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25485

STORMWATER MANAGEMENT DESIGN AND RUNOFF CALCULATIONS REPORT

for

#194 & #196 Pond Road

Wellesley, Massachusetts 02482

Prepared by:
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REVISED: February 26, 2020
REVISED: January 10, 2020
October 4, 2019

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STORMWATER MANAGEMENT REPORT

NARRATIVE AND SUMMARY

for

194 & 196 Pond Road
Wellesley, Massachusetts 02482

REVISED: February 26, 2020
REVISED: January 10, 2020

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SECTION 1

STORMWATER NARRATIVE & SUMMARY

This report contains the hydrologic computations and design information relative to the existing and proposed stormwater runoff conditions for the proposed development at #194 and #196 Pond Road in Wellesley, MA.

It includes information on the proposed stormwater management system design and assessment of stormwater impacts of the proposed project.

The report also includes the following documents:

- Stormwater Summary Calculations (Section 2)
- Soils Information (Appendix 1)
- Stormwater Operation and Maintenance Plan (Appendix 4)

An Erosion and Sediment Control Plan is included as part of the site plan set. This project is subject to the U.S. EPA's Construction General Permit under the NPDES Program. Therefore, a full Stormwater Pollution Prevention Plan (SWPPP) will prepared by the site contractor prior to the start of construction.

The hydrologic model for existing and proposed stormwater runoff conditions at the site are included in Sections 3 and 4 respectively. The watershed maps for the models are in Appendices 2 and 3.

General Project Description

The subject property consists of Lot #1 and Lot #2 as shown of the plan titled Plan of Land in Wellesley, MA, owner Andrew and Ashley Cole, dated February 24, 2017, prepared by Sullivan Surveying Company, LLC. This plan was recently endorsed by the Wellesley Planning Board.

Lot #1 will be newly defined as #194 Pond Road and contains approximately 40,767± square feet (0.94± acres) of land. Lot #2 will be newly defined as #196 Pond Road and contains approximately 43,933± square feet (1.0± acres) of land. Under existing conditions, the site is undeveloped. Currently, there are no impervious surfaces on either of the sites. **Under proposed conditions, the sites combined will contain 15,682± square feet of impervious surface.**

The project will include the development of #194 and #196 Pond Road with the construction of single-family homes with associated driveways, soil absorption systems, stormwater management features, landscape improvements, and utility connections.

The proposed site work for the project includes the following:

- Construction of two (2) single family residences.
- Construction of two (2) driveways along Pond Road.
- Construction of two (2) paved patios.
- Installation of a concrete pads for HVAC units.
- Installation of stormwater management BMPs including subsurface rechargers (infiltration systems) and water quality units to provide pretreatment.

Revisions from Site Plan dated 2/26/20 shown in bold
Revisions from Site Plan dated 1/10/20 shown in italics

- Construction associated with site landscaping and grading.
- Construction of water and electric services for each proposed dwelling.
- Construction of soil absorptions systems for each proposed dwelling.
- Installation of a subsurface propane system for each proposed dwelling.
- Installation and management of construction period erosion and sedimentation controls.

Existing Site Description
The existing conditions are shown on the "Existing Conditions Plan" in the site plan set and on the "Existing Conditions Watershed Map" included with this report.

Lot #1 will be newly defined as #194 Pond Road and contains approximately 40,767± square feet (0.94± acres) of land. Lot #2 will be newly defined as #196 Pond Road and contains approximately 43,933± square feet (1.0± acres) of land.

The site is shown on the latest FEMA National Flood Insurance Program mapping as being in an unshaded Zone X (Area of minimal flooding).

The Site is not located within a "critical area" under the Massachusetts Stormwater Management Regulations.

There are no wetland resource areas on or adjacent to the property. As such, the proposed project is not subject to the Massachusetts Wetlands Protection Act.

Background of Subdivided Lots
The proposed project site is located on portions of parcels of land known as #194 Pond Road (Assessor's Parcel ID: 195-1-D) and #200 Pond Road (Assessor's Parcel ID: 195-1-E) in Wellesley, MA. These parcels are bound by Pond Road to the east, East Central Street to the north, and residential abutters to the west and south. Lot #194 Pond Road contained 77,271± square feet (4.57± acres) of land comprised of undeveloped woodland. Lot #200 Pond Road contained 199,044± square feet (2.0± acres) of land containing a paved driveway entrance off of Pond Road, woodland and other landscape features. Note: the building with street address #200 Pond Road is located over the Natick/Wellesley Town Line and is listed as a Lot known as 0 (R) E. Central Street, Natick, MA in the Town of Natick Assessors records.

Recently, the current lots were obtained by subdividing the two above referenced parcels into three (3) parcels, thus creating a lot to be known as #196 Pond Road between the two (2) other lots. The ANR Plan showing these subject lots (Lot 1 is #194 Pond Road; Lot 2 is #196 Pond Road) is included in the Site Plan set.

Both lots are located in the S-40 zoning district and Water Supply Protection Overlay District.

Existing Stormwater Runoff
Assessment of stormwater runoff conditions is based on the topographic information shown on the Existing Conditions Plan and field reconnaissance by DGT Associates.

Existing conditions runoff modeling and computations are contained in Section 3 of this report. Existing conditions, subcatchment areas and design points are shown on the "Existing Conditions Watershed Map" included in Appendix 2.

The drainage analysis is modeled as follows:

1. A large portion of the two (2) subject lots contains woods and some lawn landscaping and drains to an on-site depression internal to the subject properties. If the depression overflows, it will drain in a northerly direction to the abutting property located at #200 Pond Road. The stormwater from #200 Pond Road ultimately overflows to Pond Road.

2. A small portion of the north side of the lot known as #196 Pond Road contains woods and some lawn landscaping. It does not flow to the on-site depression but drains northerly to the abutting property located at #200 Pond Road.

3. A small portion of the combined lots drains in an easterly direction to Pond Road.

The Stormwater Model includes two (2) "Design Points" to compare pre-development and post-development stormwater conditions. The depression is modeled as a pond.

- Design Point 1 (DP-1) is the flow to the residential abutter at #200 Pond Road.
- Design Point 2 (DP-2) is the flow to Pond Road, which includes the combined flow from DP-1.
- Pond 1 (Pd-1) is the on-site depression, modeled as a pond in HydroCAD, which corresponds with the 167.5 to 168.3 elevations located in the middle of the two lots.

The peak rates of runoff and volumes to these locations for existing and proposed conditions flows for the 2, 10, 25 and 100-year storms are shown on the summary tables in Section 2 of this report. Other points of interest can also be determined from the model printouts in Sections 3 and 4.

Soils and Groundwater

Published NRCS soil data indicates "Canton fine sandy loam." This classification was generally confirmed with the on-site soil testing. For hydrologic purposes, the soil is classified as HSG "A."

Soil testing necessary for the design of the two (2) on-site sewage disposal systems was completed and witnessed by the Town of Wellesley Health Department on June 4th and 5th of 2019**, and confirmatory / additional testing was conducted on January 29, 2020**. Generally, the testing revealed a sandy loam topsoil, over a sandy loam subsoil, over a fine to medium sand and a medium to coarse sand substratum to a depth of a minimum of ten feet.

There were no observed signs of the estimated seasonal high groundwater table (ESHGWT), including redoximorphic features, weeping or standing groundwater, were observed during our testing. Ledge was not encountered.

Percolation tests were performed within the sand substratum layers adjacent to test pits TH 19-01, TH 19-02, **TH 20-04 and TH 20-06** for #196 Pond Road, and TH 19-06, TH 19-08 **and TH 20-02** for #194 Pond Road. The soak could not be maintained in any of the four tests performed. Therefore, the resulting percolation rate was less than two minutes per inch.

Due to the consistency and extent of the sand substratum soil found throughout the testing, assumptions have been made for the design infiltration rate and the ESHGWT for the proposed recharger systems. Based on our observations listed above (also refer to the Soil Test Report in Appendix 1), the infiltration rate used for design is the Rawls Rate of 8.27 inches per hour (Sand), and the design ESHGWT will be assumed to be ten feet below the ground surface at the proposed recharger systems. Confirmatory soil testing will be performed prior to the installation of any proposed recharger system. If on-site conditions differ from the assumed design data, the stormwater drainage system will be modified accordingly. Based on two (2) soil borings performed by a geotechnical engineer, the soil extended to a depth of approximately 22 feet below the surface until ledge was encountered. The soil was dry and there was no sign of a groundwater table.

Proposed Stormwater Management Design
The drainage analysis and stormwater management design has been based on the entire development (#194 and #196 Pond Road) as an overall "site." As shown on the Existing Conditions Watershed Map (Appendix 2), runoff from both lots flow across each other before ultimately leading to Pond Road.

The proposed stormwater BMPs will provide a decrease in peak flow and volume of runoff to all design points for the 2, 10, 25, and 100-year storm events.

Limited Impact Development (LID) concepts (i.e. subsurface infiltration systems **and rain gardens**) have been incorporated into this project. Detailed information and calculations relative to compliance with the regulations are contained in Section 2 of this report. The following summarizes the features of the proposed stormwater management design:

1. **Runoff from the proposed driveway at #194 Pond Road, a portion of the proposed patio, the proposed walkway from the driveway to the entrances to the dwelling, the proposed roof overhang at the main entrance and a portion of existing and proposed landscaping is collected in a deep sump hooded catch basin and directed to a water quality unit (CDS Model 3) prior to discharging to Recharger #1. Recharger #1 consists of two (2) rows of six (6) underground concrete chambers which are approximately four and a half (4.5) feet wide by four (4) feet long by four and a quarter (4.25) feet. The recharge volume captured by the recharger is 1,364 cubic feet. The proposed infiltration BMP will drain in less than 72 hours.**

2. **Clean runoff from a portion of the roof of proposed dwelling on #194 Pond Road will be collected in gutters and directed Recharger #2. Recharger #2 consists of two (2) rows of seven (7) underground concrete chambers which**

are approximately four and a half (4.5) feet wide by four (4) feet long by four and a quarter (4.25) feet. The recharge volume captured by the recharger is 1,320 cubic feet. The proposed infiltration BMP will drain in less than 72 hours.

3. **Clean runoff from a portion of the roof of proposed dwelling on #194 Pond Road will be collected in gutters and directed to Rain Garden #1. Rain Garden #1 is located above Recharger #2. Overflow from this stormwater feature will enter the recharger through a beehive grate. The recharge volume captured by the rain garden is 61 cubic feet. The proposed infiltration BMP will drain in less than 72 hours.**

4. **Runoff from the existing wooded area at the west portion of the properties is captured into grates to grade and routed directly into Recharger #3. Recharger #3 was oversized to accommodate for any offsite contributions to the watershed and to provide some of the storage volume that was previously provided by the on-site depression described above in our Existing Conditions section of this report. Recharger #3 consists of twenty-four (24) underground concrete chambers which are approximately four and a half (4.5) feet wide by four (4) feet long by four and a quarter (4.25) feet. These chambers have been position outside the critical root zone of some of the major trees in the area to attempt to save as many as possible. The recharge volume captured by the recharger is 2,635 cubic feet. The proposed infiltration BMP will drain in less than 72 hours.**

5. **A portion of the clean runoff from the roof of proposed dwelling on #196 Pond Road will be collected in gutters and directed Recharger #4. Recharger #4 consists of nine (9) underground concrete chambers which are approximately four and a half (4.5) feet wide by four (4) feet long by four and a quarter (4.25) feet. These chambers have been position outside the critical root zone of some of the major trees in the area to attempt to save as many as possible. The recharge volume captured by the recharger is 1,043 cubic feet. The proposed infiltration BMP will drain in less than 72 hours.**

6. **A portion of the clean runoff from the roof of proposed dwelling on #196 Pond Road will be collected in gutters and directed to Rain Garden #2. Rain Garden #2 is located above Recharger #4. Overflow from this stormwater feature will enter the recharger through a beehive grate. The recharge volume captured by the rain garden is 75.5 cubic feet. The proposed infiltration BMP will drain in less than 72 hours.**

7. **A portion of the clean runoff from the roof of proposed dwelling on #196 Pond Road will be collected in gutters and directed Recharger #5. Runoff from a portion of the proposed patio and a portion of the proposed landscaping behind the proposed dwelling will be collected into an area drain and routed directly to Recharger #5. Recharger #5 consists of five (5) underground concrete chambers which are approximately four and a half (4.5) feet wide by four (4) feet long by four and a quarter (4.25) feet. The**

recharge volume captured by the recharger is 718 cubic feet. The proposed infiltration BMP will drain in less than 72 hours.

8. **Runoff from the proposed driveway at #196 Pond Road, the proposed walkway from the driveway to the entrances to the dwelling, the proposed roof overhang at the main entrance and proposed landscaped area is collected in a deep sump hooded catch basin and directed to a water quality unit (CDS Model 3) prior to discharging to Recharger #6. Runoff from a portion of the proposed patio for #196 Pond Road and a portion of the existing and proposed landscaping drains to an on-site depression. If the depression overflows it will overflow to the deep sump hooded catch basin located in the driveway for #196 Pond Road and will follow the same drainage network mentioned above. Recharger #6 consists of four (4) rows of four (4) underground concrete chambers which are approximately four and a half (4.5) feet wide by four (4) feet long by four and a quarter (4.25) feet. The recharge volume captured by the recharger is 1,689 cubic feet. The proposed infiltration BMP will drain in less than 72 hours.**

Under MassDEP Stormwater standards, the required recharge volume is based on a target factor of 0.6 inches. This equates to a required recharge volume of is 784 cubic feet.

Because design infiltration rate is faster than 2.4 inches per hour, a Water Quality Volume (WQV) of 1" is required. Therefore, the required recharger volume for water quality is 1,307 cubic feet. The proposed design provides 8,905.5 cubic feet of recharge volume between six (6) proposed rechargers and two (2) proposed rain gardens.

Erosion and Sediment Control during Construction
An Erosion and Sediment Control Plan and a Detail sheet are included in the Site Plan set to specify performance standards and practices that are to be implemented by the Site Contractor during construction to minimize the introduction of sediments into public right of ways, abutting properties, and to post-development stormwater BMP's resulting from the land disturbance activities.

The proposed stormwater management structures shall be protected from sediment using the erosion and sedimentation controls specified in the Project Site Plans. The Site Contractor shall also be made aware that all proposed new stormwater management structures that infiltrate runoff are particularly sensitive to damage by sediment as infiltration technologies are not designed to handle the high concentrations of sediments typically found in construction runoff, and must be protected from construction related sediment loadings. Site runoff from unstabilized areas shall not be discharged into the proposed infiltration systems, *deep sump catch basins* or area drains until the tributary drainage area is stable or the runoff is treated to be essentially free from sediment to the satisfaction of the Engineer. Until then, the infiltration system shall remain off-line and protected. The contractor shall provide temporary by-pass systems as necessary to prevent construction site runoff from entering the infiltration system. Clean roof runoff

may discharge into the infiltration system if it is piped directly to the system and not directed over disturbed areas.

Inspections shall be conducted by the Site Contractor on a bi-weekly basis (every two weeks), or following significant storm events (rainfall of 0.5" or more) that can affect the sediment and erosion control practices implemented at the site. The purpose of the inspections is to evaluate the effectiveness on the controls and any required maintenance activities. If an erosion/sedimentation control measure is found to be inadequate for properly controlling sediment, an adequate measure shall be designed and implemented. A copy of the written inspection shall be kept on file at the construction site.

Watershed Modeling and Best Management Practices Design
The hydrologic analysis of the existing conditions and proposed watershed was based on the nationally recognized watershed modeling techniques developed by the USDA, Soil Conservation Service (SCS). The techniques and runoff models are described in the following SCS publications:

"Urban Hydrology for Small Watersheds, Technical Release Number 55", 1986 and Technical Release 20.

National Engineering Handbook, Hydrology, Section 4, 1972.

"A Method for Estimating Volume and Rate of Runoff in Small Watersheds, Technical Release No. 149" 1973.

"Hydrology Handbook for Conservation Commissions" March 2002, Mass. DEP.

The watershed modeling was performed using computer software "HydroCAD" version 10.0 by Applied Microcomputer Systems, which is based on the publications referenced above.

Best management practices were designed utilizing the following publications: DEP "Stormwater Management Standards Handbook", February, 2008

Rainfall depths for 24-hour duration storms per the NOAA Atlas 14, Volume 10, Version 3 selected for the hydrologic analysis computations are as follows:

2 year storm	3.35 inches
10 year storm	5.25 inches
25 year storm	6.44 inches
100 year storm	8.26 inches

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SECTION 2

Stormwater Summary
Standards Summary
Standard 3 – Recharge Calculations and
Standard 4 -TSS Removal Calculations
Water Quality Unit Design Calculations
Illicit Discharge Compliance Statement

for

#194 & #196 Pond Road
Wellesley, Massachusetts 02482

REVISED: February 26, 2020
REVISED: January 10, 2020

#194 & #196 POND ROAD, WELLESLEY, MA 02482

Stormwater Standards Summary

MassDEP Stormwater Management Standards:

Standard 1: (Untreated Discharges)

There are no new stormwater conveyances proposed that discharge untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth.

Standard 2: (Peak rate control and flood protection)

Under proposed conditions, there is 15,682 square foot of impervious area. The proposed stormwater system is designed to mitigate all peak flows and runoff volumes from all storm events up to and including the 100-year storm. The computations have been made for the 2, 10, 25 and 100-year design storm events. The infiltration BMP's proposed for the new construction and oversized and result in a net positive impact on peak flows and volumes for the entire site.

TABLE 1 - Existing vs. Proposed Peak Flows and Volumes at Design Points

		DP#1 (#200 Pond Road)			
Storm Event	24 hr Rainfall	Peak Flow (cfs)		Volume (Acre feet)	
		Existing	Proposed	Existing	Proposed
2 year	3.35 in	0.00	0.00	0.000	0.000
10 year	5.25 in	0.00	0.00	0.001	0.000
25 year	6.44 in	0.01	0.00	0.005	0.003
100 year	8.26 in	0.07	0.04	0.013	0.009

		DP#2 (Pond Road)			
Storm Event	24 hr Rainfall	Peak Flow (cfs)		Volume (Acre feet)	
		Existing	Proposed	Existing	Proposed
2 year	3.35 in	0.00	0.00	0.000	0.000
10 year	5.25 in	0.00	0.00	0.002	0.000
25 year	6.44 in	0.02	0.00	0.009	0.003
100 year	8.26 in	0.10	0.04	0.027	0.009

Standard 3: (Recharge to Groundwater)

To meet the current MassDEP Stormwater Regulations, Standard 3 requires that a minimum 0.60, 0.35, 0.25 & 0.10 inches of runoff from the impervious surfaces must be recharged to the ground for hydrologic soil groups (HSG) A, B, C, & D respectively. To meet the Town of Wellesley Wetlands Protection Regulations, the volume under post development conditions cannot exceed the volume under pre development conditions. The subsurface rechargers are purposely sized to store a recharge volume to address this Wellesley requirement. The bottom of the infiltration systems are located 2-feet above the estimated seasonal high groundwater.

Revisions from Site Plan dated 2/26/20 shown in bold
Revisions from Site Plan dated 1/10/20 shown in italics

For hydrologic purposes, the soil is classified as HSG "A." Under MassDEP Stormwater standards, the required recharge volume is based on a target factor of 0.6 inches. **This equates to a required recharge volume of 784 cubic feet.**

- **The recharge volume captured by the Recharger #1 is 1,364 cubic feet.**
- **The recharge volume captured by the Recharger #2 is 1,320 cubic feet.**
- **The recharge volume captured by the Recharger #3 is 2,635 cubic feet.**
- **The recharge volume captured by the Recharger #4 is 1,043 cubic feet.**
- **The recharge volume captured by the Recharger #5 is 718 cubic feet.**
- **The recharge volume captured by the Recharger #6 in 1,689 cubic feet.**
- **The recharge volume captured by the Rain Garden #1 is 61 cubic feet.**
- **The recharge volume captured by the Rain Garden #2 is 75.5 cubic feet.**

The proposed infiltration systems provide a total capture volume of 8,905.5 cubic feet. The additional capture volume is required to meet the requirement that there is to be no increase in volume up to and including the 100-year storm event per the Wellesley Wetlands Protection Regulations. This not only exceeds the adjusted required recharge volume but is also provides sufficient water quality volume (see Standard 4).

Standard 4: (80% TSS Removal)

Because design infiltration rate is faster than 2.4 inches per hour, a Water Quality Volume (WQV) of 1" is required. **Therefore, the required recharger volume for water quality is 1,307 cubic feet. The proposed infiltration systems provide a total capture volume of 8,905.5 cubic feet.**

Runoff from the proposed driveway for #194 Pond Road is collected in a deep sump hooded catch basin and directed to a water quality unit (CDS – Model 3) prior to discharging to Recharger #1 to provide 80% TSS removal for this treatment train.

Runoff from the proposed driveway for #196 Pond Road is collected in a deep sump hooded catch basin and directed to a water quality unit (CDS – Model 3) prior to discharging to Recharger #6 to provide 80% TSS removal for this treatment train.

Clean runoff from proposed roof areas, pedestrian pavement, and landscaped areas are routed directly to the proposed recharger systems **and rain gardens.**

Standard 5: (Land Use with Higher Potential Pollutant Load)

Not Applicable.

Standard 6: (Critical Areas)

Stormwater does not discharge near or to a Critical Area (such as a Zone II, Interim Wellhead Protection Areas, Shellfish Growing Areas, Bathing Beaches, Outstanding Resource Waters, Special Resource Waters, or Cold-Water Fisheries).

Standard 7: (Redevelopment)

Not Applicable.

Standard 8: (Erosion, Sediment Control)

Erosion and sediment control BMPs are included in the Erosion and Sediment Control Plan as part of the Site Plan set.

Standard 9: (Operation & Maintenance)

A Stormwater Operation and Maintenance Plan for the stormwater management system is included in Appendix 4.

Standard 10: (Illicit Discharges)

The proposed building designs will be in compliance with state and local building codes. There are no illicit discharges designed or proposed.

An Illicit Discharge Statement is included in this section.

Revisions from Site Plan dated 2/26/20 shown in bold

Revisions from Site Plan dated 1/10/20 shown in italics

Standard 3
Recharge Calculations

and

Standard 4
Water Quality & TSS Removal Calculations

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Stormwater Calculations - Recharge

#194 & #196 Pond Road, Wellesley, MA 02482

REVISED: February 26, 2020

Proposed Impervious Area	= 15,682 sf
Existing Impervious Area	= 0 sf
Increase in Impervious Area	= 15,682 sf

Soils HSG: A → Recharge = 0.6 inches of runoff

Minimum Required Recharge:
(15,682 sf)(0.6 in ÷ 12in/ft) = 784.10 ft^3

All proposed impervious surfaces will be collected and routed to the proposed recharge (infiltration) system.

The infiltration rate used for design is 8.27 inches per hour. Therefore, all recharge facilities are designed for 1 inch capture volume to meet the Water Quality Volume (WQV) requirements. Below are the recharger calculations based on 1 inch of WQV:

(15,682 sf)(1 in ÷ 12in/ft) = 1,306.83 ft^3

Capture Volume provided by infiltration system: 8,905.50 cf > 1,306.83 cf ←Okay

Note: See attached calculations and HydroCAD print outs for provided Capture Volume.

Recharger #1 Drawdown Calculation:
$Time_{drawdown}$ = (1,364 ft^3) ÷ (364 ft^2)(8.27 in/hr)(1/12 in/ft) = 5.4 hrs ≤ 72 hours ← Okay

Recharger #2 Drawdown Calculation:
$Time_{drawdown}$ = (1,320 ft^3) ÷ (330 ft^2)(8.27 in/hr)(1/12 in/ft) = 5.8 hrs ≤ 72 hours ← Okay

Recharger #3 Drawdown Calculation:
$Time_{drawdown}$ = (2,635 ft^3) ÷ (696 ft^2)(8.27 in/hr)(1/12 in/ft) = 5.5 hrs ≤ 72 hours ← Okay

Recharger #4 Drawdown Calculation:
$Time_{drawdown}$ = (1,043 ft^3) ÷ (280 ft^2)(8.27 in/hr)(1/12 in/ft) = 5.4 hrs ≤ 72 hours ← Okay

Recharger #5 Drawdown Calculation:
$Time_{drawdown}$ = (718 ft^3) ÷ (204 ft^2)(8.27 in/hr)(1/12 in/ft) = 5.1 hrs ≤ 72 hours ← Okay

Recharger #6 Drawdown Calculation:
$Time_{drawdown}$ = (1,689 ft^3) ÷ (440 ft^2)(8.27 in/hr)(1/12 in/ft) = 5.6 hrs ≤ 72 hours ← Okay

Rain Garden #1 Drawdown Calculation:
$Time_{drawdown}$ = (61 ft^3) ÷ (126 ft^2)(8.27 in/hr)(1/12 in/ft) = 0.7 hrs ≤ 72 hours ← Okay

Rain Garden #2 Drawdown Calculation:
$Time_{drawdown}$ = (75.5 ft^3) ÷ (148 ft^2)(8.27 in/hr)(1/12 in/ft) = 0.7 hrs ≤ 72 hours ← Okay

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Job No.: 25485 - 194+196 Pond Road, Wellesley, MA
Sheet No.: 1 Of: 2
Calculated by: JAL Date: 2/26/20
Checked by Date: Date:
Scale: Recharger Calcs - Simple Dynamic

Recharger #1 → Area = 364 ft² → Static Volume = 862 ft³
↳ Infiltration Rate = 8.27 in/hr → RAWLS Rate for Sand

$V = 364\,ft^2 \times \left(8.27\,\frac{in}{hr} \times 2\,hrs \times \frac{1\,ft}{12\,in}\right)$

$V = 364\,ft^2 \times 1.3783\,ft = 501.7\,ft^3$

Total Volume Provided = $862\,ft^3 + 502\,ft^3 = \boxed{1{,}364\,ft^3}$ #

Recharger #2 → Area = 330 ft² → Static Volume = 865.5 ft³
↳ Infiltration Rate = 8.27 in/hr → RAWLS Rate for Sand

$V = 330\,ft^2 \times 1.3783\,ft = 454.8\,ft^3$

Total Volume Provided = $865.5\,ft^3 + 454.8\,ft^3 = \boxed{1{,}320\,ft^3}$ #

Recharger #3 → Area = 696 ft² → Static Volume = 1,675.5 ft³
↳ Infiltration Rate = 8.27 in/hr → RAWLS Rate for Sand

$V = 696\,ft^2 \times 1.3783\,ft = 959.3\,ft^3$

Total Volume Provided = $1675.5\,ft^3 + 959.3\,ft^3 = \boxed{2{,}635\,ft^3}$ #

Recharger #4 → Area = 280 ft² → Static Volume = 657.5 ft³
↳ Infiltration Rate = 8.27 in/hr → RAWLS Rate for Sand

$V = 280\,ft^2 \times 1.3783\,ft = 385.9\,ft^3$

Total Volume Provided = $657.5\,ft^3 + 385.9\,ft^3 = \boxed{1{,}043\,ft^3}$ #

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Job No.:

Sheet No.: 2 Of: 2

Calculated by: Date:

Checked by Date: Date:

Scale:

Recharger #5 → Area = 204 ft² → Static Volume = 437 ft³

↳ Infiltration Rate = 8.27 in/hr → RAWLS Rate for Sand

V = 204 ft² × 1.3783 ft = 281.2 ft³

Total Volume Provided = 437 ft³ + 281 ft³ = **718 ft³** #

Recharger #6 → Area = 440 ft² → Static Volume = 1,082.5 ft³

↳ Infiltration Rate = 8.27 in/hr → RAWL Rate for Sand

V = 440 ft² × 1.3783 ft = 606.5 ft³

Total Volume Provided = 1,082.5 ft³ + 606.5 ft³ = **1,689 ft³** #

Total Static Volume Provided by Rain Garden #1 = 61 ft³

Total Static Volume Provided by Rain Garden #2 = 75.5 ft³

Total Recharge Volume Provided

↳ R#1 R#2 R#3 R#4 R#5 R#6 ~~R#12~~ R#12

↳ 1,364 ft³ + 1,320 ft³ + 2,635 ft³ + 1,043 ft³ + 718 ft³ + 1689 ft³ + 61 ft³ + 75.5 ft³

↳ = **8,905.5 ft³** #

Stage-Area-Storage for Pond Pd-1: Recharger #1

Elevation (feet)	Horizontal (sq-ft)	Storage (cubic-feet)
162.25	**364**	0
162.35	364	13
162.45	364	25
162.55	364	38
162.65	364	51
162.75	364	64
162.85	364	85
162.95	364	106
163.05	364	128
163.15	364	149
163.25	364	171
163.35	364	193
163.45	364	214
163.55	364	236
163.65	364	258
163.75	364	279
163.85	364	301
163.95	364	322
164.05	364	344
164.15	364	365
164.25	364	387
164.35	364	408
164.45	364	430
164.55	364	451
164.65	364	473
164.75	364	494
164.85	364	515
164.95	364	537
165.05	364	558
165.15	364	580
165.25	364	601
165.35	364	622
165.45	364	643
165.55	364	665
165.65	364	686
165.75	364	707
165.85	364	728
165.95	364	750
166.05	364	771
166.15	364	792
166.25	364	813
166.35	364	834
166.45	364	855
166.55	364	869
166.65	364	876
166.75	364	883
166.85	364	890
166.95	364	897
167.05	364	906
167.15	364	919
167.25	364	932
167.35	364	945
167.45	364	**957**

→ Static Recharge Volume Provided
↳ Inside Top of chamber @ 166.50
∴ 862 cf provided #

Stage-Area-Storage for Pond Pd-2: Recharger #2

Elevation (feet)	Horizontal (sq-ft)	Storage (cubic-feet)
164.00	**330**	0
164.10	330	12
164.20	330	23
164.30	330	35
164.40	330	46
164.50	330	58
164.60	330	79
164.70	330	100
164.80	330	122
164.90	330	144
165.00	330	166
165.10	330	188
165.20	330	210
165.30	330	232
165.40	330	254
165.50	330	276
165.60	330	298
165.70	330	320
165.80	330	341
165.90	330	363
166.00	330	385
166.10	330	407
166.20	330	429
166.30	330	450
166.40	330	472
166.50	330	494
166.60	330	515
166.70	330	537
166.80	330	558
166.90	330	580
167.00	330	602
167.10	330	623
167.20	330	645
167.30	330	666
167.40	330	688
167.50	330	709
167.60	330	731
167.70	330	752
167.80	330	773
167.90	330	795
168.00	330	816
168.10	330	837
168.20	330	859
168.30	330	872
168.40	330	876
168.50	330	881
168.60	330	886
168.70	330	890
168.80	330	899
168.90	330	910
169.00	330	922
169.10	330	934
169.20	330	946
169.30	330	952
169.40	330	952
169.50	330	952
169.60	330	953
169.70	330	953
169.80	330	**1,953**

→ Static Recharge Volume Provided
L> Inside Top of Chamber @ 168.25

∴ 865.5 cf provided ※

Stage-Area-Storage for Pond Pd-3: Recharger #3

Elevation (feet)	Horizontal (sq-ft)	Storage (cubic-feet)
165.25	**696**	0
165.35	696	24
165.45	696	49
165.55	696	73
165.65	696	97
165.75	696	122
165.85	696	163
165.95	696	204
166.05	696	246
166.15	696	289
166.25	696	331
166.35	696	373
166.45	696	415
166.55	696	457
166.65	696	499
166.75	696	541
166.85	696	584
166.95	696	625
167.05	696	667
167.15	696	709
167.25	696	751
167.35	696	793
167.45	696	835
167.55	696	877
167.65	696	918
167.75	696	960
167.85	696	1,002
167.95	696	1,043
168.05	696	1,085
168.15	696	1,127
168.25	696	1,168
168.35	696	1,210
168.45	696	1,251
168.55	696	1,293
168.65	696	1,334
168.75	696	1,375
168.85	696	1,417
168.95	696	1,458
169.05	696	1,499
169.15	696	1,540
169.25	696	1,582
169.35	696	1,623
169.45	696	1,664
169.55	696	1,691
169.65	696	1,703
169.75	696	1,715
169.85	696	1,728
169.95	696	1,740
170.05	696	1,759
170.15	696	1,783
170.25	696	1,808
170.35	696	1,832
170.45	696	1,856
170.55	696	1,869
170.65	696	1,869
170.75	696	1,869
170.85	696	1,869
170.95	696	1,869
171.05	696	1,870
171.15	696	1,870
171.25	696	1,870
171.35	696	1,870
171.45	696	1,870
171.55	696	**2,370**

→ Static Recharge Volume Provided
↳ Inside Top of Chamber @ 169.50

∴ 1677.5 cf provided **

Stage-Area-Storage for Pond Pd-4: Recharger #4

Elevation (feet)	Horizontal (sq-ft)	Storage (cubic-feet)
163.25	**280**	0
163.35	280	10
163.45	280	20
163.55	280	29
163.65	280	39
163.75	280	49
163.85	280	65
163.95	280	81
164.05	280	98
164.15	280	114
164.25	280	131
164.35	280	147
164.45	280	164
164.55	280	180
164.65	280	197
164.75	280	213
164.85	280	229
164.95	280	246
165.05	280	262
165.15	280	279
165.25	280	295
165.35	280	311
165.45	280	328
165.55	280	344
165.65	280	360
165.75	280	377
165.85	280	393
165.95	280	409
166.05	280	426
166.15	280	442
166.25	280	458
166.35	280	474
166.45	280	490
166.55	280	507
166.65	280	523
166.75	280	539
166.85	280	555
166.95	280	571
167.05	280	587
167.15	280	604
167.25	280	620
167.35	280	636
167.45	280	652
167.55	280	663
167.65	280	668
167.75	280	673
167.85	280	679
167.95	280	684
168.05	280	691
168.15	280	701
168.25	280	711
168.35	280	721
168.45	280	731
168.55	280	736
168.65	280	736
168.75	280	736
168.85	280	736
168.95	280	736
169.05	280	736
169.15	280	736
169.25	280	736
169.35	280	736
169.45	280	737
169.55	280	737
169.65	280	737
169.75	280	737
169.85	280	737
169.95	280	737
170.05	280	737
170.15	280	737
170.25	280	737
170.35	280	737
170.45	280	738
170.55	280	**1,238**

→ Static Recharge Volume Provided
↳ Inside Top of Chamber @ 167.50

∴ 657.5 cf provided #

Stage-Area-Storage for Pond Pd-5: Recharger #5

Elevation (feet)	Horizontal (sq-ft)	Storage (cubic-feet)
164.50	**204**	0
164.60	204	7
164.70	204	14
164.80	204	21
164.90	204	29
165.00	204	36
165.10	204	46
165.20	204	57
165.30	204	68
165.40	204	79
165.50	204	90
165.60	204	100
165.70	204	111
165.80	204	122
165.90	204	133
166.00	204	144
166.10	204	155
166.20	204	165
166.30	204	176
166.40	204	187
166.50	204	198
166.60	204	209
166.70	204	219
166.80	204	230
166.90	204	241
167.00	204	252
167.10	204	262
167.20	204	273
167.30	204	284
167.40	204	295
167.50	204	305
167.60	204	316
167.70	204	327
167.80	204	337
167.90	204	348
168.00	204	359
168.10	204	369
168.20	204	380
168.30	204	391
168.40	204	401
168.50	204	412
168.60	204	423
168.70	204	433
168.80	204	441
168.90	204	446
169.00	204	450
169.10	204	455
169.20	204	460
169.30	204	466
169.40	204	473
169.50	204	480
169.60	204	487
169.70	204	**494**

→Static Recharge Volume Provided
↳Inside Top of Chamber @ 168.75
∴ 437 cf provided ※

Stage-Area-Storage for Pond Pd-6: Recharger #6

Elevation (feet)	Horizontal (sq-ft)	Storage (cubic-feet)
157.75	**440**	0
157.85	440	15
157.95	440	31
158.05	440	46
158.15	440	62
158.25	440	77
158.35	440	103
158.45	440	130
158.55	440	158
158.65	440	185
158.75	440	212
158.85	440	239
158.95	440	267
159.05	440	294
159.15	440	321
159.25	440	348
159.35	440	376
159.45	440	403
159.55	440	430
159.65	440	457
159.75	440	484
159.85	440	511
159.95	440	538
160.05	440	565
160.15	440	592
160.25	440	619
160.35	440	646
160.45	440	673
160.55	440	700
160.65	440	727
160.75	440	754
160.85	440	780
160.95	440	807
161.05	440	834
161.15	440	861
161.25	440	887
161.35	440	914
161.45	440	941
161.55	440	967
161.65	440	994
161.75	440	1,021
161.85	440	1,047
161.95	440	1,074
162.05	440	1,091
162.15	440	1,098
162.25	440	1,106
162.35	440	1,113
162.45	440	1,121
162.55	440	1,132
162.65	440	1,148
162.75	440	1,163
162.85	440	1,178
162.95	440	**1,194**

→ Static Recharge Volume Provided
↳ Inside Top of Chamber @ 162.00

∴ 1,082.5 cf provided #

Stage-Area-Storage for Pond Pd-7: Rain Garden #1

Elevation (feet)	Surface (sq-ft)	Horizontal (sq-ft)	Storage (cubic-feet)
169.00	44	44	0
169.02	46	46	1
169.04	47	47	2
169.06	49	49	3
169.08	51	51	4
169.10	52	52	5
169.12	54	54	6
169.14	56	56	7
169.16	58	58	8
169.18	60	60	9
169.20	62	62	11
169.22	64	64	12
169.24	66	66	13
169.26	68	68	14
169.28	70	70	16
169.30	72	72	17
169.32	74	74	19
169.34	76	76	20
169.36	78	78	22
169.38	80	80	23
169.40	82	82	25
169.42	85	85	27
169.44	87	87	28
169.46	89	89	30
169.48	92	92	32
169.50	94	94	34
169.52	96	96	36
169.54	99	99	38
169.56	101	101	40
169.58	104	104	42
169.60	106	106	44
169.62	109	109	46
169.64	111	111	48
169.66	114	114	50
169.68	117	117	53
169.70	119	119	55
169.72	122	122	57
169.74	125	125	60
169.76	127	127	62
169.78	130	130	65
169.80	133	133	68
169.82	136	136	70
169.84	139	139	73
169.86	142	142	76
169.88	145	145	79
169.90	148	148	82
169.92	151	151	85
169.94	154	154	88
169.96	158	158	91
169.98	161	161	94
170.00	**164**	**164**	**97**

→ Recharge Volume Provided
↳ Beehive Grate @ 169.75
∴ 61 cf provided #

Stage-Area-Storage for Pond Pd-8: Rain Garden #2

Elevation (feet)	Surface (sq-ft)	Horizontal (sq-ft)	Storage (cubic-feet)
169.00	59	59	0
169.02	61	61	1
169.04	63	63	2
169.06	65	65	4
169.08	67	67	5
169.10	69	69	6
169.12	71	71	8
169.14	73	73	9
169.16	75	75	11
169.18	77	77	12
169.20	79	79	14
169.22	81	81	15
169.24	83	83	17
169.26	85	85	19
169.28	88	88	20
169.30	90	90	22
169.32	92	92	24
169.34	94	94	26
169.36	97	97	28
169.38	99	99	30
169.40	101	101	32
169.42	104	104	34
169.44	106	106	36
169.46	109	109	38
169.48	111	111	40
169.50	114	114	42
169.52	116	116	45
169.54	119	119	47
169.56	122	122	50
169.58	124	124	52
169.60	127	127	55
169.62	130	130	57
169.64	132	132	60
169.66	135	135	62
169.68	138	138	65
169.70	141	141	68
169.72	144	144	71
169.74	147	147	74
169.76	149	149	77
169.78	152	152	80
169.80	155	155	83
169.82	158	158	86
169.84	161	161	89
169.86	163	163	92
169.88	166	166	96
169.90	169	169	99
169.92	172	172	102
169.94	175	175	106
169.96	178	178	109
169.98	181	181	113
170.00	**184**	**184**	**117**

→ Recharge Volume Provided
↳ Beehive Grate @ 169.75
∴ 75.5 cf provided #

DGT Associates
Surveying & Engineering

1071 Worcester Rd.
Framingham, MA 01701
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Stormwater Calculations – Water Quality Treatment

#194 & #196 Pond Road, Wellesley, MA 02482

REVISED: February 26, 2020

PROPOSED CONDITIONS

Required Water Quality Volume

Increase of Proposed Impervious Areas:

Roof Area	=	7,963 sf (0.18 acres)
Paved Area (Pedestrian)	=	3,187 sf (0.07 acres)
Paved Area (Vehicular)	=	4,532 sf (0.10 acres)
Total Impervious Area	=	15,682 sf (0.36 acres)

The required water quality volume equals 1 inch of runoff times the new impervious area of the post-development site.

WQV = (15,682 sf)(1 in)(1 ft/12in) = 1,306.83 cf

Capture volume provided by Rechargers: 8,905.5 cf > 1,306.83 cf ← Okay

TSS Removal Rate

Refer to attached TSS Removal Calculation Worksheets

INSTRUCTIONS:

Non-automated: Mar. 4, 2008

1. Sheet is nonautomated. Print sheet and complete using hand calculations. Column A and B: See MassDEP Structural BMP Table
2. The calculations must be completed using the Column Headings specified in Chart and Not the Excel Column Headings
3. To complete Chart Column D, multiple Column B value within Row x Column C value within Row
4. To complete Chart Column E value, subtract Column D value within Row from Column C within Row
5. Total TSS Removal = Sum All Values in Column D

Location: Subcatchment P-2a (194 Driveway)

TSS Removal Calculation Worksheet

A BMP[1]	B TSS Removal Rate[1]	C Starting TSS Load*	D Amount Removed (B*C)	E Remaining Load (C-D)
Recharger #1 w/ Pretreatment	0.80	1.00	0.80	0.20
Note: Pretreatment is provided by a deep sump catch				
basin and a water quality unit (CDS-3).				
Note: 50% TSS removal is provided prior to discharge				
to the Recharger				

Total TSS Removal = 0.80

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

Project: 194+196 Pond Road

Prepared By: DGT Associates

Date: 02/26/2020

*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

INSTRUCTIONS:

Non-automated: Mar. 4, 2008

1. Sheet is nonautomated. Print sheet and complete using hand calculations. Column A and B: See MassDEP Structural BMP Table
2. The calculations must be completed using the Column Headings specified in Chart and Not the Excel Column Headings
3. To complete Chart Column D, multiple Column B value within Row x Column C value within Row
4. To complete Chart Column E value, subtract Column D value within Row from Column C within Row
5. Total TSS Removal = Sum All Values in Column D

Location: Subcatchment P-1e (196 Driveway)

TSS Removal Calculation Worksheet

A BMP[1]	B TSS Removal Rate[1]	C Starting TSS Load*	D Amount Removed (B*C)	E Remaining Load (C-D)
Recharger #6 w/ Pretreatment	0.80	1.00	0.80	0.20
Note! Pretreatment is provided by a deep sump catch basin				
and water quality unit (CDS-3).				
Note! 50% TSS Removal is provided prior to discharge to the				
Recharger.				

Total TSS Removal = 0.80

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

Project: 194+196 Pond Road

Prepared By: DGT Associates

Date: 02/26/2020

*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

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Water Quality Unit Design

#194 & #196 Pond Road, Wellesley, MA 02482

REVISED: February 26, 2020

Computational method to convert Water Quality Volume (WQV) to Equivalent Peak Water Quality Flow Rate (WQF)

Reference: MassDEP Notice dated November 1, 2010

$WQF = (q_u)(A)(WQV)$

Where q_u = unit peak discharge (cfs / (mi^2 x in x s))
A = impervious surface drainage area (mi^2)
WQV = water quality volume (1.0 inch)
WQF = water quality flow rate (cfs)

T_c = 5.0 minutes (for all subcatchments)
From Figure 2: q_u = 800 cfs / (mi^2 x in x s)

Stormwater Treatment Unit	q_u	A (sf)	A (mi^2)	WQV (in)	WQF (cfs)	Unit Proposed
WQU #1	773	3,164	0.0001	1.0	0.077	CDS-3
WQU #2	773	9,496	0.0003	1.0	0.232	CDS-3

State of New Jersey
DEPARTMENT OF ENVIRONMENTAL PROTECTION
Bureau of Nonpoint Pollution Control
Division of Water Quality
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Trenton, New Jersey 08625-0420
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http://www.state.nj.us/dep/dwq/bnpc_home.htm

CHRIS CHRISTIE
Governor

KIM GUADAGNO
Lt. Governor

BOB MARTIN
Commissioner

March 21, 2017

Derek M. Berg
Contech Engineered Solutions, LLC
71 US Route 1, Suite F
Scarborough, ME 04074

Re: Revised MTD Lab Certification
Continuous Deflective Separator (CDS®) Stormwater Treatment Device by Contech Engineered Solutions, LLC
On-line Installation

TSS Removal Rate 50%

Dear Mr. Berg:

This revised certification letter supersedes the Department's prior certification dated January 9, 2015. This revision was completed to reflect the updated Manufactured Treatment Device (MTD) scaling methodology as agreed upon by the manufacturers' working group on September 19, 2016. In part, the updated scaling for hydrodynamic MTDs is based on the depth of the reference (tested) MTD from the top of the false floor utilized during removal efficiency testing, not from the physical bottom of the unit. Based on the above decision, Table A-2 of the NJCAT Technology Verification report located at http://www.njcat.org/uploads/newDocs/CDSVerificationReportFinal1.pdf has been revised, and Table 1 noted below has been added.

The Stormwater Management rules under N.J.A.C. 7:8-5.5(b) and 5.7 (c) allow the use of manufactured treatment devices (MTDs) for compliance with the design and performance standards at N.J.A.C. 7:8-5 if the pollutant removal rates have been verified by the New Jersey Corporation for Advanced Technology (NJCAT) and have been certified by the New Jersey Department of Environmental Protection (NJDEP). Contech Engineered Solutions, LLC has requested an MTD Laboratory Certification for the CDS® Stormwater Treatment Device.

The verification is subject to the "Procedure for Obtaining Verification of a Stormwater Manufactured Treatment Device from New Jersey Corporation for Advance Technology" dated January 25, 2013. The applicable protocol is the "New Jersey Laboratory Testing Protocol to Assess Total Suspended Solids Removal by a Hydrodynamic Sedimentation Manufactured Treatment Device" dated January 25, 2013.

NJCAT verification documents submitted to the NJDEP indicate that the requirements of the aforementioned protocol have been met or exceeded. The NJCAT letter also included a recommended certification TSS removal rate and the required maintenance plan. The NJCAT Verification Report with the Verification

Appendix dated September 2014 (Revised January 2017) for this device is published online at http://www.njcat.org/verification-process/technology-verification-database.html.

The NJDEP certifies the use of the CDS® Stormwater Treatment Device by Contech Engineered Solutions, LLC at a TSS removal rate of 50% when designed, operated, and maintained in accordance with the information provided in the Verification Appendix and the following conditions:

1. The maximum treatment flow rate (MTFR) for the manufactured treatment device (MTD) is calculated using the New Jersey Water Quality Design Storm (1.25 inches in 2 hrs) in N.J.A.C. 7:8-5.5.

2. The CDS® Stormwater Treatment Device shall be installed using the same configuration reviewed by NJCAT and shall be sized in accordance with the criteria specified in item 6 below.

3. This CDS® Stormwater Treatment Device cannot be used in series with another MTD or a media filter (such as a sand filter) to achieve an enhanced removal rate for total suspended solids (TSS) removal under N.J.A.C. 7:8-5.5.

4. Additional design criteria for MTDs can be found in Chapter 9.6 of the New Jersey Stormwater Best Management Practices (NJ Stormwater BMP) Manual which can be found on-line at www.njstormwater.org.

5. The maintenance plan for a site using this device shall incorporate, at a minimum, the maintenance requirements for the CDS® Stormwater Treatment Device. A copy of the maintenance plan is attached to this certification. However, it is recommended to review the maintenance website at http://www.conteches.com/products/stormwater-management/treatment/cds.aspx#1822141-technical-info for any changes to the maintenance requirements.

6. Sizing Requirements:

   The example below demonstrates the sizing procedure for the CDS®:

   Example: A 0.25-acre impervious site is to be treated to 50% TSS removal using a CDS®. The impervious site runoff (Q) based on the New Jersey Water Quality Design Storm was determined to be 0.79 cfs.

   Maximum Treatment Flow Rate (MTFR) Evaluation:

   The site runoff (Q) was based on the following:
   time of concentration = 10 minutes
   i=3.2 in/hr (page 5-8, Fig. 5-3 of the NJ Stormwater BMP Manual)
   c=0.99 (runoff coefficient for impervious)
   Q=ciA=0.99x3.2x0.25=0.79 cfs

   Given the site runoff is 0.79 cfs and based on Table 1 below, the CDS® Model CDS-4 with an MTFR of 0.93 cfs would be the smallest model approved that could be used for this site that could remove 50% of the TSS from the impervious area without exceeding the MTFR.

The sizing table corresponding to the available system models is noted below. Additional specifications regarding each model can be found in the Verification Appendix under Table A-1 and A-2.

Table 1 CDS Models

CDS Model	Manhole Diameter (ft.)	Treatment Chamber Depth (ft.)	MTFR (cfs)
CDS-3	3	3.50	0.52
CDS-4	4	3.50	0.93
CDS-5	5	3.75	1.5
CDS-6	6	4.50	2.1
CDS-7	7	5.25	2.8
CDS-8	8	6.00	3.7
CDS-10	10	7.50	5.8
CDS-12	12	9.00	8.4

- Treatment Chamber Depth is defined as the depth below the invert to the top of the false floor installed at 50% sediment depth.

A detailed maintenance plan is mandatory for any project with a Stormwater BMP subject to the Stormwater Management Rules, N.J.A.C. 7:8. The plan must include all of the items identified in the Stormwater Management Rules, N.J.A.C. 7:8-5.8. Such items include, but are not limited to, the list of inspection and maintenance equipment and tools, specific corrective and preventative maintenance tasks, indication of problems in the system, and training of maintenance personnel. Additional information can be found in Chapter 8: Maintenance and Retrofit of Stormwater Management Measures.

If you have any questions regarding the above information, please contact Mr. Shashi Nayak of my office at (609) 633-7021.

Sincerely,

James J. Murphy, Chief
Bureau of Nonpoint Pollution Control

Attachment: Maintenance Plan

c: Chron File
Richard Magee, NJCAT
Vince Mazzei, NJDEP - DLUR
Ravi Patraju, NJDEP - BES
Gabriel Mahon, NJDEP - BNPC
Shashi Nayak, NJDEP – BNPC

DGT Associates
Surveying &
Engineering

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Framingham, MA 01701
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February 26, 2020

Job No.: 25485

Town of Wellesley Department of Public Works
Attn: Engineering Division
20 Municipal Way
Wellesley, MA 02481

RE: Illicit Discharge Compliance Statement

The following statements are made regarding the proposed site development at #194 and #196 Pond Road in Wellesley, MA:

- The proposed site development design will be in compliance with state and local building codes. There are no illicit discharges designed or proposed.
- Sewage generated from the dwellings will be routed to on-site sewage disposal systems for each respected dwelling.
- The design of the proposed stormwater system includes no proposed illicit discharges and no illicit discharge connections.

Please feel free to contact me if you have any questions.

Sincerely yours,
DGT Associates

Bert E. Corey, P.E.
Engineering Group Manager

25485

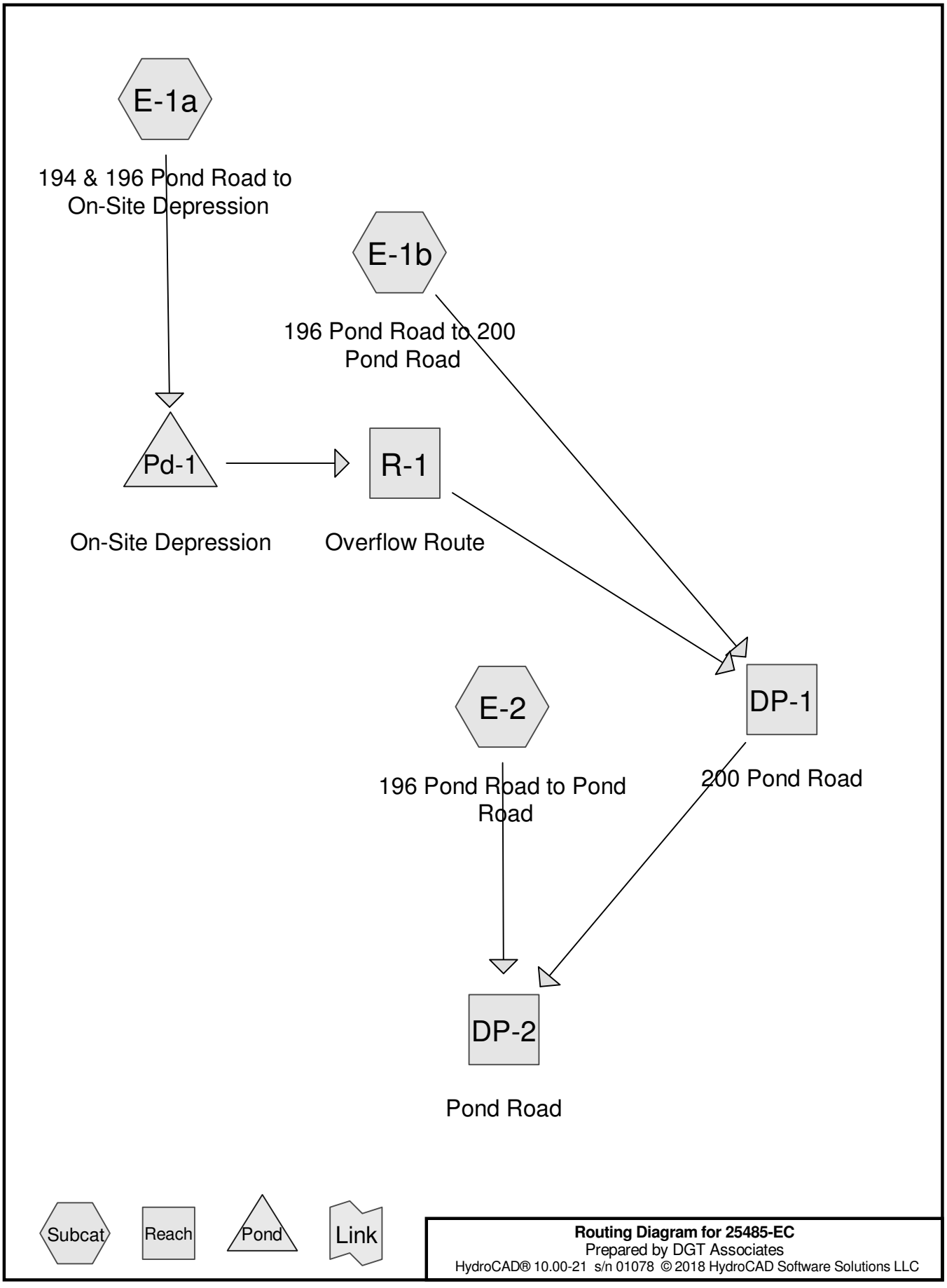
SECTION 3

Existing Conditions Stormwater Model
showing Stormwater Flows and Flood Routing
Computations using HydroCAD version 10.00

for

#194 & #196 Pond Road

Wellesley, Massachusetts 02482



Routing Diagram for 25485-EC
Prepared by DGT Associates

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.094	39	>75% Grass cover, Good, HSG A (E-1a, E-1b)
1.850	32	Woods/grass comb., Good, HSG A (E-1a, E-1b, E-2)
1.944	**32**	**TOTAL AREA**

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

Subcatchment E-1a: 194 & 196 Pond Road to Runoff Area=65,176 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=262' Tc=15.1 min CN=32 Runoff=0.00 cfs 0.000 af

Subcatchment E-1b: 196 Pond Road to 200 Pond Runoff Area=8,477 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=190' Tc=6.8 min CN=34 Runoff=0.00 cfs 0.000 af

Subcatchment E-2: 196 Pond Road to Pond Runoff Area=11,047 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=135' Tc=26.2 min CN=32 Runoff=0.00 cfs 0.000 af

Reach DP-1: 200 Pond Road Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Reach DP-2: Pond Road Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Reach R-1: Overflow Route Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.100 L=149.5' S=0.0408 '/' Capacity=0.52 cfs Outflow=0.00 cfs 0.000 af

Pond Pd-1: On-Site Depression Peak Elev=167.50' Storage=0 cf Inflow=0.00 cfs 0.000 af
Discarded=0.00 cfs 0.000 af Primary=0.00 cfs 0.000 af Outflow=0.00 cfs 0.000 af

Total Runoff Area = 1.944 ac Runoff Volume = 0.000 af Average Runoff Depth = 0.00"
100.00% Pervious = 1.944 ac 0.00% Impervious = 0.000 ac

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

Subcatchment E-1a: 194 & 196 Pond Road to Runoff Area=65,176 sf 0.00% Impervious Runoff Depth=0.04"
Flow Length=262' Tc=15.1 min CN=32 Runoff=0.01 cfs 0.006 af

Subcatchment E-1b: 196 Pond Road to 200 Pond Runoff Area=8,477 sf 0.00% Impervious Runoff Depth=0.09"
Flow Length=190' Tc=6.8 min CN=34 Runoff=0.00 cfs 0.001 af

Subcatchment E-2: 196 Pond Road to Pond Runoff Area=11,047 sf 0.00% Impervious Runoff Depth=0.04"
Flow Length=135' Tc=26.2 min CN=32 Runoff=0.00 cfs 0.001 af

Reach DP-1: 200 Pond Road Inflow=0.00 cfs 0.001 af
Outflow=0.00 cfs 0.001 af

Reach DP-2: Pond Road Inflow=0.00 cfs 0.002 af
Outflow=0.00 cfs 0.002 af

Reach R-1: Overflow Route Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.100 L=149.5' S=0.0408 '/' Capacity=0.52 cfs Outflow=0.00 cfs 0.000 af

Pond Pd-1: On-Site Depression Peak Elev=167.50' Storage=11 cf Inflow=0.01 cfs 0.006 af
Discarded=0.01 cfs 0.006 af Primary=0.00 cfs 0.000 af Outflow=0.01 cfs 0.006 af

Total Runoff Area = 1.944 ac Runoff Volume = 0.008 af Average Runoff Depth = 0.05"
100.00% Pervious = 1.944 ac 0.00% Impervious = 0.000 ac

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

Subcatchment E-1a: 194 & 196 Pond Road to Runoff Area=65,176 sf 0.00% Impervious Runoff Depth=0.20"
Flow Length=262' Tc=15.1 min CN=32 Runoff=0.04 cfs 0.026 af

Subcatchment E-1b: 196 Pond Road to 200 Pond Runoff Area=8,477 sf 0.00% Impervious Runoff Depth=0.30"
Flow Length=190' Tc=6.8 min CN=34 Runoff=0.01 cfs 0.005 af

Subcatchment E-2: 196 Pond Road to Pond Runoff Area=11,047 sf 0.00% Impervious Runoff Depth=0.20"
Flow Length=135' Tc=26.2 min CN=32 Runoff=0.01 cfs 0.004 af

Reach DP-1: 200 Pond Road Inflow=0.01 cfs 0.005 af
Outflow=0.01 cfs 0.005 af

Reach DP-2: Pond Road Inflow=0.02 cfs 0.009 af
Outflow=0.02 cfs 0.009 af

Reach R-1: Overflow Route Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.100 L=149.5' S=0.0408 '/' Capacity=0.52 cfs Outflow=0.00 cfs 0.000 af

Pond Pd-1: On-Site Depression Peak Elev=167.56' Storage=215 cf Inflow=0.04 cfs 0.026 af
Discarded=0.03 cfs 0.026 af Primary=0.00 cfs 0.000 af Outflow=0.03 cfs 0.026 af

Total Runoff Area = 1.944 ac Runoff Volume = 0.035 af Average Runoff Depth = 0.21"
100.00% Pervious = 1.944 ac 0.00% Impervious = 0.000 ac

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

Subcatchment E-1a: 194 & 196 Pond Road to Runoff Area=65,176 sf 0.00% Impervious Runoff Depth=0.64"
Flow Length=262' Tc=15.1 min CN=32 Runoff=0.35 cfs 0.079 af

Subcatchment E-1b: 196 Pond Road to 200 Pond Runoff Area=8,477 sf 0.00% Impervious Runoff Depth=0.81"
Flow Length=190' Tc=6.8 min CN=34 Runoff=0.07 cfs 0.013 af

Subcatchment E-2: 196 Pond Road to Pond Runoff Area=11,047 sf 0.00% Impervious Runoff Depth=0.64"
Flow Length=135' Tc=26.2 min CN=32 Runoff=0.05 cfs 0.013 af

Reach DP-1: 200 Pond Road Inflow=0.07 cfs 0.013 af
Outflow=0.07 cfs 0.013 af

Reach DP-2: Pond Road Inflow=0.10 cfs 0.027 af
Outflow=0.10 cfs 0.027 af

Reach R-1: Overflow Route Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.100 L=149.5' S=0.0408 '/' Capacity=0.52 cfs Outflow=0.00 cfs 0.000 af

Pond Pd-1: On-Site Depression Peak Elev=167.88' Storage=1,424 cf Inflow=0.35 cfs 0.079 af
Discarded=0.06 cfs 0.073 af Primary=0.00 cfs 0.000 af Outflow=0.06 cfs 0.073 af

Total Runoff Area = 1.944 ac Runoff Volume = 0.106 af Average Runoff Depth = 0.65"
100.00% Pervious = 1.944 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment E-1a: 194 & 196 Pond Road to On-Site Depression

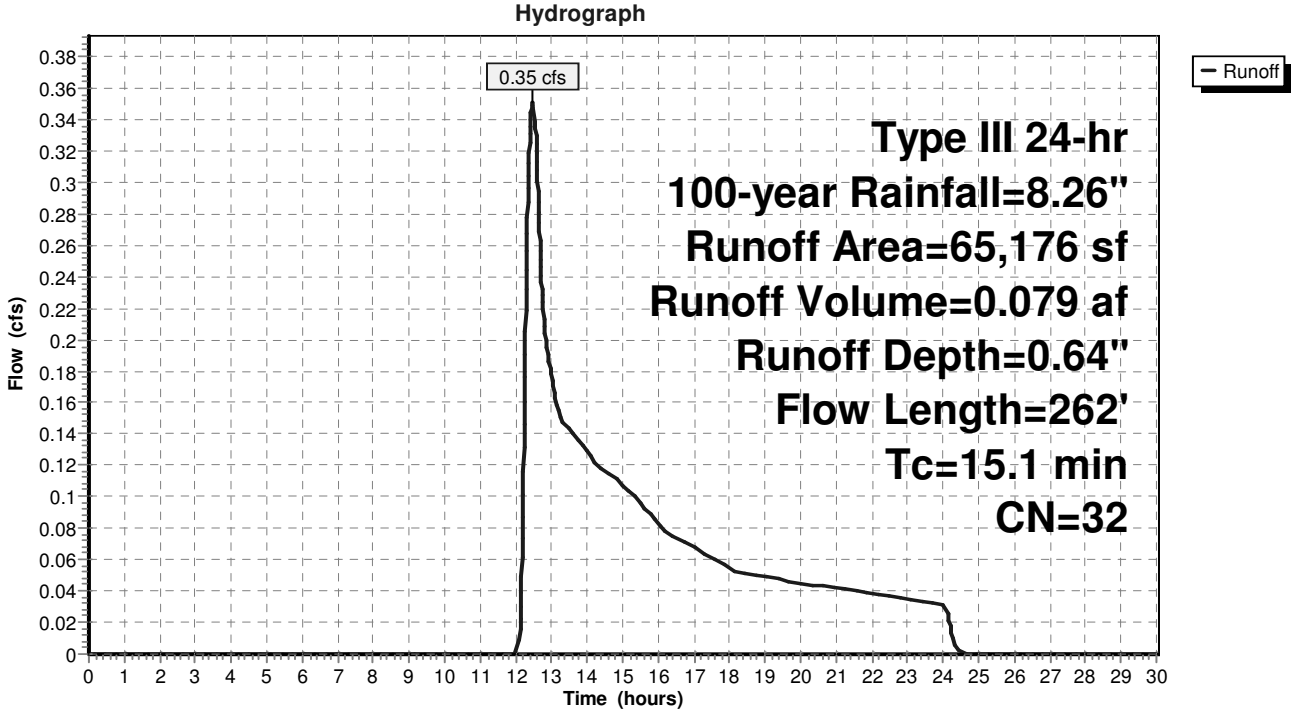
Runoff = 0.35 cfs @ 12.47 hrs, Volume= 0.079 af, Depth= 0.64"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=8.26"

Area (sf)	CN	Description
63,209	32	Woods/grass comb., Good, HSG A
1,967	39	>75% Grass cover, Good, HSG A
65,176	32	Weighted Average
65,176		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.2	50	0.2100	0.10		**Sheet Flow, Seg1** Woods: Dense underbrush n= 0.800 P2= 3.35"
1.5	103	0.2136	1.16		**Shallow Concentrated Flow, Seg 2** Forest w/Heavy Litter Kv= 2.5 fps
5.4	109	0.0183	0.34		**Shallow Concentrated Flow, Seg 3** Forest w/Heavy Litter Kv= 2.5 fps
15.1	262	Total			

Subcatchment E-1a: 194 & 196 Pond Road to On-Site Depression



Summary for Subcatchment E-1b: 196 Pond Road to 200 Pond Road

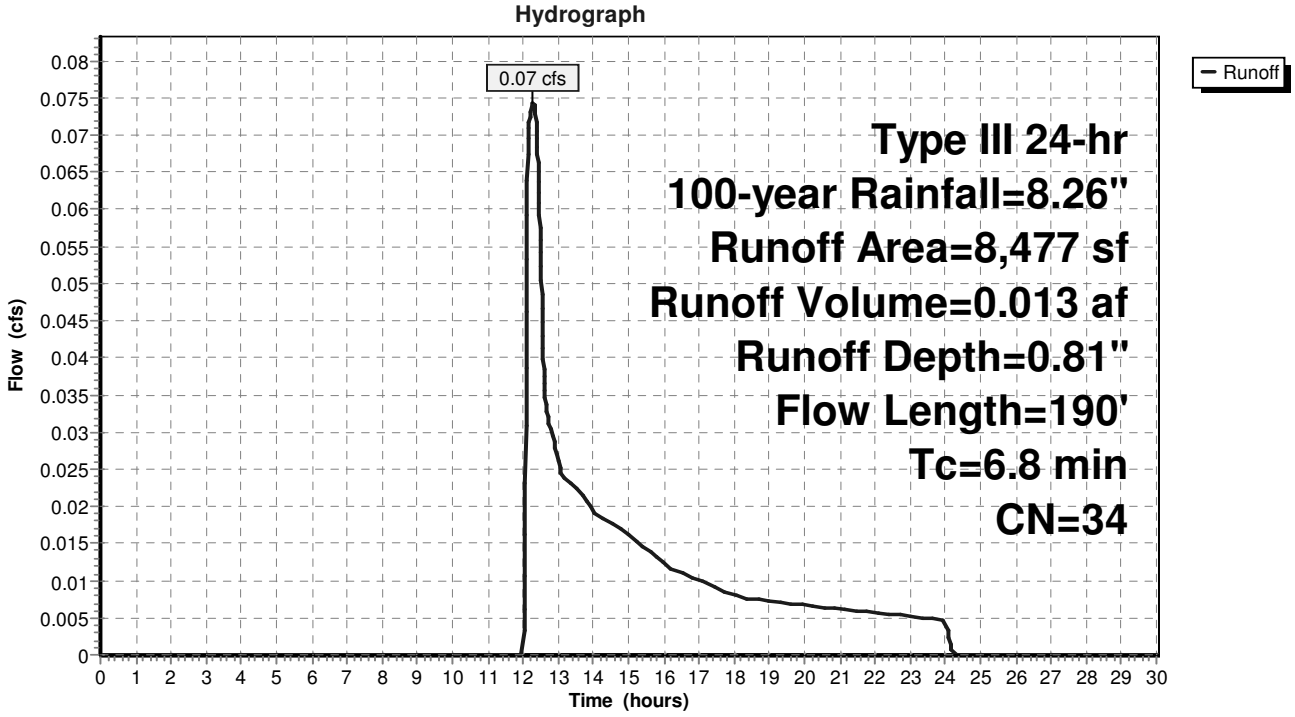
Runoff = 0.07 cfs @ 12.29 hrs, Volume= 0.013 af, Depth= 0.81"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=8.26"

Area (sf)	CN	Description
6,345	32	Woods/grass comb., Good, HSG A
2,132	39	>75% Grass cover, Good, HSG A
8,477	34	Weighted Average
8,477		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.8	50	0.1110	0.30		**Sheet Flow, Seg1** Grass: Short n= 0.150 P2= 3.35"
4.0	140	0.0536	0.58		**Shallow Concentrated Flow, Seg2** Forest w/Heavy Litter Kv= 2.5 fps
6.8	190	Total			

Subcatchment E-1b: 196 Pond Road to 200 Pond Road



Summary for Subcatchment E-2: 196 Pond Road to Pond Road

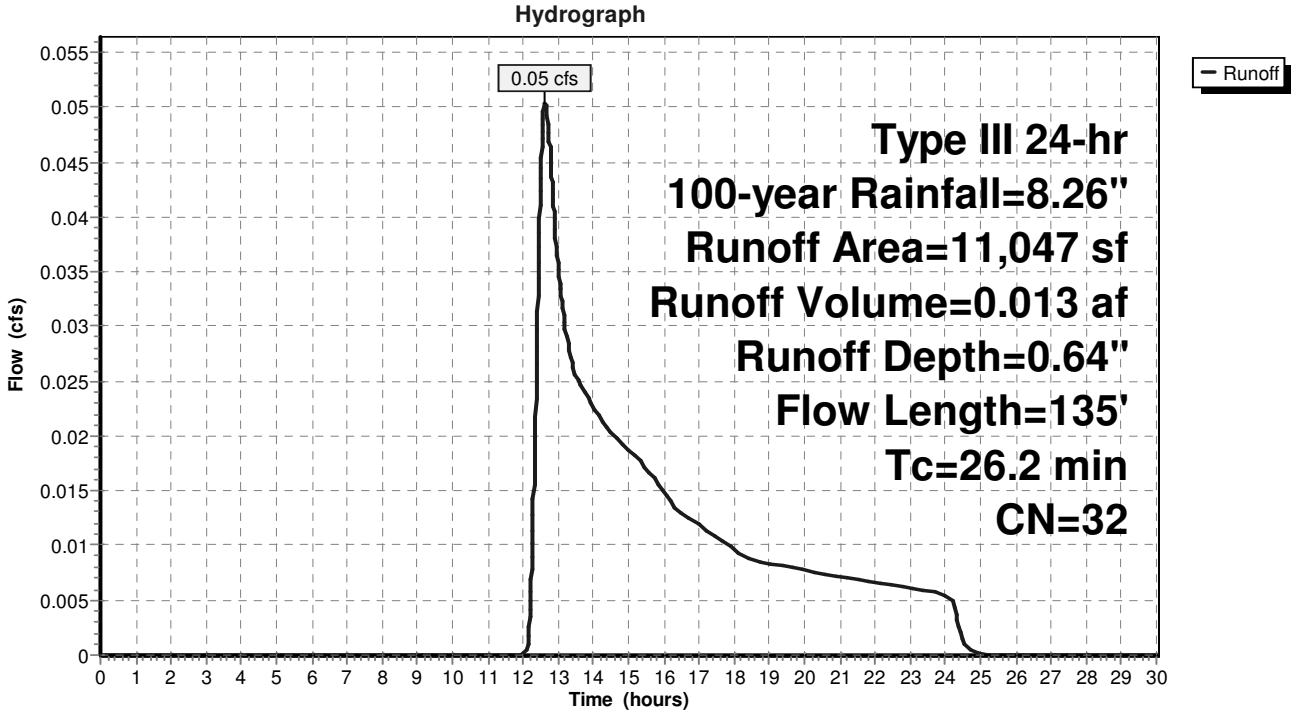
Runoff = 0.05 cfs @ 12.63 hrs, Volume= 0.013 af, Depth= 0.64"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=8.26"

Area (sf)	CN	Description
11,047	32	Woods/grass comb., Good, HSG A
11,047		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.0	50	0.0200	0.04		**Sheet Flow, Seg1** Woods: Dense underbrush n= 0.800 P2= 3.35"
5.2	85	0.0118	0.27		**Shallow Concentrated Flow, Seg2** Forest w/Heavy Litter Kv= 2.5 fps
26.2	135	Total			

Subcatchment E-2: 196 Pond Road to Pond Road

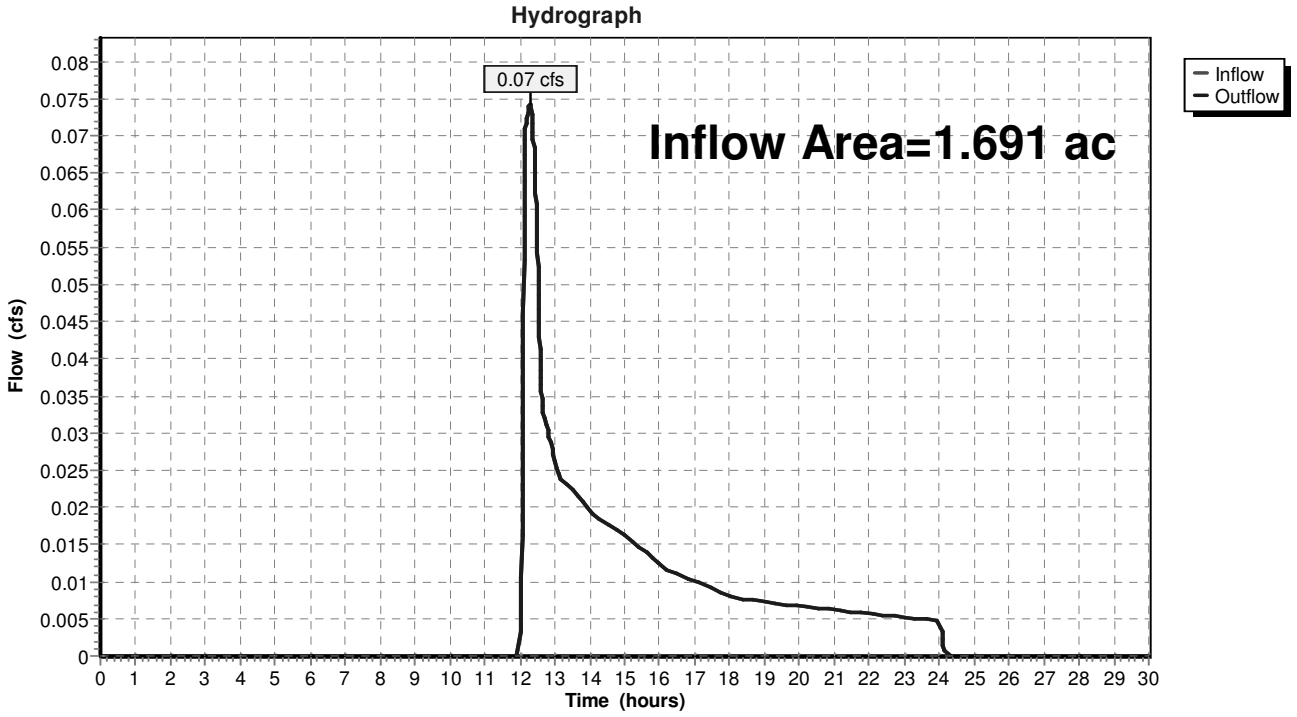


Summary for Reach DP-1: 200 Pond Road

Inflow Area = 1.691 ac, 0.00% Impervious, Inflow Depth = 0.09" for 100-year event
Inflow = 0.07 cfs @ 12.29 hrs, Volume= 0.013 af
Outflow = 0.07 cfs @ 12.29 hrs, Volume= 0.013 af, Atten= 0%, Lag= 0.0 min

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

Reach DP-1: 200 Pond Road

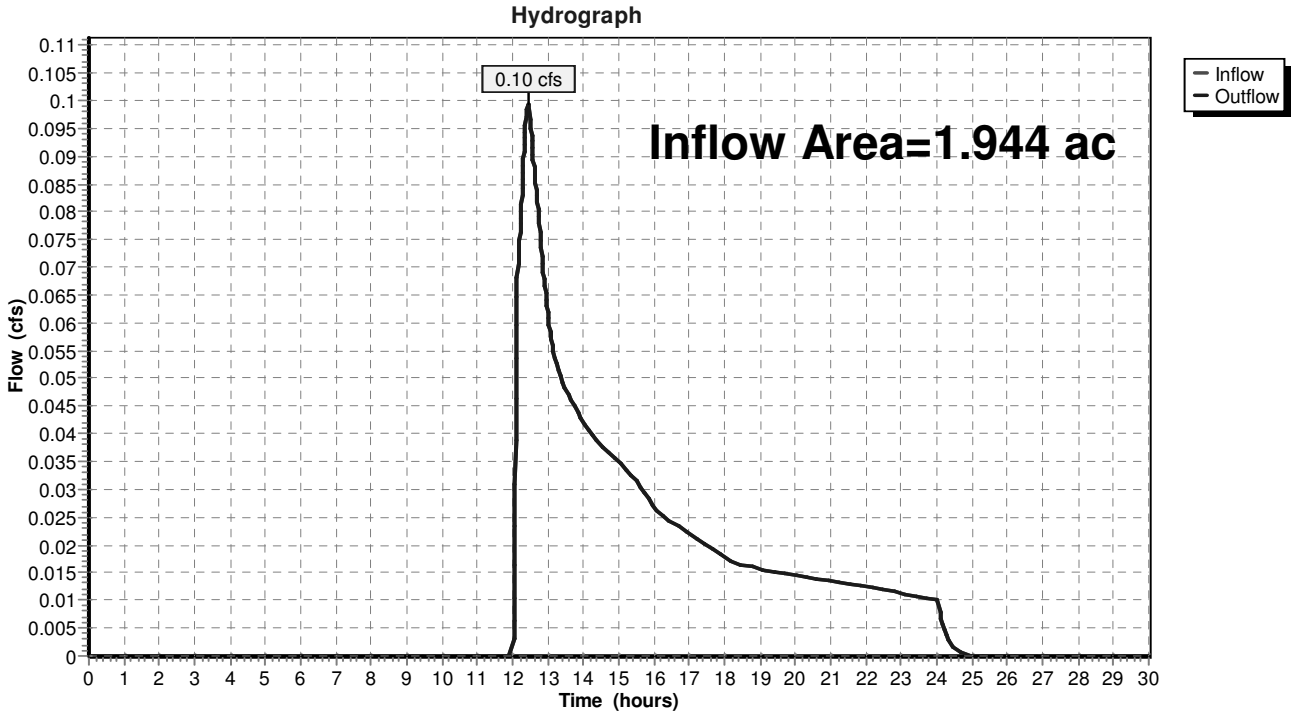


Summary for Reach DP-2: Pond Road

Inflow Area = 1.944 ac, 0.00% Impervious, Inflow Depth = 0.16" for 100-year event
Inflow = 0.10 cfs @ 12.44 hrs, Volume= 0.027 af
Outflow = 0.10 cfs @ 12.44 hrs, Volume= 0.027 af, Atten= 0%, Lag= 0.0 min

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

Reach DP-2: Pond Road



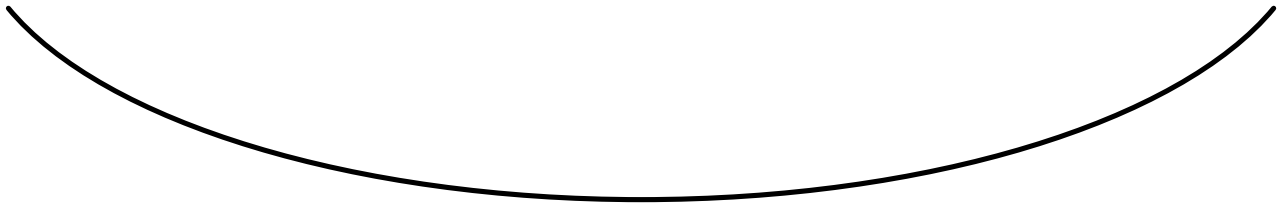
Summary for Reach R-1: Overflow Route

Inflow Area = 1.496 ac, 0.00% Impervious, Inflow Depth = 0.00" for 100-year event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

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

Peak Storage= 0 cf @ 0.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 0.20' Flow Area= 0.7 sf, Capacity= 0.52 cfs

5.00' x 0.20' deep Parabolic Channel, n= 0.100 Earth, dense brush, high stage
Length= 149.5' Slope= 0.0408 '/'
Inlet Invert= 168.10', Outlet Invert= 162.00'



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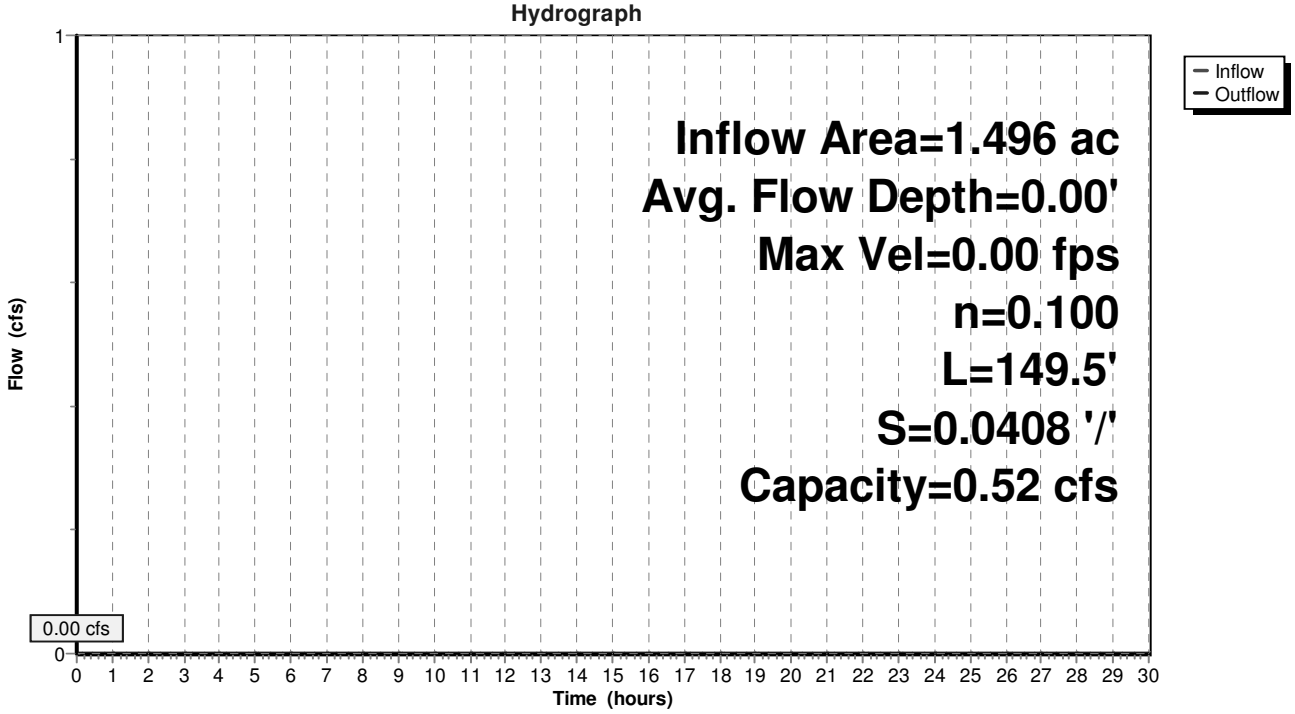
Reach R-1: Overflow Route



Summary for Pond Pd-1: On-Site Depression

Inflow Area = 1.496 ac, 0.00% Impervious, Inflow Depth = 0.64" for 100-year event
Inflow = 0.35 cfs @ 12.47 hrs, Volume= 0.079 af
Outflow = 0.06 cfs @ 17.44 hrs, Volume= 0.073 af, Atten= 82%, Lag= 298.0 min
Discarded = 0.06 cfs @ 17.44 hrs, Volume= 0.073 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 167.88' @ 17.44 hrs Surf.Area= 5,180 sf Storage= 1,424 cf

Plug-Flow detention time= 301.1 min calculated for 0.073 af (93% of inflow)
Center-of-Mass det. time= 267.1 min (1,232.2 - 965.1)

Volume	Invert	Avail.Storage	Storage Description
#1	167.50'	4,247 cf	**Custom Stage Data (Irregular)** Listed below

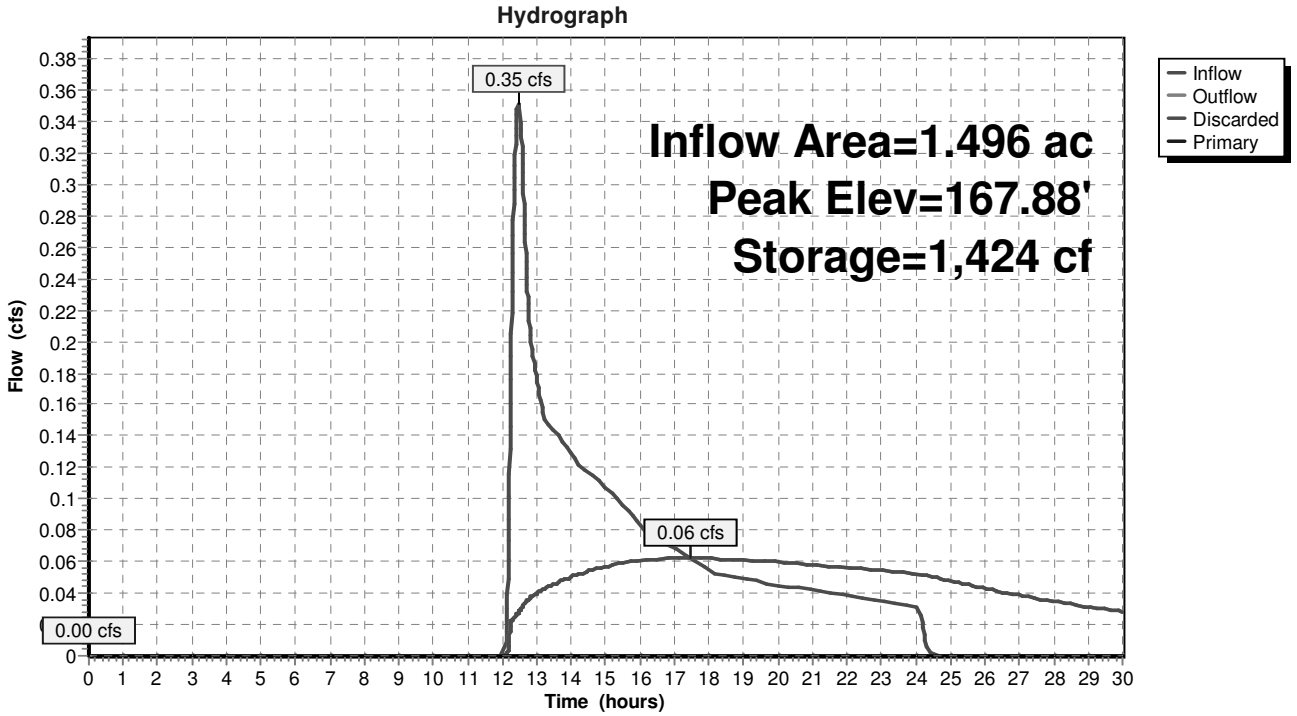
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
167.50	1,704	336.0	0	0	1,704
168.00	6,287	551.0	1,877	1,877	16,881
168.30	9,628	644.0	2,370	4,247	25,727

Device	Routing	Invert	Outlet Devices
#1	Primary	168.10'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#2	Discarded	167.50'	**0.520 in/hr Exfiltration over Horizontal area**

Discarded OutFlow Max=0.06 cfs @ 17.44 hrs HW=167.88' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.06 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=167.50' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond Pd-1: On-Site Depression



25485

SECTION 4

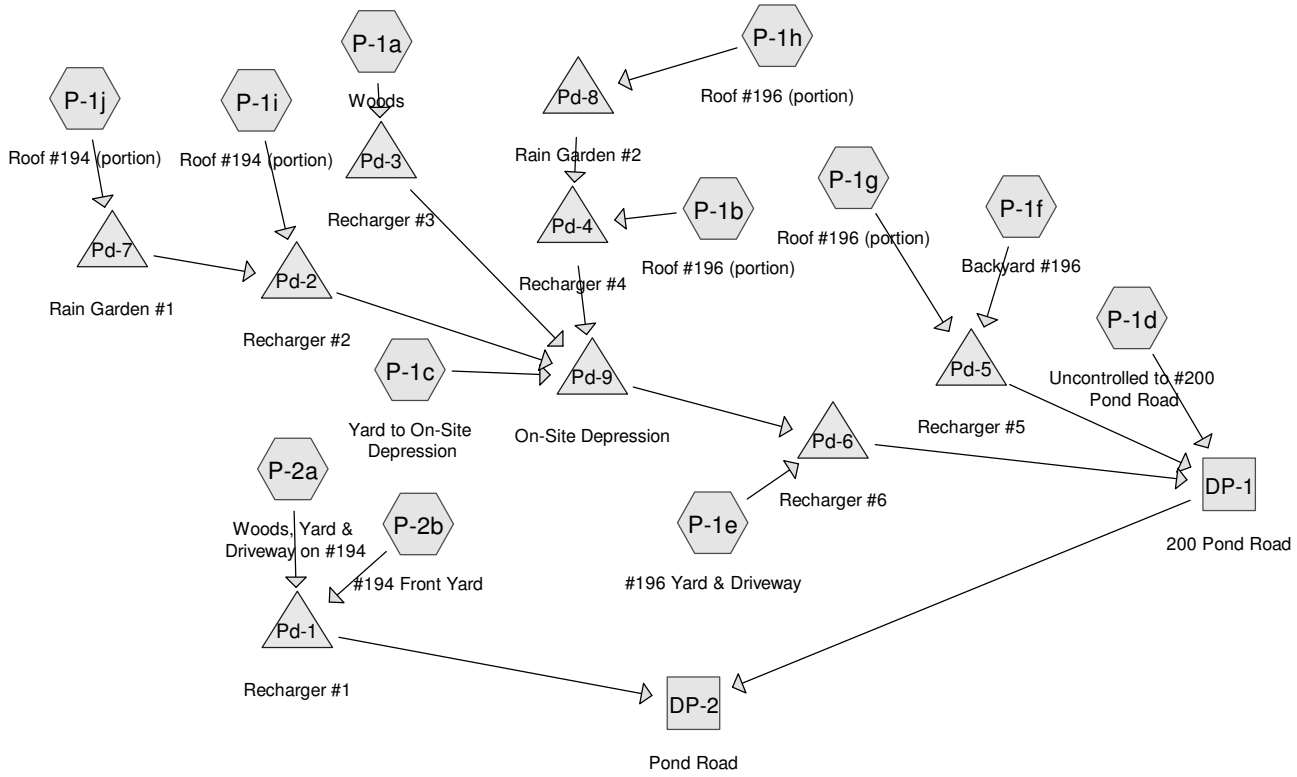
Proposed Conditions Stormwater Model showing Stormwater Flows and Flood Routing Computations using HydroCAD version 10.00

for

#194 & #196 Pond Road

Wellesley, Massachusetts 02482

REVISED: February 26, 2020
REVISED: January 10, 2020



Routing Diagram for 25485-PR
Prepared by DGT Associates
HydroCAD® 10.00-25 s/n 01078 © 2019 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.506	39	>75% Grass cover, Good, HSG A (P-1a, P-1c, P-1d, P-1e, P-1f, P-2a, P-2b)
0.104	98	Paved parking, HSG A (P-1e, P-2a)
0.183	98	Roofs, HSG A (P-1b, P-1g, P-1h, P-1i, P-1j)
0.073	98	Unconnected pavement, HSG A (P-1a, P-1c, P-1e, P-1f, P-2a, P-2b)
1.078	30	Woods, Good, HSG A (P-1a, P-1c, P-1d, P-1e, P-2a, P-2b)
1.944	**45**	**TOTAL AREA**

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

Subcatchment P-1a: Woods Runoff Area=12,690 sf 0.12% Impervious Runoff Depth=0.00"
Flow Length=139' Tc=9.3 min CN=31 Runoff=0.00 cfs 0.000 af

Subcatchment P-1b: Roof #196 (portion) Runoff Area=1,903 sf 100.00% Impervious Runoff Depth=3.12"
Tc=5.0 min CN=98 Runoff=0.15 cfs 0.011 af

Subcatchment P-1c: Yard to On-Site Depression Runoff Area=22,834 sf 5.49% Impervious Runoff Depth=0.00"
Flow Length=259' Tc=12.3 min UI Adjusted CN=36 Runoff=0.00 cfs 0.000 af

Subcatchment P-1d: Uncontrolled to #200 Pond Runoff Area=8,632 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=265' Tc=14.0 min CN=31 Runoff=0.00 cfs 0.000 af

Subcatchment P-1e: #196 Yard & Driveway Runoff Area=11,605 sf 24.10% Impervious Runoff Depth=0.12"
Flow Length=100' Tc=17.2 min UI Adjusted CN=48 Runoff=0.00 cfs 0.003 af

Subcatchment P-1f: Backyard #196 Runoff Area=2,389 sf 20.43% Impervious Runoff Depth=0.06"
Tc=5.0 min UI Adjusted CN=45 Runoff=0.00 cfs 0.000 af

Subcatchment P-1g: Roof #196 (portion) Runoff Area=1,280 sf 100.00% Impervious Runoff Depth=3.12"
Tc=5.0 min CN=98 Runoff=0.10 cfs 0.008 af

Subcatchment P-1h: Roof #196 (portion) Runoff Area=814 sf 100.00% Impervious Runoff Depth=3.12"
Tc=5.0 min CN=98 Runoff=0.06 cfs 0.005 af

Subcatchment P-1i: Roof #194 (portion) Runoff Area=3,219 sf 100.00% Impervious Runoff Depth=3.12"
Tc=5.0 min CN=98 Runoff=0.25 cfs 0.019 af

Subcatchment P-1j: Roof #194 (portion) Runoff Area=748 sf 100.00% Impervious Runoff Depth=3.12"
Tc=5.0 min CN=98 Runoff=0.06 cfs 0.004 af

Subcatchment P-2a: Woods, Yard & Driveway Runoff Area=11,234 sf 23.32% Impervious Runoff Depth=0.06"
Flow Length=276' Tc=13.7 min UI Adjusted CN=45 Runoff=0.00 cfs 0.001 af

Subcatchment P-2b: #194 Front Yard Runoff Area=7,351 sf 7.40% Impervious Runoff Depth=0.00"
Flow Length=140' Tc=31.4 min UI Adjusted CN=36 Runoff=0.00 cfs 0.000 af

Reach DP-1: 200 Pond Road Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Reach DP-2: Pond Road Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Pond Pd-1: Recharger #1 Peak Elev=162.25' Storage=0 cf Inflow=0.00 cfs 0.001 af
Discarded=0.00 cfs 0.001 af Primary=0.00 cfs 0.000 af Outflow=0.00 cfs 0.001 af

Pond Pd-2: Recharger #2 Peak Elev=164.95' Storage=155 cf Inflow=0.25 cfs 0.019 af
Discarded=0.06 cfs 0.019 af Primary=0.00 cfs 0.000 af Outflow=0.06 cfs 0.019 af

Pond Pd-3: Recharger #3 Peak Elev=165.25' Storage=0 cf Inflow=0.00 cfs 0.000 af
Discarded=0.00 cfs 0.000 af Primary=0.00 cfs 0.000 af Outflow=0.00 cfs 0.000 af

Pond Pd-4: Recharger #4 Peak Elev=163.83' Storage=62 cf Inflow=0.15 cfs 0.011 af
Discarded=0.05 cfs 0.011 af Primary=0.00 cfs 0.000 af Outflow=0.05 cfs 0.011 af

Pond Pd-5: Recharger #5 Peak Elev=165.01' Storage=36 cf Inflow=0.10 cfs 0.008 af
Discarded=0.04 cfs 0.008 af Primary=0.00 cfs 0.000 af Outflow=0.04 cfs 0.008 af

Pond Pd-6: Recharger #6 Peak Elev=157.75' Storage=0 cf Inflow=0.00 cfs 0.003 af
Discarded=0.00 cfs 0.003 af Primary=0.00 cfs 0.000 af Outflow=0.00 cfs 0.003 af

Pond Pd-7: Rain Garden #1 Peak Elev=169.53' Storage=37 cf Inflow=0.06 cfs 0.004 af
Discarded=0.02 cfs 0.004 af Primary=0.00 cfs 0.000 af Outflow=0.02 cfs 0.004 af

Pond Pd-8: Rain Garden #2 Peak Elev=169.45' Storage=37 cf Inflow=0.06 cfs 0.005 af
Discarded=0.02 cfs 0.005 af Primary=0.00 cfs 0.000 af Outflow=0.02 cfs 0.005 af

Pond Pd-9: On-Site Depression Peak Elev=167.70' Storage=0 cf Inflow=0.00 cfs 0.000 af
Discarded=0.00 cfs 0.000 af Primary=0.00 cfs 0.000 af Outflow=0.00 cfs 0.000 af

Total Runoff Area = 1.944 ac Runoff Volume = 0.052 af Average Runoff Depth = 0.32"
81.49% Pervious = 1.584 ac 18.51% Impervious = 0.360 ac

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

Subcatchment P-1a: Woods Runoff Area=12,690 sf 0.12% Impervious Runoff Depth=0.03"
Flow Length=139' Tc=9.3 min CN=31 Runoff=0.00 cfs 0.001 af

Subcatchment P-1b: Roof #196 (portion) Runoff Area=1,903 sf 100.00% Impervious Runoff Depth=5.01"
Tc=5.0 min CN=98 Runoff=0.23 cfs 0.018 af

Subcatchment P-1c: Yard to On-Site Depression Runoff Area=22,834 sf 5.49% Impervious Runoff Depth=0.15"
Flow Length=259' Tc=12.3 min UI Adjusted CN=36 Runoff=0.01 cfs 0.006 af

Subcatchment P-1d: Uncontrolled to #200 Pond Runoff Area=8,632 sf 0.00% Impervious Runoff Depth=0.03"
Flow Length=265' Tc=14.0 min CN=31 Runoff=0.00 cfs 0.000 af

Subcatchment P-1e: #196 Yard & Driveway Runoff Area=11,605 sf 24.10% Impervious Runoff Depth=0.68"
Flow Length=100' Tc=17.2 min UI Adjusted CN=48 Runoff=0.09 cfs 0.015 af

Subcatchment P-1f: Backyard #196 Runoff Area=2,389 sf 20.43% Impervious Runoff Depth=0.52"
Tc=5.0 min UI Adjusted CN=45 Runoff=0.01 cfs 0.002 af

Subcatchment P-1g: Roof #196 (portion) Runoff Area=1,280 sf 100.00% Impervious Runoff Depth=5.01"
Tc=5.0 min CN=98 Runoff=0.16 cfs 0.012 af

Subcatchment P-1h: Roof #196 (portion) Runoff Area=814 sf 100.00% Impervious Runoff Depth=5.01"
Tc=5.0 min CN=98 Runoff=0.10 cfs 0.008 af

Subcatchment P-1i: Roof #194 (portion) Runoff Area=3,219 sf 100.00% Impervious Runoff Depth=5.01"
Tc=5.0 min CN=98 Runoff=0.39 cfs 0.031 af

Subcatchment P-1j: Roof #194 (portion) Runoff Area=748 sf 100.00% Impervious Runoff Depth=5.01"
Tc=5.0 min CN=98 Runoff=0.09 cfs 0.007 af

Subcatchment P-2a: Woods, Yard & Driveway Runoff Area=11,234 sf 23.32% Impervious Runoff Depth=0.52"
Flow Length=276' Tc=13.7 min UI Adjusted CN=45 Runoff=0.06 cfs 0.011 af

Subcatchment P-2b: #194 Front Yard Runoff Area=7,351 sf 7.40% Impervious Runoff Depth=0.15"
Flow Length=140' Tc=31.4 min UI Adjusted CN=36 Runoff=0.00 cfs 0.002 af

Reach DP-1: 200 Pond Road Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Reach DP-2: Pond Road Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Pond Pd-1: Recharger #1 Peak Elev=162.30' Storage=6 cf Inflow=0.06 cfs 0.013 af
Discarded=0.06 cfs 0.013 af Primary=0.00 cfs 0.000 af Outflow=0.06 cfs 0.013 af

Pond Pd-2: Recharger #2 Peak Elev=165.86' Storage=355 cf Inflow=0.39 cfs 0.031 af
Discarded=0.06 cfs 0.031 af Primary=0.00 cfs 0.000 af Outflow=0.06 cfs 0.031 af

Pond Pd-3: Recharger #3 Peak Elev=165.25' Storage=0 cf Inflow=0.00 cfs 0.001 af
Discarded=0.00 cfs 0.001 af Primary=0.00 cfs 0.000 af Outflow=0.00 cfs 0.001 af

Pond Pd-4: Recharger #4 Peak Elev=164.42' Storage=159 cf Inflow=0.23 cfs 0.018 af
Discarded=0.05 cfs 0.018 af Primary=0.00 cfs 0.000 af Outflow=0.05 cfs 0.018 af

Pond Pd-5: Recharger #5 Peak Elev=165.76' Storage=118 cf Inflow=0.17 cfs 0.015 af
Discarded=0.04 cfs 0.015 af Primary=0.00 cfs 0.000 af Outflow=0.04 cfs 0.015 af

Pond Pd-6: Recharger #6 Peak Elev=157.84' Storage=14 cf Inflow=0.09 cfs 0.015 af
Discarded=0.08 cfs 0.015 af Primary=0.00 cfs 0.000 af Outflow=0.08 cfs 0.015 af

Pond Pd-7: Rain Garden #1 Peak Elev=169.76' Storage=63 cf Inflow=0.09 cfs 0.007 af
Discarded=0.02 cfs 0.007 af Primary=0.02 cfs 0.000 af Outflow=0.04 cfs 0.007 af

Pond Pd-8: Rain Garden #2 Peak Elev=169.74' Storage=73 cf Inflow=0.10 cfs 0.008 af
Discarded=0.03 cfs 0.008 af Primary=0.00 cfs 0.000 af Outflow=0.03 cfs 0.008 af

Pond Pd-9: On-Site Depression Peak Elev=167.86' Storage=64 cf Inflow=0.01 cfs 0.006 af
Discarded=0.01 cfs 0.006 af Primary=0.00 cfs 0.000 af Outflow=0.01 cfs 0.006 af

Total Runoff Area = 1.944 ac Runoff Volume = 0.115 af Average Runoff Depth = 0.71"
81.49% Pervious = 1.584 ac 18.51% Impervious = 0.360 ac

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

Subcatchment P-1a: Woods Runoff Area=12,690 sf 0.12% Impervious Runoff Depth=0.16"
Flow Length=139' Tc=9.3 min CN=31 Runoff=0.01 cfs 0.004 af

Subcatchment P-1b: Roof #196 (portion) Runoff Area=1,903 sf 100.00% Impervious Runoff Depth=6.20"
Tc=5.0 min CN=98 Runoff=0.29 cfs 0.023 af

Subcatchment P-1c: Yard to On-Site Depression Runoff Area=22,834 sf 5.49% Impervious Runoff Depth=0.40"
Flow Length=259' Tc=12.3 min UI Adjusted CN=36 Runoff=0.07 cfs 0.018 af

Subcatchment P-1d: Uncontrolled to #200 Pond Runoff Area=8,632 sf 0.00% Impervious Runoff Depth=0.16"
Flow Length=265' Tc=14.0 min CN=31 Runoff=0.00 cfs 0.003 af

Subcatchment P-1e: #196 Yard & Driveway Runoff Area=11,605 sf 24.10% Impervious Runoff Depth=1.21"
Flow Length=100' Tc=17.2 min UI Adjusted CN=48 Runoff=0.21 cfs 0.027 af

Subcatchment P-1f: Backyard #196 Runoff Area=2,389 sf 20.43% Impervious Runoff Depth=0.98"
Tc=5.0 min UI Adjusted CN=45 Runoff=0.04 cfs 0.004 af

Subcatchment P-1g: Roof #196 (portion) Runoff Area=1,280 sf 100.00% Impervious Runoff Depth=6.20"
Tc=5.0 min CN=98 Runoff=0.19 cfs 0.015 af

Subcatchment P-1h: Roof #196 (portion) Runoff Area=814 sf 100.00% Impervious Runoff Depth=6.20"
Tc=5.0 min CN=98 Runoff=0.12 cfs 0.010 af

Subcatchment P-1i: Roof #194 (portion) Runoff Area=3,219 sf 100.00% Impervious Runoff Depth=6.20"
Tc=5.0 min CN=98 Runoff=0.48 cfs 0.038 af

Subcatchment P-1j: Roof #194 (portion) Runoff Area=748 sf 100.00% Impervious Runoff Depth=6.20"
Tc=5.0 min CN=98 Runoff=0.11 cfs 0.009 af

Subcatchment P-2a: Woods, Yard & Driveway Runoff Area=11,234 sf 23.32% Impervious Runoff Depth=0.98"
Flow Length=276' Tc=13.7 min UI Adjusted CN=45 Runoff=0.16 cfs 0.021 af

Subcatchment P-2b: #194 Front Yard Runoff Area=7,351 sf 7.40% Impervious Runoff Depth=0.40"
Flow Length=140' Tc=31.4 min UI Adjusted CN=36 Runoff=0.02 cfs 0.006 af

Reach DP-1: 200 Pond Road Inflow=0.00 cfs 0.003 af
Outflow=0.00 cfs 0.003 af

Reach DP-2: Pond Road Inflow=0.00 cfs 0.003 af
Outflow=0.00 cfs 0.003 af

Pond Pd-1: Recharger #1 Peak Elev=163.07' Storage=133 cf Inflow=0.16 cfs 0.027 af
Discarded=0.07 cfs 0.027 af Primary=0.00 cfs 0.000 af Outflow=0.07 cfs 0.027 af

Pond Pd-2: Recharger #2 Peak Elev=166.57' Storage=508 cf Inflow=0.49 cfs 0.039 af
Discarded=0.06 cfs 0.039 af Primary=0.00 cfs 0.000 af Outflow=0.06 cfs 0.039 af

Pond Pd-3: Recharger #3 Peak Elev=165.25' Storage=1 cf Inflow=0.01 cfs 0.004 af
Discarded=0.01 cfs 0.004 af Primary=0.00 cfs 0.000 af Outflow=0.01 cfs 0.004 af

Pond Pd-4: Recharger #4 Peak Elev=165.00' Storage=254 cf Inflow=0.29 cfs 0.023 af
Discarded=0.05 cfs 0.023 af Primary=0.00 cfs 0.000 af Outflow=0.05 cfs 0.023 af

Pond Pd-5: Recharger #5 Peak Elev=166.53' Storage=202 cf Inflow=0.23 cfs 0.020 af
Discarded=0.04 cfs 0.020 af Primary=0.00 cfs 0.000 af Outflow=0.04 cfs 0.020 af

Pond Pd-6: Recharger #6 Peak Elev=158.63' Storage=181 cf Inflow=0.21 cfs 0.027 af
Discarded=0.08 cfs 0.027 af Primary=0.00 cfs 0.000 af Outflow=0.08 cfs 0.027 af

Pond Pd-7: Rain Garden #1 Peak Elev=169.78' Storage=66 cf Inflow=0.11 cfs 0.009 af
Discarded=0.03 cfs 0.008 af Primary=0.07 cfs 0.001 af Outflow=0.09 cfs 0.009 af

Pond Pd-8: Rain Garden #2 Peak Elev=169.78' Storage=79 cf Inflow=0.12 cfs 0.010 af
Discarded=0.03 cfs 0.009 af Primary=0.04 cfs 0.001 af Outflow=0.07 cfs 0.010 af

Pond Pd-9: On-Site Depression Peak Elev=168.06' Storage=233 cf Inflow=0.07 cfs 0.018 af
Discarded=0.02 cfs 0.017 af Primary=0.00 cfs 0.000 af Outflow=0.02 cfs 0.017 af

Total Runoff Area = 1.944 ac Runoff Volume = 0.177 af Average Runoff Depth = 1.09"
81.49% Pervious = 1.584 ac 18.51% Impervious = 0.360 ac

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

Subcatchment P-1a: Woods Runoff Area=12,690 sf 0.12% Impervious Runoff Depth=0.56"
Flow Length=139' Tc=9.3 min CN=31 Runoff=0.06 cfs 0.014 af

Subcatchment P-1b: Roof #196 (portion) Runoff Area=1,903 sf 100.00% Impervious Runoff Depth=8.02"
Tc=5.0 min CN=98 Runoff=0.37 cfs 0.029 af

Subcatchment P-1c: Yard to On-Site Depression Runoff Area=22,834 sf 5.49% Impervious Runoff Depth=0.98"
Flow Length=259' Tc=12.3 min UI Adjusted CN=36 Runoff=0.27 cfs 0.043 af

Subcatchment P-1d: Uncontrolled to #200 Pond Runoff Area=8,632 sf 0.00% Impervious Runoff Depth=0.56"
Flow Length=265' Tc=14.0 min CN=31 Runoff=0.04 cfs 0.009 af

Subcatchment P-1e: #196 Yard & Driveway Runoff Area=11,605 sf 24.10% Impervious Runoff Depth=2.19"
Flow Length=100' Tc=17.2 min UI Adjusted CN=48 Runoff=0.44 cfs 0.049 af

Subcatchment P-1f: Backyard #196 Runoff Area=2,389 sf 20.43% Impervious Runoff Depth=1.87"
Tc=5.0 min UI Adjusted CN=45 Runoff=0.11 cfs 0.009 af

Subcatchment P-1g: Roof #196 (portion) Runoff Area=1,280 sf 100.00% Impervious Runoff Depth=8.02"
Tc=5.0 min CN=98 Runoff=0.25 cfs 0.020 af

Subcatchment P-1h: Roof #196 (portion) Runoff Area=814 sf 100.00% Impervious Runoff Depth=8.02"
Tc=5.0 min CN=98 Runoff=0.16 cfs 0.012 af

Subcatchment P-1i: Roof #194 (portion) Runoff Area=3,219 sf 100.00% Impervious Runoff Depth=8.02"
Tc=5.0 min CN=98 Runoff=0.62 cfs 0.049 af

Subcatchment P-1j: Roof #194 (portion) Runoff Area=748 sf 100.00% Impervious Runoff Depth=8.02"
Tc=5.0 min CN=98 Runoff=0.14 cfs 0.011 af

Subcatchment P-2a: Woods, Yard & Driveway Runoff Area=11,234 sf 23.32% Impervious Runoff Depth=1.87"
Flow Length=276' Tc=13.7 min UI Adjusted CN=45 Runoff=0.37 cfs 0.040 af

Subcatchment P-2b: #194 Front Yard Runoff Area=7,351 sf 7.40% Impervious Runoff Depth=0.98"
Flow Length=140' Tc=31.4 min UI Adjusted CN=36 Runoff=0.07 cfs 0.014 af

Reach DP-1: 200 Pond Road Inflow=0.04 cfs 0.009 af
Outflow=0.04 cfs 0.009 af

Reach DP-2: Pond Road Inflow=0.04 cfs 0.009 af
Outflow=0.04 cfs 0.009 af

Pond Pd-1: Recharger #1 Peak Elev=165.78' Storage=714 cf Inflow=0.39 cfs 0.054 af
Discarded=0.07 cfs 0.054 af Primary=0.00 cfs 0.000 af Outflow=0.07 cfs 0.054 af

Pond Pd-2: Recharger #2 Peak Elev=167.73' Storage=758 cf Inflow=0.74 cfs 0.051 af
Discarded=0.06 cfs 0.051 af Primary=0.00 cfs 0.000 af Outflow=0.06 cfs 0.051 af

Pond Pd-3: Recharger #3 Peak Elev=165.28' Storage=7 cf Inflow=0.06 cfs 0.014 af
Discarded=0.06 cfs 0.014 af Primary=0.00 cfs 0.000 af Outflow=0.06 cfs 0.014 af

Pond Pd-4: Recharger #4 Peak Elev=165.97' Storage=413 cf Inflow=0.47 cfs 0.031 af
Discarded=0.05 cfs 0.031 af Primary=0.00 cfs 0.000 af Outflow=0.05 cfs 0.031 af

Pond Pd-5: Recharger #5 Peak Elev=168.09' Storage=368 cf Inflow=0.35 cfs 0.028 af
Discarded=0.04 cfs 0.028 af Primary=0.00 cfs 0.000 af Outflow=0.04 cfs 0.028 af

Pond Pd-6: Recharger #6 Peak Elev=160.26' Storage=623 cf Inflow=0.44 cfs 0.053 af
Discarded=0.08 cfs 0.053 af Primary=0.00 cfs 0.000 af Outflow=0.08 cfs 0.053 af

Pond Pd-7: Rain Garden #1 Peak Elev=169.80' Storage=68 cf Inflow=0.14 cfs 0.011 af
Discarded=0.03 cfs 0.010 af Primary=0.12 cfs 0.002 af Outflow=0.14 cfs 0.011 af

Pond Pd-8: Rain Garden #2 Peak Elev=169.80' Storage=83 cf Inflow=0.16 cfs 0.012 af
Discarded=0.03 cfs 0.011 af Primary=0.12 cfs 0.002 af Outflow=0.15 cfs 0.012 af

Pond Pd-9: On-Site Depression Peak Elev=168.31' Storage=706 cf Inflow=0.27 cfs 0.043 af
Discarded=0.03 cfs 0.037 af Primary=0.02 cfs 0.004 af Outflow=0.05 cfs 0.041 af

Total Runoff Area = 1.944 ac Runoff Volume = 0.299 af Average Runoff Depth = 1.85"
81.49% Pervious = 1.584 ac 18.51% Impervious = 0.360 ac

Summary for Subcatchment P-1a: Woods

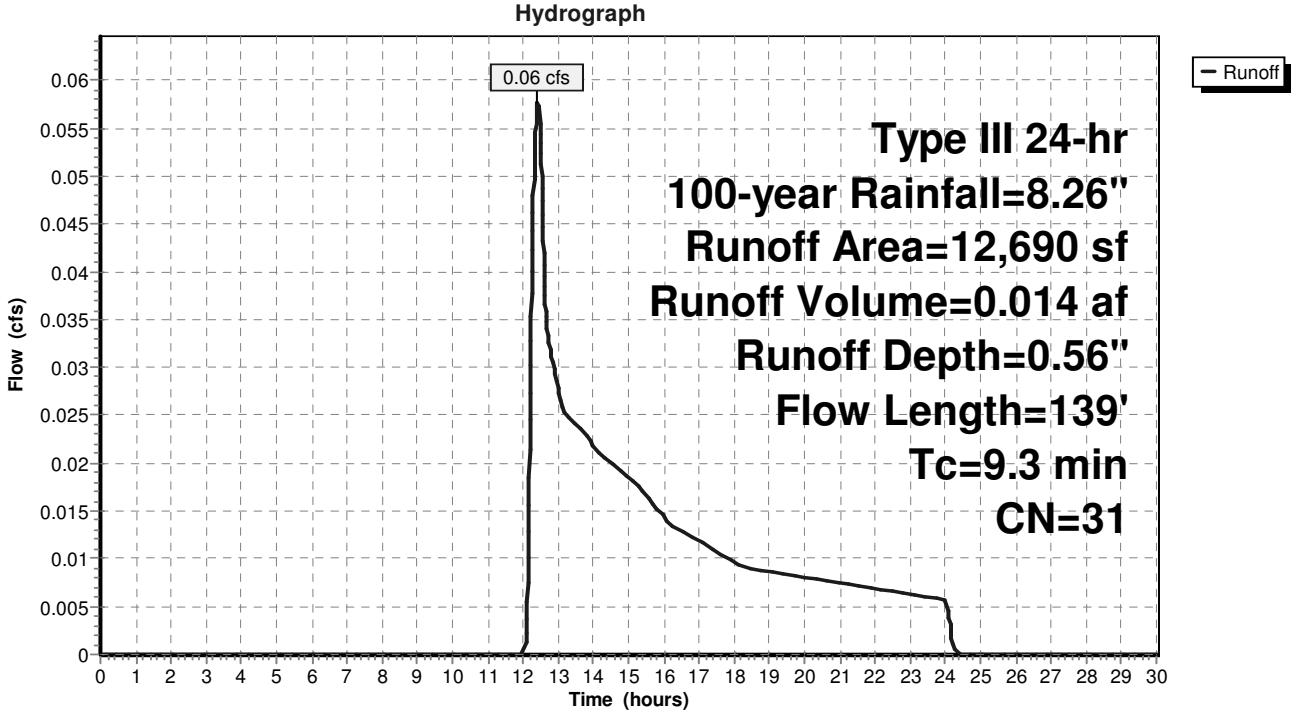
Runoff = 0.06 cfs @ 12.41 hrs, Volume= 0.014 af, Depth= 0.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=8.26"

Area (sf)	CN	Description
11,055	30	Woods, Good, HSG A
1,620	39	>75% Grass cover, Good, HSG A
15	98	Unconnected pavement, HSG A
12,690	31	Weighted Average
12,675		99.88% Pervious Area
15		0.12% Impervious Area
15		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.8	50	0.2360	0.11		**Sheet Flow, seg 1** Woods: Dense underbrush n= 0.800 P2= 3.35"
1.5	89	0.1616	1.00		**Shallow Concentrated Flow, seg 2** Forest w/Heavy Litter Kv= 2.5 fps
9.3	139	Total			

Subcatchment P-1a: Woods



Summary for Subcatchment P-1b: Roof #196 (portion)

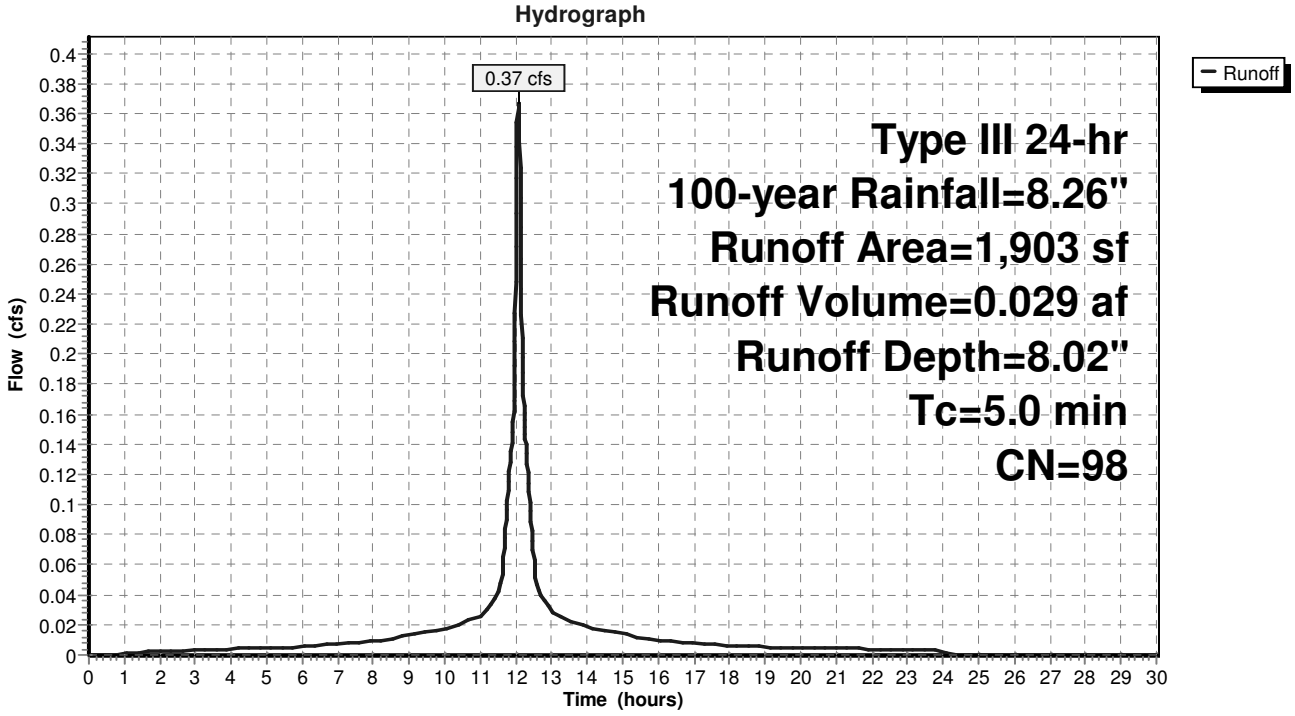
Runoff = 0.37 cfs @ 12.07 hrs, Volume= 0.029 af, Depth= 8.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=8.26"

Area (sf)	CN	Description
1,903	98	Roofs, HSG A
1,903		100.00% Impervious Area

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

Subcatchment P-1b: Roof #196 (portion)



Summary for Subcatchment P-1c: Yard to On-Site Depression

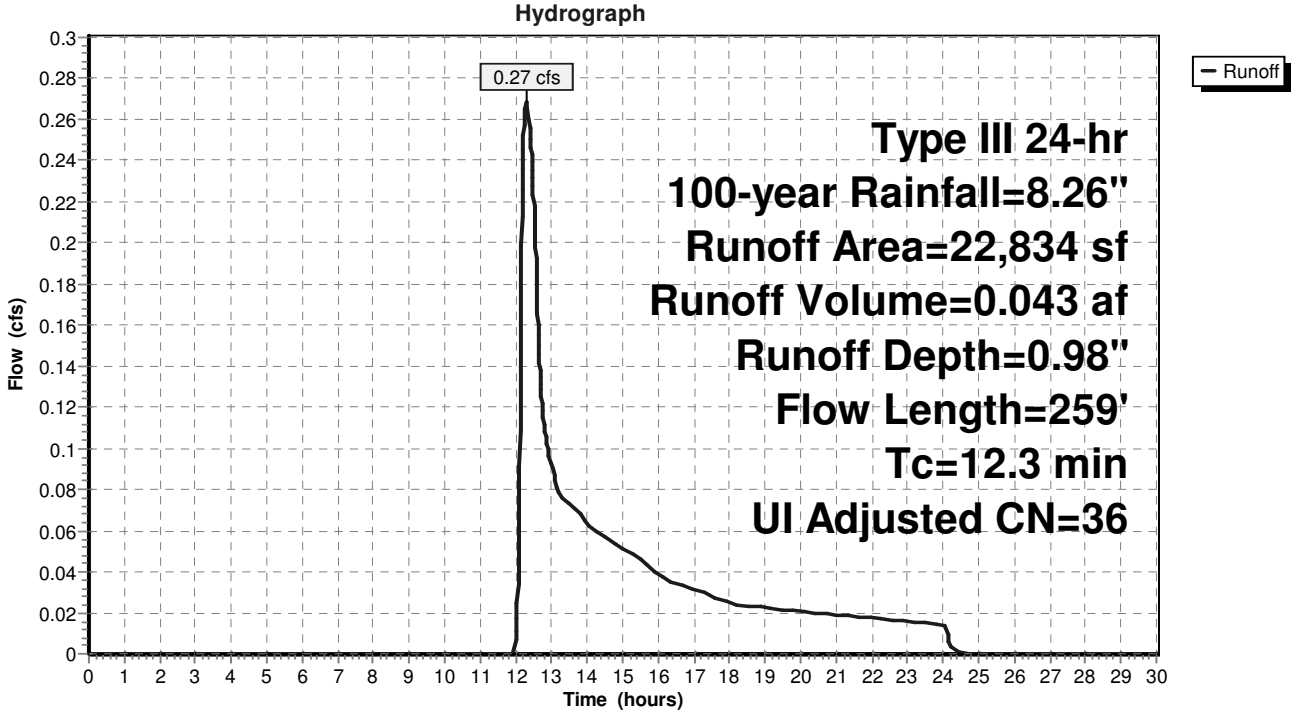
Runoff = 0.27 cfs @ 12.29 hrs, Volume= 0.043 af, Depth= 0.98"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=8.26"

Area (sf)	CN	Adj	Description
11,672	30		Woods, Good, HSG A
9,908	39		>75% Grass cover, Good, HSG A
1,254	98		Unconnected pavement, HSG A
22,834	38	36	Weighted Average, UI Adjusted
21,580			94.51% Pervious Area
1,254			5.49% Impervious Area
1,254			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.9	50	0.2300	0.11		**Sheet Flow, seg 1** Woods: Dense underbrush n= 0.800 P2= 3.35"
1.6	105	0.1801	1.06		**Shallow Concentrated Flow, seg 2** Forest w/Heavy Litter Kv= 2.5 fps
0.4	41	0.0485	1.54		**Shallow Concentrated Flow, seg 3** Short Grass Pasture Kv= 7.0 fps
2.4	63	0.0315	0.44		**Shallow Concentrated Flow, seg 4** Forest w/Heavy Litter Kv= 2.5 fps
12.3	259	Total			

Subcatchment P-1c: Yard to On-Site Depression



Summary for Subcatchment P-1d: Uncontrolled to #200 Pond Road

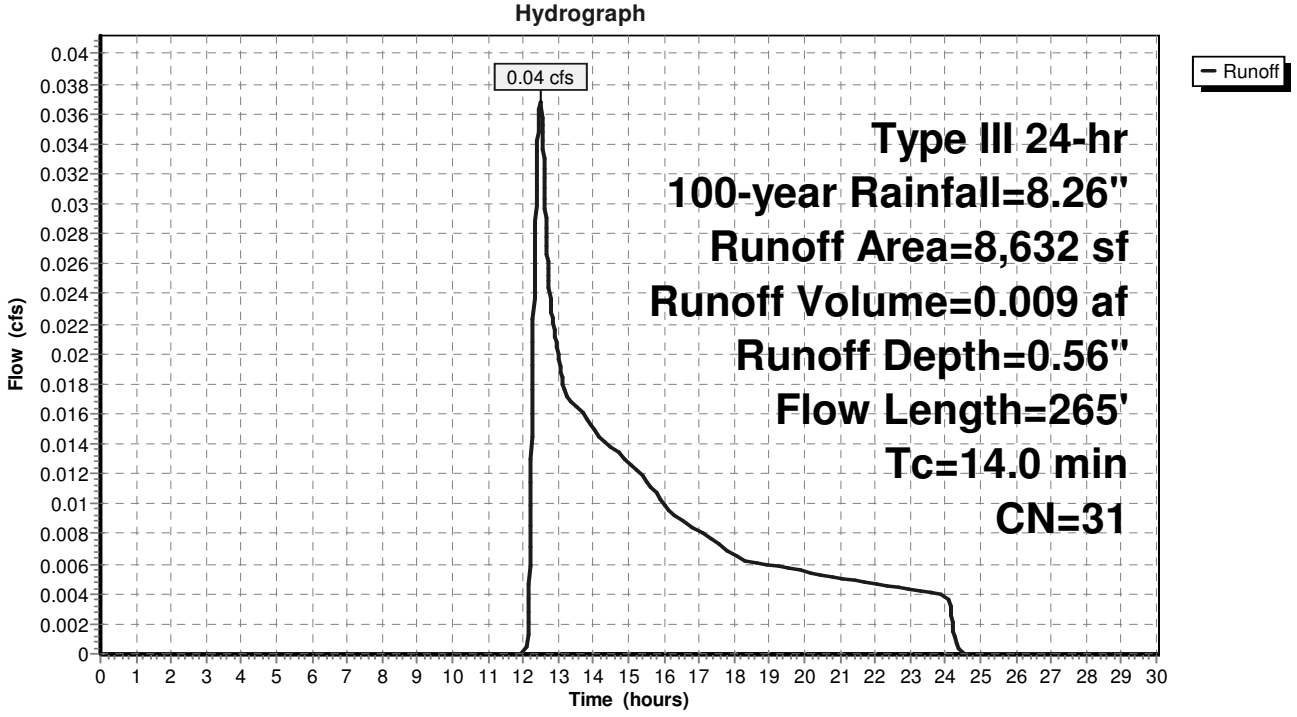
Runoff = 0.04 cfs @ 12.49 hrs, Volume= 0.009 af, Depth= 0.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=8.26"

Area (sf)	CN	Description
7,234	30	Woods, Good, HSG A
1,398	39	>75% Grass cover, Good, HSG A
8,632	31	Weighted Average
8,632		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.2	40	0.1000	0.07		**Sheet Flow, seg 1** Woods: Dense underbrush n= 0.800 P2= 3.35"
1.1	10	0.0500	0.16		**Sheet Flow, seg 2** Grass: Short n= 0.150 P2= 3.35"
1.1	113	0.0577	1.68		**Shallow Concentrated Flow, seg 3** Short Grass Pasture Kv= 7.0 fps
2.6	102	0.0685	0.65		**Shallow Concentrated Flow, seg 4** Forest w/Heavy Litter Kv= 2.5 fps
14.0	265	Total			

Subcatchment P-1d: Uncontrolled to #200 Pond Road



Summary for Subcatchment P-1e: #196 Yard & Driveway

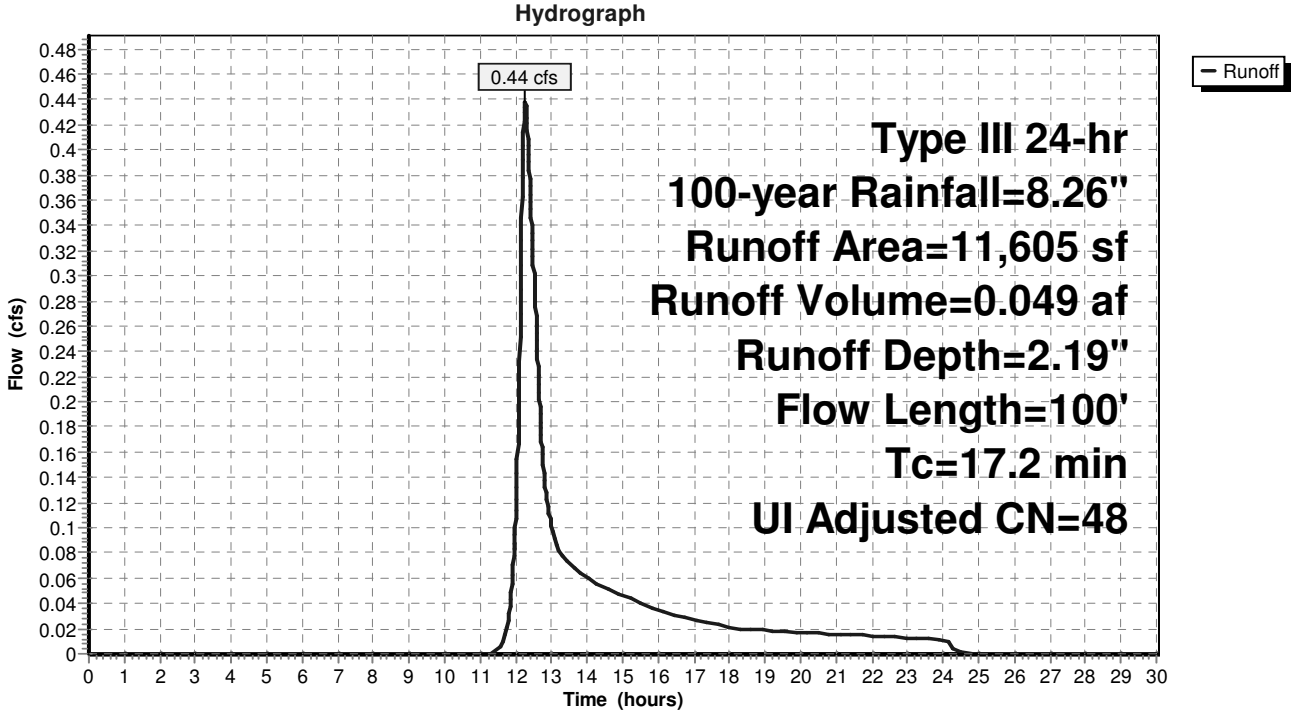
Runoff = 0.44 cfs @ 12.26 hrs, Volume= 0.049 af, Depth= 2.19"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=8.26"

Area (sf)	CN	Adj	Description
5,355	30		Woods, Good, HSG A
3,453	39		>75% Grass cover, Good, HSG A
2,487	98		Paved parking, HSG A
310	98		Unconnected pavement, HSG A
11,605	49	48	Weighted Average, UI Adjusted
8,808			75.90% Pervious Area
2,797			24.10% Impervious Area
310			11.08% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.3	50	0.0440	0.05		**Sheet Flow, seg 1** Woods: Dense underbrush n= 0.800 P2= 3.35"
1.8	40	0.0225	0.38		**Shallow Concentrated Flow, seg 2** Forest w/Heavy Litter Kv= 2.5 fps
0.1	10	0.0200	2.87		**Shallow Concentrated Flow, seg 3** Paved Kv= 20.3 fps
17.2	100	Total			

Subcatchment P-1e: #196 Yard & Driveway



Summary for Subcatchment P-1f: Backyard #196

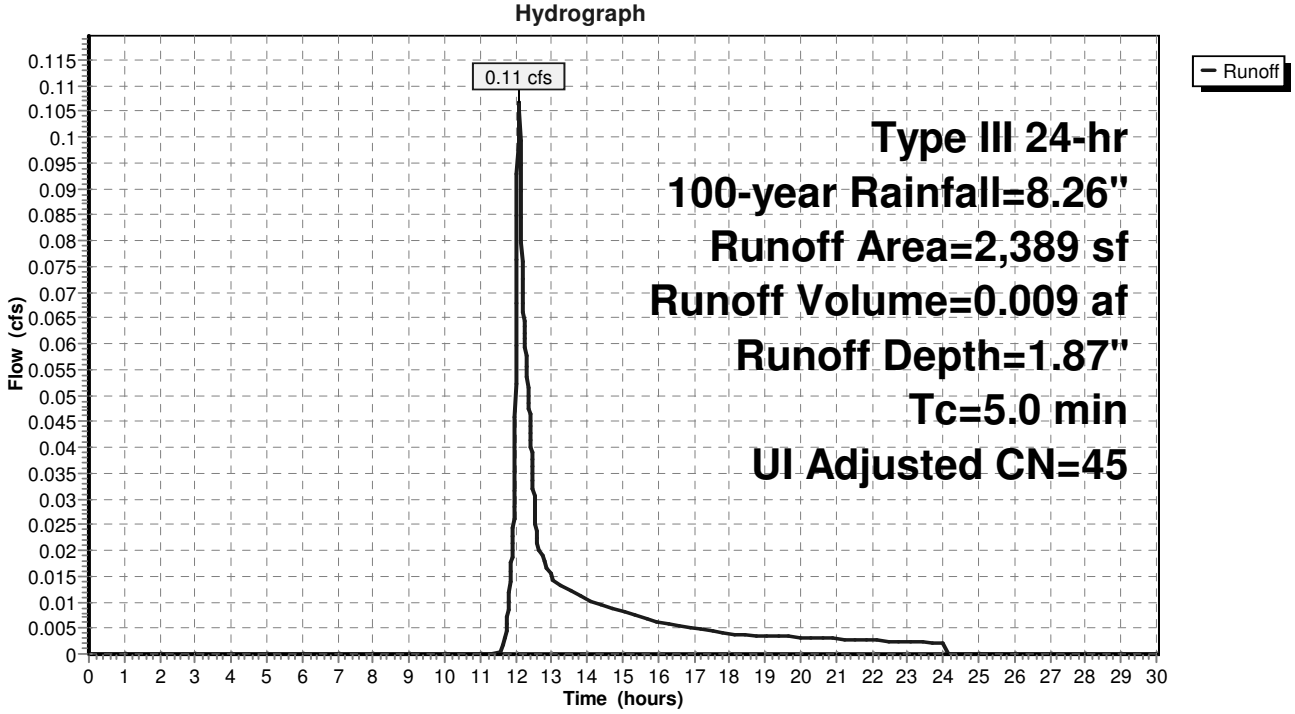
Runoff = 0.11 cfs @ 12.09 hrs, Volume= 0.009 af, Depth= 1.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=8.26"

Area (sf)	CN	Adj	Description
1,901	39		>75% Grass cover, Good, HSG A
488	98		Unconnected pavement, HSG A
2,389	51	45	Weighted Average, UI Adjusted
1,901			79.57% Pervious Area
488			20.43% Impervious Area
488			100.00% Unconnected

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

Subcatchment P-1f: Backyard #196



Summary for Subcatchment P-1g: Roof #196 (portion)

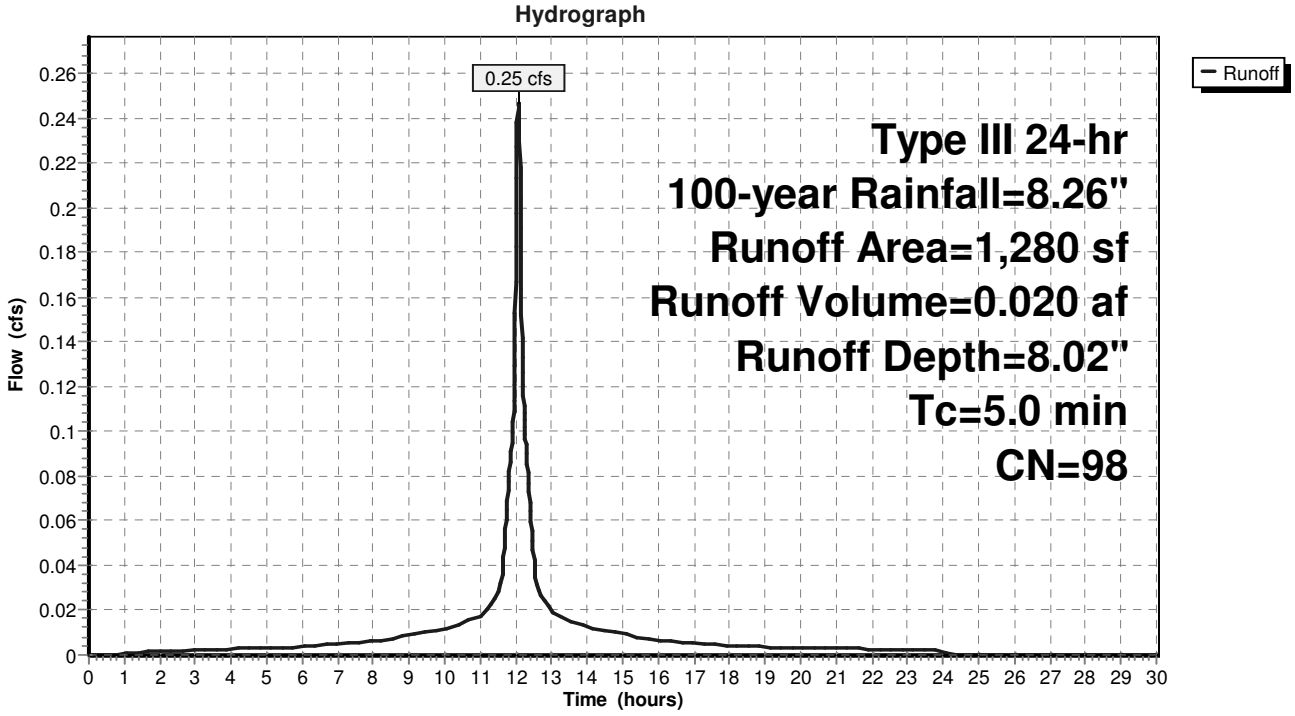
Runoff = 0.25 cfs @ 12.07 hrs, Volume= 0.020 af, Depth= 8.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=8.26"

Area (sf)	CN	Description
1,280	98	Roofs, HSG A
1,280		100.00% Impervious Area

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

Subcatchment P-1g: Roof #196 (portion)



Summary for Subcatchment P-1h: Roof #196 (portion)

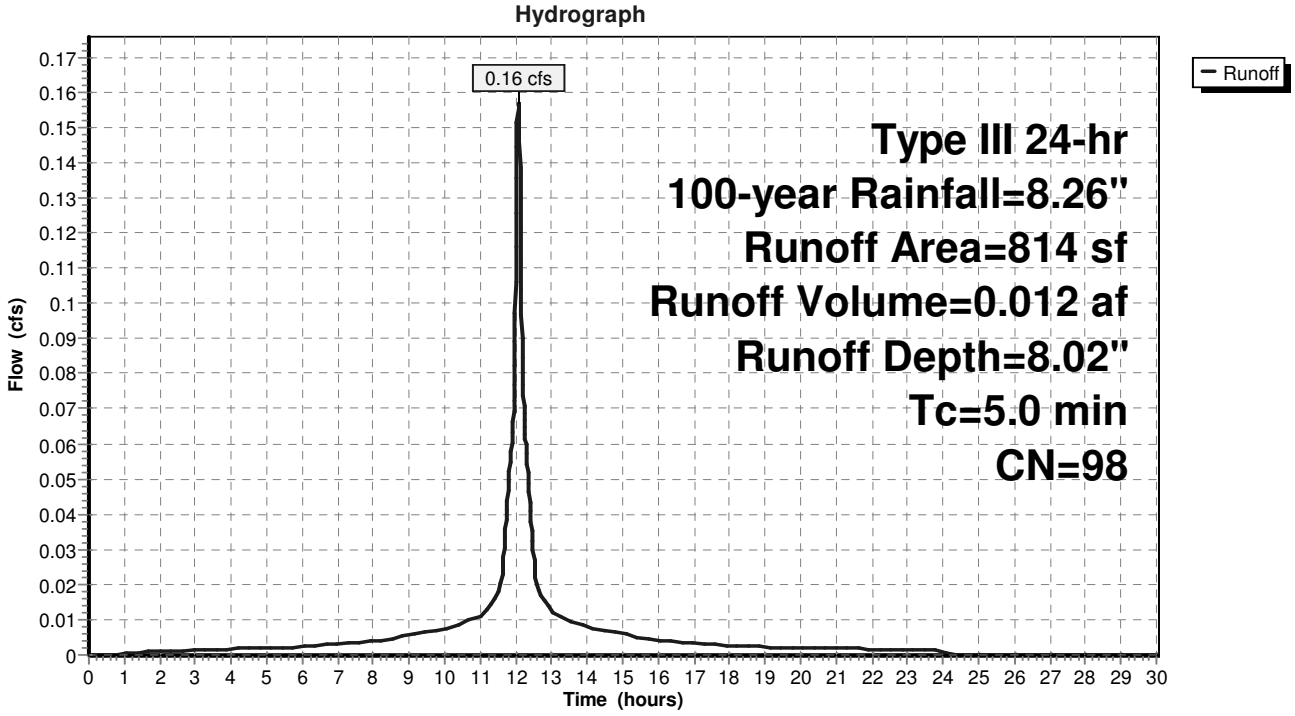
Runoff = 0.16 cfs @ 12.07 hrs, Volume= 0.012 af, Depth= 8.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=8.26"

Area (sf)	CN	Description
814	98	Roofs, HSG A
814		100.00% Impervious Area

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

Subcatchment P-1h: Roof #196 (portion)



Summary for Subcatchment P-1i: Roof #194 (portion)

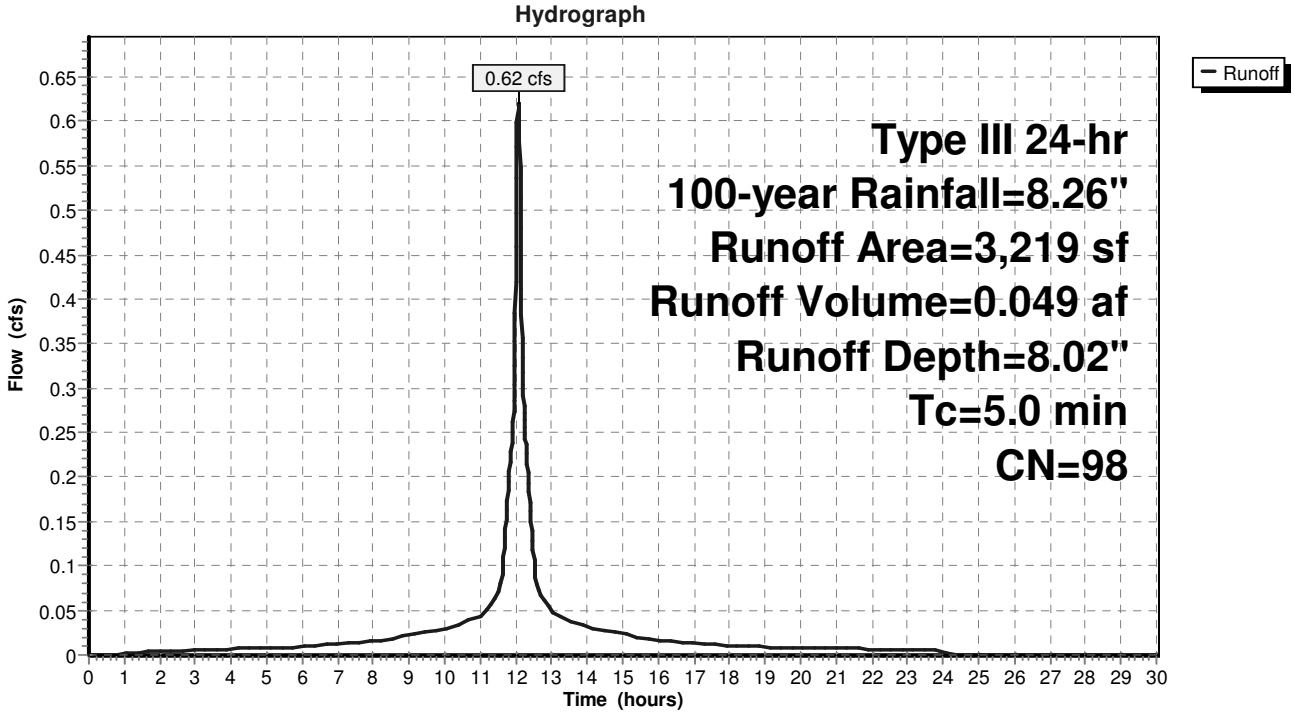
Runoff = 0.62 cfs @ 12.07 hrs, Volume= 0.049 af, Depth= 8.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=8.26"

Area (sf)	CN	Description
3,219	98	Roofs, HSG A
3,219		100.00% Impervious Area

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

Subcatchment P-1i: Roof #194 (portion)



Summary for Subcatchment P-1j: Roof #194 (portion)

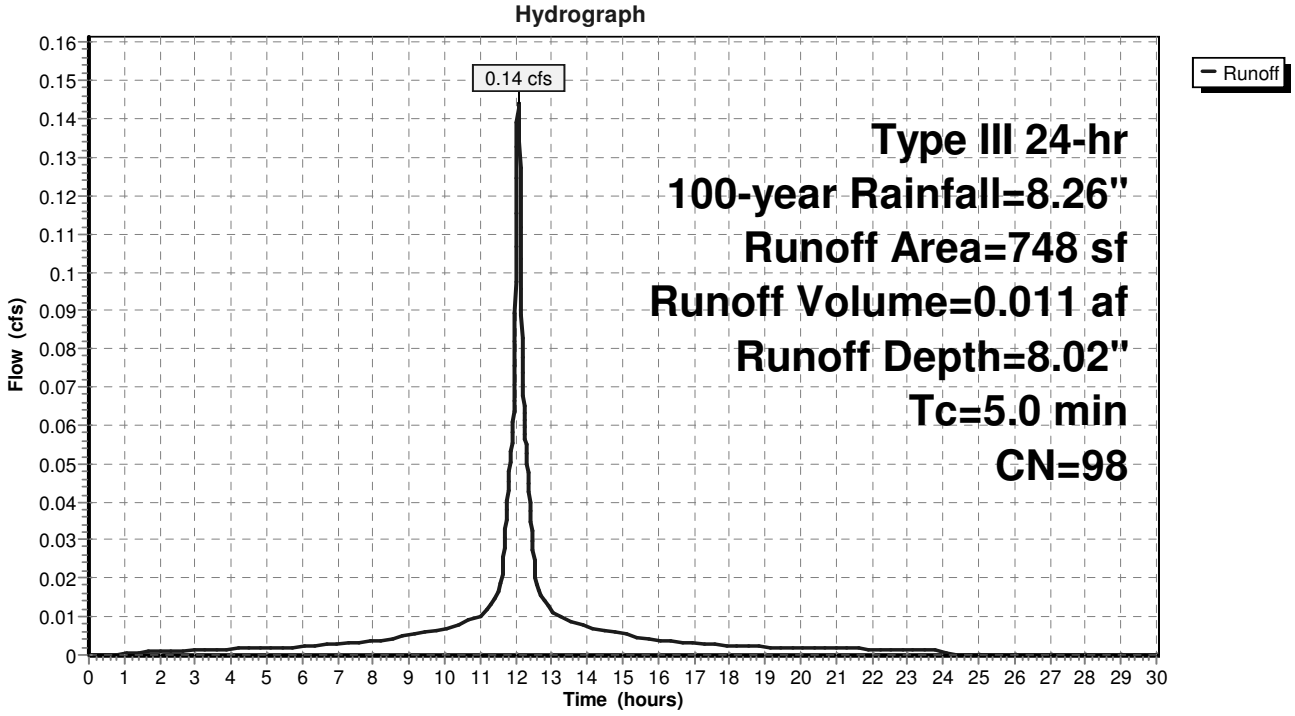
Runoff = 0.14 cfs @ 12.07 hrs, Volume= 0.011 af, Depth= 8.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=8.26"

Area (sf)	CN	Description
748	98	Roofs, HSG A
748		100.00% Impervious Area

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

Subcatchment P-1j: Roof #194 (portion)



Summary for Subcatchment P-2a: Woods, Yard & Driveway on #194

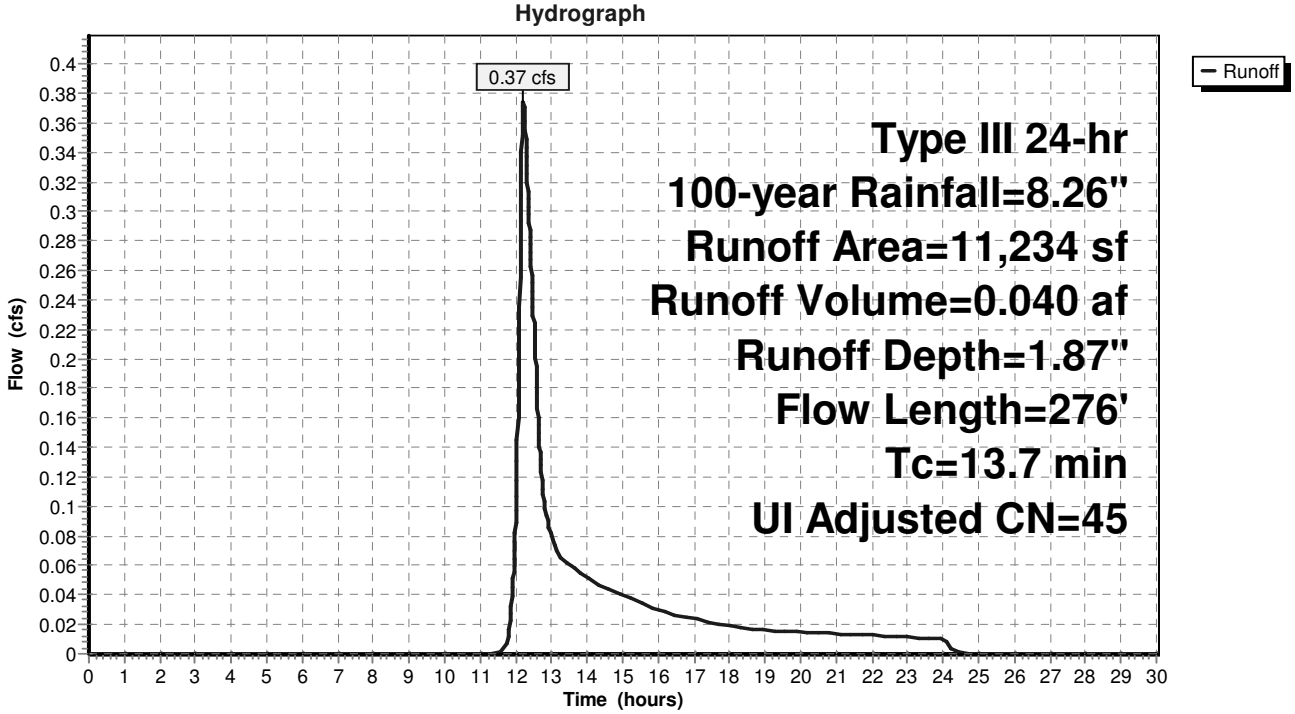
Runoff = 0.37 cfs @ 12.22 hrs, Volume= 0.040 af, Depth= 1.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=8.26"

Area (sf)	CN	Adj	Description
7,332	30		Woods, Good, HSG A
1,282	39		>75% Grass cover, Good, HSG A
575	98		Unconnected pavement, HSG A
2,045	98		Paved parking, HSG A
11,234	47	45	Weighted Average, UI Adjusted
8,614			76.68% Pervious Area
2,620			23.32% Impervious Area
575			21.95% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.0	50	0.2200	0.10		**Sheet Flow, seg 1** Woods: Dense underbrush n= 0.800 P2= 3.35"
1.1	77	0.2018	1.12		**Shallow Concentrated Flow, seg 2** Forest w/Heavy Litter Kv= 2.5 fps
3.6	66	0.0151	0.31		**Shallow Concentrated Flow, seg 3** Forest w/Heavy Litter Kv= 2.5 fps
0.4	24	0.1681	1.02		**Shallow Concentrated Flow, seg 4** Forest w/Heavy Litter Kv= 2.5 fps
0.6	59	0.0510	1.58		**Shallow Concentrated Flow, seg 5** Short Grass Pasture Kv= 7.0 fps
13.7	276	Total			

Subcatchment P-2a: Woods, Yard & Driveway on #194



Summary for Subcatchment P-2b: #194 Front Yard

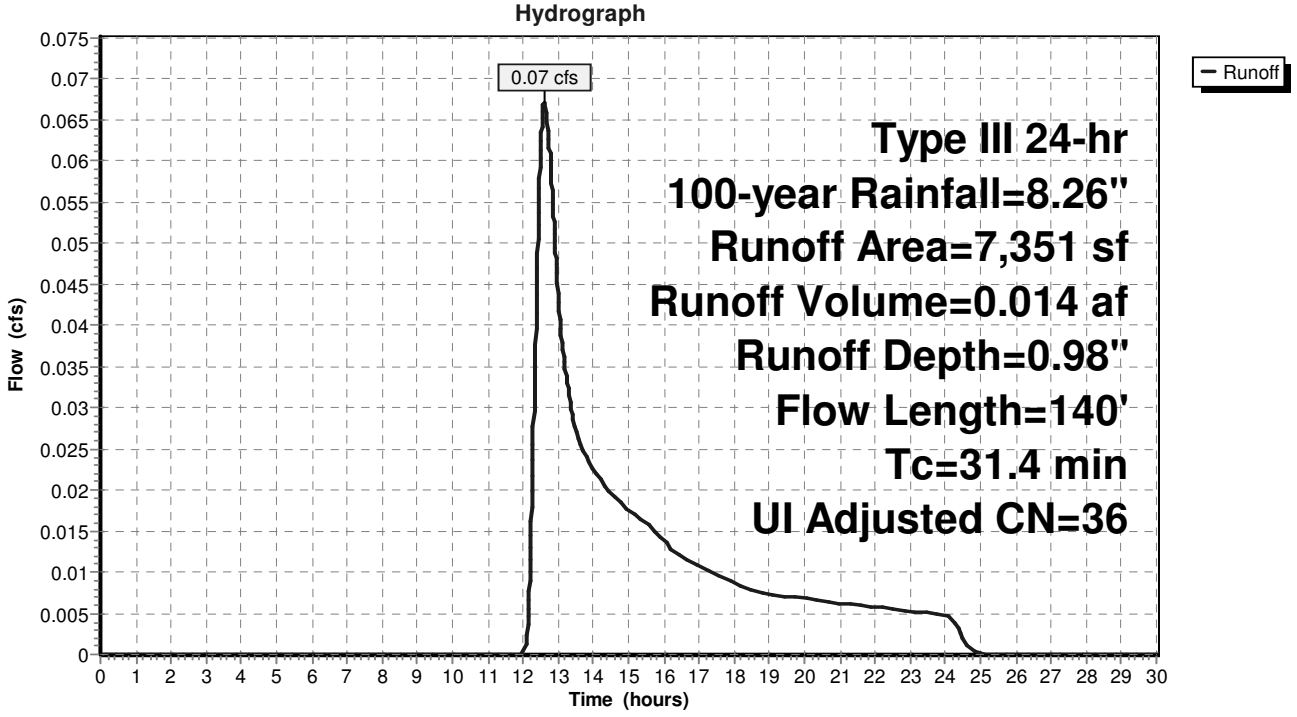
Runoff = 0.07 cfs @ 12.60 hrs, Volume= 0.014 af, Depth= 0.98"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=8.26"

Area (sf)	CN	Adj	Description
4,320	30		Woods, Good, HSG A
2,487	39		>75% Grass cover, Good, HSG A
544	98		Unconnected pavement, HSG A
7,351	38	36	Weighted Average, UI Adjusted
6,807			92.60% Pervious Area
544			7.40% Impervious Area
544			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
27.7	50	0.0100	0.03		**Sheet Flow, seg 1** Woods: Dense underbrush n= 0.800 P2= 3.35"
3.7	90	0.0261	0.40		**Shallow Concentrated Flow, seg 2** Forest w/Heavy Litter Kv= 2.5 fps
31.4	140	Total			

Subcatchment P-2b: #194 Front Yard

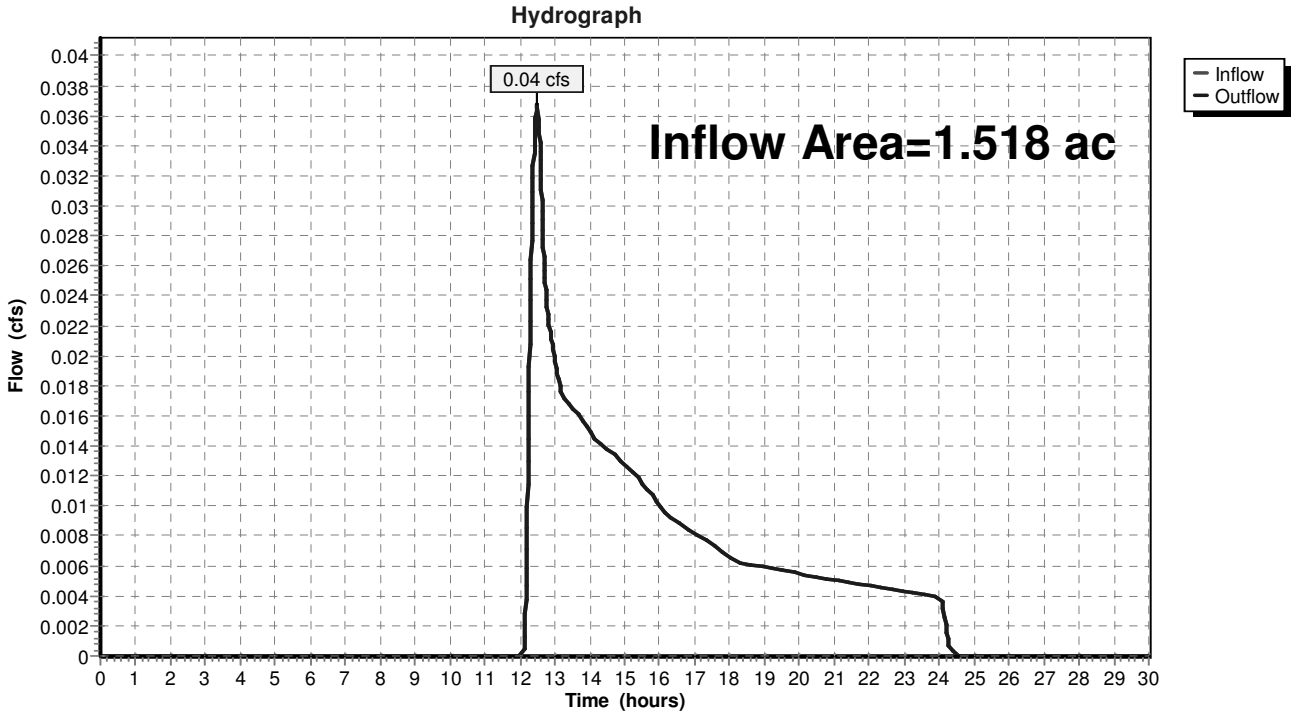


Summary for Reach DP-1: 200 Pond Road

Inflow Area = 1.518 ac, 18.93% Impervious, Inflow Depth = 0.07" for 100-year event
Inflow = 0.04 cfs @ 12.49 hrs, Volume= 0.009 af
Outflow = 0.04 cfs @ 12.49 hrs, Volume= 0.009 af, Atten= 0%, Lag= 0.0 min

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

Reach DP-1: 200 Pond Road

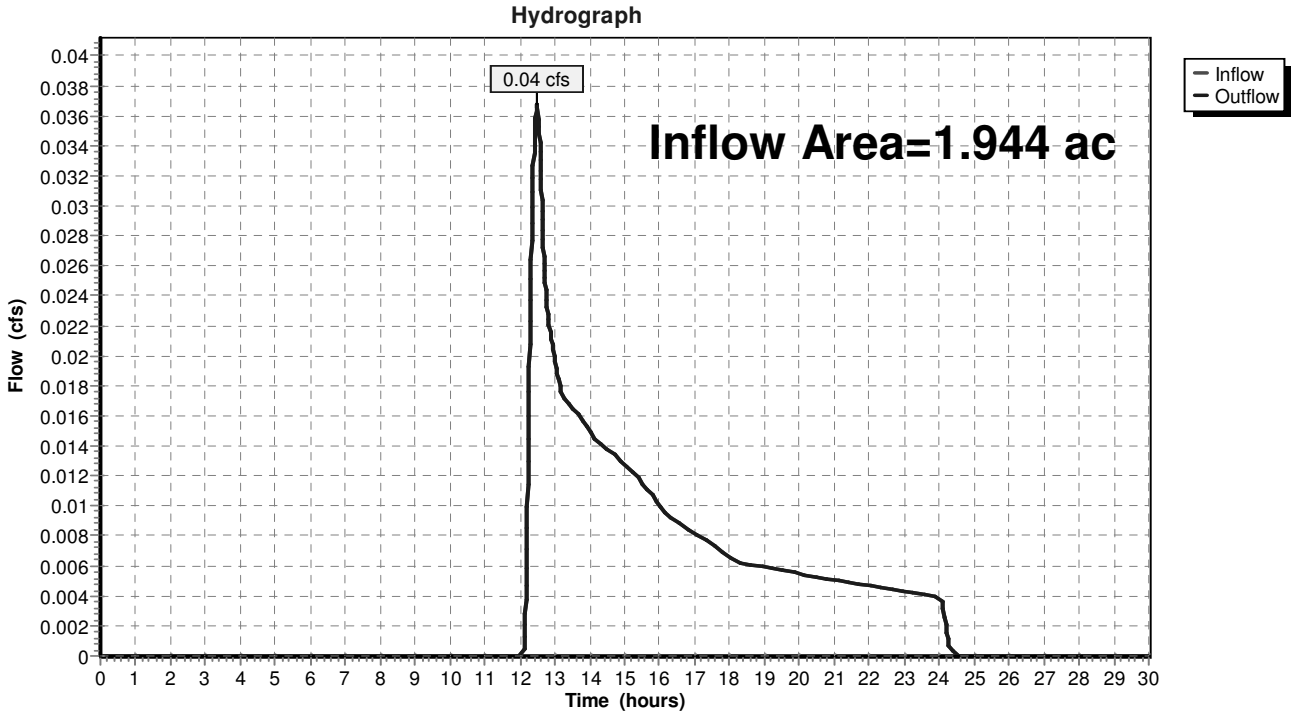


Summary for Reach DP-2: Pond Road

Inflow Area = 1.944 ac, 18.51% Impervious, Inflow Depth = 0.06" for 100-year event
Inflow = 0.04 cfs @ 12.49 hrs, Volume= 0.009 af
Outflow = 0.04 cfs @ 12.49 hrs, Volume= 0.009 af, Atten= 0%, Lag= 0.0 min

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

Reach DP-2: Pond Road



Summary for Pond Pd-1: Recharger #1

Inflow Area = 0.427 ac, 17.02% Impervious, Inflow Depth = 1.52" for 100-year event
Inflow = 0.39 cfs @ 12.22 hrs, Volume= 0.054 af
Outflow = 0.07 cfs @ 12.00 hrs, Volume= 0.054 af, Atten= 82%, Lag= 0.0 min
Discarded = 0.07 cfs @ 12.00 hrs, Volume= 0.054 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 165.78' @ 14.17 hrs Surf.Area= 364 sf Storage= 714 cf

Plug-Flow detention time= 99.1 min calculated for 0.054 af (100% of inflow)
Center-of-Mass det. time= 99.0 min (1,004.6 - 905.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	162.25'	407 cf	**13.00'W x 28.00'L x 5.25'H Field A** 1,911 cf Overall - 748 cf Embedded = 1,163 cf x 35.0% Voids
#2A	162.75'	557 cf	**Concrete Galley 4x4x4.25** x 12 Inside #1 Inside= 42.2"W x 45.0"H => 13.25 sf x 3.50'L = 46.4 cf Outside= 54.0"W x 51.0"H => 15.58 sf x 4.00'L = 62.3 cf 12 Chambers in 2 Rows
		964 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	162.25'	**8.270 in/hr Exfiltration over Horizontal area**
#2	Primary	166.50'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.07 cfs @ 12.00 hrs HW=162.31' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.07 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=162.25' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond Pd-1: Recharger #1 - Chamber Wizard Field A

Chamber Model = Concrete Galley 4x4x4.25 (Concrete Galley, Shea LE-EGH, LE-CGH or equivalent)
Inside= 42.2"W x 45.0"H => 13.25 sf x 3.50'L = 46.4 cf
Outside= 54.0"W x 51.0"H => 15.58 sf x 4.00'L = 62.3 cf

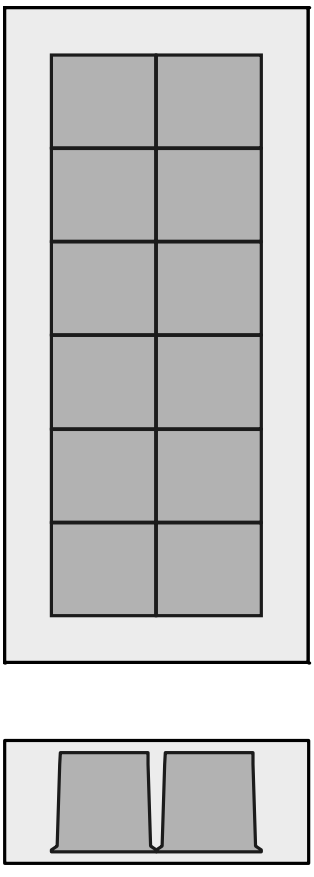
6 Chambers/Row x 4.00' Long = 24.00' Row Length +24.0" End Stone x 2 = 28.00' Base Length
2 Rows x 54.0" Wide + 24.0" Side Stone x 2 = 13.00' Base Width
6.0" Base + 51.0" Chamber Height + 6.0" Cover = 5.25' Field Height

12 Chambers x 46.4 cf = 556.6 cf Chamber Storage
12 Chambers x 62.3 cf = 748.0 cf Displacement

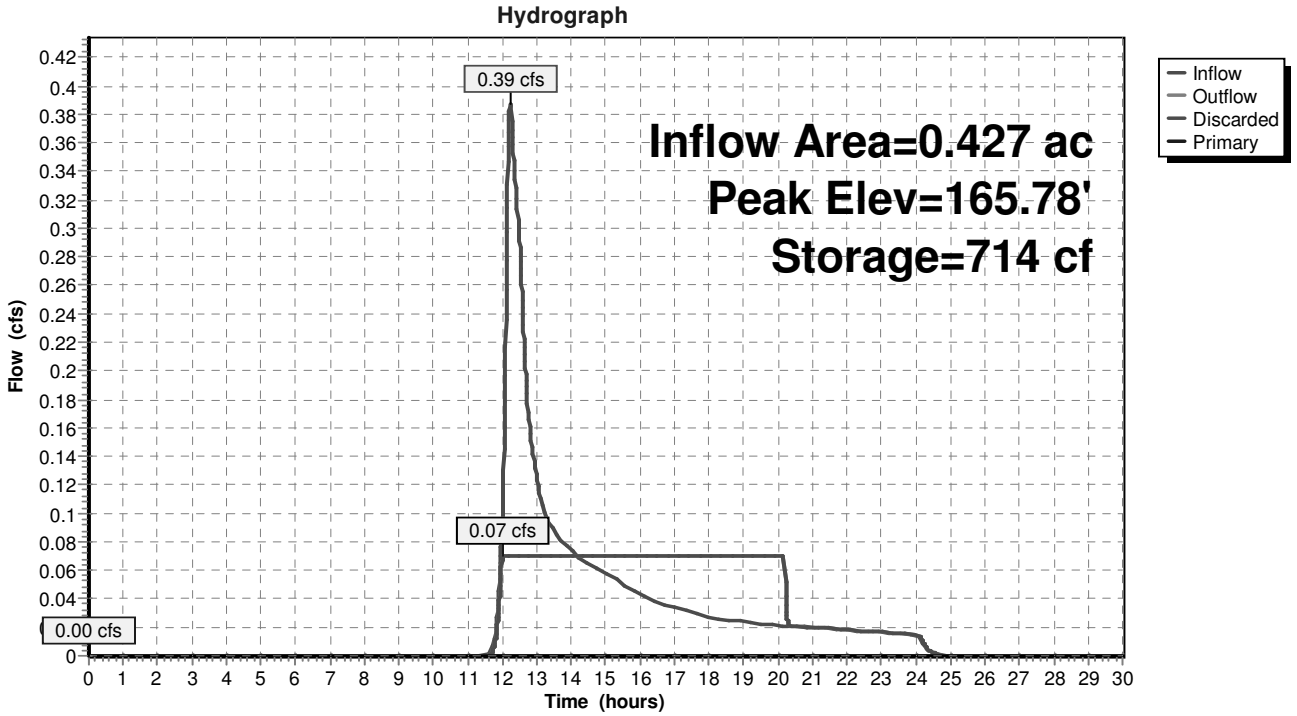
1,911.0 cf Field - 748.0 cf Chambers = 1,163.0 cf Stone x 35.0% Voids = 407.1 cf Stone Storage

Chamber Storage + Stone Storage = 963.6 cf = 0.022 af
Overall Storage Efficiency = 50.4%
Overall System Size = 28.00' x 13.00' x 5.25'

12 Chambers
70.8 cy Field
43.1 cy Stone



Pond Pd-1: Recharger #1



Summary for Pond Pd-2: Recharger #2

Inflow Area = 0.091 ac,100.00% Impervious, Inflow Depth = 6.75" for 100-year event
Inflow = 0.74 cfs @ 12.07 hrs, Volume= 0.051 af
Outflow = 0.06 cfs @ 11.44 hrs, Volume= 0.051 af, Atten= 91%, Lag= 0.0 min
Discarded = 0.06 cfs @ 11.44 hrs, Volume= 0.051 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 167.73' @ 12.75 hrs Surf.Area= 330 sf Storage= 758 cf

Plug-Flow detention time= 77.8 min calculated for 0.051 af (100% of inflow)
Center-of-Mass det. time= 77.8 min (817.4 - 739.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	164.00'	301 cf	**11.00'W x 30.00'L x 5.25'H Field A** 1,733 cf Overall - 873 cf Embedded = 860 cf x 35.0% Voids
#2A	164.50'	649 cf	**Concrete Galley 4x4x4.25** x 14 Inside #1 Inside= 42.2"W x 45.0"H => 13.25 sf x 3.50'L = 46.4 cf Outside= 54.0"W x 51.0"H => 15.58 sf x 4.00'L = 62.3 cf 14 Chambers in 2 Rows
#3	168.75'	1,003 cf	**Custom Stage Data** Listed below -Impervious
		1,953 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Elevation (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
168.75	0	0
169.00	1	1
169.50	1	2
169.75	1	3
169.80	1,000	1,003

Device	Routing	Invert	Outlet Devices
#1	Discarded	164.00'	**8.270 in/hr Exfiltration over Horizontal area**
#2	Primary	169.50'	**18.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.06 cfs @ 11.44 hrs HW=164.06' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.06 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=164.00' (Free Discharge)
↑—**2=Orifice/Grate** (Controls 0.00 cfs)

Pond Pd-2: Recharger #2 - Chamber Wizard Field A

Chamber Model = Concrete Galley 4x4x4.25 (Concrete Galley, Shea LE-EGH, LE-CGH or equivalent)
Inside= 42.2"W x 45.0"H => 13.25 sf x 3.50'L = 46.4 cf
Outside= 54.0"W x 51.0"H => 15.58 sf x 4.00'L = 62.3 cf

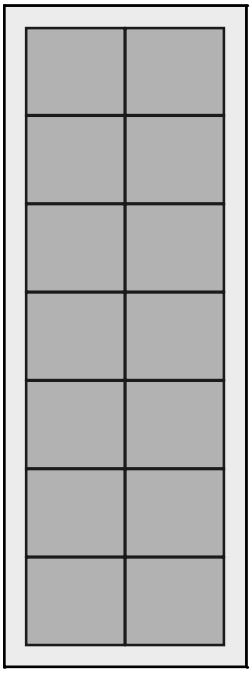
7 Chambers/Row x 4.00' Long = 28.00' Row Length +12.0" End Stone x 2 = 30.00' Base Length
2 Rows x 54.0" Wide + 12.0" Side Stone x 2 = 11.00' Base Width
6.0" Base + 51.0" Chamber Height + 6.0" Cover = 5.25' Field Height

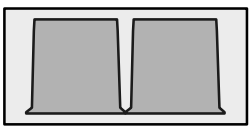
14 Chambers x 46.4 cf = 649.3 cf Chamber Storage
14 Chambers x 62.3 cf = 872.6 cf Displacement

1,732.5 cf Field - 872.6 cf Chambers = 859.9 cf Stone x 35.0% Voids = 301.0 cf Stone Storage

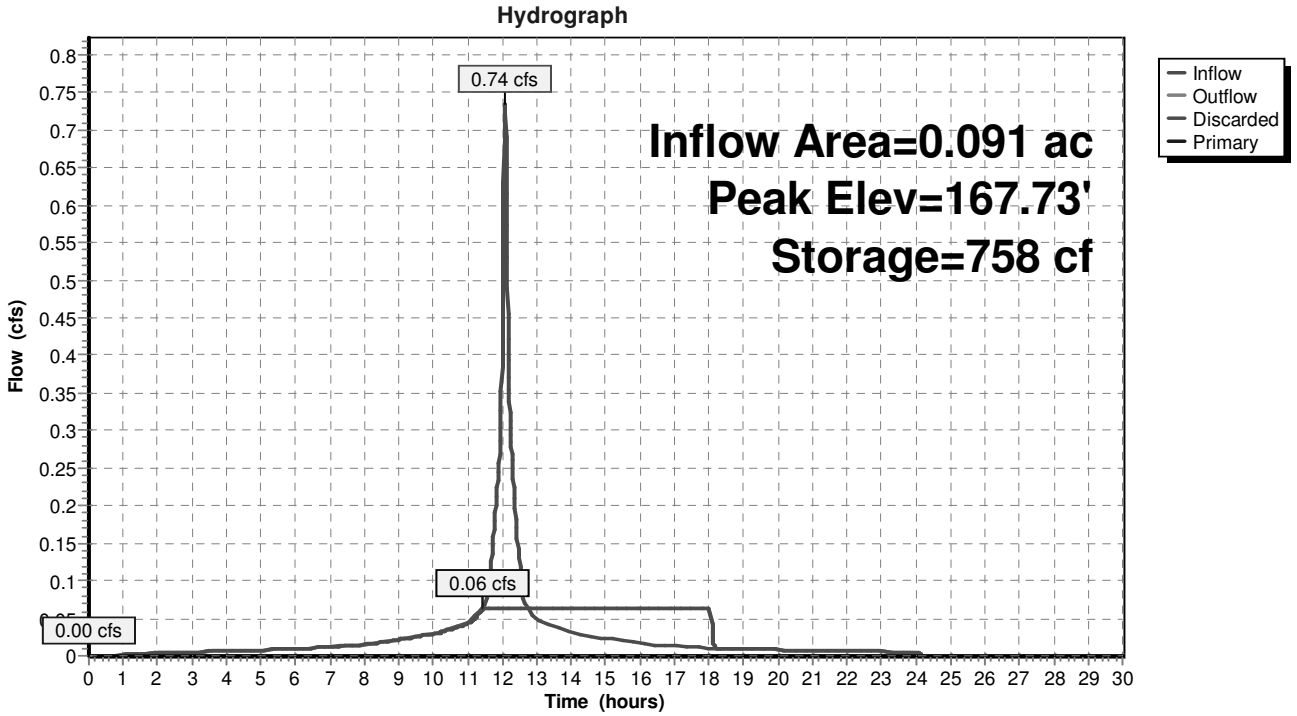
Chamber Storage + Stone Storage = 950.3 cf = 0.022 af
Overall Storage Efficiency = 54.9%
Overall System Size = 30.00' x 11.00' x 5.25'

14 Chambers
64.2 cy Field
31.8 cy Stone





Pond Pd-2: Recharger #2



Summary for Pond Pd-3: Recharger #3

Inflow Area = 0.291 ac, 0.12% Impervious, Inflow Depth = 0.56" for 100-year event
Inflow = 0.06 cfs @ 12.41 hrs, Volume= 0.014 af
Outflow = 0.06 cfs @ 12.45 hrs, Volume= 0.014 af, Atten= 1%, Lag= 2.2 min
Discarded = 0.06 cfs @ 12.45 hrs, Volume= 0.014 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 165.28' @ 12.45 hrs Surf.Area= 696 sf Storage= 7 cf

Plug-Flow detention time= 1.9 min calculated for 0.014 af (100% of inflow)
Center-of-Mass det. time= 1.9 min (972.1 - 970.2)

Volume	Invert	Avail.Storage	Storage Description
#1A	165.25'	755 cf	**58.00'W x 12.00'L x 5.25'H Field A** 3,654 cf Overall - 1,496 cf Embedded = 2,158 cf x 35.0% Voids
#2A	165.75'	1,113 cf	**Concrete Galley 4x4x4.25** x 24 Inside #1 Inside= 42.2"W x 45.0"H => 13.25 sf x 3.50'L = 46.4 cf Outside= 54.0"W x 51.0"H => 15.58 sf x 4.00'L = 62.3 cf 24 Chambers in 12 Rows
#3	170.50'	1,002 cf	**Custom Stage Data** Listed below -Impervious
		2,870 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Elevation (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
170.50	0	0
171.00	1	1
171.50	1	2
171.60	1,000	1,002

Device	Routing	Invert	Outlet Devices
#1	Discarded	165.25'	**8.270 in/hr Exfiltration over Horizontal area**
#2	Primary	171.50'	**18.0" Horiz. Orifice/Grate** X 3 rows C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.13 cfs @ 12.45 hrs HW=165.28' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.13 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=165.25' (Free Discharge)
↑—**2=Orifice/Grate** (Controls 0.00 cfs)

Pond Pd-3: Recharger #3 - Chamber Wizard Field A

Chamber Model = Concrete Galley 4x4x4.25 (Concrete Galley, Shea LE-EGH, LE-CGH or equivalent)
Inside= 42.2"W x 45.0"H => 13.25 sf x 3.50'L = 46.4 cf
Outside= 54.0"W x 51.0"H => 15.58 sf x 4.00'L = 62.3 cf

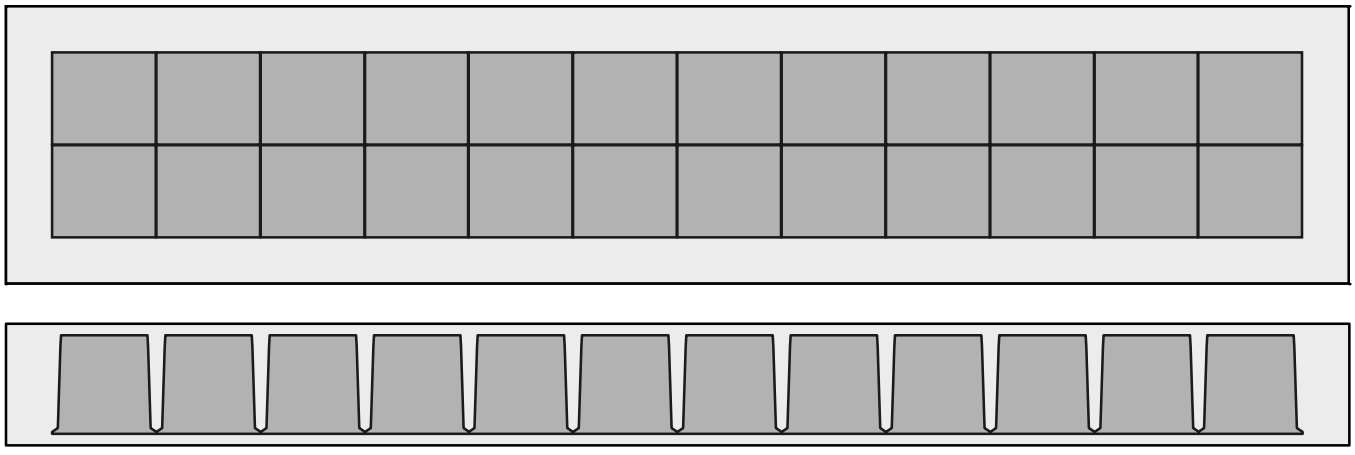
2 Chambers/Row x 4.00' Long = 8.00' Row Length +24.0" End Stone x 2 = 12.00' Base Length
12 Rows x 54.0" Wide + 24.0" Side Stone x 2 = 58.00' Base Width
6.0" Base + 51.0" Chamber Height + 6.0" Cover = 5.25' Field Height

24 Chambers x 46.4 cf = 1,113.1 cf Chamber Storage
24 Chambers x 62.3 cf = 1,496.0 cf Displacement

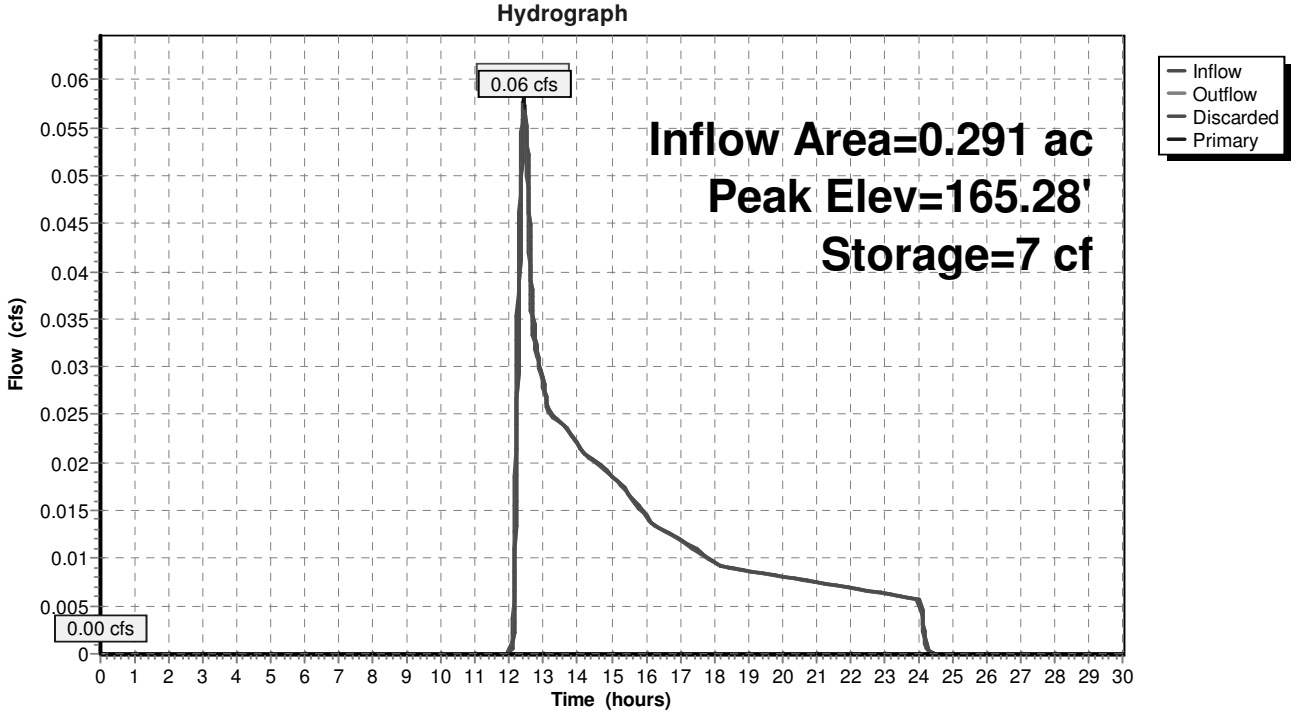
3,654.0 cf Field - 1,496.0 cf Chambers = 2,158.0 cf Stone x 35.0% Voids = 755.3 cf Stone Storage

Chamber Storage + Stone Storage = 1,868.5 cf = 0.043 af
Overall Storage Efficiency = 51.1%
Overall System Size = 12.00' x 58.00' x 5.25'

24 Chambers
135.3 cy Field
79.9 cy Stone



Pond Pd-3: Recharger #3



Summary for Pond Pd-4: Recharger #4

Inflow Area = 0.062 ac,100.00% Impervious, Inflow Depth = 5.93" for 100-year event
Inflow = 0.47 cfs @ 12.09 hrs, Volume= 0.031 af
Outflow = 0.05 cfs @ 11.64 hrs, Volume= 0.031 af, Atten= 89%, Lag= 0.0 min
Discarded = 0.05 cfs @ 11.64 hrs, Volume= 0.031 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 165.97' @ 12.55 hrs Surf.Area= 280 sf Storage= 413 cf

Plug-Flow detention time= 44.7 min calculated for 0.031 af (100% of inflow)
Center-of-Mass det. time= 44.7 min (784.1 - 739.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	163.25'	318 cf	**17.50'W x 16.00'L x 5.25'H Field A** 1,470 cf Overall - 561 cf Embedded = 909 cf x 35.0% Voids
#2A	163.75'	417 cf	**Concrete Galley 4x4x4.25** x 9 Inside #1 Inside= 42.2"W x 45.0"H => 13.25 sf x 3.50'L = 46.4 cf Outside= 54.0"W x 51.0"H => 15.58 sf x 4.00'L = 62.3 cf 9 Chambers in 3 Rows
#3	168.50'	1,002 cf	**Custom Stage Data** Listed below -Impervious
		1,738 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Elevation (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
168.50	0	0
169.50	1	1
170.50	1	2
170.60	1,000	1,002

Device	Routing	Invert	Outlet Devices
#1	Discarded	163.25'	**8.270 in/hr Exfiltration over Horizontal area**
#2	Primary	170.50'	**6.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.05 cfs @ 11.64 hrs HW=163.32' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.05 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=163.25' (Free Discharge)
2=Orifice/Grate (Controls 0.00 cfs)

Pond Pd-4: Recharger #4 - Chamber Wizard Field A

Chamber Model = Concrete Galley 4x4x4.25 (Concrete Galley, Shea LE-EGH, LE-CGH or equivalent)
Inside= 42.2"W x 45.0"H => 13.25 sf x 3.50'L = 46.4 cf
Outside= 54.0"W x 51.0"H => 15.58 sf x 4.00'L = 62.3 cf

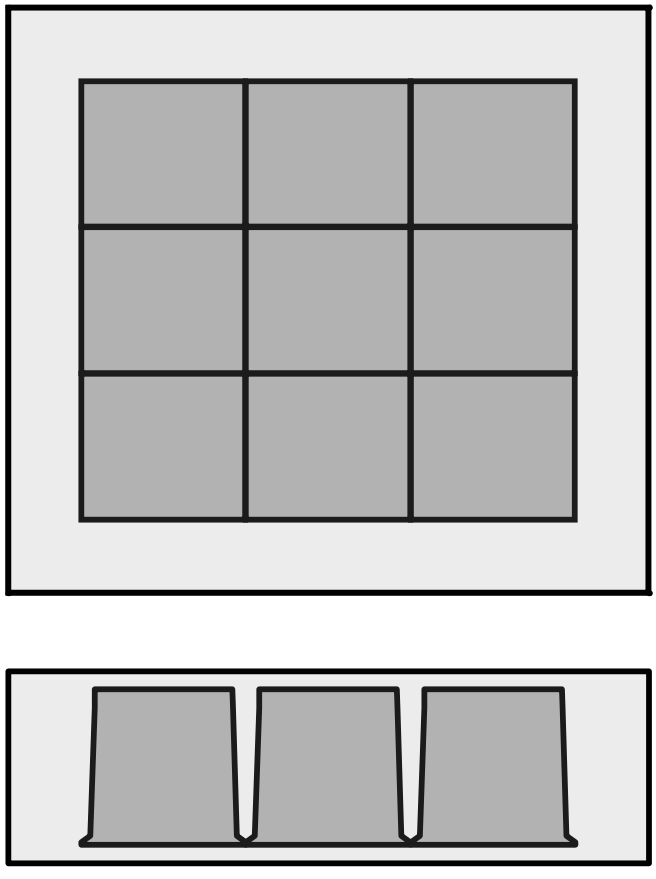
3 Chambers/Row x 4.00' Long = 12.00' Row Length +24.0" End Stone x 2 = 16.00' Base Length
3 Rows x 54.0" Wide + 24.0" Side Stone x 2 = 17.50' Base Width
6.0" Base + 51.0" Chamber Height + 6.0" Cover = 5.25' Field Height

9 Chambers x 46.4 cf = 417.4 cf Chamber Storage
9 Chambers x 62.3 cf = 561.0 cf Displacement

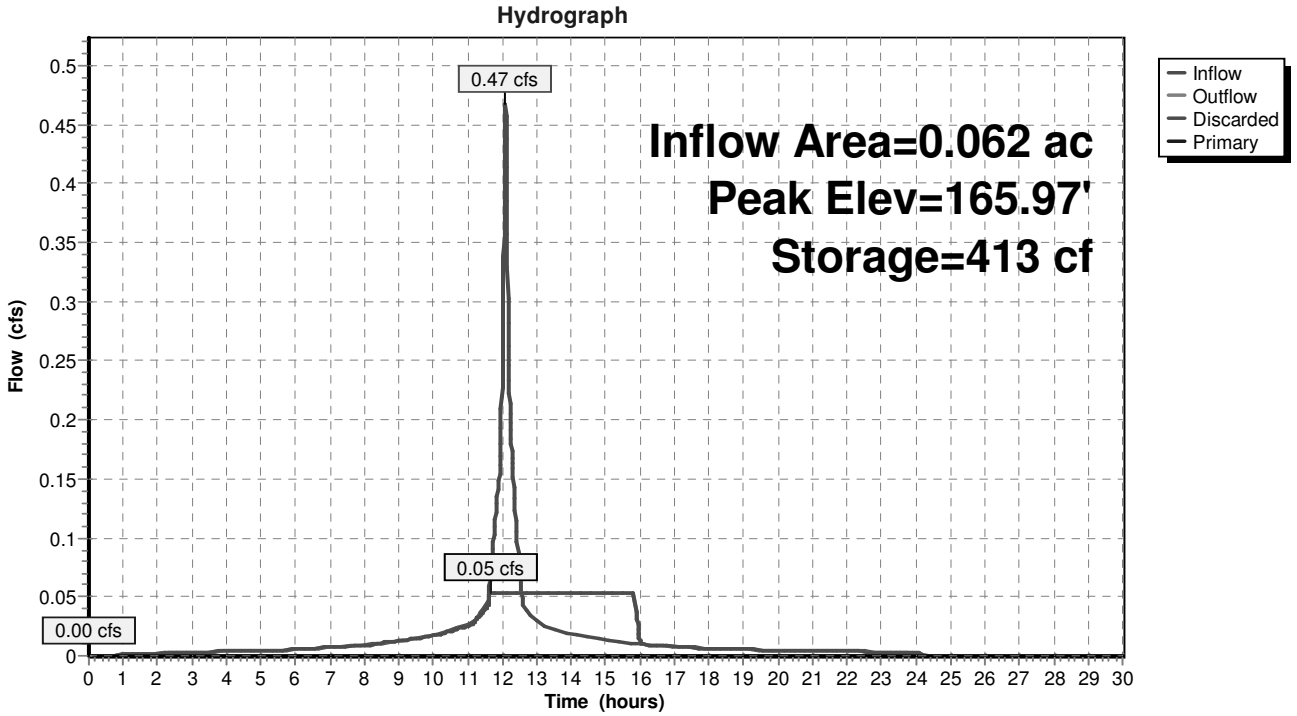
1,470.0 cf Field - 561.0 cf Chambers = 909.0 cf Stone x 35.0% Voids = 318.2 cf Stone Storage

Chamber Storage + Stone Storage = 735.6 cf = 0.017 af
Overall Storage Efficiency = 50.0%
Overall System Size = 16.00' x 17.50' x 5.25'

9 Chambers
54.4 cy Field
33.7 cy Stone



Pond Pd-4: Recharger #4



Summary for Pond Pd-5: Recharger #5

Inflow Area = 0.084 ac, 48.19% Impervious, Inflow Depth = 4.02" for 100-year event
Inflow = 0.35 cfs @ 12.08 hrs, Volume= 0.028 af
Outflow = 0.04 cfs @ 11.65 hrs, Volume= 0.028 af, Atten= 89%, Lag= 0.0 min
Discarded = 0.04 cfs @ 11.65 hrs, Volume= 0.028 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 168.09' @ 12.88 hrs Surf.Area= 204 sf Storage= 368 cf

Plug-Flow detention time= 65.5 min calculated for 0.028 af (100% of inflow)
Center-of-Mass det. time= 65.4 min (848.7 - 783.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	164.50'	266 cf	**8.50'W x 24.00'L x 5.25'H Field A** 1,071 cf Overall - 312 cf Embedded = 759 cf x 35.0% Voids
#2A	165.00'	232 cf	**Concrete Galley 4x4x4.25** x 5 Inside #1 Inside= 42.2"W x 45.0"H => 13.25 sf x 3.50'L = 46.4 cf Outside= 54.0"W x 51.0"H => 15.58 sf x 4.00'L = 62.3 cf
		498 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	164.50'	**8.270 in/hr Exfiltration over Horizontal area**
#2	Primary	168.75'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.04 cfs @ 11.65 hrs HW=164.56' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.04 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=164.50' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond Pd-5: Recharger #5 - Chamber Wizard Field A

Chamber Model = Concrete Galley 4x4x4.25 (Concrete Galley, Shea LE-EGH, LE-CGH or equivalent)
Inside= 42.2"W x 45.0"H => 13.25 sf x 3.50'L = 46.4 cf
Outside= 54.0"W x 51.0"H => 15.58 sf x 4.00'L = 62.3 cf

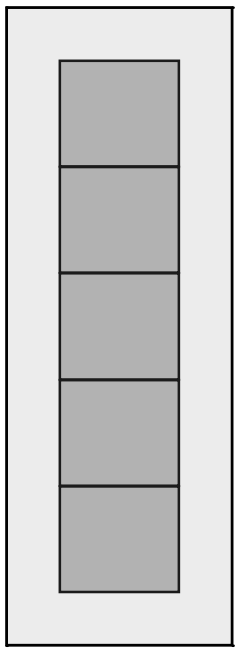
5 Chambers/Row x 4.00' Long = 20.00' Row Length +24.0" End Stone x 2 = 24.00' Base Length
1 Rows x 54.0" Wide + 24.0" Side Stone x 2 = 8.50' Base Width
6.0" Base + 51.0" Chamber Height + 6.0" Cover = 5.25' Field Height

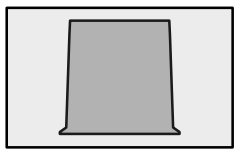
5 Chambers x 46.4 cf = 231.9 cf Chamber Storage
5 Chambers x 62.3 cf = 311.7 cf Displacement

1,071.0 cf Field - 311.7 cf Chambers = 759.3 cf Stone x 35.0% Voids = 265.8 cf Stone Storage

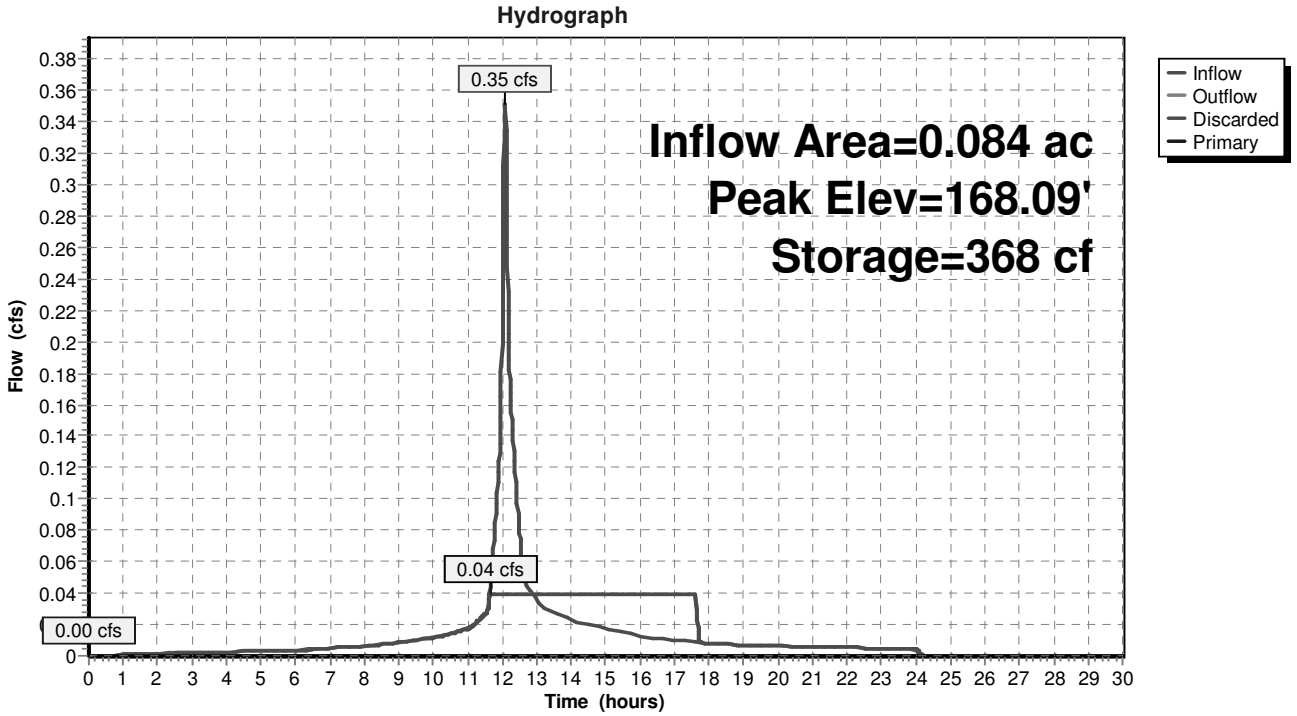
Chamber Storage + Stone Storage = 497.7 cf = 0.011 af
Overall Storage Efficiency = 46.5%
Overall System Size = 24.00' x 8.50' x 5.25'

5 Chambers
39.7 cy Field
28.1 cy Stone





Pond Pd-5: Recharger #5



Summary for Pond Pd-6: Recharger #6

Inflow Area = 1.235 ac, 19.98% Impervious, Inflow Depth = 0.51" for 100-year event
Inflow = 0.44 cfs @ 12.26 hrs, Volume= 0.053 af
Outflow = 0.08 cfs @ 11.99 hrs, Volume= 0.053 af, Atten= 81%, Lag= 0.0 min
Discarded = 0.08 cfs @ 11.99 hrs, Volume= 0.053 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 160.26' @ 13.19 hrs Surf.Area= 440 sf Storage= 623 cf

Plug-Flow detention time= 68.9 min calculated for 0.053 af (100% of inflow)
Center-of-Mass det. time= 68.8 min (955.6 - 886.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	157.75'	459 cf	**22.00'W x 20.00'L x 5.25'H Field A** 2,310 cf Overall - 997 cf Embedded = 1,313 cf x 35.0% Voids
#2A	158.25'	742 cf	**Concrete Galley 4x4x4.25** x 16 Inside #1 Inside= 42.2"W x 45.0"H => 13.25 sf x 3.50'L = 46.4 cf Outside= 54.0"W x 51.0"H => 15.58 sf x 4.00'L = 62.3 cf 16 Chambers in 4 Rows
		1,202 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	157.75'	**8.270 in/hr Exfiltration over Horizontal area**
#2	Primary	162.00'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.08 cfs @ 11.99 hrs HW=157.80' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.08 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=157.75' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond Pd-6: Recharger #6 - Chamber Wizard Field A

Chamber Model = Concrete Galley 4x4x4.25 (Concrete Galley, Shea LE-EGH, LE-CGH or equivalent)
Inside= 42.2"W x 45.0"H => 13.25 sf x 3.50'L = 46.4 cf
Outside= 54.0"W x 51.0"H => 15.58 sf x 4.00'L = 62.3 cf

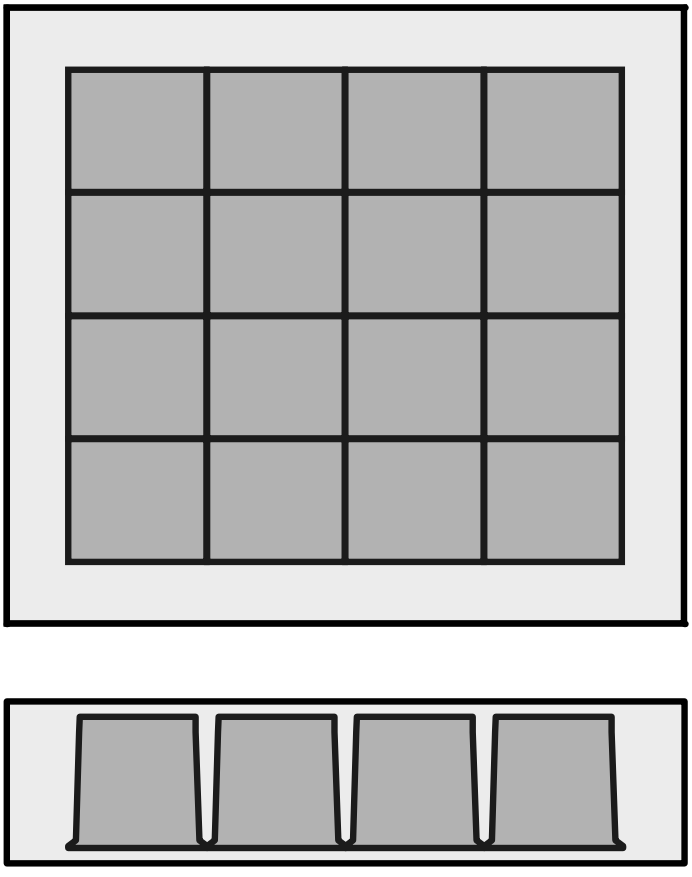
4 Chambers/Row x 4.00' Long = 16.00' Row Length +24.0" End Stone x 2 = 20.00' Base Length
4 Rows x 54.0" Wide + 24.0" Side Stone x 2 = 22.00' Base Width
6.0" Base + 51.0" Chamber Height + 6.0" Cover = 5.25' Field Height

16 Chambers x 46.4 cf = 742.1 cf Chamber Storage
16 Chambers x 62.3 cf = 997.3 cf Displacement

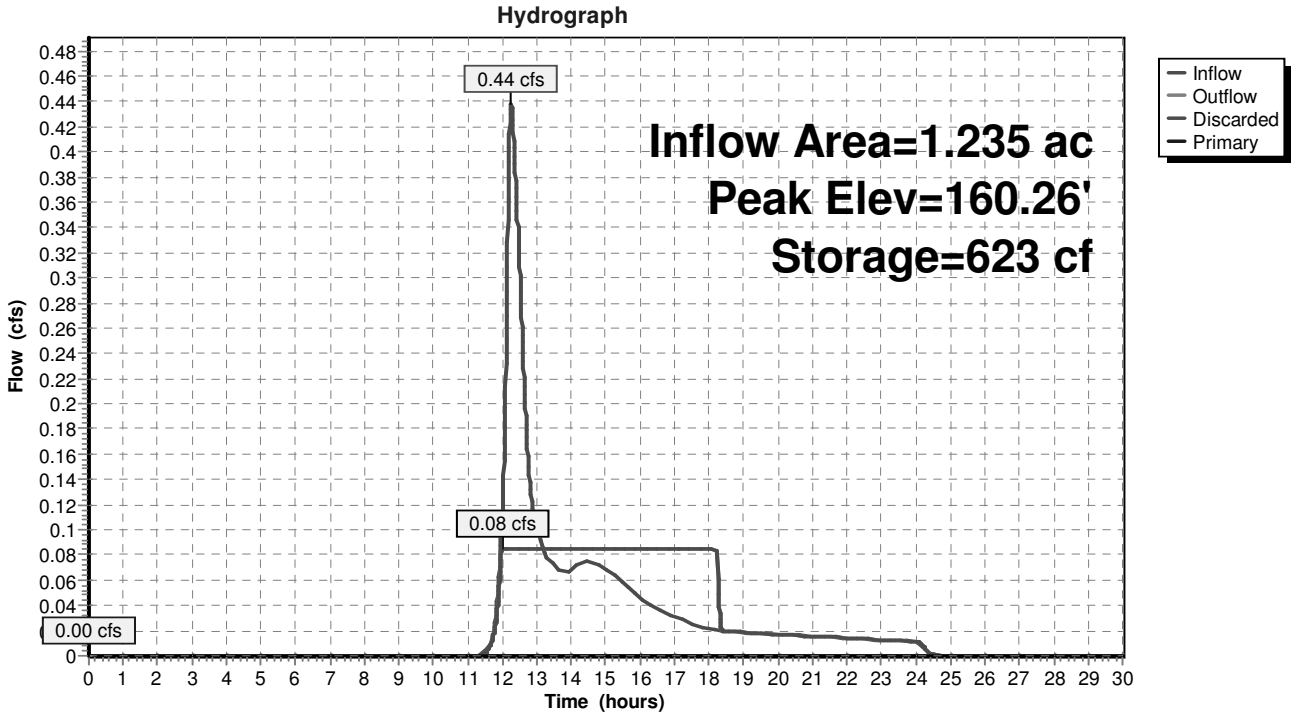
2,310.0 cf Field - 997.3 cf Chambers = 1,312.7 cf Stone x 35.0% Voids = 459.4 cf Stone Storage

Chamber Storage + Stone Storage = 1,201.5 cf = 0.028 af
Overall Storage Efficiency = 52.0%
Overall System Size = 20.00' x 22.00' x 5.25'

16 Chambers
85.6 cy Field
48.6 cy Stone



Pond Pd-6: Recharger #6



Summary for Pond Pd-7: Rain Garden #1

Inflow Area = 0.017 ac,100.00% Impervious, Inflow Depth = 8.02" for 100-year event
Inflow = 0.14 cfs @ 12.07 hrs, Volume= 0.011 af
Outflow = 0.14 cfs @ 12.08 hrs, Volume= 0.011 af, Atten= 2%, Lag= 0.8 min
Discarded = 0.03 cfs @ 12.08 hrs, Volume= 0.010 af
Primary = 0.12 cfs @ 12.08 hrs, Volume= 0.002 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 169.80' @ 12.08 hrs Surf.Area= 133 sf Storage= 68 cf

Plug-Flow detention time= 13.8 min calculated for 0.011 af (100% of inflow)
Center-of-Mass det. time= 13.8 min (753.7 - 739.9)

Volume	Invert	Avail.Storage	Storage Description
#1	169.00'	97 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

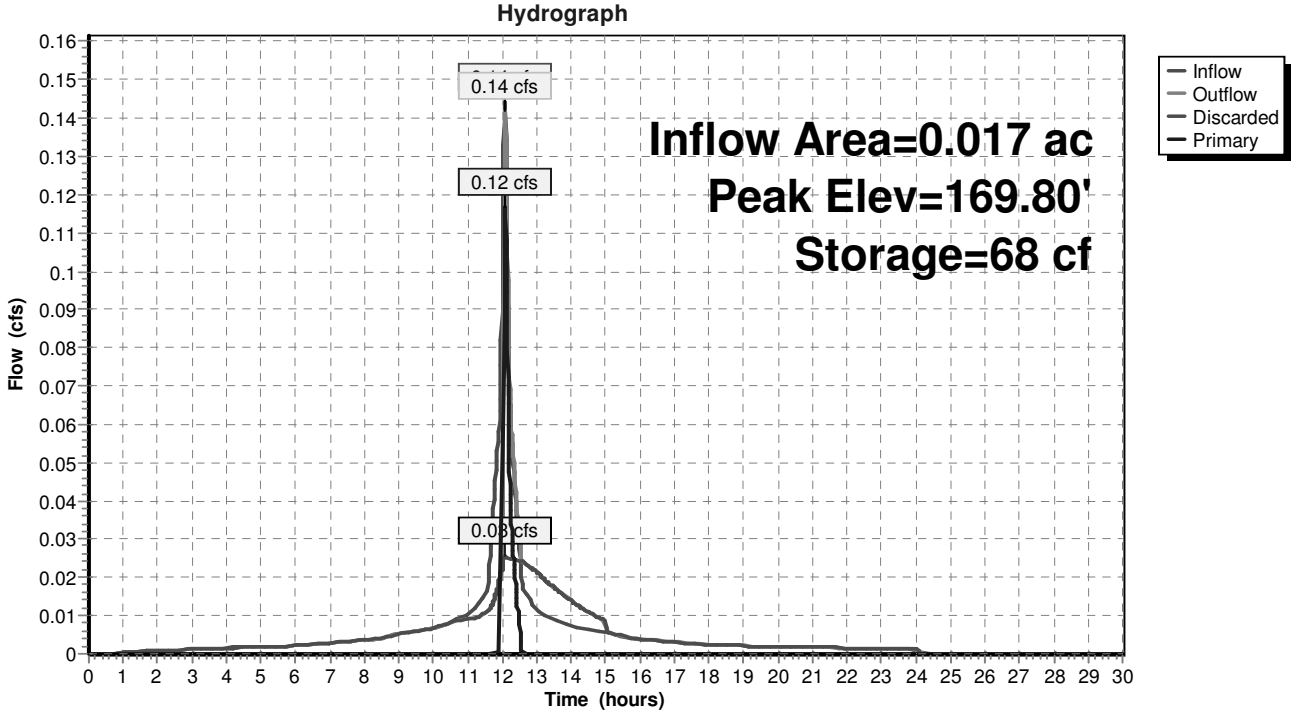
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
169.00	44	29.0	0	0	44
169.75	126	43.0	61	61	129
170.00	164	47.0	36	97	159

Device	Routing	Invert	Outlet Devices
#1	Discarded	169.00'	**8.270 in/hr Exfiltration over Horizontal area**
#2	Primary	169.75'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.03 cfs @ 12.08 hrs HW=169.80' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.03 cfs)

Primary OutFlow Max=0.12 cfs @ 12.08 hrs HW=169.80' (Free Discharge)
↑—**2=Orifice/Grate** (Weir Controls 0.12 cfs @ 0.73 fps)

Pond Pd-7: Rain Garden #1



Summary for Pond Pd-8: Rain Garden #2

Inflow Area = 0.019 ac,100.00% Impervious, Inflow Depth = 8.02" for 100-year event
Inflow = 0.16 cfs @ 12.07 hrs, Volume= 0.012 af
Outflow = 0.15 cfs @ 12.10 hrs, Volume= 0.012 af, Atten= 7%, Lag= 1.9 min
Discarded = 0.03 cfs @ 12.10 hrs, Volume= 0.011 af
Primary = 0.12 cfs @ 12.10 hrs, Volume= 0.002 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 169.80' @ 12.10 hrs Surf.Area= 155 sf Storage= 83 cf

Plug-Flow detention time= 14.4 min calculated for 0.012 af (100% of inflow)
Center-of-Mass det. time= 14.4 min (754.2 - 739.9)

Volume	Invert	Avail.Storage	Storage Description
#1	169.00'	117 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

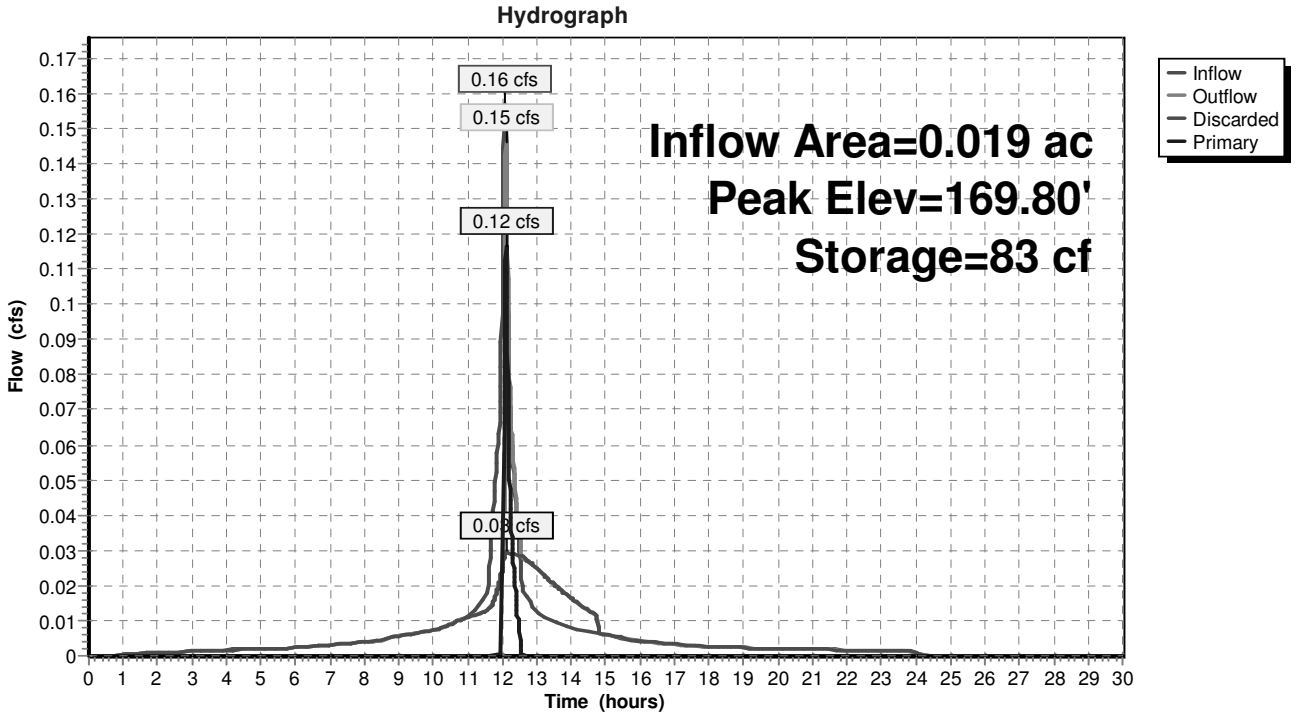
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
169.00	59	32.0	0	0	59
169.75	148	46.0	75	75	151
170.00	184	51.0	41	117	191

Device	Routing	Invert	Outlet Devices
#1	Discarded	169.00'	**8.270 in/hr Exfiltration over Horizontal area**
#2	Primary	169.75'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.03 cfs @ 12.10 hrs HW=169.80' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.03 cfs)

Primary OutFlow Max=0.12 cfs @ 12.10 hrs HW=169.80' (Free Discharge)
↑—**2=Orifice/Grate** (Weir Controls 0.12 cfs @ 0.73 fps)

Pond Pd-8: Rain Garden #2



Summary for Pond Pd-9: On-Site Depression

Inflow Area = 0.969 ac, 18.84% Impervious, Inflow Depth = 0.53" for 100-year event
Inflow = 0.27 cfs @ 12.29 hrs, Volume= 0.043 af
Outflow = 0.05 cfs @ 14.69 hrs, Volume= 0.041 af, Atten= 80%, Lag= 144.4 min
Discarded = 0.03 cfs @ 14.69 hrs, Volume= 0.037 af
Primary = 0.02 cfs @ 14.69 hrs, Volume= 0.004 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 168.31' @ 14.69 hrs Surf.Area= 2,643 sf Storage= 706 cf

Plug-Flow detention time= 271.0 min calculated for 0.041 af (95% of inflow)
Center-of-Mass det. time= 248.3 min (1,179.2 - 930.9)

Volume	Invert	Avail.Storage	Storage Description
#1	167.70'	1,283 cf	**Custom Stage Data (Irregular)** Listed below

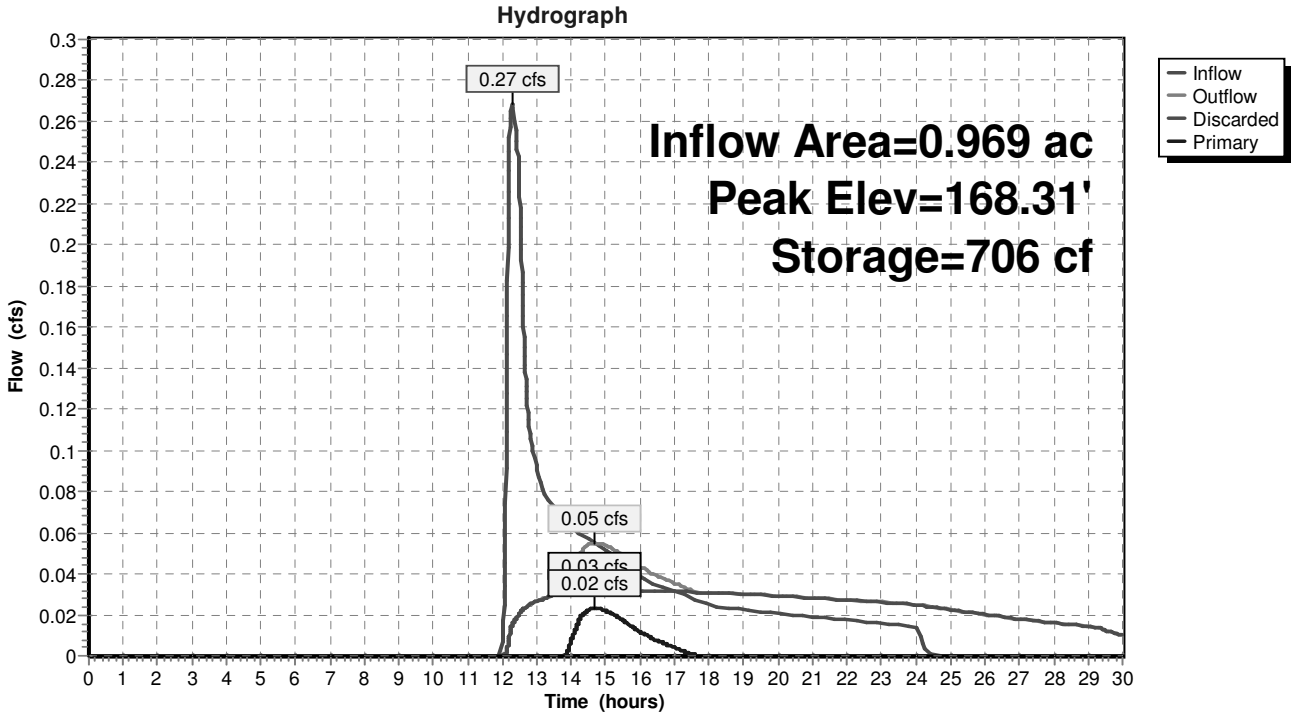
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
167.70	1	4.0	0	0	1
168.00	1,168	185.5	120	120	2,738
168.30	2,582	198.8	549	669	3,149
168.50	3,589	243.3	614	1,283	4,715

Device	Routing	Invert	Outlet Devices
#1	Primary	168.30'	**6.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#2	Discarded	167.70'	**0.520 in/hr Exfiltration over Horizontal area**

Discarded OutFlow Max=0.03 cfs @ 14.69 hrs HW=168.31' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.03 cfs)

Primary OutFlow Max=0.02 cfs @ 14.69 hrs HW=168.31' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 0.02 cfs @ 0.31 fps)

Pond Pd-9: On-Site Depression



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APPENDIX 1

Attachment 1
Soil Test Report, prepared by DGT Associates, dated 6/18/19

Attachment 2
Soil Test Logs from Additional Witnessed Soil Testing,
Conducted by DGT Associates on 1/29/20

for

#194 & #196 Pond Road
Wellesley, Massachusetts 02482

REVISED: February 26, 2020

DGT Associates
Surveying &
Engineering

1071 Worcester Rd.
Framingham, MA 01701
508.879.0030
www.dgtassociates.com

June 18, 2019

Job: 25485

Town of Wellesley – Wellesley Health Department
Attn: Mr. Steve Calichman
90 Washington Street
Wellesley, MA 02481

RE: 194 & 196 Pond Road, Wellesley – Soil Testing

Dear Mr. Calichman:

This report contains the results of the on-site soil testing conducted by DGT Associates (formerly Schofield Brothers) on June 4th & 5th of 2019 at the subject properties in Wellesley, Massachusetts. (Note: The lots that were tested have not officially been subdivided, and therefore the addresses are subject to change. The lot is currently known as 200 Pond Road, Wellesley, MA 02482.) The testing consisted of eight (8) deep hole test pits and four (4) percolation test holes. D.J. Morris Contracting Co. Inc. provided the backhoe services for both days of testing. Attachment 3 contains a map showing the locations of the soil test pits.

The purpose of the testing was to assess the suitability of the soils for the design of soil absorption systems (SAS) for a proposed development at each potential lot. Testing was performed by Massachusetts Licensed Soil Evaluator (Joseph A. Losanno, EIT) of DGT. Steve Calichman from the Town of Wellesley Health Department witnessed both days of testing.

According to the Natural Resources Conservation Service (NRCS) Soils Mapping, the soil in the area of testing is Canton fine sandy loam. The testing generally confirmed the NRCS data. Attachment 2 contains the NRCS Map for the site and descriptions of the soil type.

Generally, the testing revealed a sandy loam topsoil, over a sandy loam subsoil, over a fine to medium sand and a medium to coarse sand substratum. No signs of refusal or Estimated Seasonal High Groundwater Table (ESHGWT), including redoximorphic features, weeping or standing groundwater, were observed during our testing. Deep observation hole logs are contained in Attachment 1.

Percolation tests were performed within the sand substratum layers adjacent to test pits TH 19-01 and TH 19-02 for #196 Pond Road, and TH 19-06 and TH 19-08 for #194 Pond Road. The soak could not be maintained in any of the four tests performed, and therefore a rate less than two (2) minutes per inch will be used for design purposes. The percolation test logs are contained at the end of Attachment 1.

As discussed on-site, due to the project development program and to minimize the size of the SAS, all material above the sand substratum soil will be removed prior to the installation of any SAS. No percolation testing was performed above the sand substratum soil, and therefore confirmatory/additional testing will be required if this layer is not to be removed due to any project/scope changes in the future.

DGT Associates
Surveying &
Engineering

1071 Worcester Rd.
Framingham, MA 01701
508.879.0030
www.dgtassociates.com

Please contact me if you have any questions regarding this report.

Sincerely,
DGT Associates

Joseph A. Losanno, EIT (SE 13870)
Project Engineer

Attachments:

1. Deep Observation Hole & Percolation Test Logs
2. NRCS Soils Map and Information
3. Soil Test Hole Location Plan
4. USGS Surficial Geology Map

Location Address or Lot No. 196 Pond Road, Wellesley, MA 02482

On-site Witnessed Soil Test Review

Deep Hole Number 19-01 Date: 6/4/19 Time: AM Weather 65° Sunny

Location (identify on site plan) see sketch

Land Use Woods Slope (%) 0-3 Surface Stones Some

Vegetation Wooded

Landform Ground Moraine

Position on landscape (sketch on the back) see sketch

Distances from:

Open Water Body	see sketch	Feet	Drainageway	see sketch	Feet
Possible Wet Area	see sketch	Feet	Property Line	see sketch	Feet
Drinking Water Well	see sketch	Feet	Other		

DEEP OBSERVATION HOLE LOG*

Depth from Surface (inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (Munsell)	Soil Mottling	Other (Structure, Stones, Boulders, Consistency, % Gravel)
0 – 9"	A	Sandy Loam	10 YR 3/2	None Observed	Massive-Friable, w/ some gravel
9 – 17"	B_w	Sandy Loam	10 YR 4/6	None Observed	Massive-Friable, gravelly
17 – 27"	C_1	Loamy Sand	10 YR 4/3	None Observed	Massive-Friable, w/ gravel, stones & cobbles
27 – 40"	C_2	Sand (Fine–Medium)	2.5 Y 5/3	None Observed	Loose-Single-Grained, very gravelly, w/ few stones & cobbles
40 – 122"	C_3	Sand (Medium–Coarse)	2.5 Y 5/2	None Observed	Loose-Single-Grained, extremely gravelly, w/ some stones & cobbles

* MINIMUM OF 2 HOLES REQUIRED AT EVERY PROPOSED DISPOSAL AREA

Parent Material (geologic) Coarse-Loamy over Sandy Melt-Out Till Depth to Bedrock: None Observed

Depth to Groundwater: Standing Water in the Hole: None Observed Weeping from Pit Face: None Observed

Estimated Seasonal High Ground Water: > 122" – No signs of ESHGW were observed

Location Address or Lot No. 196 Pond Road, Wellesley, MA 02482

On-site Witnessed Soil Test Review

Deep Hole Number 19-02 Date: 6/4/19 Time: AM Weather 65° Sunny

Location (identify on site plan) see sketch

Land Use Woods Slope (%) 0-3 Surface Stones Some

Vegetation Wooded

Landform Ground Moraine

Position on landscape (sketch on the back) see sketch

Distances from:

Open Water Body	see sketch	Feet	Drainageway	see sketch	Feet
Possible Wet Area	see sketch	Feet	Property Line	see sketch	Feet
Drinking Water Well	see sketch	Feet	Other		

DEEP OBSERVATION HOLE LOG*

Depth from Surface (inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (Munsell)	Soil Mottling	Other (Structure, Stones, Boulders, Consistency, % Gravel)
0 – 11"	A	Sandy Loam	10 YR 3/2	None Observed	Massive-Friable, w/ some gravel
11 – 30"	B_w	Loamy Sand	10 YR 4/6	None Observed	Massive-Friable, gravelly, w/ stones & cobbles
30 – 44"	C_1	Sand (Fine–Medium)	2.5 Y 5/4	None Observed	Loose-Single-Grained, w/ gravel
44 – 89"	C_2	Sand (Medium–Coarse)	2.5 Y 5/2	None Observed	Loose-Single-Grained, extremely gravelly, w/ some stones & cobbles
89 – 121"	C_3	Sand (Fine–Medium)	2.5 Y 5/3	None Observed	Loose-Single-Grained, very gravelly, w/ few stones & cobbles

* MINIMUM OF 2 HOLES REQUIRED AT EVERY PROPOSED DISPOSAL AREA

Parent Material (geologic) Coarse-Loamy over Sandy Melt-Out Till Depth to Bedrock: None Observed

Depth to Groundwater: Standing Water in the Hole: None Observed Weeping from Pit Face: None Observed

Estimated Seasonal High Ground Water: > 121" – No signs of ESHGW were observed

Location Address or Lot No. 196 Pond Road, Wellesley, MA 02482

On-site Witnessed Soil Test Review

Deep Hole Number 19-03 Date: 6/4/19 Time: AM Weather 65° Sunny

Location (identify on site plan) see sketch

Land Use Woods Slope (%) 0-3 Surface Stones Some

Vegetation Wooded

Landform Ground Moraine

Position on landscape (sketch on the back) see sketch

Distances from:

Open Water Body	see sketch	Feet	Drainageway	see sketch	Feet
Possible Wet Area	see sketch	Feet	Property Line	see sketch	Feet
Drinking Water Well	see sketch	Feet	Other		

DEEP OBSERVATION HOLE LOG*

Depth from Surface (inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (Munsell)	Soil Mottling	Other (Structure, Stones, Boulders, Consistency, % Gravel)
0 – 13"	A	Sandy Loam	10 YR 3/2	None Observed	Massive-Friable, w/ some gravel
13 – 30"	B_w	Sandy Loam	10 YR 4/6	None Observed	Massive-Friable, gravelly
30 – 49"	BC	Sandy Loam	10 YR 4/4	None Observed	Massive-Friable, w/ cobbles & stones
49 – 96"	C_1	Sand (Medium–Coarse)	2.5 Y 5/2	None Observed	Loose-Single-Grained, extremely gravelly, w/ some stones & cobbles
96 – 122"	C_2	Sand (Fine–Medium)	2.5 Y 5/3	None Observed	Loose-Single-Grained, very gravelly, w/ few stones & cobbles

* MINIMUM OF 2 HOLES REQUIRED AT EVERY PROPOSED DISPOSAL AREA

Parent Material (geologic) Coarse-Loamy over Sandy Melt-Out Till Depth to Bedrock: None Observed

Depth to Groundwater: Standing Water in the Hole: None Observed Weeping from Pit Face: None Observed

Estimated Seasonal High Ground Water: > 122" – No signs of ESHGW were observed

Location Address or Lot No. 196 Pond Road, Wellesley, MA 02482

On-site Witnessed Soil Test Review

Deep Hole Number 19-04 Date: 6/4/19 Time: AM Weather 65° Sunny

Location (identify on site plan) see sketch

Land Use Woods Slope (%) 0-3 Surface Stones Some

Vegetation Wooded

Landform Ground Moraine

Position on landscape (sketch on the back) see sketch

Distances from:

Open Water Body	see sketch	Feet	Drainageway	see sketch	Feet
Possible Wet Area	see sketch	Feet	Property Line	see sketch	Feet
Drinking Water Well	see sketch	Feet	Other		

DEEP OBSERVATION HOLE LOG*

Depth from Surface (inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (Munsell)	Soil Mottling	Other (Structure, Stones, Boulders, Consistency, % Gravel)
0 – 10"	A	Sandy Loam	10 YR 3/2	None Observed	Massive-Friable, w/ some gravel
10 – 24"	B_w	Sandy Loam	10 YR 4/6	None Observed	Massive-Friable, gravelly
24 – 77"	C_1	Sand (Medium–Coarse)	2.5 Y 5/2	None Observed	Loose-Single-Grained, extremely gravelly, w/ many stones & cobbles
77 – 120"	C_2	Sand (Fine–Medium)	2.5 Y 5/3	None Observed	Loose-Single-Grained, very gravelly, w/ few stones & cobbles

* MINIMUM OF 2 HOLES REQUIRED AT EVERY PROPOSED DISPOSAL AREA

Parent Material (geologic) Coarse-Loamy over Sandy Melt-Out Till Depth to Bedrock: None Observed

Depth to Groundwater: Standing Water in the Hole: None Observed Weeping from Pit Face: None Observed

Estimated Seasonal High Ground Water: > 120" – No signs of ESHGW were observed

Location Address or Lot No. 196 Pond Road, Wellesley, MA 02482

On-site Witnessed Soil Test Review

Deep Hole Number 19-05 Date: 6/4/19 Time: AM Weather 65° Sunny

Location (identify on site plan) see sketch

Land Use Woods Slope (%) 0-3 Surface Stones Some

Vegetation Wooded

Landform Ground Moraine

Position on landscape (sketch on the back) see sketch

Distances from:

Open Water Body	see sketch	Feet	Drainageway	see sketch	Feet
Possible Wet Area	see sketch	Feet	Property Line	see sketch	Feet
Drinking Water Well	see sketch	Feet	Other		

DEEP OBSERVATION HOLE LOG*

Depth from Surface (inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (Munsell)	Soil Mottling	Other (Structure, Stones, Boulders, Consistency, % Gravel)
0 – 15"	A	Sandy Loam	10 YR 3/2	None Observed	Massive-Friable, w/ some gravel
15 – 30"	B_w	Loamy Sand	10 YR 4/6	None Observed	Massive-Friable, gravelly, w/ stones & cobbles
30 – 58"	C_1	Sand (Fine–Medium)	2.5 Y 5/3	None Observed	Loose-Single-Grained, very gravelly, w/ few stones & cobbles
58 – 121"	C_2	Sand (Medium–Coarse)	2.5 Y 5/2	None Observed	Loose-Single-Grained, extremely gravelly, w/ many stones & cobbles

* MINIMUM OF 2 HOLES REQUIRED AT EVERY PROPOSED DISPOSAL AREA

Parent Material (geologic) Coarse-Loamy over Sandy Melt-Out Till Depth to Bedrock: None Observed

Depth to Groundwater: Standing Water in the Hole: None Observed Weeping from Pit Face: None Observed

Estimated Seasonal High Ground Water: > 121" – No signs of ESHGW were observed

Location Address or Lot No. 194 Pond Road, Wellesley, MA 02482

On-site Witnessed Soil Test Review

Deep Hole Number 19-06 Date: 6/5/19 Time: AM Weather 65° Sunny

Location (identify on site plan) see sketch

Land Use Woods Slope (%) 0-3 Surface Stones Some

Vegetation Wooded

Landform Ground Moraine

Position on landscape (sketch on the back) see sketch

Distances from:

Open Water Body	see sketch	Feet	Drainageway	see sketch	Feet
Possible Wet Area	see sketch	Feet	Property Line	see sketch	Feet
Drinking Water Well	see sketch	Feet	Other		

DEEP OBSERVATION HOLE LOG*

Depth from Surface (inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (Munsell)	Soil Mottling	Other (Structure, Stones, Boulders, Consistency, % Gravel)
0 – 18"	A	Sandy Loam (Fine)	10 YR 2/2	None Observed	Massive-Friable
18 – 33"	B_w	Sandy Loam	10 YR 3/6	None Observed	Massive-Friable
33 – 58"	BC	Loamy Sand	2.5 Y 4/4	None Observed	Massive-Friable, w/ stones & cobbles
58 – 126"	C	Sand (Fine–Coarse)	2.5 Y 4/3	None Observed	Loose-Single-Grained, very gravelly, w/ stones & cobbles

* MINIMUM OF 2 HOLES REQUIRED AT EVERY PROPOSED DISPOSAL AREA

Parent Material (geologic) Coarse-Loamy over Sandy Melt-Out Till Depth to Bedrock: None Observed

Depth to Groundwater: Standing Water in the Hole: None Observed Weeping from Pit Face: None Observed

Estimated Seasonal High Ground Water: > 126" – No signs of ESHGW were observed

Location Address or Lot No. 194 Pond Road, Wellesley, MA 02482

On-site Witnessed Soil Test Review

Deep Hole Number 19-07 Date: 6/5/19 Time: AM Weather 65° Sunny

Location (identify on site plan) see sketch

Land Use Woods Slope (%) 0-3 Surface Stones Some

Vegetation Wooded

Landform Ground Moraine

Position on landscape (sketch on the back) see sketch

Distances from:

Open Water Body	see sketch	Feet	Drainageway	see sketch	Feet
Possible Wet Area	see sketch	Feet	Property Line	see sketch	Feet
Drinking Water Well	see sketch	Feet	Other		

DEEP OBSERVATION HOLE LOG*

Depth from Surface (inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (Munsell)	Soil Mottling	Other (Structure, Stones, Boulders, Consistency, % Gravel)
0 – 18"	A / O	Sandy Loam (Fine)	10 YR 2/2	None Observed	Massive-Friable, w/ Organics
18 – 54"	B_w / O	Sandy Loam (Fine)	7.5 YR 3/4	None Observed	Massive-Friable, w/ Organics
54 – 72"	BC	Loamy Sand	10 YR 5/4	None Observed	Massive-Friable, w/ stones & cobbles
72 – 126"	C	Sand (Fine–Coarse)	2.5 Y 4/3	None Observed	Loose-Single-Grained, very gravelly, w/ stones & cobbles

* MINIMUM OF 2 HOLES REQUIRED AT EVERY PROPOSED DISPOSAL AREA

Parent Material (geologic) Coarse-Loamy over Sandy Melt-Out Till Depth to Bedrock: None Observed

Depth to Groundwater: Standing Water in the Hole: None Observed Weeping from Pit Face: None Observed

Estimated Seasonal High Ground Water: > 126" – No signs of ESHGW were observed

Location Address or Lot No. 194 Pond Road, Wellesley, MA 02482

On-site Witnessed Soil Test Review

Deep Hole Number 19-08 Date: 6/5/19 Time: AM Weather 65° Sunny

Location (identify on site plan) see sketch

Land Use Woods Slope (%) 0-3 Surface Stones Some

Vegetation Wooded

Landform Ground Moraine

Position on landscape (sketch on the back) see sketch

Distances from:

Open Water Body	see sketch	Feet	Drainageway	see sketch	Feet
Possible Wet Area	see sketch	Feet	Property Line	see sketch	Feet
Drinking Water Well	see sketch	Feet	Other		

DEEP OBSERVATION HOLE LOG*

Depth from Surface (inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (Munsell)	Soil Mottling	Other (Structure, Stones, Boulders, Consistency, % Gravel)
0 – 14"	O	Organic	-	-	Stones, Cobbles & Forest litter
14 – 33"	A	Sandy Loam (Fine)	10 YR 2/2	None Observed	Massive-Friable
33 – 53"	B_w	Sandy Loam	10 YR 3/6	None Observed	Massive-Friable
53 – 122"	C	Sand (Fine–Coarse)	2.5 Y 4/3	None Observed	Loose-Single-Grained, very gravelly, w/ stones & cobbles

* MINIMUM OF 2 HOLES REQUIRED AT EVERY PROPOSED DISPOSAL AREA

Parent Material (geologic) Coarse-Loamy over Sandy Melt-Out Till Depth to Bedrock: None Observed

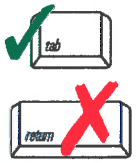
Depth to Groundwater: Standing Water in the Hole: None Observed Weeping from Pit Face: None Observed

Estimated Seasonal High Ground Water: > 122" – No signs of ESHGW were observed

Commonwealth of Massachusetts
City/Town of Wellesley
Percolation Test
Form 12

Percolation test results must be submitted with the Soil Suitability Assessment for On-site Sewage Disposal. DEP has provided this form for use by local Boards of Health. Other forms may be used, but the information must be substantially the same as that provided here. Before using this form, check with the local Board of Health to determine the form they use.

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



A. Site Information

Boston Real Estate Capital
Owner Name

196 Pond Road
Street Address or Lot #

Wellesley	MA	02482
City/Town	State	Zip Code

Joseph A. Losanno, EIT	508-879-0030 ext. 252
Contact Person (if different from Owner)	Telephone Number

B. Test Results

	June 4, 2019 / Date	1:53 P.M. / Time	June 4, 2019 / Date	2:06 P.M. / Time
Observation Hole #	Perc. 19-01		Perc. 19-02	
Depth of Perc	33-45		41-53	
Start Pre-Soak	1:53 P.M.		2:06 P.M.	
End Pre-Soak	Could Not		Could Not	
Time at 12"	Maintain Soak		Maintain Soak	
Time at 9"				
Time at 6"				
Time (9"-6")				
Rate (Min./Inch)	<2 Minutes Per Inch		<2 Minutes Per Inch	
	Test Passed: ☒ Test Failed: ☐		Test Passed: ☒ Test Failed: ☐	

Joseph A. Losanno, EIT
Test Performed By:

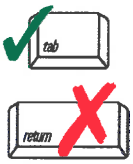
Steve Calichman - Town of Wellesley Health Department
Witnessed By:

Comments:

Commonwealth of Massachusetts
City/Town of Wellesley
Percolation Test
Form 12

Percolation test results must be submitted with the Soil Suitability Assessment for On-site Sewage Disposal. DEP has provided this form for use by local Boards of Health. Other forms may be used, but the information must be substantially the same as that provided here. Before using this form, check with the local Board of Health to determine the form they use.

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



A. Site Information

Boston Real Estate Capital
Owner Name

194 Pond Road
Street Address or Lot #

Wellesley	MA	02482
City/Town	State	Zip Code

Joseph A. Losanno, EIT	508-879-0030 ext. 252
Contact Person (if different from Owner)	Telephone Number

B. Test Results

	June 5, 2019 / 1:38 P.M. (Date / Time)	June 5, 2019 / 2:01 P.M. (Date / Time)
Observation Hole #	Perc. 19-06	Perc. 19-08
Depth of Perc	66-78	74-86
Start Pre-Soak	1:38 P.M.	2:01 P.M.
End Pre-Soak	Could Not	Could Not
Time at 12"	Maintain Soak	Maintain Soak
Time at 9"		
Time at 6"		
Time (9"-6")		
Rate (Min./Inch)	<2 Minutes Per Inch	<2 Minutes Per Inch
	Test Passed: ☒ Test Failed: ☐	Test Passed: ☒ Test Failed: ☐

Joseph A. Losanno, EIT
Test Performed By:

Steve Calichman - Town of Wellesley Health Department
Witnessed By:

Comments:

Soil Map—Middlesex County, Massachusetts, and Norfolk and Suffolk Counties, Massachusetts

Map Scale: 1:2,340 if printed on A landscape (11" x 8.5") 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 Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

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 18, Sep 7, 2018

Soil Survey Area: Norfolk and Suffolk Counties, Massachusetts
Survey Area Data: Version 14, Sep 12, 2018

Your area of interest (AOI) includes more than one soil survey area. These survey areas may have been mapped at different scales, with a different land use in mind, at different times, or at different levels of detail. This may result in map unit symbols, soil properties, and interpretations that do not completely agree across soil survey area boundaries.

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

MAP LEGEND

MAP INFORMATION

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.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
103B	Charlton-Hollis-Rock outcrop complex, 3 to 8 percent slopes	0.1	0.3%
103C	Charlton-Hollis-Rock outcrop complex, 8 to 15 percent slopes	3.2	14.2%
104D	Hollis-Rock outcrop-Charlton complex, 15 to 25 percent slopes	2.8	12.6%
420C	Canton fine sandy loam, 8 to 15 percent slopes	1.8	7.9%
Subtotals for Soil Survey Area		**7.9**	**34.9%**
Totals for Area of Interest		**22.7**	**100.0%**

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
104D	Hollis-Rock outcrop-Charlton complex, 15 to 35 percent slopes	1.3	5.6%
245B	Hinckley loamy sand, 3 to 8 percent slopes	5.1	22.5%
245C	Hinckley loamy sand, 8 to 15 percent slopes	2.1	9.3%
253D	Hinckley loamy sand, 15 to 35 percent slopes	0.0	0.2%
254B	Merrimac fine sandy loam, 3 to 8 percent slopes	0.4	1.8%
420C	Canton fine sandy loam, 8 to 15 percent slopes	5.8	25.7%
Subtotals for Soil Survey Area		**14.8**	**65.1%**
Totals for Area of Interest		**22.7**	**100.0%**

Norfolk and Suffolk Counties, Massachusetts

420C—Canton fine sandy loam, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: 2w817
Elevation: 0 to 1,330 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Canton and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Canton

Setting

Landform: Ridges, moraines, hills
Landform position (two-dimensional): Backslope, summit, shoulder
Landform position (three-dimensional): Side slope, crest, nose slope
Down-slope shape: Convex, linear
Across-slope shape: Convex
Parent material: Coarse-loamy over sandy melt-out till derived from gneiss, granite, and/or schist

Typical profile

Ap - 0 to 7 inches: fine sandy loam
Bw1 - 7 to 15 inches: fine sandy loam
Bw2 - 15 to 26 inches: gravelly fine sandy loam
2C - 26 to 65 inches: gravelly loamy sand

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: 19 to 39 inches to strongly contrasting textural stratification
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Very low (about 2.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e

Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Scituate

Percent of map unit: 6 percent
Landform: Ground moraines, drumlins, hills
Landform position (two-dimensional): Backslope, footslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear, convex
Across-slope shape: Convex
Hydric soil rating: No

Montauk

Percent of map unit: 6 percent
Landform: Moraines, drumlins, hills, ground moraines
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear, convex
Across-slope shape: Convex
Hydric soil rating: No

Newfields

Percent of map unit: 4 percent
Landform: Moraines, hills, ground moraines
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Concave
Hydric soil rating: No

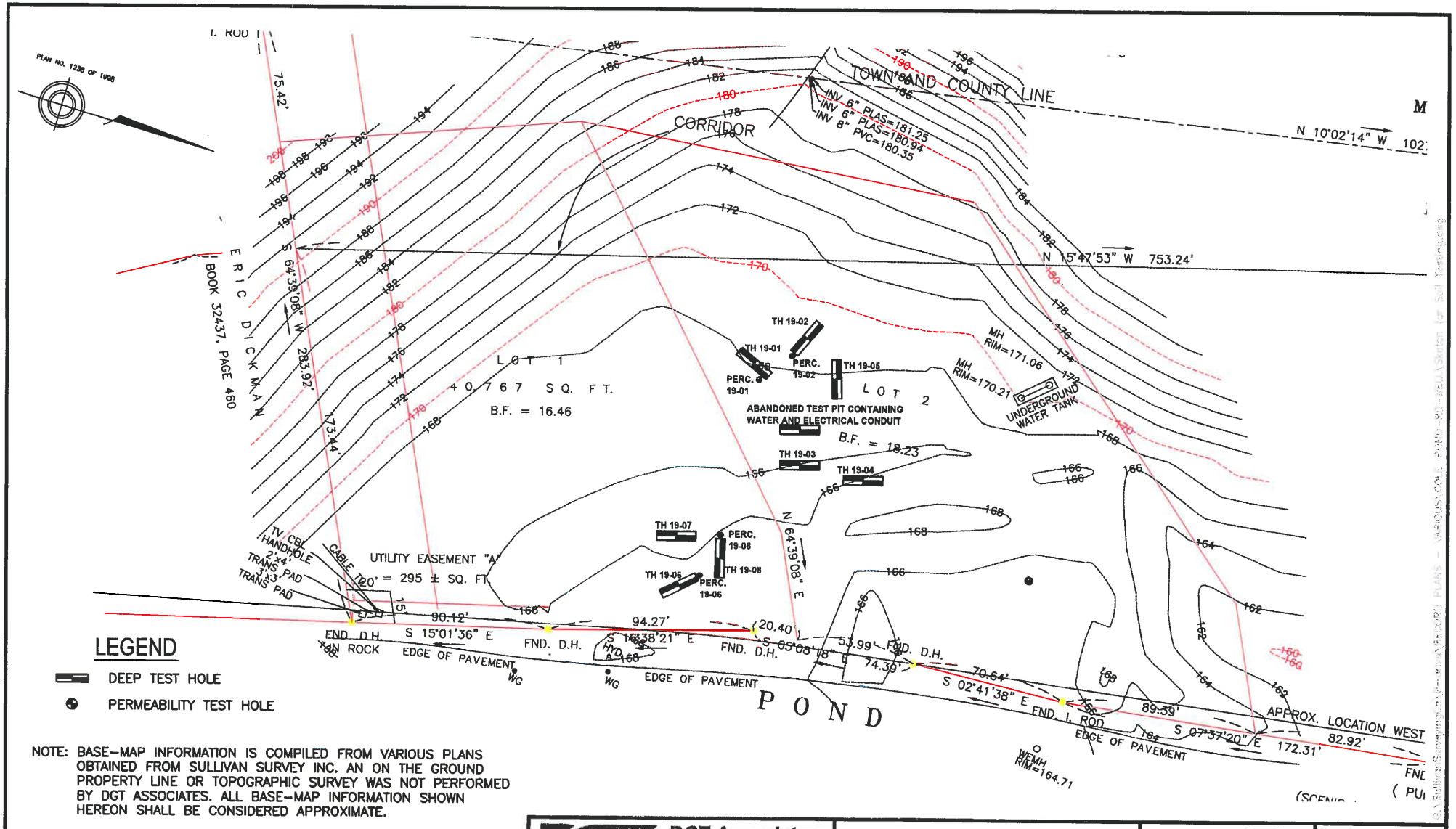
Charlton

Percent of map unit: 4 percent
Landform: Hills, ground moraines, ridges
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear, convex
Across-slope shape: Convex
Hydric soil rating: No

Data Source Information

Soil Survey Area: Middlesex County, Massachusetts
Survey Area Data: Version 18, Sep 7, 2018

Soil Survey Area: Norfolk and Suffolk Counties, Massachusetts
Survey Area Data: Version 14, Sep 12, 2018



LEGEND

- DEEP TEST HOLE
- PERMEABILITY TEST HOLE

NOTE: BASE-MAP INFORMATION IS COMPILED FROM VARIOUS PLANS OBTAINED FROM SULLIVAN SURVEY INC. AN ON THE GROUND PROPERTY LINE OR TOPOGRAPHIC SURVEY WAS NOT PERFORMED BY DGT ASSOCIATES. ALL BASE-MAP INFORMATION SHOWN HEREON SHALL BE CONSIDERED APPROXIMATE.

40 0 20 40 80 160

SCALE: 1" = 40'

DGT Associates
1071 Worcester Road
Framingham, MA 01701
508-879-0030
www.DGTassociates.com

SOIL TEST HOLE LOCATION PLAN
AT
194 & 196 POND ROAD
IN
WELLESLEY, MA 02482

DATE:	June 19, 2019
DRAWN BY:	JAL
SCALE:	1" = 40'

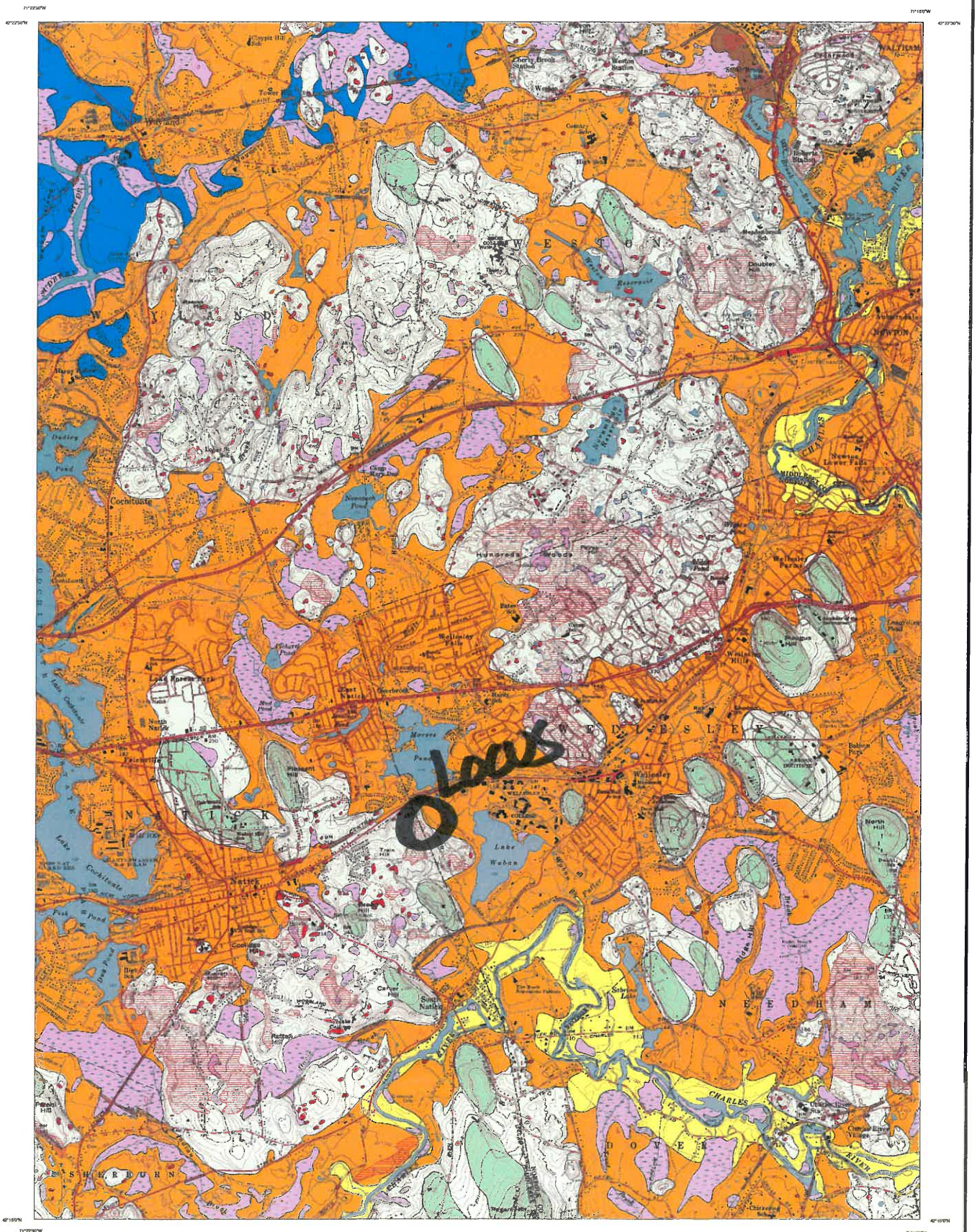
ST-1

25485

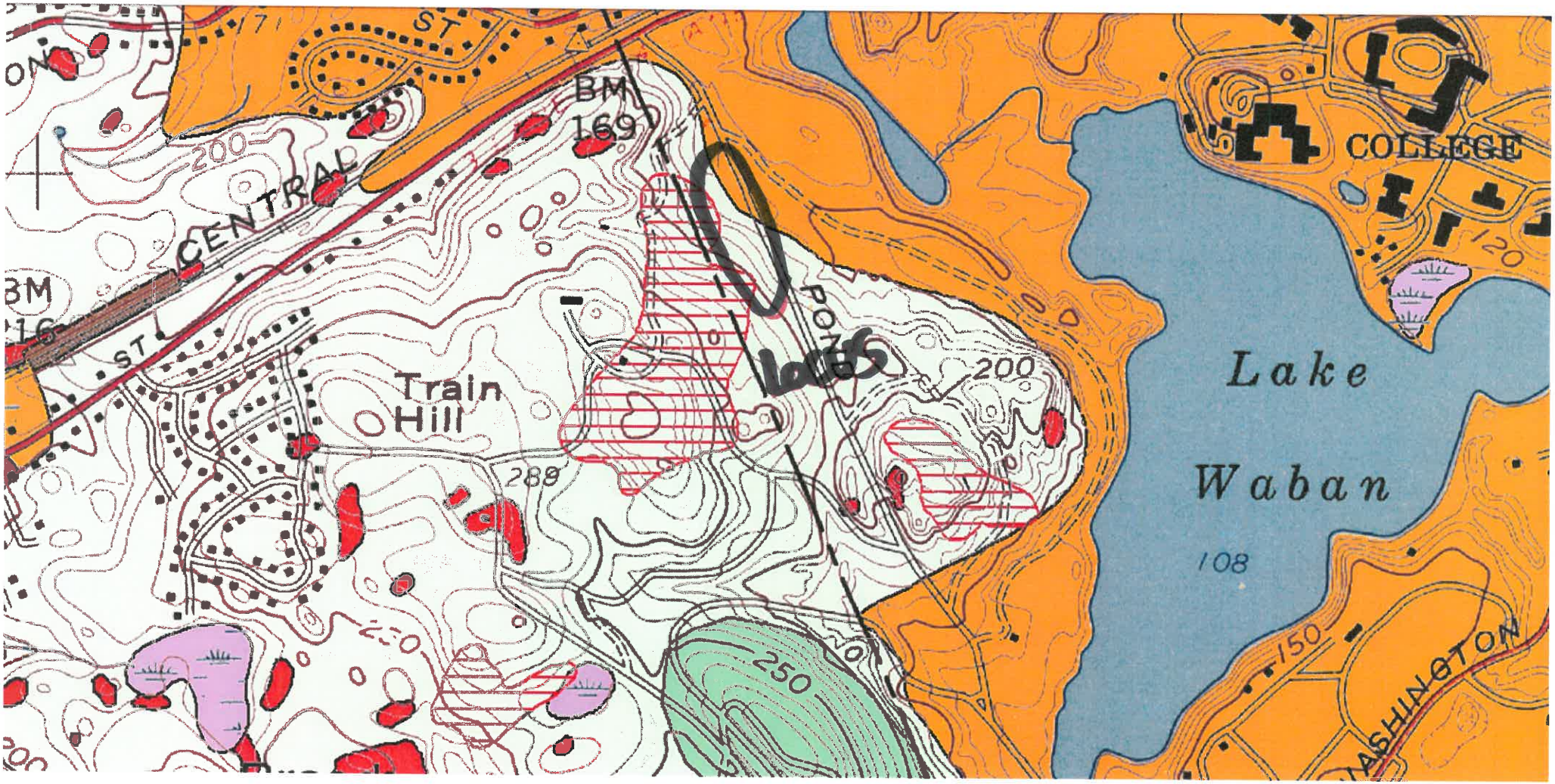
NATICK QUADRANGLE

Excerpted from: Surficial Geologic Map of the Clinton-Concord-Grafton-Medfield 12-Quadrangle Area in East Central Massachusetts
By Janet R. Stone and Byron D. Stone
Open-File Report 2006-1260A

Explanatory pamphlet accompanies map



USGS
science for a changing world


ST
BM
1697
200
CENTRAL
ST
Train
Hill
288
POND
200
COLLEGE
120
Lake
Waban
108
150
250
WASHINGTON

Location Address or Lot No. 194 Pond Road, Wellesley, MA 02482

On-site Witnessed Soil Test Review

Deep Hole Number 20-01 Date: 1/29/20 Time: AM Weather 50° Sunny

Location (identify on site plan) see sketch

Land Use Woods Slope (%) 0-3 Surface Stones Some

Vegetation Wooded

Landform Ground Moraine

Position on landscape (sketch on the back) see sketch

Distances from:

Open Water Body	see sketch	Feet	Drainageway	see sketch	Feet
Possible Wet Area	see sketch	Feet	Property Line	see sketch	Feet
Drinking Water Well	see sketch	Feet	Other		

DEEP OBSERVATION HOLE LOG*

Depth from Surface (inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (Munsell)	Soil Mottling	Other (Structure, Stones, Boulders, Consistency, % Gravel)
0 – 14”	A/O	Fine Sandy Loam	10 YR 2/2	None Observed	Massive-Friable, w/ stones & forest litter
14 – 30”	BC	Loamy Sand	10 YR 4/4	None Observed	Loose-Single-Grained, very gravelly, w/ many rocks & cobbles
30 – 132”	C	Sand (Fine–Coarse)	2.5 Y 5/3	None Observed	Loose-Single-Grained, very gravelly, w/ rocks & cobbles

* MINIMUM OF 2 HOLES REQUIRED AT EVERY PROPOSED DISPOSAL AREA

Parent Material (geologic) Coarse-Loamy over Sandy Melt-Out Till Depth to Bedrock: None Observed

Depth to Groundwater: Standing Water in the Hole: None Observed Weeping from Pit Face: None Observed

Estimated Seasonal High Ground Water: > 132” – No signs of ESHGW were observed

Location Address or Lot No. 194 Pond Road, Wellesley, MA 02482

On-site Witnessed Soil Test Review

Deep Hole Number 20-02 Date: 1/29/20 Time: AM Weather 50° Sunny

Location (identify on site plan) see sketch

Land Use Woods Slope (%) 0-3 Surface Stones Some

Vegetation Wooded

Landform Ground Moraine

Position on landscape (sketch on the back) see sketch

Distances from:

Open Water Body	see sketch	Feet	Drainageway	see sketch	Feet
Possible Wet Area	see sketch	Feet	Property Line	see sketch	Feet
Drinking Water Well	see sketch	Feet	Other		

DEEP OBSERVATION HOLE LOG*

Depth from Surface (inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (Munsell)	Soil Mottling	Other (Structure, Stones, Boulders, Consistency, % Gravel)
0 – 11”	Fill	-	-	-	
11 – 26”	A/O	Fine Sandy Loam	10 YR 2/2	None Observed	Massive-Friable, w/ stones & forest litter
26 – 46”	B_w/O	Fine Sandy Loam	7.5 YR 3/4	None Observed	Massive-Friable, w/ orgaincs
46 – 136”	C	Sand (Fine–Coarse)	2.5 Y 5/3	None Observed	Loose-Single-Grained, very gravelly, w/ rocks & cobbles

* MINIMUM OF 2 HOLES REQUIRED AT EVERY PROPOSED DISPOSAL AREA

Parent Material (geologic) Coarse-Loamy over Sandy Melt-Out Till Depth to Bedrock: None Observed

Depth to Groundwater: Standing Water in the Hole: None Observed Weeping from Pit Face: None Observed

Estimated Seasonal High Ground Water: > 136” – No signs of ESHGW were observed

Location Address or Lot No. 196 Pond Road, Wellesley, MA 02482

On-site Witnessed Soil Test Review

Deep Hole Number 20-03 Date: 1/29/20 Time: AM Weather 50° Sunny

Location (identify on site plan) see sketch

Land Use Woods Slope (%) 0-3 Surface Stones Some

Vegetation Wooded

Landform Ground Moraine

Position on landscape (sketch on the back) see sketch

Distances from:

Open Water Body	see sketch	Feet	Drainageway	see sketch	Feet
Possible Wet Area	see sketch	Feet	Property Line	see sketch	Feet
Drinking Water Well	see sketch	Feet	Other		

DEEP OBSERVATION HOLE LOG*

Depth from Surface (inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (Munsell)	Soil Mottling	Other (Structure, Stones, Boulders, Consistency, % Gravel)
0 – 5”	A/O	Fine Sandy Loam	10 YR 2/2	None Observed	Massive-Friable, w/ stones & forest litter
5 – 17”	B_w	Fine Sandy Loam	10 YR 4/4	None Observed	Massive-Friable, very gravelly, w/ many rocks & cobbles
17 – 25”	B_2	Fine Sandy Loam	2.5 Y 3/2	None Observed	Massive-Friable, w/ some gravel & organics
25 – 132”	C	Sand (Fine–Coarse)	2.5 Y 5/3	None Observed	Loose-Single-Grained, very gravelly, w/ stones & few cobbles

* MINIMUM OF 2 HOLES REQUIRED AT EVERY PROPOSED DISPOSAL AREA

Parent Material (geologic) Coarse-Loamy over Sandy Melt-Out Till Depth to Bedrock: None Observed

Depth to Groundwater: Standing Water in the Hole: None Observed Weeping from Pit Face: None Observed

Estimated Seasonal High Ground Water: > 132” – No signs of ESHGW were observed

Location Address or Lot No. 196 Pond Road, Wellesley, MA 02482

On-site Witnessed Soil Test Review

Deep Hole Number 20-04 Date: 1/29/20 Time: AM Weather 50° Sunny

Location (identify on site plan) see sketch

Land Use Woods Slope (%) 0-3 Surface Stones Some

Vegetation Wooded

Landform Ground Moraine

Position on landscape (sketch on the back) see sketch

Distances from:

Open Water Body	see sketch	Feet	Drainageway	see sketch	Feet
Possible Wet Area	see sketch	Feet	Property Line	see sketch	Feet
Drinking Water Well	see sketch	Feet	Other		

DEEP OBSERVATION HOLE LOG*

Depth from Surface (inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (Munsell)	Soil Mottling	Other (Structure, Stones, Boulders, Consistency, % Gravel)
0 – 5”	A/O	Fine Sandy Loam	10 YR 2/2	None Observed	Massive-Friable, w/ stones & forest litter
5 – 12”	B_w	Fine Sandy Loam	10 YR 4/4	None Observed	Massive-Friable, very gravelly, w/ many rocks & cobbles
12 – 132”	C	Sand (Fine–Coarse)	2.5 Y 5/3	None Observed	Loose-Single-Grained, very gravelly, w/ rocks & cobbles

* MINIMUM OF 2 HOLES REQUIRED AT EVERY PROPOSED DISPOSAL AREA

Parent Material (geologic) Coarse-Loamy over Sandy Melt-Out Till Depth to Bedrock: None Observed

Depth to Groundwater: Standing Water in the Hole: None Observed Weeping from Pit Face: None Observed

Estimated Seasonal High Ground Water: > 132” – No signs of ESHGW were observed

Location Address or Lot No. 196 Pond Road, Wellesley, MA 02482

On-site Witnessed Soil Test Review

Deep Hole Number 20-05 Date: 1/29/20 Time: AM Weather 50° Sunny

Location (identify on site plan) see sketch

Land Use Woods Slope (%) 0-3 Surface Stones Some

Vegetation Wooded

Landform Ground Moraine

Position on landscape (sketch on the back) see sketch

Distances from:

Open Water Body	see sketch	Feet	Drainageway	see sketch	Feet
Possible Wet Area	see sketch	Feet	Property Line	see sketch	Feet
Drinking Water Well	see sketch	Feet	Other		

DEEP OBSERVATION HOLE LOG*

Depth from Surface (inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (Munsell)	Soil Mottling	Other (Structure, Stones, Boulders, Consistency, % Gravel)
0 – 5”	A/O	Fine Sandy Loam	10 YR 2/2	None Observed	Massive-Friable, w/ stones & forest litter
5 – 12”	B_w	Fine Sandy Loam	10 YR 4/4	None Observed	Massive-Friable, very gravelly, w/ many rocks & cobbles
12 – 36”	C_1	Sand (Fine – Coarse)	2.5 Y 4/4	None Observed	Loose-Single-Grained, mostly rocks & cobbles, w/ some gravel
36 – 132”	C_2	Sand (Fine – Coarse)	2.5 Y 5/3	None Observed	Loose-Single-Grained, very gravelly, w/ rocks & cobbles

* MINIMUM OF 2 HOLES REQUIRED AT EVERY PROPOSED DISPOSAL AREA

Parent Material (geologic) Coarse-Loamy over Sandy Melt-Out Till Depth to Bedrock: None Observed

Depth to Groundwater: Standing Water in the Hole: None Observed Weeping from Pit Face: None Observed

Estimated Seasonal High Ground Water: > 132” – No signs of ESHGW were observed

Location Address or Lot No. 196 Pond Road, Wellesley, MA 02482

On-site Witnessed Soil Test Review

Deep Hole Number 20-06 Date: 1/29/20 Time: AM Weather 50º Sunny

Location (identify on site plan) see sketch

Land Use Woods Slope (%) 0-3 Surface Stones Some

Vegetation Wooded

Landform Ground Moraine

Position on landscape (sketch on the back) see sketch

Distances from:

Open Water Body	see sketch	Feet	Drainageway	see sketch	Feet
Possible Wet Area	see sketch	Feet	Property Line	see sketch	Feet
Drinking Water Well	see sketch	Feet	Other		

DEEP OBSERVATION HOLE LOG*

Depth from Surface (inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (Munsell)	Soil Mottling	Other (Structure, Stones, Boulders, Consistency, % Gravel)
0 – 31”	A/O	Fine Sandy Loam	10 YR 2/2	None Observed	Massive-Friable, w/ stones & forest litter
31 – 132”	C	Sand (Fine–Coarse)	2.5 Y 5/3	None Observed	Loose-Single-Grained, very gravelly, w/ stones & few cobbles

* MINIMUM OF 2 HOLES REQUIRED AT EVERY PROPOSED DISPOSAL AREA

Parent Material (geologic) Coarse-Loamy over Sandy Melt-Out Till Depth to Bedrock: None Observed

Depth to Groundwater: Standing Water in the Hole: None Observed Weeping from Pit Face: None Observed

Estimated Seasonal High Ground Water: > 132” – No signs of ESHGW were observed

Commonwealth of Massachusetts
City/Town of Wellesley
Percolation Test
Form 12

Percolation test results must be submitted with the Soil Suitability Assessment for On-site Sewage Disposal. DEP has provided this form for use by local Boards of Health. Other forms may be used, but the information must be substantially the same as that provided here. Before using this form, check with the local Board of Health to determine the form they use.

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

A. Site Information

Boston Real Estate Capital
Owner Name

194 Pond Road
Street Address or Lot #

Wellesley	MA	02482
City/Town	State	Zip Code

Joseph A. Losanno, EIT	508-879-0030 ext. 252
Contact Person (if different from Owner)	Telephone Number

B. Test Results

	01/29/2020	11:53 P.M.		
	Date	Time	Date	Time
Observation Hole #	Perc. 20-04			
Depth of Perc	42-54			
Start Pre-Soak	11:53 A.M.			
End Pre-Soak	Could Not			
Time at 12”	Maintain Soak			
Time at 9”				
Time at 6”				
Time (9”-6”)				
Rate (Min./Inch)	<2 Minutes Per Inch			
	Test Passed: ☒		Test Passed: ☐	
	Test Failed: ☐		Test Failed: ☐	

Joseph A. Losanno, EIT
Test Performed By:

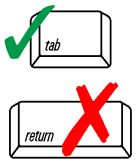
Steve Calichman - Town of Wellesley Health Department
Witnessed By:

Comments:

Commonwealth of Massachusetts
City/Town of Wellesley
Percolation Test
Form 12

Percolation test results must be submitted with the Soil Suitability Assessment for On-site Sewage Disposal. DEP has provided this form for use by local Boards of Health. Other forms may be used, but the information must be substantially the same as that provided here. Before using this form, check with the local Board of Health to determine the form they use.

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



A. Site Information

Boston Real Estate Capital
Owner Name

196 Pond Road
Street Address or Lot #

Wellesley	MA	02482
City/Town	State	Zip Code

Joseph A. Losanno, EIT	508-879-0030 ext. 252
Contact Person (if different from Owner)	Telephone Number

B. Test Results

	01/29/2020 Date	A.M. Time	01/29/2020 Date	11:27 A.M. Time
Observation Hole #	Perc. 20-04		Perc. 20-06	
Depth of Perc	36-48		24-36	
Start Pre-Soak	A.M.		11:27 P.M.	
End Pre-Soak	Could Not		Could Not	
Time at 12”	Maintain Soak		Maintain Soak	
Time at 9”	Note: Soak Never Reached			
Time at 6”	12" Mark			
Time (9”-6”)				
Rate (Min./Inch)	<2 Minutes Per Inch		<2 Minutes Per Inch	
	Test Passed: ☒ Test Failed: ☐		Test Passed: ☒ Test Failed: ☐	

Joseph A. Losanno, EIT
Test Performed By:

Steve Calichman - Town of Wellesley Health Department
Witnessed By:

Comments:

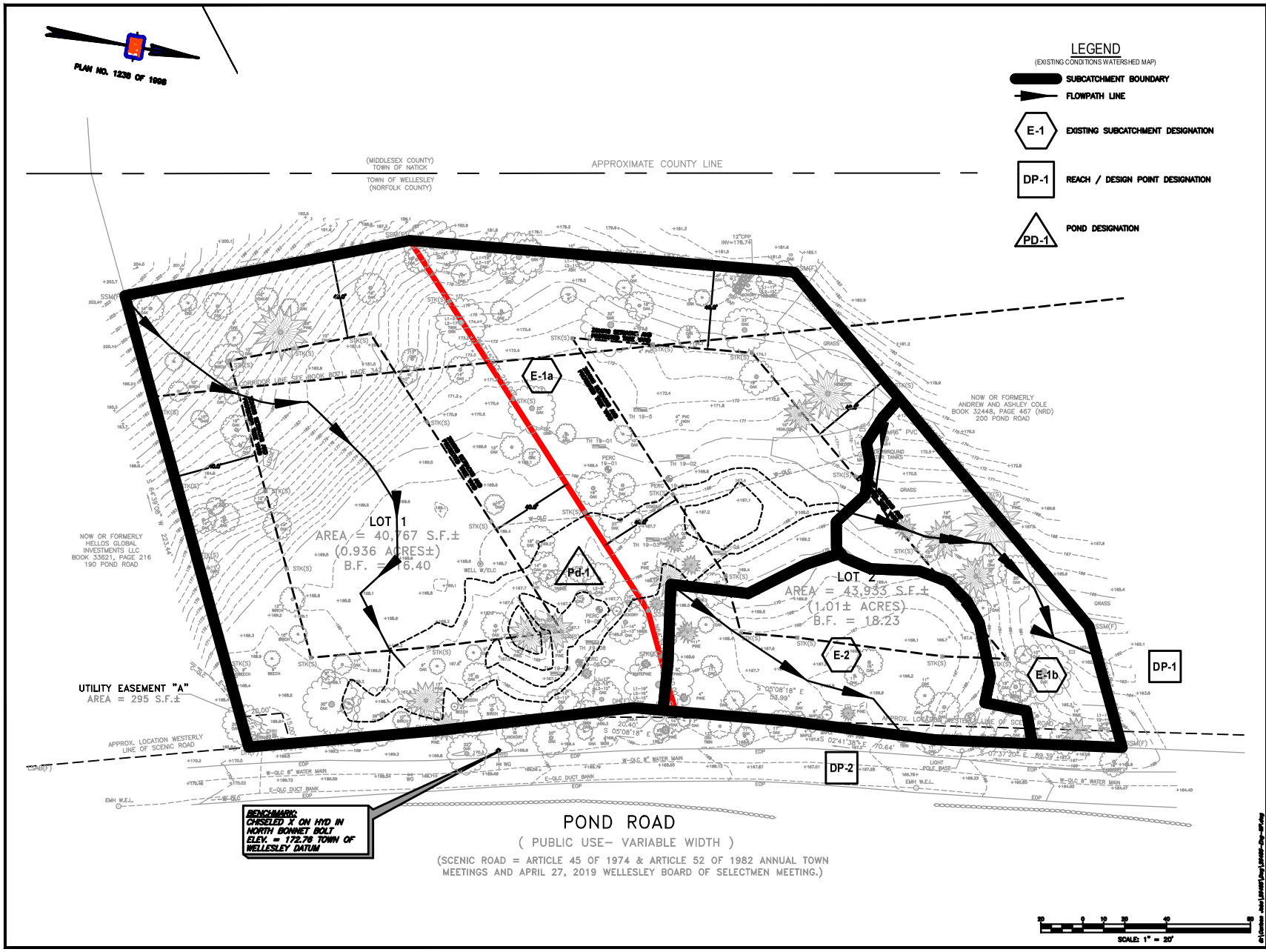
25485

APPENDIX 2

Existing Conditions Watershed Map, WSD-EX

for

#194 & #196 Pond Road
Wellesley, Massachusetts 02482



DGT Associates
Surveying & Engineering
Framingham
Boston • Worcester
1071 Worcester Road
Framingham, MA 01701
508-879-0030
www.DGTassociates.com

NO.	APP	DATE	DESCRIPTION

DATE: OCTOBER 1, 2019

SCALE: 1" = 20'

DRAFTED:	CHECKED:	APPROVED:
JAL		

PROJECT TITLE:

194 & 196 POND ROAD: RESIDENTIAL SITE PLAN

194 & 196 POND ROAD
WELLESLEY, MASSACHUSETTS 02482

SHEET TITLE:

EXISTING CONDITIONS WATERSHED MAP

SHEET: 1 OF 1

PROJECT NO.: 25485

WSD-EX

25485

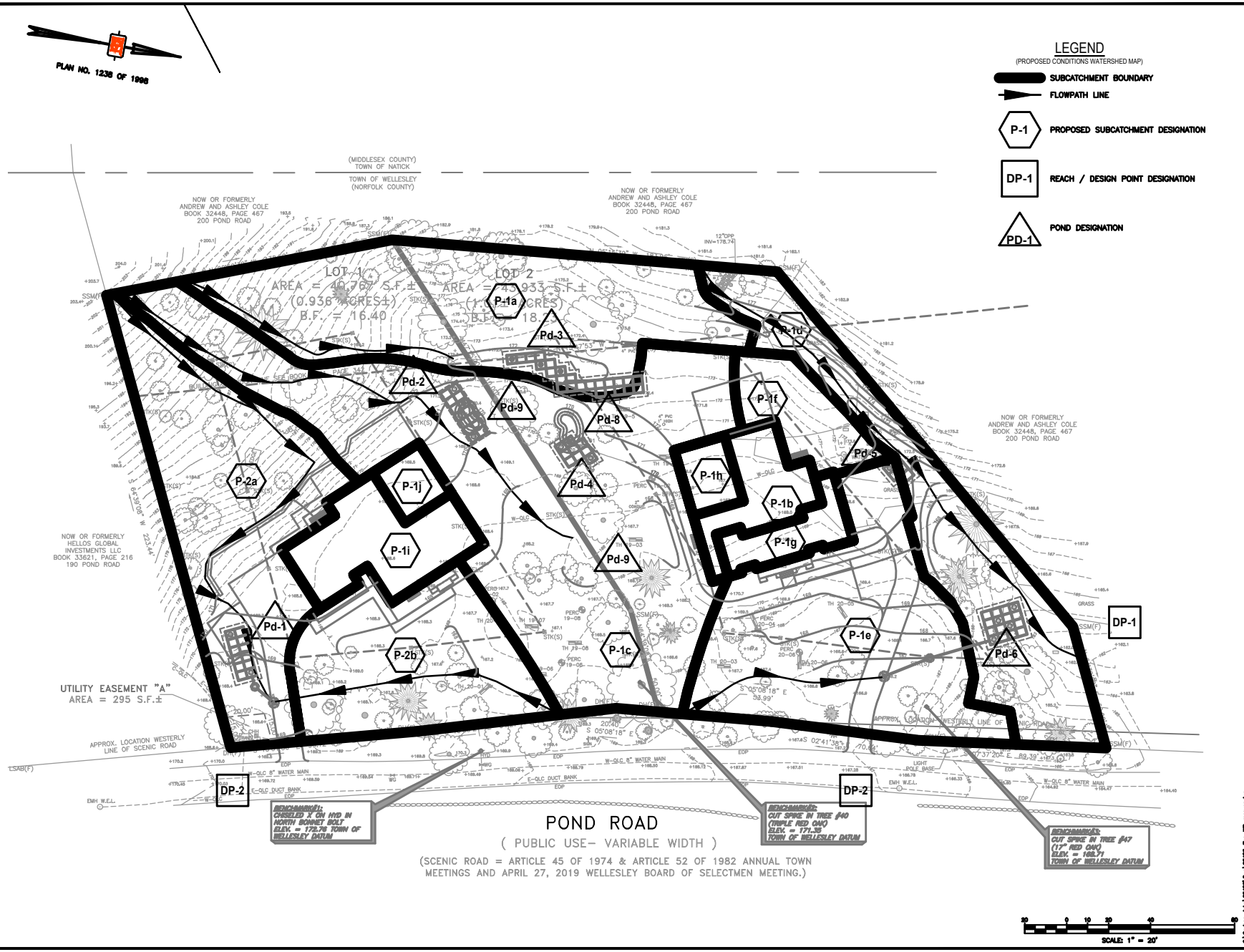
APPENDIX 3

Proposed Conditions Watershed Map, WSD-PR

for

#194 & #196 Pond Road
Wellesley, Massachusetts 02482

REVISED: February 26, 2020
REVISED: January 10, 2020



DGT Associates
Surveying & Engineering
Framingham
Boston • Worcester
1071 Worcester Road
Framingham, MA 01701
508-879-0030
www.DGTassociates.com

NO.	APP	DATE	DESCRIPTION

DATE: FEBRUARY 26, 2020

SCALE: 1" = 20'

DRAFTED:	CHECKED:	APPROVED:
JAL		

PROJECT TITLE:

194 & 196 POND ROAD: RESIDENTIAL SITE PLAN

194 & 196 POND ROAD
WELLESLEY, MASSACHUSETTS 02482

SHEET TITLE:

PROPOSED CONDITIONS WATERSHED MAP

SHEET: 1 OF 1

PROJECT NO.: 25485

WSD-PR

25485

APPENDIX 4

Attachment 1
Stormwater Operation and Maintenance Plan:
#194 Pond Road, Wellesley, Massachusetts 02482

Attachment 2
Stormwater Operation and Maintenance Plan:
#196 Pond Road, Wellesley, Massachusetts 02482

for

#194 & #196 Pond Road
Wellesley, Massachusetts 02482

REVISED: February 26, 2020
REVISED: January 10, 2020

25485

Attachment 1

STORMWATER OPERATION & MAINTENANCE PLAN

for

#194 Pond Road
Wellesley, Massachusetts 02482

REVISED: February 26, 2020
REVISED: January 10, 2020

25485

STORMWATER
OPERATION AND MAINTENANCE PLAN

#194 POND ROAD, WELLESLEY, MASSACHUSETTS 02482

Post Construction and Long-Term Maintenance

In order for the stormwater management system to function properly as designed, the system must be inspected on a regular basis and routine maintenance performed. The responsibility for the maintenance and operation of the system will be as follows:

Property Owners:
194 Pond Road
Wellesley, MA 02482

Per the Town of Wellesley Department of Public Works, Engineering Division, the inspection logs and reports must be submitted to the Wellesley Town Engineer on an annual basis. The operation and maintenance of the onsite stormwater drainage system must be performed annually and in perpetuity upon completion.

Routine inspections and some of the routine maintenance tasks will be performed by the owner's maintenance personnel.

For any questions regarding maintenance or operation of the stormwater management system, contact:

DGT Associates
1071 Worcester Road
Framingham MA 01701
Tel: 508-879-0030

The system contains the following Stormwater Best Management Practices (BMPs):

Deep Sump Catch Basin
Recharge (Infiltration) Systems
Water Quality Unit
Rain Garden

OPERATION AND MAINTENANCE MANUAL AND TRAINING
Upon completion of the construction project, a complete as-built plan of the system components will be prepared and will be a part of this O&M Plan. This O&M Plan includes a description of the purpose and function of each component, inspection and maintenance tasks and schedules, check lists, and report forms. The Plan should be used as the management document for the system. All maintenance personnel shall be trained in the specifics of the entire stormwater management system in order to be able to perform the inspections, documentation and the maintenance required. The design engineer will be available to provide a training session for the supervisors and personnel if necessary.

INSPECTIONS AND MAINTENANCE

The following pages describe the inspection, routine maintenance and non routine maintenance which are required for each BMP. The inspection and maintenance requirements are based on the recommendations from the MassDEP Stormwater Management Standards Handbook, February 2008. Maintenance requirements for the Oil and Sediment Separator - Stormwater Treatment System, will be per the manufacturer's specifications.

The recommended procedures below should be followed strictly for at least the first two years of the system operation. During that period, the observations and experience gained from the monitoring and maintenance will provide the information necessary so that adjustments can be made for the most efficient operation and maintenance of the system.

NON-STORMWATER DISCHARGES

This is to provide notice to the owner and operator(s) of the subject property and stormwater system that the discharge of any non-stormwater to the subject stormwater management system is prohibited. Also, there shall be no modifications to the stormwater system for the purpose of discharging non-stormwater to the system. Non-stormwater discharges are any liquid or materials that are not the result of natural rainfall runoff or runoff from snow and ice melt. The purpose of this is to protect groundwater and surface water quality as well as to assure compliance with applicable laws.

CONFINED SPACE ENTRY

Note that any inspections or maintenance activity of underground piping, chambers, deep manholes, etc that requires entry into the system must be in accordance with OSHA confined space regulations.

DEEP SUMP CATCH BASINS

DESCRIPTION AND FUNCTION

These structures are modified catch basins that collect stormwater from small drainage areas with added features to enhance the capture of gas, oils, grease, trash, floating debris, and sediment over that of conventional catch basins and stormwater inlets. The inlet of the deep sump catch basin is a cast iron grate over the precast concrete structure. The sump below the elevation of the outlet pipe invert traps sediment. The outlet pipe includes an oil and gas trap hood that keeps floating hydrocarbons and other floating debris in the structure chamber until they settle with the sediment or is removed by a pumper as part of the routine cleaning.

INSPECTIONS

The catch basins should be inspected at least four times per year including at the end of the foliage and snow removal seasons. For a full inspection, remove the grate and inspect the general condition of the unit including the amount of floating debris and the presence of hydrocarbons if any. If the inspection finds a large presence of hydrocarbons, such as a layer of floating oil or a strong odor of gas, hydrocarbons should be removed immediately. Measure the amount of sediment that has collected. Pipe outlets should be clear of debris. If the water level is below the outlet pipe, closer inspection for possible

leaks is warranted. Note that a water level somewhat below the outlet level is normal during extended periods with no precipitation due to evaporation and minor expected seepage.

ROUTINE MAINTENANCE
Initially, the catch basins should be cleaned a minimum of two times a year and additionally if necessary based on the results of the quarterly inspection. Cleaning consists of the removal of floating hydrocarbons and accumulated sediment, and clearing the inlet grate and outlet tee and pipe. Sediment should be removed from the catch basin if the measurement of the sediment is over one foot in depth. A hazardous waste disposal contractor must perform the removal of hydrocarbons.

NON-ROUTINE MAINTENANCE
These are structural repairs and replacement of system components. Typical items for this BMP may include:

Repairing the outlet snout and/or pipe
Filling cracks in the concrete
Patching of mortar and brick
Resetting of inlet grates

MAINTENANCE EQUIPMENT

Hand tools for opening grates
Measuring stick
Vacuum pumping truck (haz-mat contractor for hydrocarbon removal)
Vacuum pumping truck (for sediment removal)

RECHARGE (INFILTRATION) SYSTEMS

DESCRIPTION AND FUNCTION
The subsurface (underground) recharger systems proposed for this project are constructed of precast concrete galleys surrounded by washed stone and filter fabric. The chambers are constructed in a permeable soil suitable for infiltrating. Manholes/observation ports are brought to finished grade for access.

The purpose of the recharger systems is to meet recharge requirements and to treat runoff from the site.

INSPECTIONS
The recharger systems should be inspected after every major storm for the first few months. After this time period it may be inspected once each year and should preferably be done two to three days after a significant storm event. The inspection should examine whether the chambers are draining properly following storms. The underground recharger systems should drain within a few hours following the end of a storm up to a maximum of 72 hours. Pipe inlets should be clear of debris and there should be no significant accumulation of sediment in the chambers. The annual inspection of the infiltration systems should include removal of the key manhole covers/observation ports to view the interior of the chambers. If significant accumulation of sediment occurs, most will be near the inlet pipe(s) to the

underground chambers and can be removed by hand or vacuum pumper. A significant accumulation of sediment may indicate a problem with soil migrating into the system from the surrounding soil indicating a failure of the filter fabric protection or a pipe problem in the pipe leading into the systems.

ROUTINE MAINTENANCE
The stormwater system includes a pretreatment BMP or collects clean roof runoff so sediment removal should rarely be required. Routine maintenance generally includes clearing debris from the inlet pipes if found during an inspection.

NON-ROUTINE MAINTENANCE
These are structural repairs and replacement of system components. Typical items for this BMP may include:

Repairing the inlet pipes
Filling cracks in the concrete
Resetting of covers
Removal of significant accumulation of sediment from the chambers that affects the infiltration capacity.

MAINTENANCE EQUIPMENT

Hand tools for opening covers, flash light.
Equipment as may be necessary to comply with OSHA confined space requirements.

WATER QUALITY UNIT

INSPECTIONS
This unit should be inspected on a monthly basis and after major storm events for the first year. Remove the cover and inspect the general condition of the unit including the amount of floating debris and the presence of hydrocarbons if any. If the inspection finds a large presence of hydrocarbons, such as a layer of floating oil or a strong odor of gasoline, it should be removed immediately. Measure the amount of sediment that has collected using a measuring stick or "Sludge Judge" measuring tube. Pipe inlets and outlets should be clear of debris. After the first year, the number of inspections may be reduced based on the experience during the first year monitoring but not less than 2 times per year. Two of the inspections must include one at the end of the foliage season and one at the end of the snow season.

ROUTINE MAINTENANCE
The unit should be cleaned a minimum of two times during the first year or when the sediment level reaches 8 inches in depth per the manufacturer's maintenance specifications. A copy of the manufacturer's chart is provided attached to the end of this section. Cleaning consists of the removal of floating hydrocarbons and accumulated sediment, and clearing the inlet pipes. The removal of hydrocarbons must be performed by a hazardous waste disposal contractor. Removal of the sediment is by a standard vacuum truck.

NON-ROUTINE MAINTENANCE
These are structural repairs and replacement of system components. Typical items for this BMP may include:

Repairing the inlet or outlet pipes.
Filling cracks in the concrete
Resetting of covers.

MAINTENANCE EQUIPMENT

Hand tools for opening covers
Measuring stick or "Sludge Judge".
Vacuum pumping truck (haz-mat contractor for hydrocarbon removal)
Contracted vacuum pumping truck (for sediment removal)

RAIN GARDEN

DESCRIPTION AND FUNCTION
The rain garden uses soils, plants, and microbes to treat stormwater before it is infiltrated and/or discharged. The rain garden is a shallow depression filled with sandy soil topped with a thick layer of mulch and planted with dense native vegetation. The runoff percolates through the soil media that acts as a filter.

INSPECTIONS
The rain garden requires careful attention while plants are being established and seasonal landscaping maintenance thereafter. Inspect pretreatment devices and the rain garden regularly for sediment build-up, structural damage, and standing water. Overall the rain garden should be inspected monthly. Remove and replace dead vegetation as well as trash and other debris. The areas should be inspected for trash and debris, vegetative health, stability, and soil erosion.

ROUTINE MAINTENANCE
Remove and replace dead vegetation semi-annually or as needed. Removal of trash and debris should take place monthly with replacement of mulch occurring 1-2 times per year. Mow ground cover vegetation once per year. Prune shrubs and trees 1or 2 times per year as recommended for the particular plant species. Other tasks include fertilizing (only when necessary), liming, watering, pruning, and weed and pest control if necessary to maintain the health of the vegetated cover.

NON-ROUTINE MAINTENANCE
These are structural repairs and replacement of system components. Typical items for this BMP may include:

- **Major repairs to vegetation**
- **Replace the media and vegetation when prolonged ponding of water occurs following rain events (greater than 72 hours).**
- **Repair of eroded areas creating an improperly functioning BMP**

MAINTENANCE EQUIPMENT

- **Typical lawn and vegetation maintenance equipment (mower, rakes, pruning shears, etc.)**
- **Shovels, trash bags, and wheelbarrow for removal of sediment.**

Revisions from Site Plan dated 2/26/20 shown in bold
Revisions from Site Plan dated 1/10/20 shown in italics

STORMWATER MANAGEMENT SYSTEM

INSPECTION AND MAINTENANCE FORMS

CONTENTS:

DEEP SUMP CATCH BASIN

Routine Inspection Checklist - Inspected quarterly Date _____

	Inlet Grate	Sediment Depth	Hydrocarbons*	Structural Integrity	Pipes Clear	Comments
CB #1						

* Presence of hydrocarbons is a clearly visible layer of oil, gasoline, grease, hydraulic fluid, etc., floating on the surface or a strong odor of gas or oil

SUBSURFACE INFILTRATION (RECHARGER) SYSTEMS

Routine Inspection Checklist - Inspected annually and two to three days after a rainfall. Date _____

	Draining Properly	Sediment	Structural Integrity	Pipe Inlet	Debris	Comments
Recharger #1						
Recharger #2						

WATER QUALITY UNIT

Routine Inspection Checklist - Inspected Semi-Annually Date _____

	Structural Integrity	Sediment Depth	Hydrocarbons*	Inlet/Outlet Pipe	Floating Debris	Comments
WQU #1						

* Presence of hydrocarbons is a clearly visible layer of oil, gasoline, grease, hydraulic fluid, etc., floating on the surface or a strong odor of gas or oil

RAIN GARDEN

Routine Inspection Checklist - Inspection semi-annually Date _____

	Slope Integrity	Sediment Depth	Vegetation	Erosion	Ponding	Comments
Rain Garden #1						

STORMWATER MAINTENANCE / REPAIR RECORD FORM

Date of Maintenance: ________________ Performed By: ________________________

Maintenance / repair tasks were performed on the following on-site BMP structures:

Stormwater Structure Work Performed

Other Comments:

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CDS® Inspection and Maintenance Guide

CDS TECHNOLOGIES

Maintenance

The CDS system should be inspected at regular intervals and maintained when necessary to ensure optimum performance. The rate at which the system collects pollutants will depend more heavily on site activities than the size of the unit. For example, unstable soils or heavy winter sanding will cause the grit chamber to fill more quickly but regular sweeping of paved surfaces will slow accumulation.

Inspection

Inspection is the key to effective maintenance and is easily performed. Pollutant transport and deposition may vary from year to year and regular inspections will help ensure that the system is cleaned out at the appropriate time. At a minimum, inspections should be performed twice per year (e.g. spring and fall) however more frequent inspections may be necessary in climates where winter sanding operations may lead to rapid accumulations, or in equipment washdown areas. Installations should also be inspected more frequently where excessive amounts of trash are expected.

The visual inspection should ascertain that the system components are in working order and that there are no blockages or obstructions in the inlet and separation screen. The inspection should also quantify the accumulation of hydrocarbons, trash, and sediment in the system. Measuring pollutant accumulation can be done with a calibrated dipstick, tape measure or other measuring instrument. If absorbent material is used for enhanced removal of hydrocarbons, the level of discoloration of the sorbent material should also be identified during inspection. It is useful and often required as part of an operating permit to keep a record of each inspection. A simple form for doing so is provided.

Access to the CDS unit is typically achieved through two manhole access covers. One opening allows for inspection and cleanout of the separation chamber (cylinder and screen) and isolated sump. The other allows for inspection and cleanout of sediment captured and retained outside the screen. For deep units, a single manhole access point would allows both sump cleanout and access outside the screen.

The CDS system should be cleaned when the level of sediment has reached 75% of capacity in the isolated sump or when an appreciable level of hydrocarbons and trash has accumulated. If absorbent material is used, it should be replaced when significant discoloration has occurred. Performance will not be impacted until 100% of the sump capacity is exceeded however it is recommended that the system be cleaned prior to that for easier removal of sediment. The level of sediment is easily determined by measuring from finished grade down to the top of the sediment pile. To avoid underestimating the level of sediment in the chamber, the measuring device must be lowered to the top of the sediment pile carefully. Particles at the top of the pile typically offer less resistance to the end of the rod than consolidated particles toward the bottom of the pile. Once this measurement is recorded, it should be compared to the as-built drawing for the unit to determine weather the height of the sediment pile off the bottom of the sump floor exceeds 75% of the total height of isolated sump.

Cleaning

Cleaning of a CDS systems should be done during dry weather conditions when no flow is entering the system. The use of a vacuum truck is generally the most effective and convenient method of removing pollutants from the system. Simply remove the manhole covers and insert the vacuum hose into the sump. The system should be completely drained down and the sump fully evacuated of sediment. The area outside the screen should also be cleaned out if pollutant build-up exists in this area.

In installations where the risk of petroleum spills is small, liquid contaminants may not accumulate as quickly as sediment. However, the system should be cleaned out immediately in the event of an oil or gasoline spill should be cleaned out immediately. Motor oil and other hydrocarbons that accumulate on a more routine basis should be removed when an appreciable layer has been captured. To remove these pollutants, it may be preferable to use absorbent pads since they are usually less expensive to dispose than the oil/water emulsion that may be created by vacuuming the oily layer. Trash and debris can be netted out to separate it from the other pollutants. The screen should be power washed to ensure it is free of trash and debris.

Manhole covers should be securely seated following cleaning activities to prevent leakage of runoff into the system from above and also to ensure that proper safety precautions have been followed. Confined space entry procedures need to be followed if physical access is required. Disposal of all material removed from the CDS system should be done in accordance with local regulations. In many jurisdictions, disposal of the sediments may be handled in the same manner as the disposal of sediments removed from catch basins or deep sump manholes.

CDS Model	Diameter		Distance from Water Surface to Top of Sediment Pile		Sediment Storage Capacity	
	ft	m	ft	m	y^3	m^3
CDS1515	3	0.9	3.0	0.9	0.5	0.4
CDS2015	4	1.2	3.0	0.9	0.9	0.7
CDS2015	5	1.3	3.0	0.9	1.3	1.0
CDS2020	5	1.3	3.5	1.1	1.3	1.0
CDS2025	5	1.3	4.0	1.2	1.3	1.0
CDS3020	6	1.8	4.0	1.2	2.1	1.6
CDS3025	6	1.8	4.0	1.2	2.1	1.6
CDS3030	6	1.8	4.6	1.4	2.1	1.6
CDS3035	6	1.8	5.0	1.5	2.1	1.6
CDS4030	8	2.4	4.6	1.4	5.6	4.3
CDS4040	8	2.4	5.7	1.7	5.6	4.3
CDS4045	8	2.4	6.2	1.9	5.6	4.3
CDS5640	10	3.0	6.3	1.9	8.7	6.7
CDS5653	10	3.0	7.7	2.3	8.7	6.7
CDS5668	10	3.0	9.3	2.8	8.7	6.7
CDS5678	10	3.0	10.3	3.1	8.7	6.7

Table 1: CDS Maintenance Indicators and Sediment Storage Capacities

Support

- Drawings and specifications are available at www.contechstormwater.com.
- Site-specific design support is available from our engineers.

Contech Engineered Solutions LLC provides site solutions for the civil engineering industry. Contech's portfolio includes bridges, drainage, sanitary sewer, stormwater, earth stabilization and wastewater treament products. For information, visit www.ContechES.com or call 800.338.1122

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800.925.5240
www.ContechES.com

CDS Inspection & Maintenance Log

CDS Model: _____ Location: _____

Date	Water depth to sediment[1]	Floatable Layer Thickness[2]	Describe Maintenance Performed	Maintenance Personnel	Comments

1. The water depth to sediment is determined by taking two measurements with a stadia rod: one measurement from the manhole opening to the top of the sediment pile and the other from the manhole opening to the water surface. If the difference between these measurements is less than the values listed in table 1 the system should be cleaned out. **Note: to avoid underestimating the volume of sediment in the chamber, the measuring device must be carefully lowered to the top of the sediment pile.**

2. For optimum performance, the system should be cleaned out when the floating hydrocarbon layer accumulates to an appreciable thickness. In the event of an oil spill, the system should be cleaned immediately.

25485

Attachment 1

STORMWATER OPERATION & MAINTENANCE PLAN

for

#196 Pond Road
Wellesley, Massachusetts 02482

REVISED: February 26, 2020
REVISED: January 10, 2020

25485

STORMWATER
OPERATION AND MAINTENANCE PLAN

#196 POND ROAD, WELLESLEY, MASSACHUSETTS 02482

Post Construction and Long-Term Maintenance

In order for the stormwater management system to function properly as designed, the system must be inspected on a regular basis and routine maintenance performed. The responsibility for the maintenance and operation of the system will be as follows:

Property Owners:
196 Pond Road
Wellesley, MA 02482

Per the Town of Wellesley Department of Public Works, Engineering Division, the inspection logs and reports must be submitted to the Wellesley Town Engineer on an annual basis. The operation and maintenance of the onsite stormwater drainage system must be performed annually and in perpetuity upon completion.

Routine inspections and some of the routine maintenance tasks will be performed by the owner's maintenance personnel.

For any questions regarding maintenance or operation of the stormwater management system, contact:

DGT Associates
1071 Worcester Road
Framingham MA 01701
Tel: 508-879-0030

The system contains the following Stormwater Best Management Practices (BMPs):

Deep Sump Catch Basin
Recharge (Infiltration) System
Water Quality Unit
Rain Garden

OPERATION AND MAINTENANCE MANUAL AND TRAINING
Upon completion of the construction project, a complete as-built plan of the system components will be prepared and will be a part of this O&M Plan. This O&M Plan includes a description of the purpose and function of each component, inspection and maintenance tasks and schedules, check lists, and report forms. The Plan should be used as the management document for the system. All maintenance personnel shall be trained in the specifics of the entire stormwater management system in order to be able to perform the inspections, documentation and the maintenance required. The design engineer will be available to provide a training session for the supervisors and personnel if necessary.

INSPECTIONS AND MAINTENANCE

The following pages describe the inspection, routine maintenance and non-routine maintenance which are required for each BMP. The inspection and maintenance requirements are based on the recommendations from the MassDEP Stormwater Management Standards Handbook, February 2008. Maintenance requirements for the Oil and Sediment Separator - Stormwater Treatment System, will be per the manufacturer's specifications.

The recommended procedures below should be followed strictly for at least the first two years of the system operation. During that period, the observations and experience gained from the monitoring and maintenance will provide the information necessary so that adjustments can be made for the most efficient operation and maintenance of the system.

NON-STORMWATER DISCHARGES
This is to provide notice to the owner and operator(s) of the subject property and stormwater system that the discharge of any non-stormwater to the subject stormwater management system is prohibited. Also, there shall be no modifications to the stormwater system for the purpose of discharging non-stormwater to the system. Non-stormwater discharges are any liquid or materials that are not the result of natural rainfall runoff or runoff from snow and ice melt. The purpose of this is to protect groundwater and surface water quality as well as to assure compliance with applicable laws.

CONFINED SPACE ENTRY
Note that any inspections or maintenance activity of underground piping, chambers, deep manholes, etc. that requires entry into the system must be in accordance with OSHA confined space regulations.

DEEP SUMP CATCH BASINS

DESCRIPTION AND FUNCTION
These structures are modified catch basins that collect stormwater from small drainage areas with added features to enhance the capture of gas, oils, grease, trash, floating debris, and sediment over that of conventional catch basins and stormwater inlets. The inlet of the deep sump catch basin is a cast iron grate over the precast concrete structure. The sump below the elevation of the outlet pipe invert traps sediment. The outlet pipe includes an oil and gas trap hood that keeps floating hydrocarbons and other floating debris in the structure chamber until they settle with the sediment or is removed by a pumper as part of the routine cleaning.

INSPECTIONS
The catch basins should be inspected at least four times per year including at the end of the foliage and snow removal seasons. For a full inspection, remove the grate and inspect the general condition of the unit including the amount of floating debris and the presence of hydrocarbons if any. If the inspection finds a large presence of hydrocarbons, such as a layer of floating oil or a strong odor of gas, hydrocarbons should be removed immediately. Measure the amount of sediment that has collected. Pipe outlets should be clear of debris. If the water level is below the outlet pipe, closer inspection for possible leaks is warranted. Note that a water level somewhat below the outlet level is normal

during extended periods with no precipitation due to evaporation and minor expected seepage.

ROUTINE MAINTENANCE
Initially, the catch basins should be cleaned a minimum of two times a year and additionally if necessary based on the results of the quarterly inspection. Cleaning consists of the removal of floating hydrocarbons and accumulated sediment, and clearing the inlet grate and outlet tee and pipe. Sediment should be removed from the catch basin if the measurement of the sediment is over one foot in depth. A hazardous waste disposal contractor must perform the removal of hydrocarbons.

NON-ROUTINE MAINTENANCE
These are structural repairs and replacement of system components. Typical items for this BMP may include:

Repairing the outlet snout and/or pipe
Filling cracks in the concrete
Patching of mortar and brick
Resetting of inlet grates

MAINTENANCE EQUIPMENT

Hand tools for opening grates
Measuring stick
Vacuum pumping truck (haz-mat contractor for hydrocarbon removal)
Vacuum pumping truck (for sediment removal)

RECHARGE (INFILTRATION) SYSTEMS

DESCRIPTION AND FUNCTION
The subsurface (underground) recharger systems proposed for this project is constructed of precast concrete galleys surrounded by washed stone and filter fabric. The chambers are constructed in a permeable soil suitable for infiltrating. Manholes/observation ports are brought to finished grade for access.

The purpose of the recharger systems are to meet recharge requirements and to treat runoff from the site.

INSPECTIONS
The recharger systems should be inspected after every major storm for the first few months. After this time period it may be inspected once each year and should preferably be done two to three days after a significant storm event. The inspection should examine whether the chamber is draining properly following storms. The underground recharger systems should drain within a few hours following the end of a storm up to a maximum of 72 hours. Pipe inlets should be clear of debris and there should be no significant accumulation of sediment in the chambers. The annual inspection of the infiltration systems should include removal of the key manhole covers/observation ports to view the interior of the chamber. If significant accumulation of sediment occurs, most will be near the inlet pipe(s) to the underground chamber and can be removed by hand or vacuum pumper. A significant accumulation of sediment may indicate a problem with soil

migrating into the system from the surrounding soil indicating a failure of the filter fabric protection or a pipe problem in the pipe leading into the systems.

ROUTINE MAINTENANCE
The stormwater systems include a pretreatment BMP so sediment removal should rarely be required. Routine maintenance generally includes clearing debris from the inlet pipes if found during an inspection.

NON-ROUTINE MAINTENANCE
These are structural repairs and replacement of system components. Typical items for this BMP may include:

Repairing the inlet pipes
Filling cracks in the concrete
Resetting of covers
Removal of significant accumulation of sediment from the chambers that affects the infiltration capacity.

MAINTENANCE EQUIPMENT

Hand tools for opening covers, flash light.
Equipment as may be necessary to comply with OSHA confined space requirements.

WATER QUALITY UNIT

INSPECTIONS
This unit should be inspected on a monthly basis and after major storm events for the first year. Remove the cover and inspect the general condition of the unit including the amount of floating debris and the presence of hydrocarbons if any. If the inspection finds a large presence of hydrocarbons, such as a layer of floating oil or a strong odor of gasoline, it should be removed immediately. Measure the amount of sediment that has collected using a measuring stick or "Sludge Judge" measuring tube. Pipe inlets and outlets should be clear of debris. After the first year, the number of inspections may be reduced based on the experience during the first year monitoring but not less than 2 times per year. Two of the inspections must include one at the end of the foliage season and one at the end of the snow season.

ROUTINE MAINTENANCE
The unit should be cleaned a minimum of two times during the first year or when the sediment level reaches 8 inches in depth per the manufacturer's maintenance specifications. A copy of the manufacturer's chart is provided attached to the end of this section. Cleaning consists of the removal of floating hydrocarbons and accumulated sediment, and clearing the inlet pipes. The removal of hydrocarbons must be performed by a hazardous waste disposal contractor. Removal of the sediment is by a standard vacuum truck.

NON-ROUTINE MAINTENANCE
These are structural repairs and replacement of system components. Typical items for this BMP may include:

Repairing the inlet or outlet pipes.
Filling cracks in the concrete
Resetting of covers.

MAINTENANCE EQUIPMENT

Hand tools for opening covers
Measuring stick or "Sludge Judge".
Vacuum pumping truck (haz-mat contractor for hydrocarbon removal)
Contracted vacuum pumping truck (for sediment removal)

RAIN GARDEN

DESCRIPTION AND FUNCTION

The rain garden uses soils, plants, and microbes to treat stormwater before it is infiltrated and/or discharged. The rain garden is a shallow depression filled with sandy soil topped with a thick layer of mulch and planted with dense native vegetation. The runoff percolates through the soil media that acts as a filter.

INSPECTIONS

The rain garden requires careful attention while plants are being established and seasonal landscaping maintenance thereafter. Inspect pretreatment devices and the rain garden regularly for sediment build-up, structural damage, and standing water. Overall the rain garden should be inspected monthly. Remove and replace dead vegetation as well as trash and other debris. The areas should be inspected for trash and debris, vegetative health, stability, and soil erosion.

ROUTINE MAINTENANCE

Remove and replace dead vegetation semi-annually or as needed. Removal of trash and debris should take place monthly with replacement of mulch occurring 1-2 times per year. Mow ground cover vegetation once per year. Prune shrubs and trees 1or 2 times per year as recommended for the particular plant species. Other tasks include fertilizing (only when necessary), liming, watering, pruning, and weed and pest control if necessary to maintain the health of the vegetated cover.

NON-ROUTINE MAINTENANCE

These are structural repairs and replacement of system components. Typical items for this BMP may include:

- **Major repairs to vegetation**
- **Replace the media and vegetation when prolonged ponding of water occurs following rain events (greater than 72 hours).**
- **Repair of eroded areas creating an improperly functioning BMP**

MAINTENANCE EQUIPMENT

- **Typical lawn and vegetation maintenance equipment (mower, rakes, pruning shears, etc.)**
- **Shovels, trash bags, and wheelbarrow for removal of sediment.**

STORMWATER MANAGEMENT SYSTEM

INSPECTION AND MAINTENANCE FORMS

CONTENTS:

DEEP SUMP CATCH BASIN

Routine Inspection Checklist - Inspected quarterly Date _____

	Inlet Grate	Sediment Depth	Hydrocarbons*	Structural Integrity	Pipes Clear	Comments
CB #2						

* Presence of hydrocarbons is a clearly visible layer of oil, gasoline, grease, hydraulic fluid, etc., floating on the surface or a strong odor of gas or oil

SUBSURFACE INFILTRATION (RECHARGER) SYSTEMS

Routine Inspection Checklist - Inspected annually and two to three days after a rainfall. Date _____

	Draining Properly	Sediment	Structural Integrity	Pipe Inlet	Debris	Comments
Recharger #3						
Recharger #4						
Recharger #5						
Recharger #6						

WATER QUALITY UNIT

Routine Inspection Checklist - Inspected Semi-Annually Date _____

	Structural Integrity	Sediment Depth	Hydrocarbons*	Inlet/Outlet Pipe	Floating Debris	Comments
WQU #2						

* Presence of hydrocarbons is a clearly visible layer of oil, gasoline, grease, hydraulic fluid, etc., floating on the surface or a strong odor of gas or oil

RAIN GARDEN

Routine Inspection Checklist - Inspection semi-annually Date _____

	Slope Integrity	Sediment Depth	Vegetation	Erosion	Ponding	Comments
Rain Garden #2						

STORMWATER MAINTENANCE / REPAIR RECORD FORM

Date of Maintenance: _______________ Performed By: _______________________

Maintenance / repair tasks were performed on the following on-site BMP structures:

Stormwater Structure Work Performed

Other Comments:

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CDS® Inspection and Maintenance Guide

CDS TECHNOLOGIES

Maintenance

The CDS system should be inspected at regular intervals and maintained when necessary to ensure optimum performance. The rate at which the system collects pollutants will depend more heavily on site activities than the size of the unit. For example, unstable soils or heavy winter sanding will cause the grit chamber to fill more quickly but regular sweeping of paved surfaces will slow accumulation.

Inspection

Inspection is the key to effective maintenance and is easily performed. Pollutant transport and deposition may vary from year to year and regular inspections will help ensure that the system is cleaned out at the appropriate time. At a minimum, inspections should be performed twice per year (e.g. spring and fall) however more frequent inspections may be necessary in climates where winter sanding operations may lead to rapid accumulations, or in equipment washdown areas. Installations should also be inspected more frequently where excessive amounts of trash are expected.

The visual inspection should ascertain that the system components are in working order and that there are no blockages or obstructions in the inlet and separation screen. The inspection should also quantify the accumulation of hydrocarbons, trash, and sediment in the system. Measuring pollutant accumulation can be done with a calibrated dipstick, tape measure or other measuring instrument. If absorbent material is used for enhanced removal of hydrocarbons, the level of discoloration of the sorbent material should also be identified during inspection. It is useful and often required as part of an operating permit to keep a record of each inspection. A simple form for doing so is provided.

Access to the CDS unit is typically achieved through two manhole access covers. One opening allows for inspection and cleanout of the separation chamber (cylinder and screen) and isolated sump. The other allows for inspection and cleanout of sediment captured and retained outside the screen. For deep units, a single manhole access point would allows both sump cleanout and access outside the screen.

The CDS system should be cleaned when the level of sediment has reached 75% of capacity in the isolated sump or when an appreciable level of hydrocarbons and trash has accumulated. If absorbent material is used, it should be replaced when significant discoloration has occurred. Performance will not be impacted until 100% of the sump capacity is exceeded however it is recommended that the system be cleaned prior to that for easier removal of sediment. The level of sediment is easily determined by measuring from finished grade down to the top of the sediment pile. To avoid underestimating the level of sediment in the chamber, the measuring device must be lowered to the top of the sediment pile carefully. Particles at the top of the pile typically offer less resistance to the end of the rod than consolidated particles toward the bottom of the pile. Once this measurement is recorded, it should be compared to the as-built drawing for the unit to determine weather the height of the sediment pile off the bottom of the sump floor exceeds 75% of the total height of isolated sump.

Cleaning

Cleaning of a CDS systems should be done during dry weather conditions when no flow is entering the system. The use of a vacuum truck is generally the most effective and convenient method of removing pollutants from the system. Simply remove the manhole covers and insert the vacuum hose into the sump. The system should be completely drained down and the sump fully evacuated of sediment. The area outside the screen should also be cleaned out if pollutant build-up exists in this area.

In installations where the risk of petroleum spills is small, liquid contaminants may not accumulate as quickly as sediment. However, the system should be cleaned out immediately in the event of an oil or gasoline spill should be cleaned out immediately. Motor oil and other hydrocarbons that accumulate on a more routine basis should be removed when an appreciable layer has been captured. To remove these pollutants, it may be preferable to use absorbent pads since they are usually less expensive to dispose than the oil/water emulsion that may be created by vacuuming the oily layer. Trash and debris can be netted out to separate it from the other pollutants. The screen should be power washed to ensure it is free of trash and debris.

Manhole covers should be securely seated following cleaning activities to prevent leakage of runoff into the system from above and also to ensure that proper safety precautions have been followed. Confined space entry procedures need to be followed if physical access is required. Disposal of all material removed from the CDS system should be done in accordance with local regulations. In many jurisdictions, disposal of the sediments may be handled in the same manner as the disposal of sediments removed from catch basins or deep sump manholes.

CDS Model	Diameter		Distance from Water Surface to Top of Sediment Pile		Sediment Storage Capacity	
	ft	m	ft	m	y^3	m^3
CDS1515	3	0.9	3.0	0.9	0.5	0.4
CDS2015	4	1.2	3.0	0.9	0.9	0.7
CDS2015	5	1.3	3.0	0.9	1.3	1.0
CDS2020	5	1.3	3.5	1.1	1.3	1.0
CDS2025	5	1.3	4.0	1.2	1.3	1.0
CDS3020	6	1.8	4.0	1.2	2.1	1.6
CDS3025	6	1.8	4.0	1.2	2.1	1.6
CDS3030	6	1.8	4.6	1.4	2.1	1.6
CDS3035	6	1.8	5.0	1.5	2.1	1.6
CDS4030	8	2.4	4.6	1.4	5.6	4.3
CDS4040	8	2.4	5.7	1.7	5.6	4.3
CDS4045	8	2.4	6.2	1.9	5.6	4.3
CDS5640	10	3.0	6.3	1.9	8.7	6.7
CDS5653	10	3.0	7.7	2.3	8.7	6.7
CDS5668	10	3.0	9.3	2.8	8.7	6.7
CDS5678	10	3.0	10.3	3.1	8.7	6.7

Table 1: CDS Maintenance Indicators and Sediment Storage Capacities

Support

- Drawings and specifications are available at www.contechstormwater.com.
- Site-specific design support is available from our engineers.

Contech Engineered Solutions LLC provides site solutions for the civil engineering industry. Contech's portfolio includes bridges, drainage, sanitary sewer, stormwater, earth stabilization and wastewater treament products. For information, visit www.ContechES.com or call 800.338.1122

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CDS Inspection & Maintenance Log

CDS Model: _____ Location: _____

Date	Water depth to sediment[1]	Floatable Layer Thickness[2]	Describe Maintenance Performed	Maintenance Personnel	Comments

1. The water depth to sediment is determined by taking two measurements with a stadia rod: one measurement from the manhole opening to the top of the sediment pile and the other from the manhole opening to the water surface. If the difference between these measurements is less than the values listed in table 1 the system should be cleaned out. **Note: to avoid underestimating the volume of sediment in the chamber, the measuring device must be carefully lowered to the top of the sediment pile.**

2. For optimum performance, the system should be cleaned out when the floating hydrocarbon layer accumulates to an appreciable thickness. In the event of an oil spill, the system should be cleaned immediately.