt 1** Inflow=0.35 cfs 1,841 cf
Primary=0.35 cfs 1,841 cf

**Pond P2: Analysis Pt 2** Inflow=4.37 cfs 21,746 cf
Primary=4.37 cfs 21,746 cf

**Total Runoff Area = 214,069 sf Runoff Volume = 31,883 cf Average Runoff Depth = 1.79"**
**77.55% Pervious = 166,001 sf 22.45% Impervious = 48,068 sf**

## Summary for Subcatchment S1: Subcat S1

[49] Hint: Tc<2dt may require smaller dt

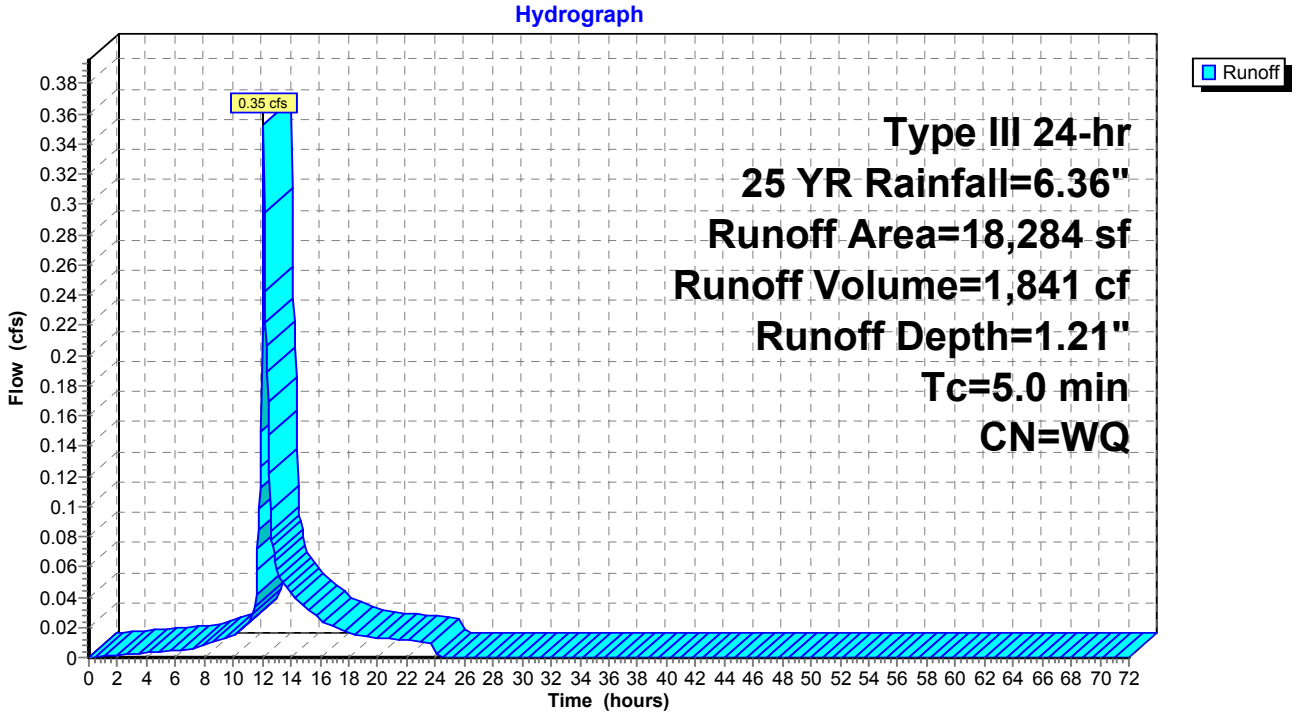
Runoff = 0.35 cfs @ 12.09 hrs, Volume= 1,841 cf, Depth= 1.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 YR Rainfall=6.36"

| Area (sf) | CN | Description |
|---|---|---|
| 13,672 | 39 | Pasture/grassland/range, Good, HSG A |
| 2,410 | 39 | Pasture/grassland/range, Good, HSG A |
| 48 | 30 | Woods, Good, HSG A |
| 2,154 | 98 | Paved parking, HSG A |
| 18,284 | | Weighted Average |
| 16,130 | | 88.22% Pervious Area |
| 2,154 | | 11.78% Impervious Area |

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

## Subcatchment S1: Subcat S1



## Summary for Subcatchment S2A: Subcat S2A

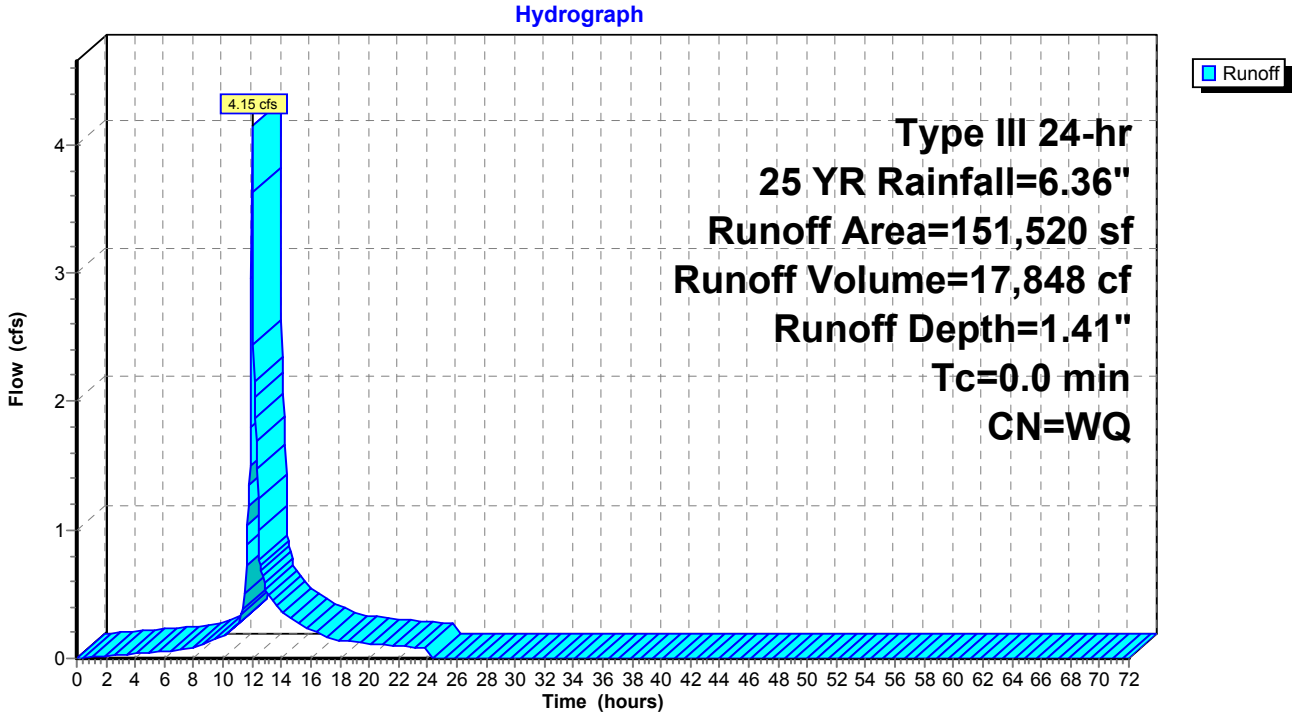
[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 4.15 cfs @ 12.01 hrs, Volume= 17,848 cf, Depth= 1.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 YR Rainfall=6.36"

| Area (sf) | CN | Description |
|---|---|---|
| 12,933 | 39 | Pasture/grassland/range, Good, HSG A |
| 8,306 | 39 | Pasture/grassland/range, Good, HSG A |
| 76,277 | 39 | Pasture/grassland/range, Good, HSG A |
| 9 | 39 | Pasture/grassland/range, Good, HSG A |
| 22,045 | 39 | Pasture/grassland/range, Good, HSG A |
| 149 | 30 | Woods, Good, HSG A |
| 360 | 30 | Woods, Good, HSG A |
| 7,184 | 30 | Woods, Good, HSG A |
| 24,012 | 98 | Paved parking, HSG A |
| 246 | 39 | Pasture/grassland/range, Good, HSG A |
| 151,520 | | Weighted Average |
| 127,508 | | 84.15% Pervious Area |
| 24,012 | | 15.85% Impervious Area |

## Subcatchment S2A: Subcat S2A



## Summary for Subcatchment S2B: Subcat S2B

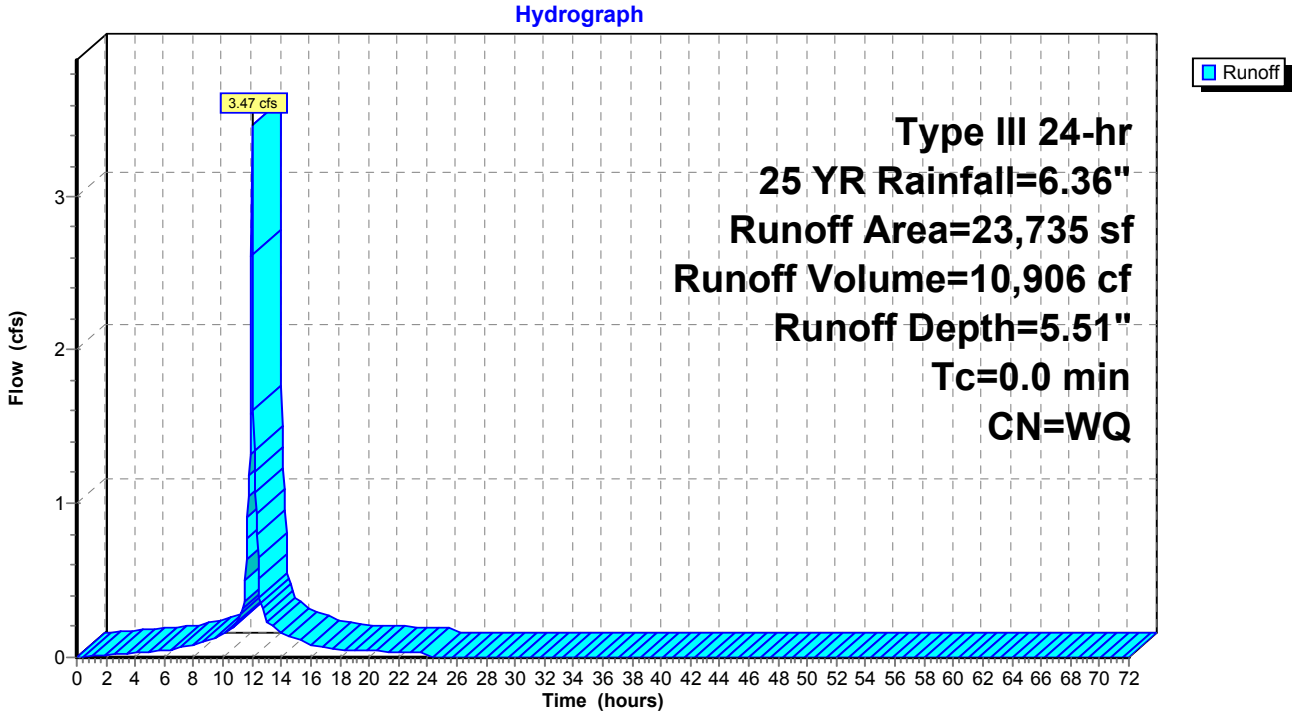
[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 3.47 cfs @ 12.00 hrs, Volume= 10,906 cf, Depth= 5.51"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 YR Rainfall=6.36"

| Area (sf) | CN | Description |
|---|---|---|
| 21,144 | 98 | Paved parking, HSG A |
| 266 | 39 | Pasture/grassland/range, Good, HSG A |
| 40 | 39 | Pasture/grassland/range, Good, HSG A |
| 266 | 39 | Pasture/grassland/range, Good, HSG A |
| 0 | 39 | Pasture/grassland/range, Good, HSG A |
| 2,018 | 39 | Pasture/grassland/range, Good, HSG A |
| 23,735 | | Weighted Average |
| 2,591 | | 10.92% Pervious Area |
| 21,144 | | 89.08% Impervious Area |

## Subcatchment S2B: Subcat S2B



## Summary for Subcatchment S2C: Subcat S2C

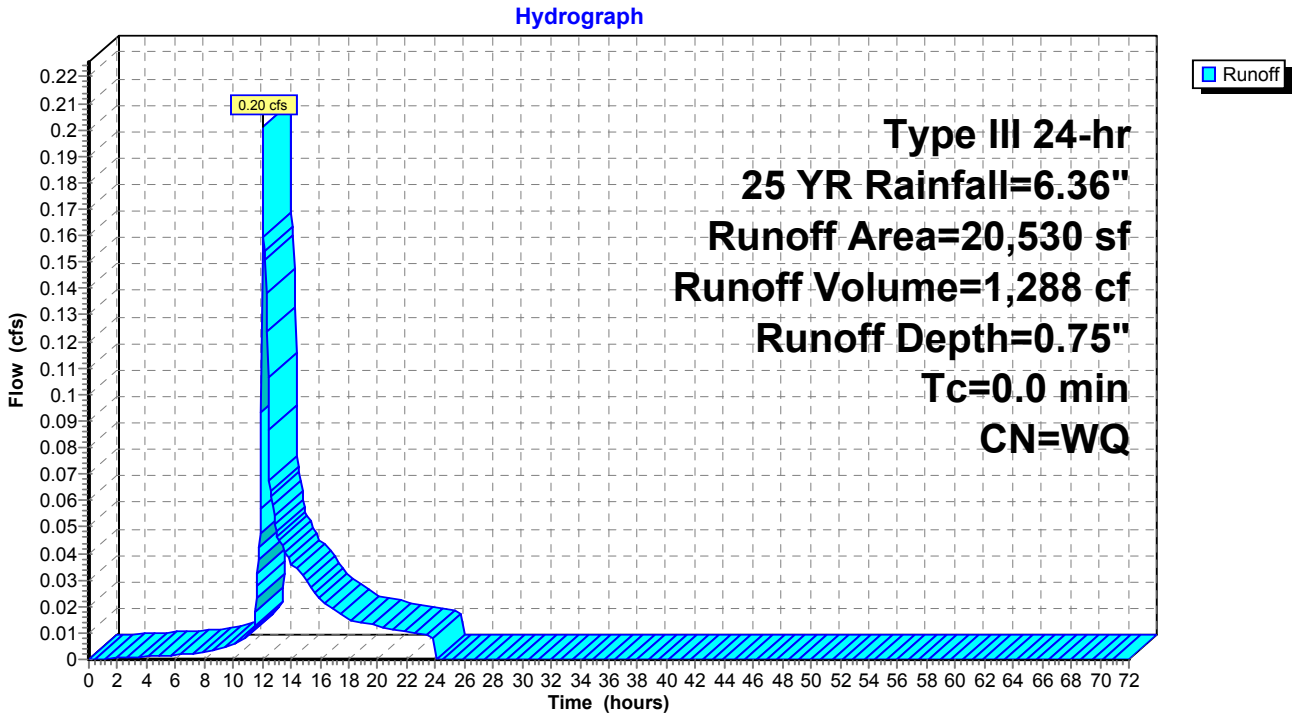
[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 0.20 cfs @ 12.05 hrs, Volume= 1,288 cf, Depth= 0.75"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 YR Rainfall=6.36"

| Area (sf) | CN | Description |
|---|---|---|
| 1,384 | 39 | Pasture/grassland/range, Good, HSG A |
| 18,118 | 39 | Pasture/grassland/range, Good, HSG A |
| 270 | 30 | Woods, Good, HSG A |
| 757 | 98 | Paved parking, HSG A |
| 20,530 | | Weighted Average |
| 19,772 | | 96.31% Pervious Area |
| 757 | | 3.69% Impervious Area |

## Subcatchment S2C: Subcat S2C



## Summary for Pond 1P: Chambers

Inflow Area = 23,735 sf, 89.08% Impervious, Inflow Depth = 5.51" for 25 YR event
Inflow = 3.47 cfs @ 12.00 hrs, Volume= 10,906 cf
Outflow = 1.06 cfs @ 12.25 hrs, Volume= 10,906 cf, Atten= 69%, Lag= 15.3 min
Discarded = 0.12 cfs @ 12.25 hrs, Volume= 8,296 cf
Primary = 0.95 cfs @ 12.25 hrs, Volume= 2,609 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 196.15' @ 12.25 hrs Surf.Area= 2,052 sf Storage= 3,675 cf

Plug-Flow detention time= 166.8 min calculated for 10,898 cf (100% of inflow)
Center-of-Mass det. time= 166.8 min ( 907.7 - 741.0 )

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1A | 193.50' | 1,838 cf | **25.25'W x 80.76'L x 3.50'H Field A**<br>7,137 cf Overall - 2,541 cf Embedded = 4,596 cf x 40.0% Voids |
| #2A | 194.00' | 2,541 cf | **ADS_StormTech SC-740** x 55 Inside #1<br>Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf<br>Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap<br>Row Length Adjustment= +0.44' x 6.45 sf x 5 rows |
| #3 | 193.50' | 75 cf | **4.00'D x 6.00'H Vertical Cone/Cylinder** |
| | | 4,455 cf | Total Available Storage |

Storage Group A created with Chamber Wizard

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Discarded | 193.50' | **2.410 in/hr Exfiltration over Horizontal area**<br>Conductivity to Groundwater Elevation = 0.00' |
| #2 | Primary | 197.00' | **4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) |
| #3 | Primary | 195.50' | **8.0" Vert. Orifice/Grate** C= 0.600 |

**Discarded OutFlow** Max=0.12 cfs @ 12.25 hrs HW=196.15' (Free Discharge)
└**1=Exfiltration** ( Controls 0.12 cfs)

**Primary OutFlow** Max=0.95 cfs @ 12.25 hrs HW=196.15' (Free Discharge)
├**2=Sharp-Crested Rectangular Weir** ( Controls 0.00 cfs)
└**3=Orifice/Grate** (Orifice Controls 0.95 cfs @ 2.74 fps)

## Pond 1P: Chambers - Chamber Wizard Field A

**Chamber Model = ADS_StormTechSC-740 (ADS StormTech® SC-740)**
Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf
Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap
Row Length Adjustment= +0.44' x 6.45 sf x 5 rows

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

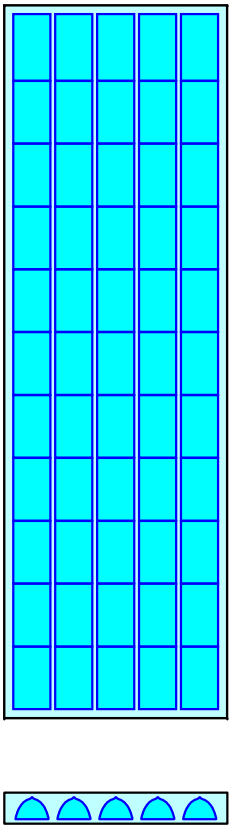
11 Chambers/Row x 7.12' Long +0.44' Row Adjustment = 78.76' Row Length +12.0" End Stone x 2 = 80.76' Base Length
5 Rows x 51.0" Wide + 6.0" Spacing x 4 + 12.0" Side Stone x 2 = 25.25' Base Width
6.0" Base + 30.0" Chamber Height + 6.0" Cover = 3.50' Field Height

55 Chambers x 45.9 cf +0.44' Row Adjustment x 6.45 sf x 5 Rows = 2,540.8 cf Chamber Storage

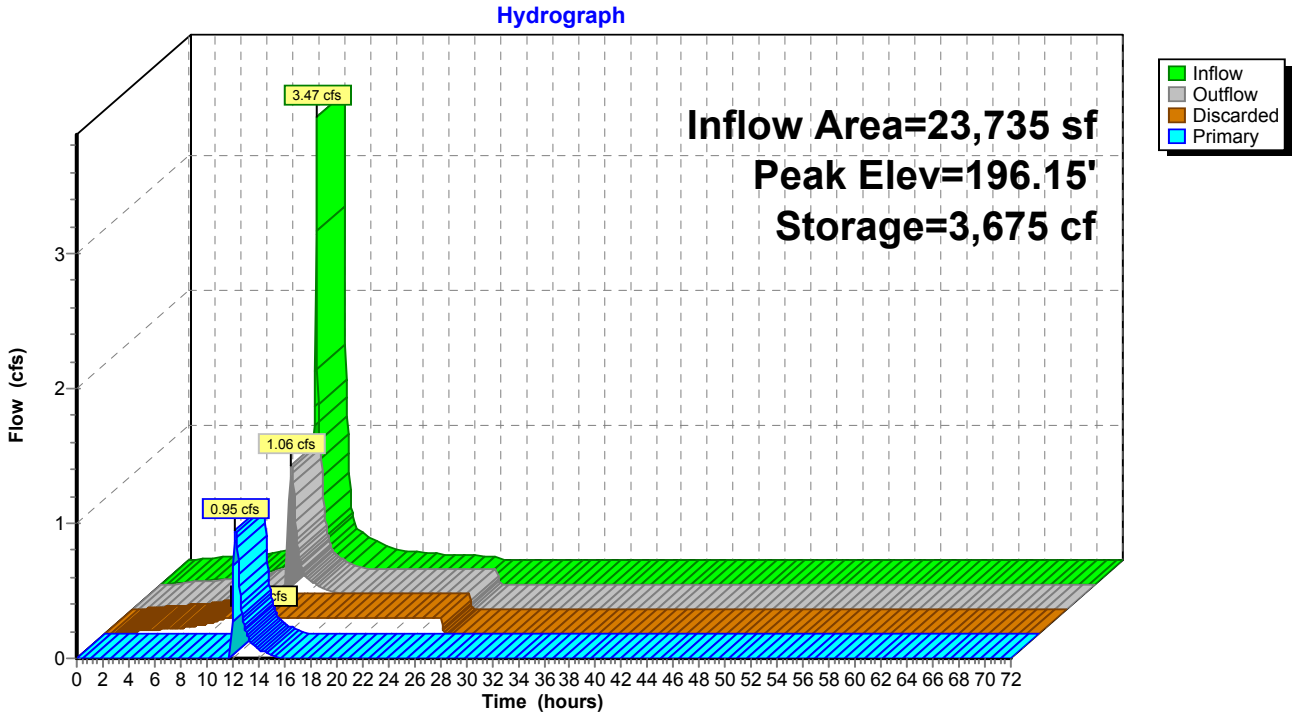
7,137.0 cf Field - 2,540.8 cf Chambers = 4,596.2 cf Stone x 40.0% Voids = 1,838.5 cf Stone Storage

Chamber Storage + Stone Storage = 4,379.3 cf = 0.101 af
Overall Storage Efficiency = 61.4%

55 Chambers
264.3 cy Field
170.2 cy Stone



## Pond 1P: Chambers



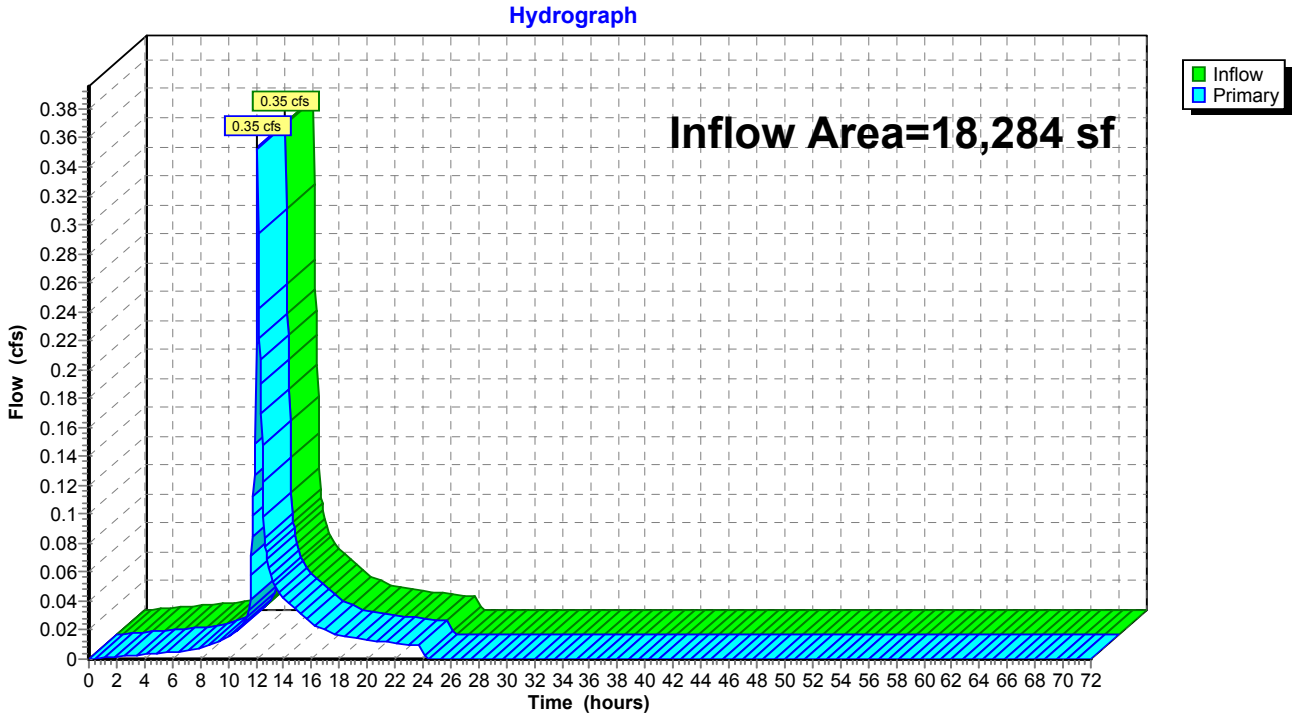
## Summary for Pond P1: Analysis Pt 1

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

Inflow Area = 18,284 sf, 11.78% Impervious, Inflow Depth = 1.21" for 25 YR event
Inflow = 0.35 cfs @ 12.09 hrs, Volume= 1,841 cf
Primary = 0.35 cfs @ 12.09 hrs, Volume= 1,841 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

### Pond P1: Analysis Pt 1



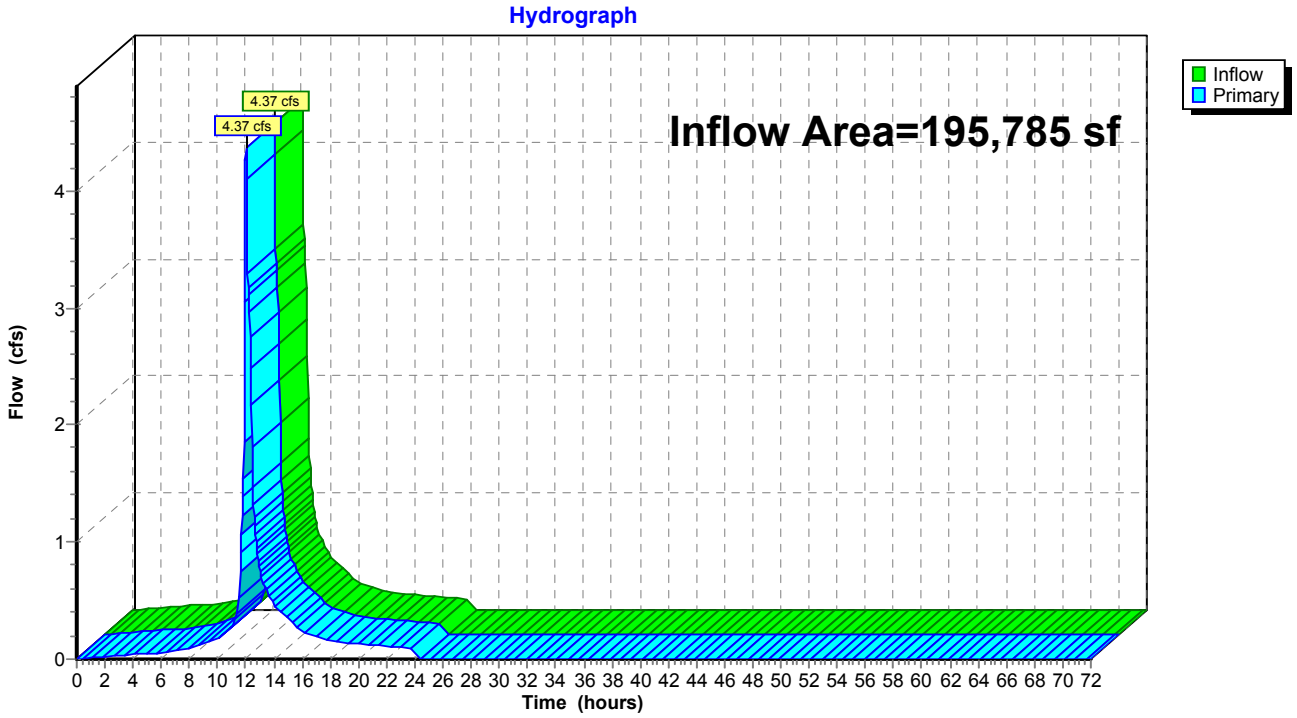
## Summary for Pond P2: Analysis Pt 2

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

Inflow Area = 195,785 sf, 23.45% Impervious, Inflow Depth = 1.33" for 25 YR event
Inflow = 4.37 cfs @ 12.02 hrs, Volume= 21,746 cf
Primary = 4.37 cfs @ 12.02 hrs, Volume= 21,746 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

### Pond P2: Analysis Pt 2



Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment S1: Subcat S1** Runoff Area=18,284 sf 11.78% Impervious Runoff Depth=2.02"
Tc=5.0 min CN=WQ Runoff=0.75 cfs 3,072 cf

**Subcatchment S2A: Subcat S2A** Runoff Area=151,520 sf 15.85% Impervious Runoff Depth=2.25"
Tc=0.0 min CN=WQ Runoff=7.97 cfs 28,433 cf

**Subcatchment S2B: Subcat S2B** Runoff Area=23,735 sf 89.08% Impervious Runoff Depth=7.20"
Tc=0.0 min CN=WQ Runoff=4.52 cfs 14,238 cf

**Subcatchment S2C: Subcat S2C** Runoff Area=20,530 sf 3.69% Impervious Runoff Depth=1.47"
Tc=0.0 min CN=WQ Runoff=0.65 cfs 2,508 cf

**Pond 1P: Chambers** Peak Elev=196.98' Storage=4,404 cf Inflow=4.52 cfs 14,238 cf
Discarded=0.12 cfs 9,161 cf Primary=1.80 cfs 5,077 cf Outflow=1.91 cfs 14,238 cf

**Pond P1: Analysis Pt 1** Inflow=0.75 cfs 3,072 cf
Primary=0.75 cfs 3,072 cf

**Pond P2: Analysis Pt 2** Inflow=9.89 cfs 36,018 cf
Primary=9.89 cfs 36,018 cf

**Total Runoff Area = 214,069 sf Runoff Volume = 48,252 cf Average Runoff Depth = 2.70"**
**77.55% Pervious = 166,001 sf 22.45% Impervious = 48,068 sf**

## Summary for Subcatchment S1: Subcat S1

[49] Hint: Tc<2dt may require smaller dt

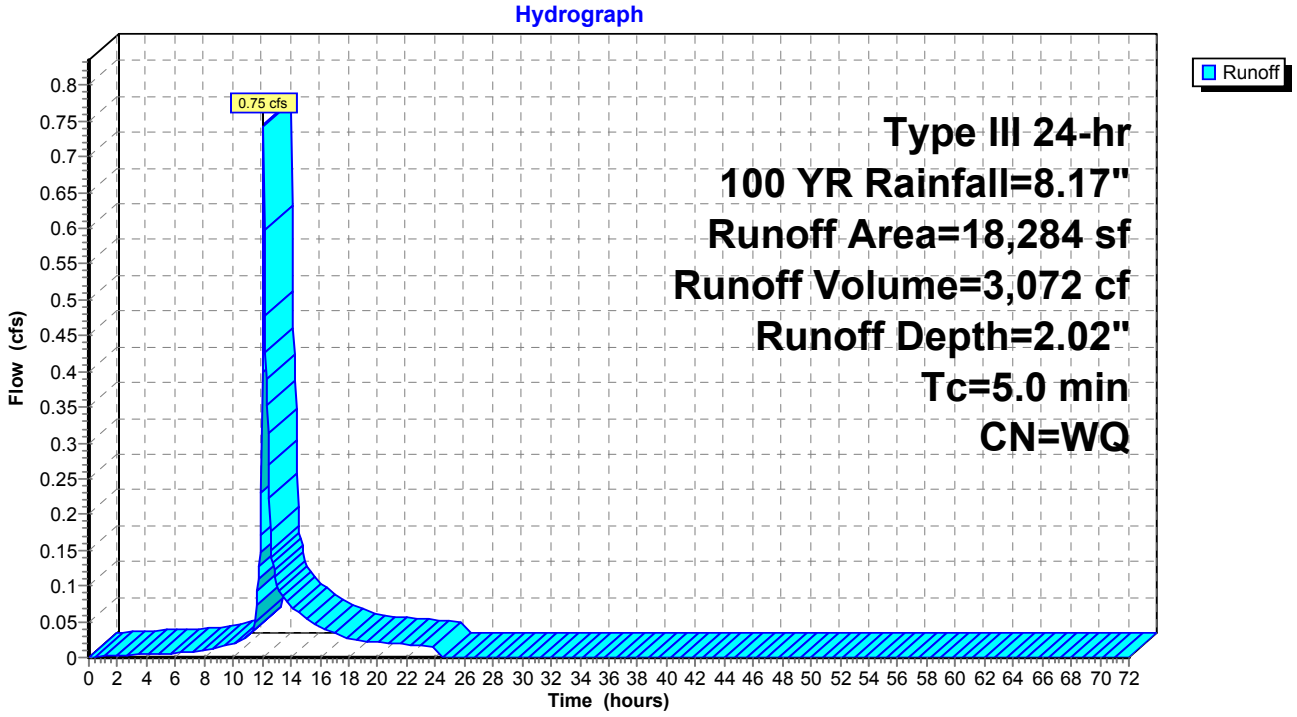
Runoff = 0.75 cfs @ 12.09 hrs, Volume= 3,072 cf, Depth= 2.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 YR Rainfall=8.17"

| Area (sf) | CN | Description |
|---|---|---|
| 13,672 | 39 | Pasture/grassland/range, Good, HSG A |
| 2,410 | 39 | Pasture/grassland/range, Good, HSG A |
| 48 | 30 | Woods, Good, HSG A |
| 2,154 | 98 | Paved parking, HSG A |
| 18,284 | | Weighted Average |
| 16,130 | | 88.22% Pervious Area |
| 2,154 | | 11.78% Impervious Area |

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

## Subcatchment S1: Subcat S1



## Summary for Subcatchment S2A: Subcat S2A

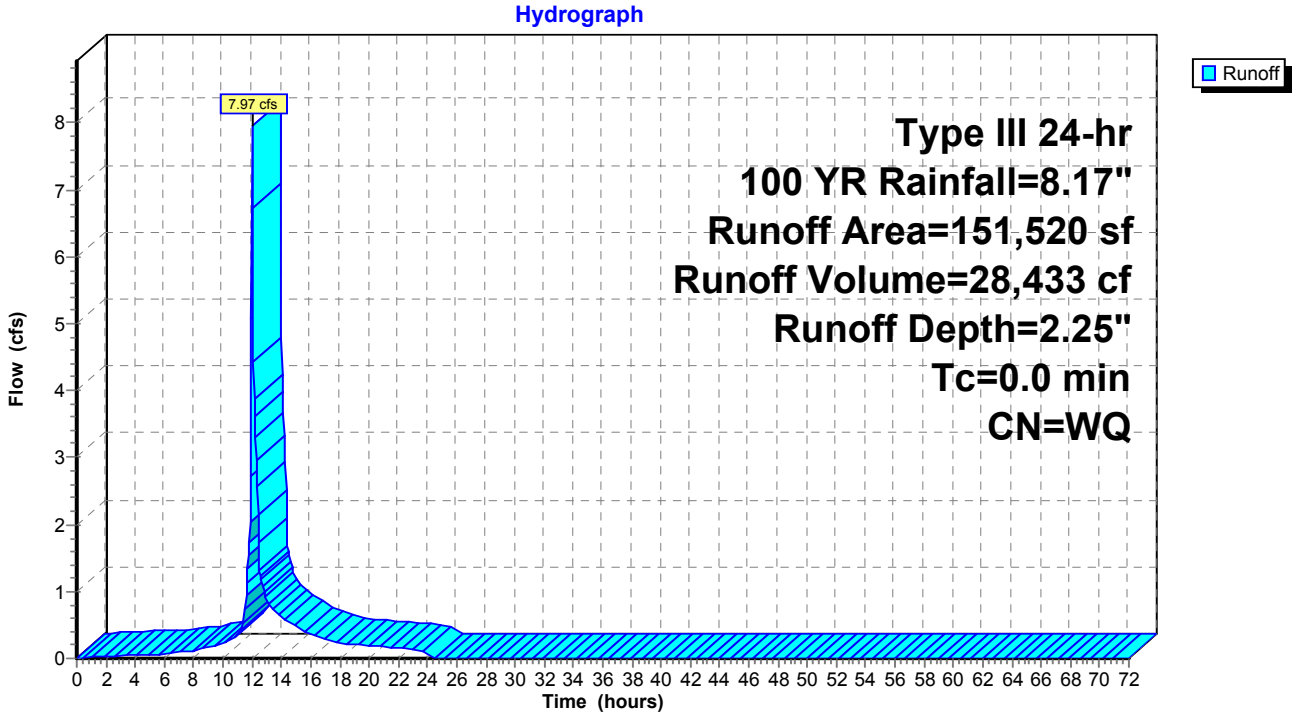
[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 7.97 cfs @ 12.01 hrs, Volume= 28,433 cf, Depth= 2.25"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 YR Rainfall=8.17"

| Area (sf) | CN | Description |
|---|---|---|
| 12,933 | 39 | Pasture/grassland/range, Good, HSG A |
| 8,306 | 39 | Pasture/grassland/range, Good, HSG A |
| 76,277 | 39 | Pasture/grassland/range, Good, HSG A |
| 9 | 39 | Pasture/grassland/range, Good, HSG A |
| 22,045 | 39 | Pasture/grassland/range, Good, HSG A |
| 149 | 30 | Woods, Good, HSG A |
| 360 | 30 | Woods, Good, HSG A |
| 7,184 | 30 | Woods, Good, HSG A |
| 24,012 | 98 | Paved parking, HSG A |
| 246 | 39 | Pasture/grassland/range, Good, HSG A |
| 151,520 | | Weighted Average |
| 127,508 | | 84.15% Pervious Area |
| 24,012 | | 15.85% Impervious Area |

## Subcatchment S2A: Subcat S2A



## Summary for Subcatchment S2B: Subcat S2B

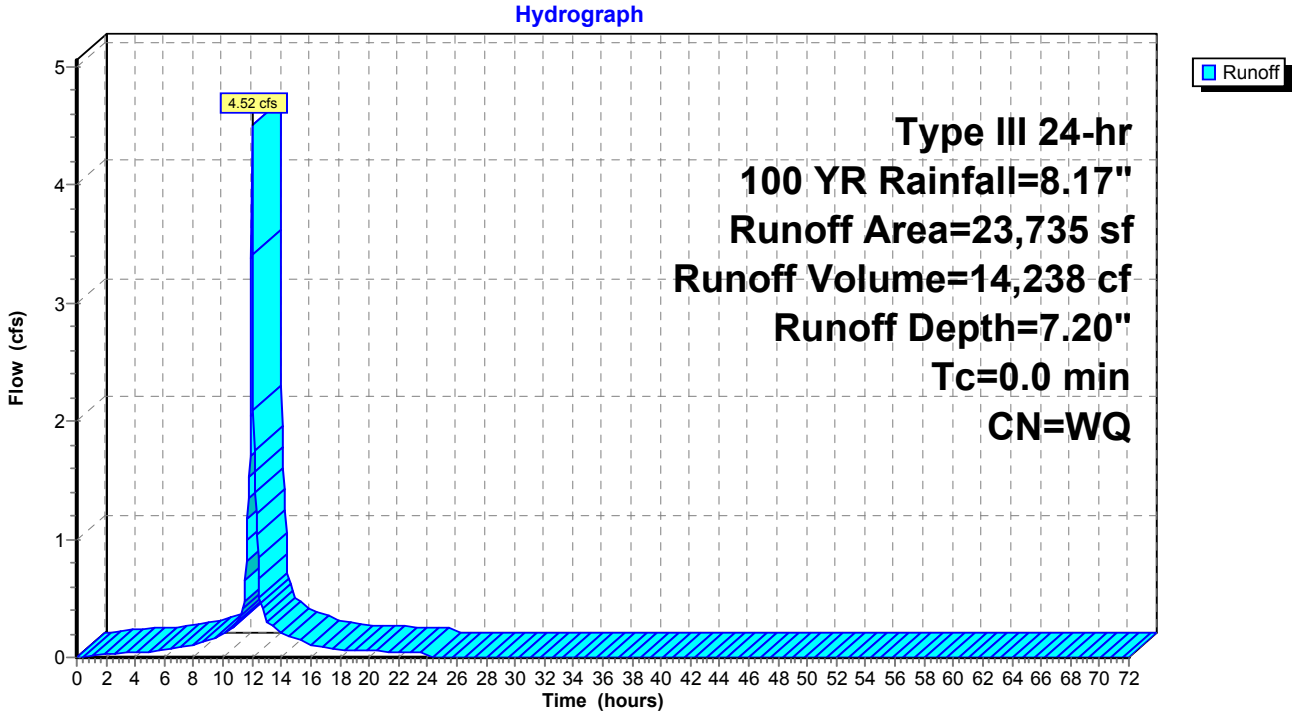
[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 4.52 cfs @ 12.00 hrs, Volume= 14,238 cf, Depth= 7.20"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 YR Rainfall=8.17"

| Area (sf) | CN | Description |
|---|---|---|
| 21,144 | 98 | Paved parking, HSG A |
| 266 | 39 | Pasture/grassland/range, Good, HSG A |
| 40 | 39 | Pasture/grassland/range, Good, HSG A |
| 266 | 39 | Pasture/grassland/range, Good, HSG A |
| 0 | 39 | Pasture/grassland/range, Good, HSG A |
| 2,018 | 39 | Pasture/grassland/range, Good, HSG A |
| 23,735 | | Weighted Average |
| 2,591 | | 10.92% Pervious Area |
| 21,144 | | 89.08% Impervious Area |

## Subcatchment S2B: Subcat S2B



## Summary for Subcatchment S2C: Subcat S2C

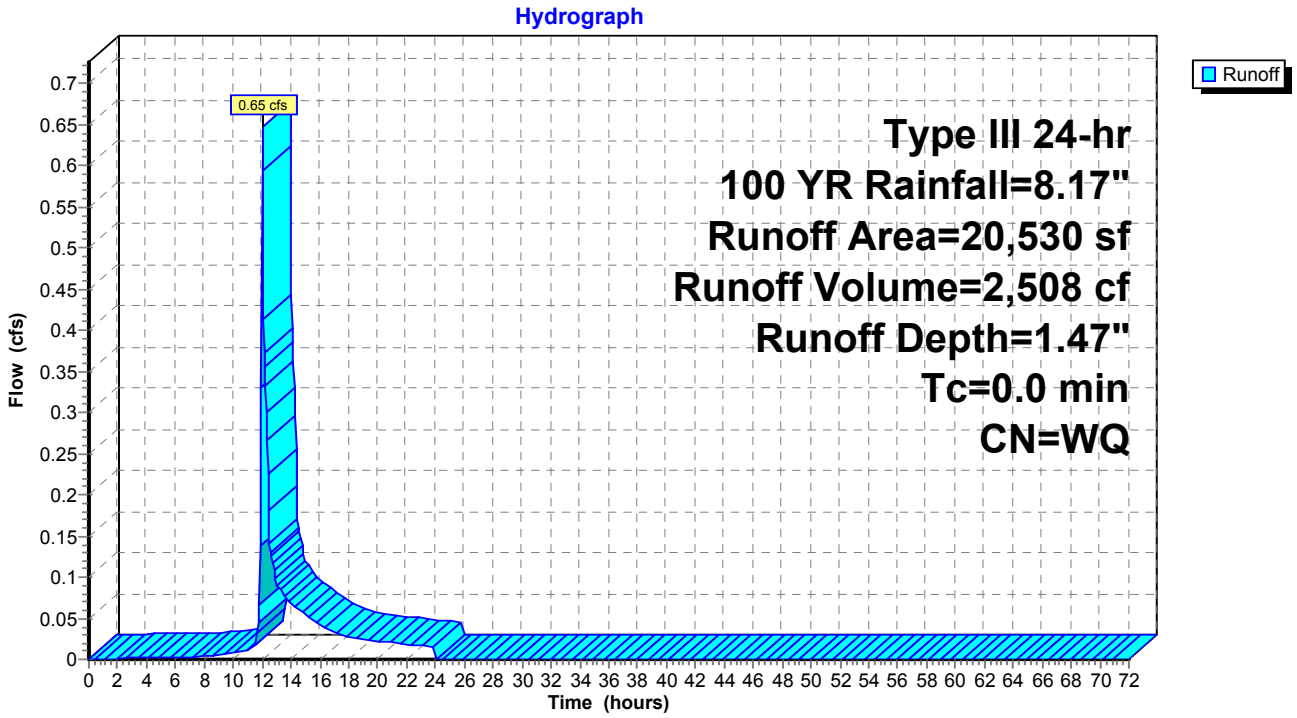
[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 0.65 cfs @ 12.02 hrs, Volume= 2,508 cf, Depth= 1.47"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 YR Rainfall=8.17"

| Area (sf) | CN | Description |
|---|---|---|
| 1,384 | 39 | Pasture/grassland/range, Good, HSG A |
| 18,118 | 39 | Pasture/grassland/range, Good, HSG A |
| 270 | 30 | Woods, Good, HSG A |
| 757 | 98 | Paved parking, HSG A |
| 20,530 | | Weighted Average |
| 19,772 | | 96.31% Pervious Area |
| 757 | | 3.69% Impervious Area |

## Subcatchment S2C: Subcat S2C



## Summary for Pond 1P: Chambers

Inflow Area = 23,735 sf, 89.08% Impervious, Inflow Depth = 7.20" for 100 YR event
Inflow = 4.52 cfs @ 12.00 hrs, Volume= 14,238 cf
Outflow = 1.91 cfs @ 12.13 hrs, Volume= 14,238 cf, Atten= 58%, Lag= 7.6 min
Discarded = 0.12 cfs @ 12.13 hrs, Volume= 9,161 cf
Primary = 1.80 cfs @ 12.13 hrs, Volume= 5,077 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 196.98' @ 12.13 hrs Surf.Area= 2,052 sf Storage= 4,404 cf

Plug-Flow detention time= 149.0 min calculated for 14,229 cf (100% of inflow)
Center-of-Mass det. time= 149.1 min ( 887.6 - 738.5 )

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1A | 193.50' | 1,838 cf | **25.25'W x 80.76'L x 3.50'H Field A**<br>7,137 cf Overall - 2,541 cf Embedded = 4,596 cf x 40.0% Voids |
| #2A | 194.00' | 2,541 cf | **ADS_StormTech SC-740** x 55 Inside #1<br>Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf<br>Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap<br>Row Length Adjustment= +0.44' x 6.45 sf x 5 rows |
| #3 | 193.50' | 75 cf | **4.00'D x 6.00'H Vertical Cone/Cylinder** |
| | | 4,455 cf | Total Available Storage |

Storage Group A created with Chamber Wizard

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Discarded | 193.50' | **2.410 in/hr Exfiltration over Horizontal area**<br>Conductivity to Groundwater Elevation = 0.00' |
| #2 | Primary | 197.00' | **4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) |
| #3 | Primary | 195.50' | **8.0" Vert. Orifice/Grate** C= 0.600 |

**Discarded OutFlow** Max=0.12 cfs @ 12.13 hrs HW=196.97' (Free Discharge)
└**1=Exfiltration** ( Controls 0.12 cfs)

**Primary OutFlow** Max=1.79 cfs @ 12.13 hrs HW=196.97' (Free Discharge)
├**2=Sharp-Crested Rectangular Weir** ( Controls 0.00 cfs)
└**3=Orifice/Grate** (Orifice Controls 1.79 cfs @ 5.13 fps)

## Pond 1P: Chambers - Chamber Wizard Field A

**Chamber Model = ADS_StormTechSC-740 (ADS StormTech® SC-740)**
Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf
Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap
Row Length Adjustment= +0.44' x 6.45 sf x 5 rows

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

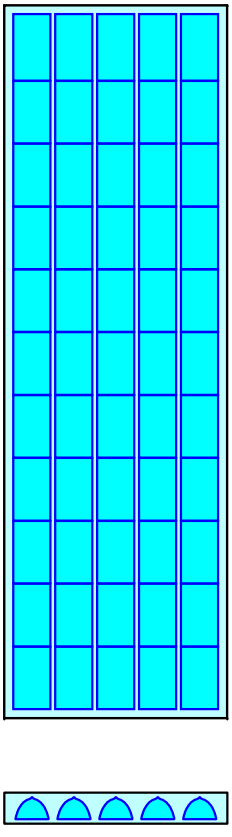
11 Chambers/Row x 7.12' Long +0.44' Row Adjustment = 78.76' Row Length +12.0" End Stone x 2 = 80.76' Base Length
5 Rows x 51.0" Wide + 6.0" Spacing x 4 + 12.0" Side Stone x 2 = 25.25' Base Width
6.0" Base + 30.0" Chamber Height + 6.0" Cover = 3.50' Field Height

55 Chambers x 45.9 cf +0.44' Row Adjustment x 6.45 sf x 5 Rows = 2,540.8 cf Chamber Storage

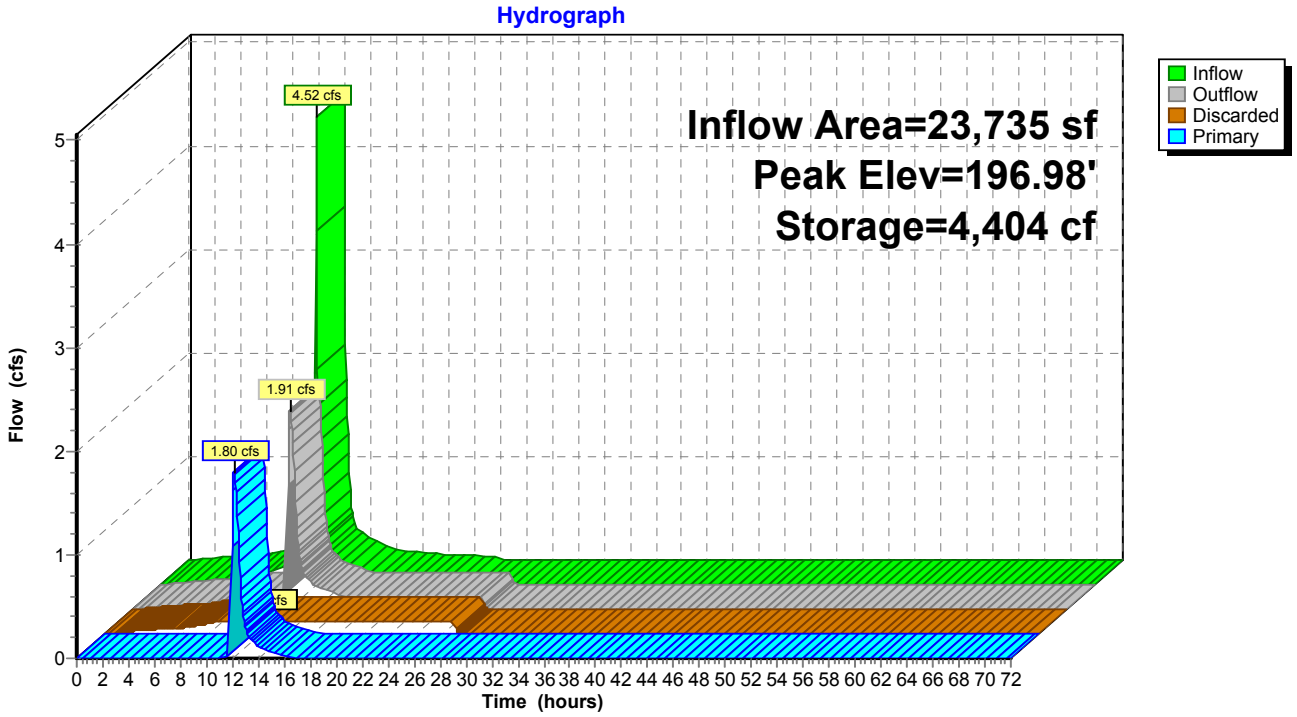
7,137.0 cf Field - 2,540.8 cf Chambers = 4,596.2 cf Stone x 40.0% Voids = 1,838.5 cf Stone Storage

Chamber Storage + Stone Storage = 4,379.3 cf = 0.101 af
Overall Storage Efficiency = 61.4%

55 Chambers
264.3 cy Field
170.2 cy Stone



## Pond 1P: Chambers



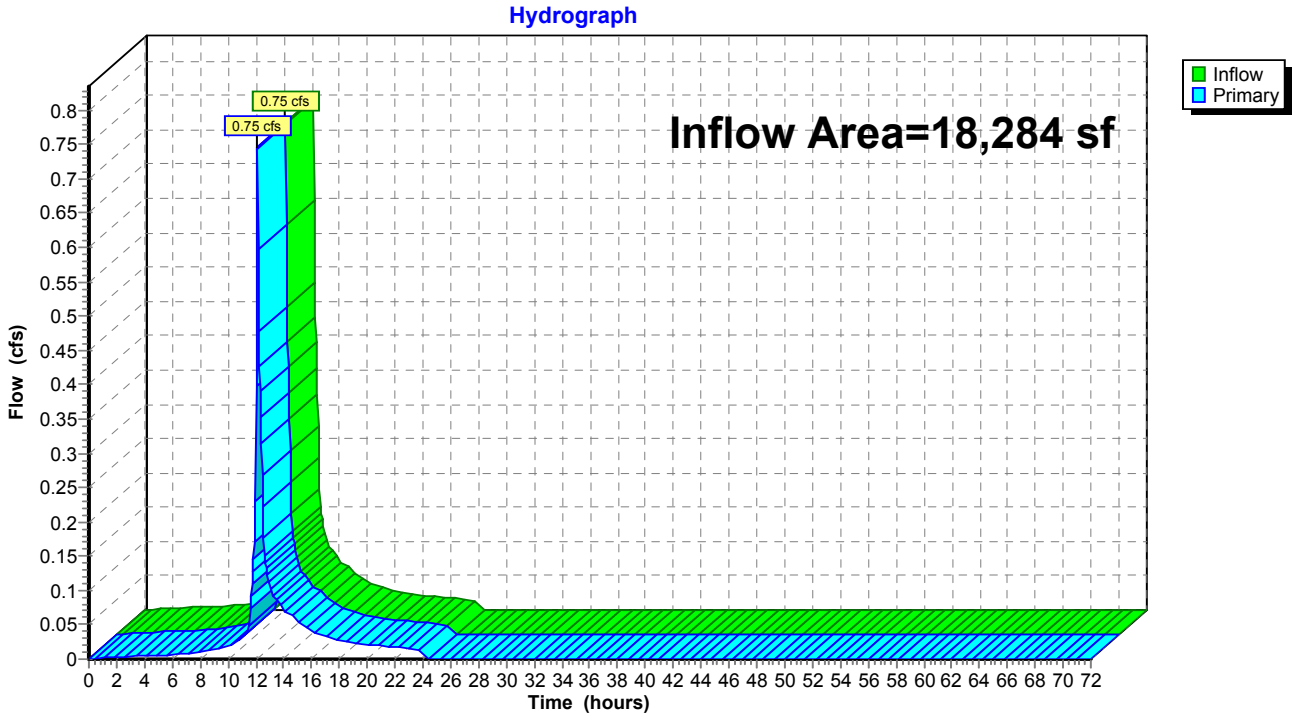
## Summary for Pond P1: Analysis Pt 1

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

Inflow Area = 18,284 sf, 11.78% Impervious, Inflow Depth = 2.02" for 100 YR event
Inflow = 0.75 cfs @ 12.09 hrs, Volume= 3,072 cf
Primary = 0.75 cfs @ 12.09 hrs, Volume= 3,072 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

### Pond P1: Analysis Pt 1



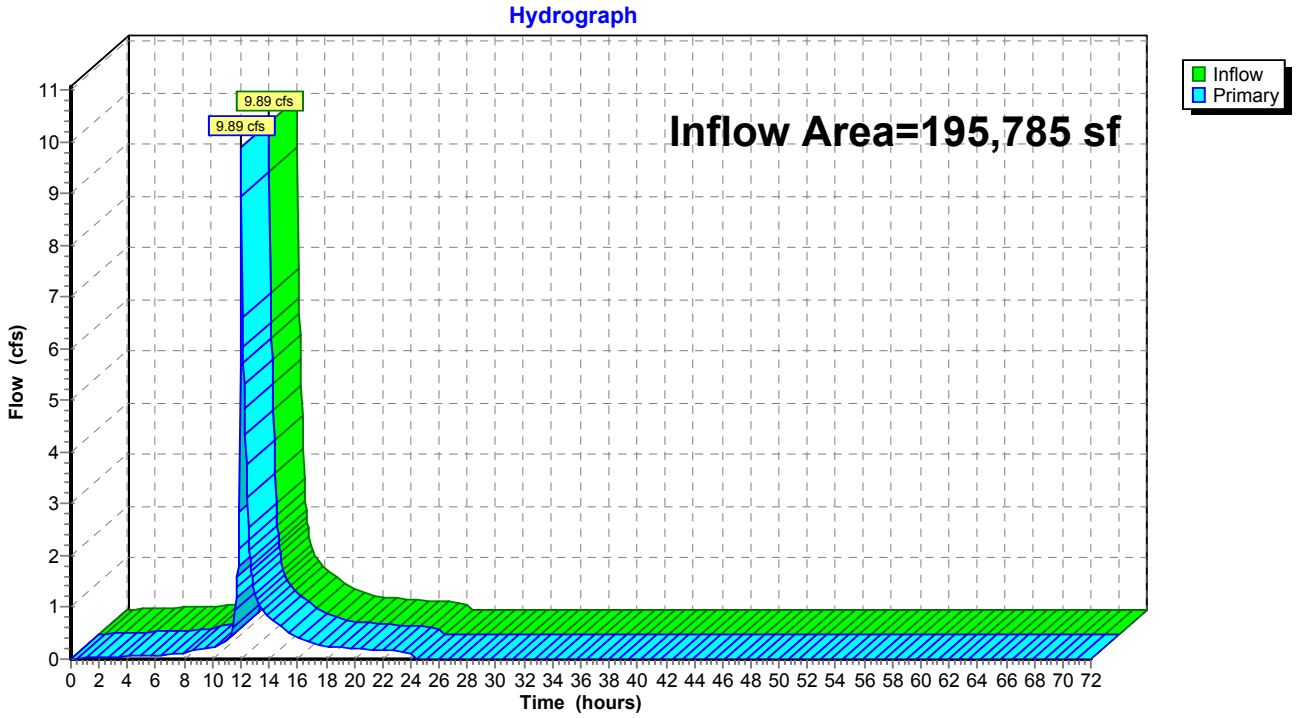
## Summary for Pond P2: Analysis Pt 2

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

Inflow Area = 195,785 sf, 23.45% Impervious, Inflow Depth = 2.21" for 100 YR event
Inflow = 9.89 cfs @ 12.02 hrs, Volume= 36,018 cf
Primary = 9.89 cfs @ 12.02 hrs, Volume= 36,018 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

### Pond P2: Analysis Pt 2



# Attachment E - Calculations

**Wayland - Loker Field**
**Recharge Calculation**

Required Recharge

| Area Summary | |
|---|---|
| | Area (SF)* |
| Existing Impervious | 0 |
| Proposed Impervious | 21,144 |
| Required Recharge Area *(Proposed - Existing)* | 21,144 |

* Areas calculated in HydroCAD

Note: Site consists of HSG A soils.

| Hydrologic Soil Group Summary | | |
|---|---|---|
| Group | Target Depth Factor (in) | Area (SF) |
| A | 0.6 | 21,144 |
| B | 0.35 | 0 |
| C | 0.25 | 0 |
| D | 0.1 | 0 |

Required Recharge (*Rv*) Calculation:

*Rv* = Target Depth Factor x Δ Impervious Area
*Rv* = 0.6 x (1/12) x 21,144
*Rv* = 1,057 CF

Proposed Recharge Summary

| Location | Volume (CF)* | Description |
|---|---|---|
| Underground Chambers | 2,826 | Chamber Field A |
| | | |
| | | |
| | | |
| | | |
| Total | 2,826 | |

*Rv* = 1,057 CF
Provided recharge = 2,826 CF

***Recharge Requirement is met.***

*Note: Volume numbers listed above reflect static volume available in recharge systems. Actual volume of recharged water will be much higher due to dynamic action reflected in the HydroCAD analysis.

**Wayland-Loker Field**
**Water Quality Volume Calculation**
*Aug-18*

Required Water Quality Storage
Proposed Paved Area sf x 1" x 1'/12"= Required WQ Storage CF

| Location | Proposed Impervious Area (sqft) | Required WQ Storage (cf) | Provided WQ Storage (cf) | Description |
|---|---|---|---|---|
| Facility Site | 21,144 | 1,762 | 2,826 | Chamber Field A (Volume below lowest outlet) |

INSTRUCTIONS:
1. In BMP Column, click on Blue Cell to Activate Drop Down Menu
2. Select BMP from Drop Down Menu
3. After BMP is selected, TSS Removal and other Columns are automatically completed.

*Version 1, Automated: Mar. 4, 2008*

Location: Loker Field Parking Lot

## TSS Removal Calculation Worksheet

| B<br>BMP[1] | C<br>TSS Removal Rate[1] | D<br>Starting TSS Load* | E<br>Amount Removed (C*D) | F<br>Remaining Load (D-E) |
|---|---|---|---|---|
| **Deep Sump and Hooded Catch Basin** | **0.25** | **1.00** | **0.25** | **0.75** |
| **Subsurface Infiltration Structure** | **0.80** | **0.75** | **0.60** | **0.15** |
| | **0.00** | **0.15** | **0.00** | **0.15** |
| | **0.00** | **0.15** | **0.00** | **0.15** |
| | **0.00** | **0.15** | **0.00** | **0.15** |

**Total TSS Removal =** **85%**

**Separate Form Needs to be Completed for Each Outlet or BMP Train**

Project: **Loker Field**
Prepared By: **JIP**
Date: **7/11/2018**

*Equals remaining load from previous BMP (E) which enters the BMP

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed
1. From MassDEP Stormwater Handbook Vol. 1

# Attachment F - Long Term Pollution Prevention Plan

# Long Term Pollution Prevention Plan
# Loker Field Improvemetns
# Wayland, MA

To meet the requirements of Standard 4 of the Massachusetts Stormwater Handbook, this Long Term Pollution Prevention Plan is provided to identify the proper procedures of practices for source control and pollution prevention.

## Storage and Handling of Oil and other Hazardous Materials

There will be no oil or other hazardous materials stored onsite.

## Salt Storage

There will be no salt storage onsite.

## Vehicle Storage and Washing

Vehicles will only park on a temporary basis during use of the field. Vehicles will not be stored or washed onsite.

## Operation and Maintenance of Stormwater Control Structures

Included in Attachment H of this appendix is the Operation and Maintenance plan for this site, which includes street sweeping of the paved areas and periodic removal of sediment from catch basins and other stormwater structures. The Town will be responsible for implementing the plan.

## Landscaping

The landscaped areas will be maintained by the Town. Fertilizers will not be stored onsite.

## De-icing & Snow Disposal

The Town of Wayland DPW currently does not maintain the Loker Conservation and Recreation Area property during the winter months, which includes following a snow fall event. The expectation is that the Recreation Commission does not intend to program activities during the winter months where snow and ice would be a factor. Therefore, the expectation is that there will not be a need for "salt" (or Calcium Chloride) for de-icing.

# Attachment G - Construction Period Pollution and Erosion and Sedimentation Control Plan

# Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan

## SECTION 1: Introduction

The project applicant, the Town of Wayland, is proposing the installation of a multi-purpose athletic field within the Loker Conservation and Recreation Area. The project includes field installation, field lighting, parking, trail improvements, and the addition of a stormwater management system. There would also be improvements to the existing emergency access road and parking area. The goal of this project is to utilize the Loker Conservation and Recreation Area to provide the Town of Wayland with a multi-purpose athletic field. Currently there is existing open field space on the property. By expanding this open space there will be room for the new athletic field. There is also an existing parking lot that will also be expanded on to allow for additional parking. In addition to the field and parking lot, new lighting will be added to allow for field use after daylight hours. The existing emergency access road will also be improved upon to allow for easier use, and miscellaneous paved areas in various locations of the site will be removed and converted to grassed space.

As part of this project, this "Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan" has been created to insure that no further disturbance to the wetland resource is created during the construction of these repairs.

## SECTION 2: Construction Period Pollution Prevention Measures

Best Management Practices (BMPs) will be utilized as Construction Period Pollution Prevention Measures to reduce potential pollutants and prevent any off-site discharge. The objectives of the BMPs for construction activity are to minimize the disturbed areas, stabilize any disturbed areas, control the site perimeter and retain sediment. Both erosion and sedimentation controls and non-stormwater best management measures will be used to minimize site disturbance and ensure compliance with the performance standards of the WPA and Stormwater Standards. Measures will be taken to minimize the area disturbed by construction activities to reduce the potential for soil erosion and stormwater pollution problems. In addition, good housekeeping measures will be followed for the day-to-day operation of the construction site under the control of the contractor to minimize the impact of construction. This section describes the control practices that will be in place during construction activities. All recommended control practices will comply with the standards set in the MA DEP Stormwater Policy Handbook.

### 2.1 Minimize Disturbed Area and Protect Natural Features and Soil

In order to minimize disturbed areas all work will be completed within well-defined work limits. These work limits are shown on the construction plans. The Contractor shall not disturb native vegetation in the undisturbed wetland area without prior approval from the Engineer. The Contractor will be responsible to make sure that all workers know the

proper work limits and do not extend their work into the undisturbed areas. The protective measures are described in more detail in the following sections.

### 2.2 Control Stormwater Flowing onto and through the project

All construction areas adjacent to wetlands will be lined with compost filter tubes and silt fence. The tubes and silt fence will be inspected daily and accumulated silt will be removed as appropriate. In addition, any storage of material will require a second level of protection by surrounding the areas with another row of compost filter tubes. A stabilized truck entrance/exit is proposed so that equipment visiting the site can remove any accumulated dirt and mud from vehicles to prevent tracking the mud onto public roads.

### 2.3 Stabilize Soils

The Contractor shall limit the area of land which is exposed and free from vegetation during construction. In areas where the period of exposure will be greater than two (2) months, mulching, the use of erosion control mats, or other protective measures shall be provided as specified.

The Contractor shall take account of the conditions of the soil where erosion control seeding will take place to insure that materials used for re-vegetation are adaptive to the sediment control.

### 2.4 Proper storage and cover of any stockpiles

The location of the Contractor's storage areas for equipment and/or materials shall be upon cleared portions of the job site or areas to be cleared as a part of this project, and shall require written approval of the Engineer.

No excavated materials or materials used in backfill operations shall be stored within a minimum distance of fifty (50) feet of any watercourse or any wetlands. Adequate measures for erosion and sediment control such as the placement of compost filter tubes around the downstream perimeter of stockpiles shall be employed to protect any downstream areas from siltation.

There shall be no storage of equipment or materials in areas designated as wetlands.

The Engineer may designate a particular area or areas where the Contractor may store materials used in his operations.

### 2.5 Perimeter Controls and Sediment Barriers

Erosion control lines as described in Section 5 will be utilized to ensure that no sedimentation occurs outside the perimeter of the work area.

## 2.6 Storm Drain Inlet Protection

Storm Drain inlets (catch basins) will be fitted with a protective insert.

## 2.7 Retain Sediment On-Site

The Contractor will be responsible to monitor all erosion control measures. Whenever necessary the Contractor will clear all sediment from the compost filter tubes and silt fence that have been silted up during construction. Daily monitoring shall be conducted using the attached Monitoring Form.

The following good housekeeping practices will be followed on-site during the construction project.

## 2.8 Material Handling and Waste Management

All materials stored on-site will be stored in a neat, orderly manner in appropriate containers. All materials will be kept in their original containers with the original manufacturer's label. Substances will not be mixed with one another unless recommended by the manufacturer.

All waste materials will be collected and stored in a securely lidded metal container from a licensed management company. The waste and any construction debris from the site will be hauled off-site daily and disposed of properly. The contractor will be responsible for all waste removal. Manufacturer's recommendations for proper use and disposal will be followed for all materials. Sanitary waste will be collected from the portable units a minimum of once a week, by a licensed sanitary waste management contractor.

## 2.9 Designated Washout Areas

The Contractor shall use washout facilities at their own facilities, unless otherwise directed by the Engineer.

## 2.10 Proper Equipment/Vehicle Fueling and Maintenance Practices

On-site vehicles will be monitored for leaks and receive regular preventative maintenance to reduce the risk of leakage. To ensure that leaks on stored equipment do not contaminate the site, oil-absorbing mats will be placed under all equipment during storage. Regular fueling and service of the equipment shall not be performed. Repair of equipment or machinery shall not be allowed in any event within 100' of wetlands. Any petroleum products will be stored in tightly sealed containers that are clearly labeled.

## 2.11 Equipment/Vehicle Washing

The Contractor will be responsible to ensure that no equipment is washed on-site.

## SECTION 3: Spill Prevention and Control Plan

The Contractor will be responsible for preventing spills in accordance with the project specifications and applicable federal, state and local regulations. The Contractor will identify a properly trained site employee, involved with the day-to-day site operations to be the spill prevention and cleanup coordinator. The name(s) of the responsible spill personnel will be posted on-site. Each employee will be instructed that all spills are to be reported to the spill prevention and cleanup coordinator.

### 3.1 Spill Control Equipment

Spill control/containment equipment will be kept in the Work Area. Materials and equipment necessary for spill cleanup will be kept either in the Work Area or in an otherwise accessible on-site location. Equipment and materials will include, but not be limited to, absorbent booms/mats, brooms, dust pans, mops, rags, gloves, goggles, sand, plastic and metal containers specifically for this purpose. It is the responsibility of the Contractor to ensure the inventory will be readily accessible and maintained.

### 3.2 Notification

All workers will be directed to inform the on-site supervisor of a spill event. The supervisor will assess the incident and initiate proper containment and response procedures immediately upon notification. Workers should avoid direct contact with spilled materials during the containment procedures. Primary notification of a spill should be made to the local Fire Department and Police Departments. Secondary Notification will be to the certified cleanup contractor if deemed necessary by Fire and/or Police personnel. The third level of notification is to the DEP. The specific cleanup contractor to be used will be identified by the Contractor prior to commencement of construction activities.

### 3.3 Spill Containment and Clean-Up Measures

Spills will be contained with granular sorbent material, sand, sorbent pads, booms or all of the above to prevent spreading. Certified cleanup contractors should complete spill cleanup. The material manufacturer's recommended methods for spill cleanup will be clearly posted and on-site personnel will be made aware of the procedures and the location of the information and cleanup supplies.

### 3.4 Hazardous Materials Spill Report

The Contractor will report and record any spill. The spill report will present a description

of the release, including the quantity and type of material, date of the spill, circumstances leading to the release, location of spill, response actions and personnel, documentation of notifications and corrective measures implemented to prevent reoccurrence.

*This document does not relieve the Contractor of the Federal reporting requirements of 40 CFR Part 110, 40 CFR Part 117, 40 CFR Part 302 and the State requirements specified under the Massachusetts Contingency Plan (M.C.P) relating to spills or other releases of oils or hazardous substances. Where a release containing a hazardous substance or oil in an amount equal to or in excess of a reportable quantity established under either 40 CFR Part 110, 40 CFR Part 117 or 40 CFR Part 302, occurs during a twenty-four (24) hour period, the Contractor is required to comply with the response requirements of the above mentioned regulations. Spills of oil or hazardous material in excess of the reportable quantity will be reported to the National Response Center (NRC).*

## SECTION 4: Contact Information/Responsible Parties

**Owner/Operator:**
Town of Wayland
41 Cochituate Road
Wayland, MA 01778

**Engineer:**
James Pearson, P.E.
Weston & Sampson, Inc.
5 Centennial Drive
Peabody, MA 01960
978-532-1900

**Site Inspector:**
TBD

**Contractor:**
TBD

## SECTION 5: Erosion and Sedimentation Control

Erosion and Sedimentation Controls are shown on the project plans. In addition a technical specification (***Section 01570 Environmental Protection***) has been included as part of Appendix D, which details all Erosion and Sedimentation controls.

## SECTION 6: Site Development Plans

A full set of site development plans are included with this submittal.

## SECTION 7: Operation and Maintenance of Erosion Control

The erosion control measures will be installed as detailed in the technical specification ***01570 Environmental Protection***. If there is a failure to the controls the Contractor, under the supervision of the Engineer, will be required to stop work until the failure is repaired.

Periodically throughout the work, the sediment that has been deposited against the controls shall be removed pursuant to DEP guidelines to ensure that the controls are working properly.

## SECTION 8: Inspection Schedule

During construction the erosion and sedimentation controls will be inspected daily. Once the Contractor is selected, an on site inspector will be selected to work closely with the Engineer to insure that all erosion and sedimentation controls are in place and working properly. An Inspection Form is included.

Inspection Form

Inspected By: _____ Date: _____Time:_____

| YES | NO | DOES NOT APPLY | ITEM |
|---|---|---|---|
| | | | Do any erosion/siltation control measures require repair or clean out to maintain adequate function? |
| | | | Is there any evidence that sediment is leaving the site and entering the wetlands? |
| | | | Are any temporary soil stockpiles or construction materials located in non-approved areas? |
| | | | Are on-site construction traffic routes, parking, and storage of equipment and supplies located in areas not specifically designed for them? |

Specific location, current weather conditions, and action to be taken:

_____

_____

_____

_____

_____

Other Comments:

_____

_____

Pending the actions noted above I certify that the site is in compliance with the Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan.

Signature: _____ Date: _____

# Attachment H - Operations and Maintenance Plan

# Attachment H –
# Long-Term Operation and Maintenance Plan

## 1.0 Introduction

The following document has been written to comply with the stormwater guidelines set forth by the Massachusetts Department of Environmental Protection (MassDEP). The intent of these guidelines is to encourage Low Impact Development techniques to improve the quality of the stormwater runoff. These techniques, also known as Best Management Practices (BMPs) collect, store, and treat the runoff before discharging to adjacent environmental resources.

## 2.0 Purpose

This Operation and Maintenance Plan (O&M Plan) is intended to provide a mechanism for the consistent inspection and maintenance of each BMP installed on the project site. Included in this O&M Plan is a description of each BMP type and an inspection form for each BMP. The Town of Wayland is the owner and operator of the system and is responsible for its upkeep and maintenance.

This work will be funded on an annual basis through the town's operating budget. The estimated budget to maintain these BMPs utilizing the Municipal Services Department workforce and equipment is approximately $2,000 per year. This budget assumes that Town equipment will be utilized and no additional equipment rental is required.

In the event the Town sells the property, it is the Town's responsibility to transfer this plan as well as the past three years of operation and maintenance records to the new property owner.

## 3.0 BMP Description and Locations

### 3.1 Street Sweeping

Street sweeping consists of using a street sweeping machine to clean impervious areas of accumulated sediment, debris, and trash at parking areas.

### 3.2 Deep Sump Catch Basins

Deep sump catch basins will be located throughout the site and used as pre-treatment before entering the stormwater detention/infiltration basin. The deep sump catch basins are designed to remove trash, debris, and coarse sediment from the stormwater runoff.

### 3.4 Stormwater Infiltration Chambers

There is one underground infiltration chamber field in the facility that will receive stormwater. A stormwater infiltration chamber field will be built beneath the

parking lot area of the site. This structure also significantly mitigates TSS and provides for stormwater detention to mitigate peak discharges from the site.

## 4.0 Inspection, Maintenance Checklist and Schedule

### 4.1 Street Sweeping

Street sweeping shall be performed on the proposed parking lot areas in accordance with the Town of Wayland DPW's current street sweeping schedule, primarily in the spring and fall. Street sweeping shall be performed using an appropriate street sweeping machine.

In the event of contamination by a spill or other means, all street sweeping cleanings must be evaluated in accordance with the Hazardous Waste Regulations, 310 CMR 30.000 and handled as hazardous waste.

In the absence of evidence of contamination, street sweeping cleanings may be taken to a landfill or other facility permitted by MassDEP to accept Solid Waste without any prior approval by MassDEP. Please note that current MassDEP regulations prevent landfills from accepting materials that contain free-draining liquids. Also see attached operations and maintenance standards (reproduced from the Massachusetts Stormwater Handbook) at the end of this section

### 4.2 Deep Sump Catch Basins

Inspect and/or clean catch basin at least four times per year and at the end of foliage and snow removal seasons. Sediments must be removed whenever the depth of deposits is greater than or equal to one half the depth from the bottom of the invert of the lowest pipe in the basin. The catch basin and oil-grit separators shall be cleaned a minimum of four times per year regardless of the amount of sediment in the basin. Catch basins shall be cleaned with clamshell buckets or vacuum trucks.

In the event of contamination by a spill or other means, all cleanings must be evaluated in accordance with the Hazardous Waste Regulations, 310 CMR 30.000 and handled as hazardous waste.

In the absence of evidence of contamination, catch basin cleanings may be taken to a landfill or other facility permitted by MassDEP to accept Solid Waste without any prior approval by MassDEP. Please note that current MassDEP regulations prevent landfills from accepting materials that contain free-draining liquids. Also see attached operations and maintenance standards (reproduced from the Massachusetts Stormwater Handbook) at the end of this section

4.3 Stormwater Infiltration Chambers

The stormwater infiltration chamber field shall be inspected every six months during the first year, and annually thereafter. All accumulated sediment and debris in the isolation row(s) shall be removed using water jetting and vacuum truck equipment as described in manufacturer literature for the chamber system.

4.4 Inspections and Record Keeping

- An inspection form should be filled out each and every time maintenance work is performed.
- A binder should be kept by the owner that contains all of the completed inspection forms and any other related materials.
- A review of all Operation & Maintenance actions should take place annually to ensure that these Stormwater BMPs are being taken care of in the manner illustrated in this Operation & Maintenance Plan.
- All operation and maintenance log forms for the last three years, at a minimum, shall be kept on site at the owner.
- The inspection and maintenance schedule may be refined in the future based on the findings and results of this operation and maintenance program or policy.

## 5.0 Public Safety Features

Underground stormwater system measures are protected from access via manhole covers and grates.

## 6.0 Stormwater Management System Owner/Responsible Party

Town of Wayland
41 Cochituate Road
Wayland, MA 01778

This operation and Maintenance Plan will be recorded with the registry of deeds so that current and future owners are aware of the requirement for proper operation and maintenance of the onsite stormwater system.

Town of Wayland
Loker Recreation Area
Permanent BMP Inspection Checklist

**Street Sweeping**

| | |
|---|---|
| Frequency: | In accordance with DPW's current street sweeping schedule, primarily in the spring and fall. |
| Location: | Parking Lot and Driveways |
| Inspected By: | _____ Date: _____ |
| Observations: | _____<br>_____<br>_____ |
| Actions Taken: | _____<br>_____<br>_____ |
| Instructions: | Sweep parking lot using street sweeping machine. All trash, debris, and sediments shall be disposed of in accordance with local, state, and federal regulations. |

☐ **Deep Sump Catch Basins**

Frequency: Inspect and clean deep sump catch basins in March, June, September and December.

Structure Number: _____

Inspected By: _____ Date: _____

Observations: _____
_____
_____

Actions Taken: _____
_____
_____

Instructions: Clean units four times per year or whenever the depth of the deposits is greater than or equal to one half the depth from the bottom of the invert to the lowest pipe in the structure.

☐ **Stormwater Detention/Infiltration Chambers**

Frequency: The detention/infiltration chambers shall be inspected every six months during the first year and annually thereafter.

Structure No.: _____

Inspected By: _____ Date: _____

Observations: _____
_____
_____

Actions Taken: _____
_____
_____

Instructions: Inspect isolation rows. If visible sediment deposition has occurred, insert reverse water jet into isolation row via access manhole and jet sediment backward into manhole. Remove sediment with vacuum truck and dispose of sediment as required.

# Attachment I - Illicit Discharge Compliance Statement

# Illicit Discharge Compliance Statement

## Section I – Purpose/Intent

The purpose of this document is to provide for the health, safety, and general welfare of the citizens of Wayland, Massachusetts through the regulation of non-stormwater discharges into existing outstanding resource areas near the Wayland Public Works Facility to the maximum extent practicable, as required by federal and state law. This document establishes methods for controlling the introduction of pollutants into existing outstanding resource areas to comply with requirements of the National Pollutant Discharge Elimination System (NPDES) permit process.

## Section II - Definitions

For the purposes of this statement, the following shall mean:

*Best Management Practices (BMPs)*: Schedules of activities, prohibitions of practices, general good housekeeping practices, pollution prevention and educational practices, maintenance procedures, and other management practices to prevent or reduce the discharge of pollutants directly or indirectly to stormwater, receiving waters, or stormwater conveyance systems. BMPs also include treatment practices, operating procedures, and practices to control site runoff, spillage or leaks, sludge or water disposal, or drainage from raw materials storage.

*Clean Water Act*: The federal Water Pollution Control Act (33 U.S.C § 1251 et seq.), and any subsequent amendments thereto.

*Construction Activity*: Activities subject to the Massachusetts Erosion and Sedimentation Control Act or NPDES Construction Permits. Such activities include but are not limited to clearing and grubbing, grading, excavating, and demolition.

*Hazardous Materials*: Any material, including any substance, waste, or combination thereof, which because of its quantity, concentration, or physical, chemical, or infectious characteristics may cause, or significantly contribute to, a substantial present or potential hazard to human health, safety, property, or the environment when improperly treated, stored, transported, disposed of, or otherwise managed.

*Illegal Connection*: An illegal connection is defined as either of the following:

a. Any pipe, open channel, drain or conveyance, whether on the surface or subsurface, which allows an illicit discharge to enter the outstanding resource area including but not limited to any conveyances which allow any non-stormwater discharge including sewage, process wastewater, and wash water, regardless of whether said drain or connection has been previously allowed, permitted, or approved by an authorized enforcement agency; or
b. Any pipe, open channel, drain or conveyance connected to the Town of Wayland storm water treatment system which has not been documented in plans, maps, or equivalent records and approved by an authorized enforcement agency.

*Illicit Discharge*: Any direct or indirect non-stormwater discharge to the Town of Wayland stormwater treatment system, except as exempted in Section II of this ordinance.

*Industrial Activity*: Activities subject to NPDES Industrial Permits as defined in 40CFR, Section 122.26 (b) (14).

*National Pollutant Discharge Elimination System (NPDES) Stormwater Discharge Permit*: A permit issued by MassDEP under authority delegated pursuant to 33 USC § 1342 (b) that authorizes the discharge of pollutants to waters of the United States, whether the permit is applicable on an individual, group, or general area-wide basis.

*Town of Wayland Stormwater Treatment System*: Any facility, owned or maintained by the town, designed or used for collecting and/or conveying stormwater, including but not limited to roads with drainage systems, Town of Wayland streets, curbs, gutters, inlets, catch basins, piped storm drains, pumping facilities, infiltration, retention and detention basins, natural and man-made or altered drainage channels, reservoirs, and other drainage structures.

*Non-Stormwater Discharge*: Any discharge to the storm drain system that is not composed entirely of stormwater.

*Person*: Any individual, association, organization, partnership, firm, joint venture, public or private corporation, trust, estate, commission, board, public or private institution, utility, cooperative, city, county or other political subdivision of the State, interstate body, or any other legal entity.

*Pollutant*: Anything which causes or contributes to pollution. Pollutants may include, but are not limited to: paints, varnishes, and solvents; petroleum hydrocarbons; automotive fluids; cooking grease; detergents (biodegradable or otherwise); degreasers; cleaning chemicals; non-hazardous liquid and solid wastes; refuse, rubbish, garbage, litter, or other discarded or abandoned objects and accumulations, so that same may cause or contribute to pollution; floatables; pesticides, herbicides, and fertilizers; liquid and solid wastes; sewage, fecal coliform and pathogens; dissolved and particulate metals; animal wastes; wastes and residues that result from constructing a building or structure; concrete and cement; and noxious or offensive matter of any kind.

*Pollution*: Contamination or other alteration of any water's physical, chemical, or biological properties by addition of any constituent including but not limited to a change in temperature, taste, color, turbidity, or odor of such waters, or the discharge of any liquid, gaseous, solid, radioactive, or other substance into any such waters as will or is likely to create a nuisance or render such waters harmful, detrimental, or injurious to the public health, safety, welfare, or environment, or to domestic, commercial, industrial, agricultural, recreational, or other legitimate beneficial uses, or to livestock, wild animals, birds, fish or other aquatic life.

*Premises*: Any building, lot, parcel of land, or portion of land whether improved or unimproved including adjacent sidewalks and parking strips.

*Stormwater*: Any surface flow, runoff, and drainage consisting entirely of water from any form of natural precipitation, and resulting from such precipitation.

*Wastewater*: Any water or other liquid discharged from a facility, that has been used, as for washing, flushing, or in a manufacturing process, and so contains waste products.

## Section III - Prohibitions

*Prohibition of Illicit Discharges:*

No person shall throw, drain, or otherwise discharge, cause or allow others under its control to throw, drain, or otherwise discharge into the Town of Wayland stormwater treatment system or watercourses any materials, including but not limited to, any pollutants or waters containing any pollutants, other than stormwater. The commencement, conduct or continuance of any illicit discharge to the storm drain system is prohibited except as described as follows:

1. Water line flushing performed by a government agency, other potable water sources, landscape irrigation or lawn watering, diverted stream flows, rising ground water, ground water infiltration to storm drains, uncontaminated pumped ground water, foundation or footing drains (not including active groundwater dewatering systems), crawl space pumps, air conditioning condensation, springs, natural riparian habitat or wetland flows, and any other water source not containing pollutants;

2. Discharges or flows from fire fighting, and other discharges specified in writing by the Town of Wayland as being necessary to protect public health and safety;

3. Dye testing is an allowable discharge, but requires a verbal notification to the Town of Wayland prior to the time of the test;

4. Any non-stormwater discharge permitted under an NPDES permit, waiver, or waste discharge order issued to the discharger and administered under the authority of the Federal Environmental Protection Agency, provided that the discharger is in full compliance with all requirements of the permit, waiver, or order and other applicable laws and regulations, and provided that written approval has been granted for a discharge to the Town of Wayland stormwater treatment system.

## Section IV - Industrial or Construction Activity Discharges

Any person subject to an industrial or construction activity NPDES stormwater discharge permit shall comply with all provisions of such permit. Proof of compliance with said permit may be required in a form acceptable to the Town of Wayland Department of Public Works prior to allowing discharges to the Wayland stormwater treatment system.

**Section V - Notification of Spills and Accidental Discharges**

Notwithstanding other requirements of law, as soon as any person responsible for a facility, activity or operation, or responsible for emergency response for a facility, activity or operation has information of any known or suspected release of pollutants or non-stormwater discharges from that facility, activity, or operation which are resulting or may result in illicit discharges or pollutants discharging into stormwater, the Town of Londmeadow stormwater treatment system, State Waters, or Waters of the U.S., said person shall take all necessary steps to ensure the discovery, containment, and cleanup of such release so as to minimize the effects of the discharge. In the event of such a release of hazardous materials, said person shall immediately notify emergency response agencies of the occurrence via emergency dispatch services. In the event of a release of non-hazardous materials, said person shall notify the Town of Wayland Department Public Works in person or by phone no later than the next business day, including the nature, quantity and time of occurrence of the discharge. Notifications in person or by phone shall be confirmed by written notice, via certified mail return receipt requested addressed to the Town of Wayland Department of Public Works within three (3) business days of the initial notice. If the discharge of prohibited materials emanates from a commercial or industrial establishment, the owner or operator of such establishment shall also retain an on-site written record of the discharge and the actions taken to prevent its recurrence. Such records shall be retained for at least three years.

IN WITNESS WHEREOF the parties hereto have executed copies of this Agreement on the _____ day of _____, _____.

_____

Town of Wayland

SECTION 01570

ENVIRONMENTAL PROTECTION

PART 1 – GENERAL

1.01 DESCRIPTION:

A. The work covered by this section of the specifications consists of furnishing all labor, materials, tools and equipment and performing all work required for the prevention of environmental pollution during and as a result of construction operations under this contract.

B. The requirements set forth in this section of the specifications apply to construction in and adjacent to wetlands, unless otherwise specifically stated.

C. All work under this Contract shall be in accordance with the Conservation Commissions' Orders of Conditions as well as any conditional requirements applied.

D. Prior to commencement of work, the Contractor shall meet with representatives of the Engineer to develop mutual understandings relative to compliance of the environmental protection program.

1.02 SUBMITTALS:

A. The Contractor shall submit for approval six sets of details and literature fully describing environmental protection methods to be employed in carrying out construction activities within 100 feet of wetlands or across areas designated as wetlands.

PART 2 - PRODUCTS

2.01 STRAW BALES:

A. Straw bales shall consist of certified seed free stems of agricultural grain and cereal crops and shall be free of grasses and legumes. Standard bales shall be 14-inches high, 18- inches wide and 36- to 40-inches long tied with polypropylene twine and weigh within 5 percent of 7 lbs. per cubic ft.

2.02 CATCH BASIN PROTECTION:

A. To trap sediment and to prevent sediment from clogging drainage systems, catch basin protection in the form of a siltation sack (Siltsack as manufactured by ACF Environmental, Inc. or approved equal) shall be provided as approved by the Engineer.

2.03 COMPOST FILTER TUBES:

A. Silt socks shall be a tubular filter sock of mesh fabric. The fabric will have openings of between 1/8" to ¼" diameter. The mesh material will either photo degrade within one

year or be made of nylon with a life expectancy of 24 months. The sock shall be filled with a mix of composted leaf mulch, bark mulch and wood chips that have been composted for at least one year. The sock will have a minimum diameter of 12-inches.

PART 3- EXECUTION

3.01 NOTIFICATION AND STOPPAGE OF WORK:

A. The Engineer will notify the Contractor in writing of any non-compliance with the provisions of the Order of Conditions. The Contractor shall, after receipt of such notice, immediately take corrective action. Such notice, when delivered to the Contractor or his authorized representative at the site of the work, shall be deemed sufficient for the purpose. If the Contractor fails to act promptly, the Owner may order stoppage of all or part of the work through the Engineer until satisfactory corrective action has been taken. No claim for an extension of time or for excess costs or damage incurred by the Contractor as a result of time lost due to any stop work orders shall be made unless it was later determined that the Contractor was in compliance.

3.02 AREA OF CONSTRUCTION ACTIVITY:

A. Insofar as possible, the Contractor shall confine his construction activities to those areas defined by the plans and specifications. All land resources within the project boundaries and outside the limits of permanent work performed under this contract shall be preserved in their present condition or be restored to a condition after completion of construction at least equal to that which existed prior to work under this contract.

3.03 PROTECTION OF WATER RESOURCES:

A. The Contractor shall not pollute streams, lakes or reservoirs with fuels, oils, bitumens, calcium chloride, acids or other harmful materials. It is the Contractor's responsibility to comply with all applicable Federal, State, County and Municipal laws regarding pollution of rivers and streams.

B. Special measures should be taken to insure against spillage of any pollutants into public waters.

3.04 CONSTRUCTION IN AREAS DESIGNATED AS WETLANDS ON THE DRAWINGS:

A. The Contractor shall not create disturbance within areas designated as wetlands or within 100-feet of wetland resource areas unless approved by the conservation commission.

B. The Contractor shall perform his work in such a way that these areas are left in the condition existing prior to construction.

3.05 PROTECTING AND MINIMIZING EXPOSED AREAS:

A. The Contractor shall limit the area of land which is exposed and free from vegetation during construction. In areas where the period of exposure will be greater than two (2) months, temporary vegetation, mulching or other protective measures shall be provided

as specified.

B. The Contractor shall take account of the conditions of the soil where temporary cover crop will be used to insure that materials used for temporary vegetation are adaptive to the sediment control. Materials to be used for temporary vegetation shall be approved by the Engineer.

3.06 LOCATION OF STORAGE AREAS:

A. The location of the Contractor's storage areas for equipment and/or materials shall be upon cleared portions of the job site or areas to be cleared as a part of this project, and shall require written approval of the Engineer. Plans showing storage facilities for equipment and materials shall be submitted for approval of the Engineer.

B. No excavated materials or materials used in backfill operations shall be deposited within a minimum distance of one hundred (100) feet of any watercourse or any drainage facility. Adequate measures for erosion and sediment control such as the placement of straw wattles around the downstream perimeter of stockpiles shall be employed to protect any downstream areas from siltation.

C. There shall be no storage of equipment or materials in areas designated as wetlands.

D. The Engineer may designate a particular area or areas where the Contractor may store materials used in his operations.

3.07 PROTECTION OF LANDSCAPE:

A. The Contractor shall not deface, injure, or destroy trees or shrubs nor remove or cut them without written authority from the Owner. No ropes, cables, or guys shall be fastened to or attached to any existing nearby trees for anchorages unless specifically authorized by the Engineer. Excavating machinery and cranes shall be of suitable type and be operated with care to prevent injury to trees which are not to be removed, particularly overhanging branches and limbs. The Contractor shall, in any event, be responsible for any damage resulting from such use.

B. Branches, limbs, and roots shall not be cut except by permission of the Engineer. All cutting shall be smoothly and neatly done without splitting or crushing. When there is unavoidable injury to branches, limbs and trunks of trees, the injured portions shall be neatly trimmed and covered with an application of grafting wax or tree healing paint as directed.

C. Where, in the opinion of the Engineer, trees may possibly be defaced, bruised, injured, or otherwise damaged by the Contractor's equipment or by his blasting or other operations, the Engineer may require the Contractor to adequately protect such trees by placing boards, planks, poles or fencing around them. Any trees or landscape feature scarred or damaged by the Contractor's equipment or operations shall be restored as nearly as possible to its original condition at the expense of the Contractor. The Engineer will decide what method of restoration shall be used, and whether damaged trees shall be treated and healed or removed and disposed of.

D. Cultivated hedges, shrubs, and plants which could be injured by the Contractor's operations shall be protected by suitable means or shall be dug up, balled and temporarily replanted and maintained. After construction operations have been substantially completed, they shall be replanted in their original positions and cared for until growth is re-established. If cultivated hedges, shrubs, and plants are injured to such a degree as to affect their growth or diminish their beauty or usefulness, they shall be replaced by items of a kind and quality at least equal to that existing at the start of the work.

3.08 CLEARING AND GRUBBING:

A. The Contractor shall clear and grub only on the Owner's land or the Owner's easements, and only the area required for construction operations, as approved by the Engineer.

3.09 DISCHARGE OF DEWATERING OPERATIONS:

A. Any water that is pumped and discharged from the trench and/or excavation as part of the Contractor's water handling shall be filtered by an approved method prior to its discharge into a receiving water or drainage system.

B. Under no circumstances shall the Contractor discharge water to the areas designated as wetlands. When constructing in a wetlands area, the Contractor shall discharge water from dewatering operations directly to the nearest drainage system, stream, or waterway after filtering by an approved method.

C. The pumped water shall be filtered through filter fabric and baled straw, a vegetative filter strip or a vegetated channel to trap sediment occurring as a result of the construction operations. The vegetated channel shall be constructed such that the discharge flow rate shall not exceed a velocity of more than 1 foot per second. Accumulated sediment shall be cleared from the channel periodically.

3.10 DUST CONTROL:

A. During the progress of the work, the Contractor shall conduct his operations and maintain the area of his activities, including sweeping and sprinkling of streets as necessary, to minimize creation and dispersion of dust. If the Engineer decides it is necessary to use calcium chloride for more effective dust control, the Contractor shall furnish and spread the material, as directed.

B. Calcium Chloride shall not be used for dust control within a drainage basin or in the vicinity of any source of potable water.

3.11 BALED STRAW:

A. To trap sediment during any dewatering process, baled straw shall be used where shown on the drawings. Care shall be taken to keep the bales from breaking apart. All deposited sediment shall be removed periodically. Straw bales shall not be placed within a waterway during construction.

3.12 CATCH BASIN PROTECTION:

A. Catch basin protection shall be used for every catch basin, shown on the plans or as required by the Engineer, to trap sediment and prevent it from clogging drainage systems and entering wetlands. Siltation sacks shall be securely installed under the catch basin grate. Care shall be taken to keep the siltation sacks from breaking apart or clogging. All deposited sediment shall be removed periodically and at times prior to predicted precipitation to allow free drainage flow. Prior to working in areas where catch basins are to be protected, each catch basin sump shall be cleaned of all debris and protected. The contractor shall properly dispose of all debris at no additional cost to the Owner.

3.13 COMPOST FILTER TUBES:

A. The silt socks will be staked in the ground using wooden stakes driven at 4-foot intervals. The wooden stakes will be placed at a minimum depth of 24-inches into the ground.

END OF SECTION