STORMWATER MANAGEMENT REPORT

Arlington Reservoir – Phase 2

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COMMITMENT & INTEGRITY DRIVE RESULTS

0233115.00
Town of Arlington
Massachusetts
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APPENDICES

1. PROJECT DESCRIPTION

1.1 Introduction

On behalf of the Town of Arlington, Massachusetts (the Town), Woodard & Curran, Inc. (Woodard & Curran) has prepared this Stormwater Management Report for the proposed improvements to the Arlington Reservoir, located at 210 Lowell Street in Arlington, Massachusetts (the Site). The Town is proposing to revitalize the eastern shore of the Arlington Reservoir recreation area. Weston & Sampson Engineers, Inc. (Weston and Sampson), on behalf of the Town of Arlington, developed a Master Plan for the Reservoir in 2018. This proposed project encompasses Phase 2 of the Master Plan and improvements include installing porous pavement over the approximately 0.5-acre gravel parking area in the southern portion of the site, installation of new ADA-accessible pathways, a new play area, a multi-use court, a boat launch, and several other Site improvements as shown on the Post-Development Watershed Figure located in **Appendix C**. The impacts of these improvements to the Site's stormwater drainage patterns are summarized in this report.

1.2 Existing Conditions

A Site Locus Plan on a United States Geological Survey (USGS) Quadrangle Map depicting the project location has been provided in **Appendix A**. Arlington Reservoir is a 65-acre man-made recreational and stormwater-control pond on the Arlington and Lexington Town border. About half of the reservoir's open water is located in the Town of Lexington, however, the Town of Arlington owns and manages the reservoir. The earthen dam around the southern edge of the Reservoir is approximately 600 yards long and up to 14 feet tall. The water within the Reservoir discharges into Mill Brook through a sluice gate.

In 1935, the Town of Arlington constructed a sandy beach on the Reservoir's eastern shore. In the late 1970s, the Town completed improvements to the beach and added an embankment to separate the swimming area from the rest of the Reservoir. The beach now includes a filtered, chlorinated swimming area with a ramp for ADA accessibility, a bathhouse, vending machines, a concession area, and a playground. The Reservoir also has a one-mile walking trail around its perimeter, open to the public throughout the year.

1.2.1 Land Cover and Soils

Land cover and soils datasets were used to develop hydrologic curve numbers. Land cover was determined by a site visit conducted on September 3, 2020 and review of aerial photography and site survey data. A more detailed examination of the existing land cover within individual drainage subcatchments can be found in section 2.2.2. All existing impervious areas located within the Town of Lexington that are proposed to be replaced with a pervious land cover are required to be considered open space in good condition for stormwater calculations purposes per Lexington's Stormwater Management Regulations.

Soil characteristics were observed during test pit evaluations conducted in August 2020 and supplemented with information obtained from the United States Department of Agriculture's (USDA's) most recent Web Soil Survey. A Site map showing soil types and hydrologic soil group classifications within the project vicinity from the USDA's Web Soil Survey is located in **Appendix B**.

Test pits were conducted by Civil Design Consultants, Inc. (CDCI) of Methuen, Massachusetts on August 6, 2020 to evaluate the subsurface soil conditions and identify the estimated seasonal high groundwater table elevation. In all four borings conducted, CDCI observed a surface layer of fill ranging from 9 to 27 inches in depth, followed by a sandy loam layer extending to the bottom of each test pit. From these test pits, it was determined that at its highest elevation in the 0.5-acre parking lot, the seasonal high groundwater table is located approximately at elevation 159.40. Woodard & Curran used this data to locate the proposed stormwater best management practices (BMPs) at elevations with at

least two feet of separation from groundwater. Bedrock was not encountered during test pitting activities. The test pit logs and location figure provided by CDCI are located in **Appendix B**.

1.2.2 Topography

Subcatchment boundaries were delineated using the site survey performed and prepared by Weston & Sampson in December 2017. Topographically, the eastern shore of the Reservoir generally slopes downward from Lowell Street towards the Reservoir, with the exception of the southern-most portion of the 0.5-acre gravel parking area, which slopes downwards towards a ditch just north of the property located at 202 Lowell Street.

In both the pre- and post-development Site conditions, stormwater travels across the Site via overland flow and discharges into one of three Design Points: Arlington Reservoir, the on-Site swimming area, and the ditch located north of 202 Lowell Street. The Design Points and contributing areas are further described in Section 2.2.1. and are depicted in the Pre- and Post-Development Watershed Figures in **Appendix C**.

1.2.3 Resource and Critical Areas

Woodard & Curran reviewed Massachusetts Geographic Information System (MassGIS) data, the Massachusetts Department of Environmental Protection's (MassDEP's) Habitat of Potential Regional and Statewide Importance maps, the Massachusetts Stormwater Handbook, the Massachusetts Year 2016 Integrated List of Waters, and the Federal Emergency Management Agency's (FEMA's) National Flood Hazard Layer (NFHL) database. The findings of our review are below:

- The Massachusetts Endangered Species Act (MESA) protects rare species and their habitats by prohibiting the taking of any plant or animal species listed as Endangered, Threatened, or Special Concern by the Massachusetts Division of Fisheries & Wildlife. MESA review is required by the Natural Heritage & Endangered Species Program (NHESP) for projects and activities located within a Priority or Estimated Habitat of Rare Species. Review of the MassGIS Data shows there are no Priority or Estimated Habitats within the Project Area; therefore, the project is not subject to MESA review.

- Per MassGIS Data, there are no Certified or Potential Vernal Pools within or near the project area.

- Per MassGIS Data, the project is not located within any Areas of Critical Environmental Concern.

- Per the MassDEP's Habitat of Potential Regional and Statewide Importance maps for the Towns of Arlington and Lexington, the project in not located within a Habitat of Regional or Statewide Importance.

- Per the Massachusetts Stormwater Handbook, critical areas include Outstanding Resource Waters and Special Resource Waters, recharge areas for public water supplies, bathing beaches, cold-water fisheries, and shellfish growing areas. Review of MassGIS Data indicated that the Arlington Reservoir is not located within a resource area, however, the Swimming Area on the eastern shore of the Reservoir is classified as a bathing beach, as defined in 105 CMR 445, and thus a critical area.

- Per the Massachusetts Year 2016 Integrated List of Waters, Mill Brook, which receives discharges from Arlington Reservoir via a sluice gate on the southern portion of the Reservoir, is classified as a Category 5 water, meaning the waterbody requires a Total Maximum Daily Load (TMDL) restriction. Mill Brook's impairment of concern is Escherichia Coli (E. Coli). Proposed site improvements are not likely to increase E. Coli levels in Arlington Reservoir, and thus contributing to Mill Brook's impairment.

- Per FEMA's NFHL database, the majority of the Site is located within an area of minimal flood hazard (Zone X). The Reservoir's shoreline and the isolated swimming area are located within special flood hazard areas (Zone AE). The FEMA NFHL FIRMette Map is located in **Appendix A**.

Measures taken to address the presence of a critical area on-Site are detailed in Section 3.6. Critical areas have specific stormwater analysis guidelines, requiring the use of certain pollution prevention measures and BMPs to the maximum extent practicable for redevelopment projects.

1.3 Proposed Project Work

The proposed project consists of paving the approximately 0.5-acre gravel parking area in the southern portion of the site, renovation of the existing bathhouse and concessions building, installation of new ADA-accessible concrete pathways, lifeguard stands, picnic tables, a playground, multi-use court, boat launch, check-in shelter, and several other surficial Site improvements. Construction activities are expected to begin in March 2021 and end in November 2021.

2. STORMWATER EVALUATION

2.1 Stormwater Modeling Methodology

TR-55/TR-20 methodology was used to develop a hydrologic model of the site. Woodard & Curran used the computer program entitled HydroCAD Version 10.0, developed by HydroCAD Software Solutions, LLC in order to create and analyze the site hydrology. The analysis was conducted in order to establish the peak rates of runoff and estimated runoff volume from the project site. This was accomplished to evaluate pre- and post-development conditions during various storm events. Contributing drainage areas were identified and soils, surface cover, watershed slope, and flow paths were evaluated to develop the necessary HydroCAD model input parameters. A minimum Time of Concentration (Tc) of 6 minutes was used in the calculations, as applicable.

Drainage calculations were performed for the pre- and post-development conditions for the 1-, 2-, 10-, 25-, and 100-year 24-hour Type III storm events, and are included in **Appendix D**, in accordance with the Town of Arlington's, Town of Lexington's, and the Massachusetts Department of Environmental Protection's Stormwater Management Regulations. The total rainfall for each of the storm events was based upon data published by the Northeast Regional Climate Center (NRCC) and Natural Resources Conservation Service (NRCS) entitled *Extreme Precipitation in New York and New England* found at http://precip.eas.cornell.edu/. The total precipitation depth for the project site associated with each rainfall event is outlined in **Table 2-1**, below.

Table 2-1: Design Rainfall Data

Type III 24-Hour Storm Event (Frequency)	Rainfall Depth (Inches)
1-Year	2.67
2-Year	3.21
10-Year	4.86
25-Year	6.17
100-Year	8.85

A copy of the NRCC and NRCS Extreme Precipitation Table for the project Site is included in **Appendix A**.

2.2 Hydraulic Model Description

A stormwater model has been developed to compare the peak runoff rates from the pre-development site to the peak runoff rates anticipated from the post-development site. As further described herein, the model demonstrates that the post-development runoff rates will not exceed pre-development rates.

2.2.1 Design Points

Existing and proposed subcatchments were delineated in order to compare pre- and post-development peak rates of runoff. Although the size of each subcatchment differs slightly between the existing and proposed site conditions, the total area analyzed between the two conditions remained the same. A Design Point was established for each watershed, symbolizing the area's ultimate stormwater discharge location. For this analysis, two watershed areas were identified, and therefore two Design Points were chosen, as follows:

- Design Point 1 (DP-1): represents runoff discharging to the Arlington Reservoir and Swimming Area.

- Design Point 2 (DP-2): represents runoff discharging to the ditch located north of the property at 202 Lowell Street.

The locations of the Design Points do not differ in the pre- and post-development analyses, as seen in the figures located in **Appendix C**.

2.2.2 Pre-Development Conditions

The pre-development project area consists of a swimming area, sandy beach, bathhouse, vending machines, concession area, playground, pump station building, walking paths, benches, lifeguard stands, a 0.5-acre gravel parking lot, a small paved parking lot, and various other Site features. Existing grassed areas on-Site were modeled to be in "fair" condition, as much of the grassed surfaces are currently covered in beach sand and therefore are not likely infiltrating groundwater as efficiently as grass in "good" condition would be.

Per Article 15 – Storm Water Mitigation of the Town of Arlington's Title V – Regulations Upon the Use of Private Property Bylaws, impervious surfaces are defined as "a hard-surfaced, human-made area that does not readily absorb or retain water, preventing the infiltration of storm water runoff; including but not limited to…parking and driveway areas…" Upon review of existing conditions at the site, it appears the 0.5-acre gravel parking lot on the southern half of the Site exhibits the hydrologic characteristics one would expect with an impervious surface. Ponded water has been observed on the gravel surface several days after rain events due to its inability to infiltrate to the soil below. Based on this review and Article 15 of the Town of Arlington's Title V Bylaws, the gravel parking area has been considered impervious for the purposes of this stormwater analysis.

The pre-development watershed area is approximately 5.42 acres in size. There are no existing stormwater BMPs on-Site; stormwater runoff from the three subcatchments within the project area is conveyed via overland flow to their respective design points, as described below:

- *Subcatchment 1:* Subcatchment 1 encompasses the northern portion of the Site, including the playground, beach, and parking lots. Stormwater runoff from subcatchment 1 flows via overland flow from east to west before discharging into the Arlington Reservoir and Swimming Area (DP-1), which is classified by MassDEP as a critical area. The area is approximately 5.22 acres in size; land cover is primarily comprised of grass, beach sand, surface water, and impervious gravel with smaller areas of brush, impervious structures, and sand pathways. The calculated weighted curve number for this subcatchment is 71.

- *Subcatchment 2:* Subcatchment 2 encompasses the southern-most portion of the 0.5-acre gravel parking area. Stormwater runoff from subcatchment 3 flows via overland flow from north to south before discharging into the ditch just north of the property at 202 Lowell Street (DP-2). The area is approximately 0.20 acre in size; land cover is primarily comprised of impervious gravel, grass, and brush, with smaller areas of impervious surfaces. The calculated weighted curve number for this subcatchment is 64.

The subcatchment areas and their associated design points are illustrated on the Pre-Development Watershed Figure provided in **Appendix C** of this Report.

2.2.3 Post-Development Conditions

The post-development project area will consist of a swimming area, sandy beach, renovated bathhouse, vending machine, and concession area, a newly-paved picnic pavilion and drop-off area, a new check-in area, permeable multi-surface athletic court, playground, lifeguard stands, walking paths, restored grass areas, 21,500 square-foot porous pavement parking lot, and various other Site features. The new walking paths around the project area will be ADA-

accessible and will allow increased Site access not currently provided in the Site's existing condition. The porous pavement parking lot is described in further detail in Section 2.2.4.

Similar to the pre-development model, the post-development watershed area is also 5.42 acres in size. Stormwater runoff from the two subcatchments will flow to its respective design points, as described below:

- *Subcatchment 1:* Subcatchment 1 will encompass the northern portion of the Site, including the playground, beach, and parking lots. Stormwater runoff from subcatchment 1 will flow via overland flow from east to west before either discharging directly into Arlington Reservoir and Swimming Area (DP-1) or into the porous pavement system proposed for installation over the Site's southern parking area. Stormwater entering the porous pavement system will either infiltrate into the ground or, during large storm events, will be collected by the system's underdrain and discharged towards Arlington Reservoir. The subcatchment area will be approximately 5.32 acres in size; land cover will be primarily comprised of grass, surface water, beach sand, porous asphalt pavement, and various impervious surfaces (including standard asphalt pavement, concrete walkways, and structures), with smaller areas of brush, permeable playground and athletic court surfaces, and stone dust. The calculated weighted curve number for this subcatchment is 69.

- *Subcatchment 2:* Subcatchment 2 will encompass the area south of the porous pavement parking area. Stormwater runoff from subcatchment 2 will flow via overland flow from north to south before discharging into the ditch just north of the property at 202 Lowell Street (DP-2). The area will be approximately 0.10 acre in size; land cover will be entirely comprised of grass. The calculated weighted curve number for this subcatchment is 39.

The subcatchment areas and their associated design points are illustrated on the Post-Development Watershed Figure provided in **Appendix D** of this Report.

2.2.4 Low Impact Development Technique – Porous Pavement

Porous pavement was selected as a Low Impact Development (LID) technique for this Site in accordance with the Arlington Reservoir Master Plan written by Weston & Sampson in 2018. The proposed 21,500 square-foot porous pavement parking lot will replace the existing impervious gravel lot, which will provide a stabilized parking area and minimize the amount of maintenance required to upkeep the parking lot and reduce the amount sediment transported into Arlington Reservoir during post-construction conditions. Stormwater directed to the porous pavement will filter through the system's asphalt, choker, and pea gravel courses and enter the reservoir course, designed to provide storage capacity while stormwater infiltrates into the soils beneath the system. The bottom of the reservoir course was designed at elevation 161.40, providing a 2-foot separation from the highest seasonal high groundwater table elevation observed during test pitting activities conducted at the Site. A four-inch PVC underdrain and three grate inlets will be installed within the western-most portion of the system's reservoir course to provide an outlet for stormwater during extreme storm events. The invert of these outlets was designed at the 100-year storm elevation within the porous pavement BMP, meaning rainfall greater than the 100-year storm will flow through the reservoir course of the pavement system to the PVC underdrain and grate inlets and will discharge to the Arlington Reservoir (DP-1).

Volume 1, Chapter 1 of the Massachusetts Stormwater Handbook does not list porous pavement as an approved stormwater BMP for discharges near bathing beaches and Volume 2, Chapter 2 of the Handbook states that porous pavement shall be set back at least 100 feet from surface waters to receive any water quality credit. Existing Site constraints, including the lack of available area to install stormwater BMPs and the proximity to surface water across the entire project area, inhibit the use of many typical BMPs. Although porous pavement is not a listed BMP for bathing beaches, its use can be implemented within the project area and it will improve stormwater treatment at the Site by increasing water quality volume, annual recharge, and removal of total suspended solids (TSS) in the post-development Site condition.

2.3 Peak Discharge Rates and Runoff Volumes

The tables below summarize the pre- and post-development peak discharge rates and runoff volumes for each Design Point.

Table 2-2: Pre- and Post-Development Peak Discharge Rates

Design Point	1-year (cfs)			2-year (cfs)			10-year (cfs)			25-year (cfs)			100-year (cfs)		
	Pre	Post	Δ	Pre	Post	Δ	Pre	Post	Δ	Pre	Post	Δ	Pre	Post	Δ
DP-1	2.96	1.65	**-1.31**	4.93	3.15	**-1.78**	12.11	8.92	**-3.19**	18.53	14.29	**-4.24**	32.53	26.30	**-6.23**
DP-2	0.04	0.00	**-0.04**	0.10	0.00	**-0.10**	0.33	0.00	**-0.33**	0.54	0.02	**-0.52**	1.04	0.13	**-0.91**

Note: Δ stands for net difference between the pre- and post-development rates.

Table 2-3: Pre- and Post-Development Runoff Volumes

Design Point	1-year (af)			2-year (af)			10-year (af)			25-year (af)			100-year (af)		
	Pre	Post	Δ	Pre	Post	Δ	Pre	Post	Δ	Pre	Post	Δ	Pre	Post	Δ
DP-1	0.25	0.17	**-0.08**	0.38	0.27	**-0.11**	0.87	0.66	**-0.21**	1.32	1.03	**-0.29**	2.32	1.87	**-0.45**
DP-2	0.00	0.00	**0.00**	0.00	0.00	**0.00**	0.03	0.00	**-0.03**	0.04	0.00	**-0.04**	0.07	0.01	**-0.06**

Note: Δ stands for net difference between the pre- and post-development volumes.

Table 2-2 demonstrates a decrease in peak discharge rates between the existing and proposed site conditions for all scenarios shown above; **Table 2-3** demonstrates a decrease in runoff volumes between the existing and proposed site conditions for all scenarios shown above. Complete copies of the pre- and post-development HydroCAD computer model outputs demonstrating that peak discharge rates and runoff volumes decrease between the existing and proposed Site conditions are included in **Appendix D**.

3. COMPLIANCE WITH STORMWATER MANAGEMENT STANDARDS

Volume 1, Chapter 1 of the Massachusetts Stormwater Handbook states:

> *"For purposes of the Stormwater Management Standards, redevelopment projects are defined to include…maintenance and improvement of existing roadways, including widening less than a single lane, adding shoulders, correcting substandard intersections, improving existing drainage systems, and repaving."*

By this definition, the Arlington Reservoir Phase 2 project is considered a redevelopment project, meaning certain Standards included in the Massachusetts Stormwater Handbook only need to be met to the maximum extent practicable (as defined by Standard 7). The following sections further detail applicability of these Stormwater Management Standards and demonstrates that the proposed Arlington Reservoir – Phase 2 Project complies with these requirements.

3.1 Standard 1: No New Untreated Discharges

"No new stormwater conveyances (e.g. outfalls) will discharge untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth."

In the existing site condition, stormwater is generally transported via overland flow towards the Arlington Reservoir and Swimming Area (DP-1) and the ditch just north of the property at 202 Lowell Street (DP-2). Runoff from the project area is not currently treated prior to discharge. The proposed site improvements will not create any new untreated stormwater discharges and will result in a net decrease in impervious area of approximately 18,000 square feet. Stormwater runoff from Site will be either conveyed via overland flow to Design Points, similar to existing condition drainage patterns, or will be treated by a new porous pavement system prior to infiltrating into the ground or, during extreme storms greater than the 100-year event, discharging into the Arlington Reservoir (DP-1) after filter treatment. There are no proposed untreated stormwater discharges that will cause erosion in or to wetlands or waters of the Commonwealth. This Standard has been met.

3.2 Standard 2: Peak Rate Attenuation

"Stormwater management systems shall be designed so that post-development peak discharge rates do not exceed pre-development peak discharge rates."

Calculations are provided to show that the post-development peak discharge rates do not exceed pre-development rates for the 1-, 2-, 10-, 25-, and 100-year 24-hour storm events. A detailed description of both the existing and proposed Site conditions are located in Section 2.2 of this report. Copies of the existing and proposed HydroCAD computer model outputs demonstrating that this standard has been met are included in **Appendix D**.

3.3 Standard 3: Recharge

"Loss of annual recharge to groundwater shall be eliminated or minimized through the use of infiltration measures including environmentally sensitive site design, low impact development techniques, stormwater best management practices, and good operation and maintenance. At a minimum, the annual recharge from the post-development site shall approximate the annual recharge from pre-development conditions based on soil type. This condition is met when the stormwater management system is designed to infiltrate the required volume as determined in accordance with the Massachusetts Stormwater Handbook."

The proposed improvements will decrease the amount of impervious area across the project Site by approximately 18,000 square feet. No additional groundwater recharge volume is required, however, installation of porous pavement over the existing gravel parking lot in the southern portion of the Site and restoration of grass areas throughout the Site

are proposed as part of this project. The porous pavement and restored grass areas will increase stormwater infiltration, and therefore annual recharge, in the post-development Site condition.

3.4 Standard 4: Water Quality

"Stormwater management systems shall be designed to remove 80% of the average annual post-construction load of Total Suspended Solids (TSS). This Standard is met when: (a) Suitable practices for source control and pollution prevention are identified in long-term pollution prevention plan, and thereafter implemented and maintained; (b) Structural stormwater best management practices are sized to capture the required water quality volume determined in accordance with the Massachusetts Stormwater Handbook; and (c) Pretreatment is provided in accordance with the Massachusetts Stormwater Handbook."

Existing Site conditions provide 0% TSS removal. The Town of Arlington is proposing to install a porous pavement system over the existing gravel parking lot in the southern portion of the Site. The system will increase water quality volume and remove TSS from the stormwater runoff produced from the proposed parking lot area and the adjacent grass area to the east sloping downward from Lowell Street in the post-development Site condition. During storm events, stormwater will filter through the porous pavement system's asphalt, choker, and pea gravel courses and enter the reservoir course, designed to provide storage capacity while stormwater infiltrates into the soils beneath the system.

According to Volume 2, Chapter 2 of the Massachusetts Stormwater Handbook, porous pavement systems can remove up to 80% of TSS if the reservoir course is designed to hold the Site's required water quality volume and to drain within 72 hours of a storm event. The proposed Site improvements will decrease the amount of impervious area across the project Site by approximately 18,000 square feet, and therefore no additional water quality volume is required on-Site. However, the porous pavement system's reservoir course has been designed to store the 100-year storm event and to drain within 26 hours of the 100-year event. Therefore, it can be assumed that the proposed porous pavement system will remove up to 80% of the TSS in stormwater runoff discharging to the system. On other parts of the proposed project Site, this Standard is met to the maximum extent practicable by not creating any new untreated stormwater discharges.

An Operations and Maintenance Plan is provided in **Appendix E**, which specifies suitable practices for source control and long-term pollution prevention.

3.5 Standard 5: Land Uses with Higher Potential Pollutant Loads

"For land uses with higher potential pollutant loads, source control and pollution prevention shall be implemented in accordance with the Massachusetts Stormwater Handbook to eliminate or reduce the discharge of stormwater runoff from such land uses to the maximum extent practicable. If through source control and/or pollution prevention all land uses with higher potential pollutant loads cannot be completely protected from exposure to rain, snow, snow melt, and stormwater runoff, the proponent shall use the specific structural stormwater BMPs determined by the Department to be suitable for such uses as provided in the Massachusetts Stormwater Handbook."

The proposed project is not considered a Land Use with Higher Potential Pollutant Loads; therefore, this standard does not apply.

3.6 Standard 6: Critical Areas

"Stormwater discharges within the Zone II or Interim Wellhead Protection Area of a public water supply and stormwater discharges near or to any other critical area require the use of the specific source control and pollution prevention measures and the specific structural stormwater best management practices determined by the Department to be suitable for managing discharges to such areas as provided in the Massachusetts Stormwater Handbook."

Per the Massachusetts Stormwater Handbook, the Arlington Reservoir and associated Swimming Area on the eastern shore of the Reservoir are classified as critical areas. These surface water features are described throughout this report as DP-1 and will receive stormwater discharges from subcatchment 1 in the post-development Site condition. Critical areas have specific stormwater analysis guidelines, requiring the use of certain pollution prevention measures and BMPs to the maximum extent practicable for redevelopment projects. Compliance with these guidelines is discussed below:

- Standard 6 requires BMP trains discharging to critical areas to remove 80% of TSS prior to discharge. There are no existing stormwater BMPs located in subcatchment 1. In the proposed Site condition, the majority of stormwater runoff from subcatchment 1 will travel, via overland flow, to the Reservoir and Swimming Area by passing over grassed areas and beach sand prior to discharging into DP-1. This stormwater runoff will not be treated by a stormwater BMP, similar to existing Site conditions. Stormwater runoff produced from the proposed porous parking lot area and the adjacent grass area to the east sloping downward from Lowell Street will filter through the porous pavement system, during which 80% of TSS will be removed.

- A water quality depth of one-inch (1") must be used for water quality volume calculations in critical areas. The proposed Site improvements will decrease the amount of impervious area across the project Site by approximately 18,000 square feet, and therefore no additional water quality volume is required on-Site.

The proposed Site improvements meet this Standard to the maximum extent practicable.

3.7 Standard 7: Redevelopment

"A redevelopment project is required to meet the following Stormwater Management Standards only to the maximum extent practicable: Standard 2, Standard 3, and the pretreatment and structural best management practice requirements of Standards 4, 5 and 6. Existing stormwater discharges shall comply with Standard 1 only to the maximum extent practicable. A redevelopment project shall also comply with all other requirements of the Stormwater Management Standards and improve existing conditions."

The proposed project is considered a redevelopment project and will decrease the overall impervious area on Site by approximately 18,000 square feet. The proposed work fully complies with Stormwater Management Standards 1, 2, 3, 5, 8, 9, and 10, and complies, to the maximum extent practicable, with Standards 4 and 6 as described herein.

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

"A plan to control construction related impacts including erosion, sedimentation, and other pollutant sources during construction and land disturbance activities (construction period erosion, sedimentation, and pollution prevention plan) shall be developed and implemented."

A plan to control construction-related impacts, specifically erosion and sedimentation, has been developed and is included in **Appendix F**. The proposed project has been designed to minimize land disturbance and preserve existing vegetation to the maximum extent practicable. The proposed construction BMPs have been designed in accordance with Massachusetts Erosion and Sediment Control BMPs Handbook published by MassDEP.

The Contractor will be responsible for implementing the specified erosion and sedimentation control methods. These measures will be maintained and kept in place until the disturbed areas of the project have fully stabilized. In addition, a U.S. Environmental Protection Agency (EPA) National Pollutant Discharge Elimination System (NPDES) Construction General Permit is required whenever construction activities will disturb one or more acres; the proposed project will disturb approximately 5.42 acres.

3.9 Standard 9: Operation and Maintenance Plan

"A long-term operation and maintenance plan shall be developed and implemented to ensure that stormwater management systems function as designed."

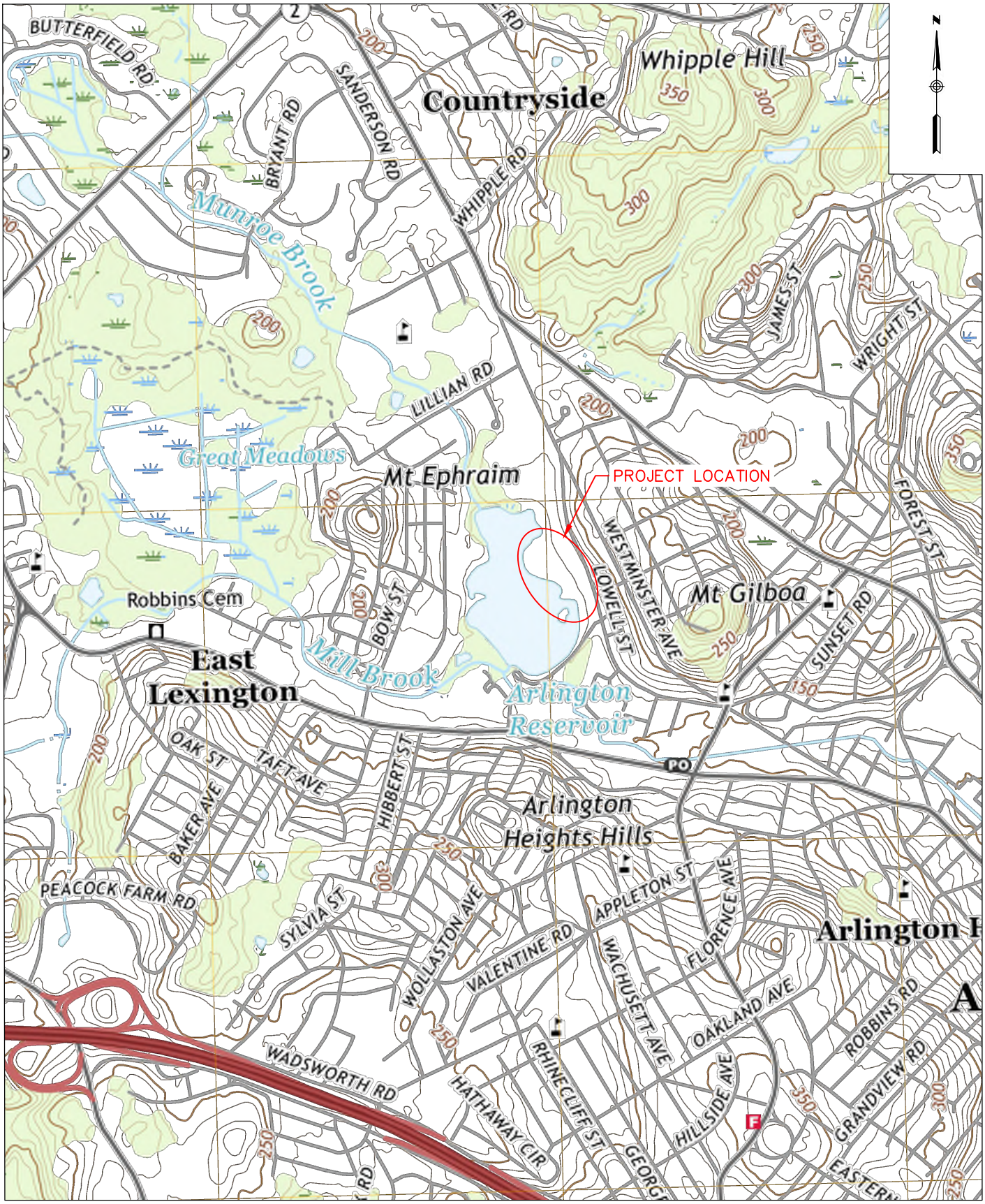
A long-term Operation and Maintenance Plan is included in **Appendix E** of this report.

3.10 Standard 10: Prohibition of Illicit Discharges

Standard 10 states that "All illicit discharges to the stormwater management system are prohibited."

The project will not result in any new illicit discharges. An Illicit Discharge Compliance Statement will be submitted prior to construction.

APPENDIX A: ENVIRONMENTAL RESOURCE DOCUMENTATION



NOTES:

1. BASE MAP TAKEN FROM UNITED STATES GEOLOGICAL SERVICES, DATED 2018. ACCESSED ON SEPTEMBER 15, 2020.

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ARLINGTON RESERVOIR PHASE 2
LOCUS MAP

DESIGNED BY: LLT	CHECKED BY: BSM
DRAWN BY: LLT	2020.09.15 LOCUS MAP.dwg

TOWN OF ARLINGTON, MA
51 GROVE STREET
ARLINGTON, MA 02476

ARLINGTON RESERVOIR
210 LOWELL ST, ARLINGTON, MA

JOB NO:	0233115.00
DATE:	SEPTEMBER 2020
SCALE:	N.T.S.

FIGURE 1

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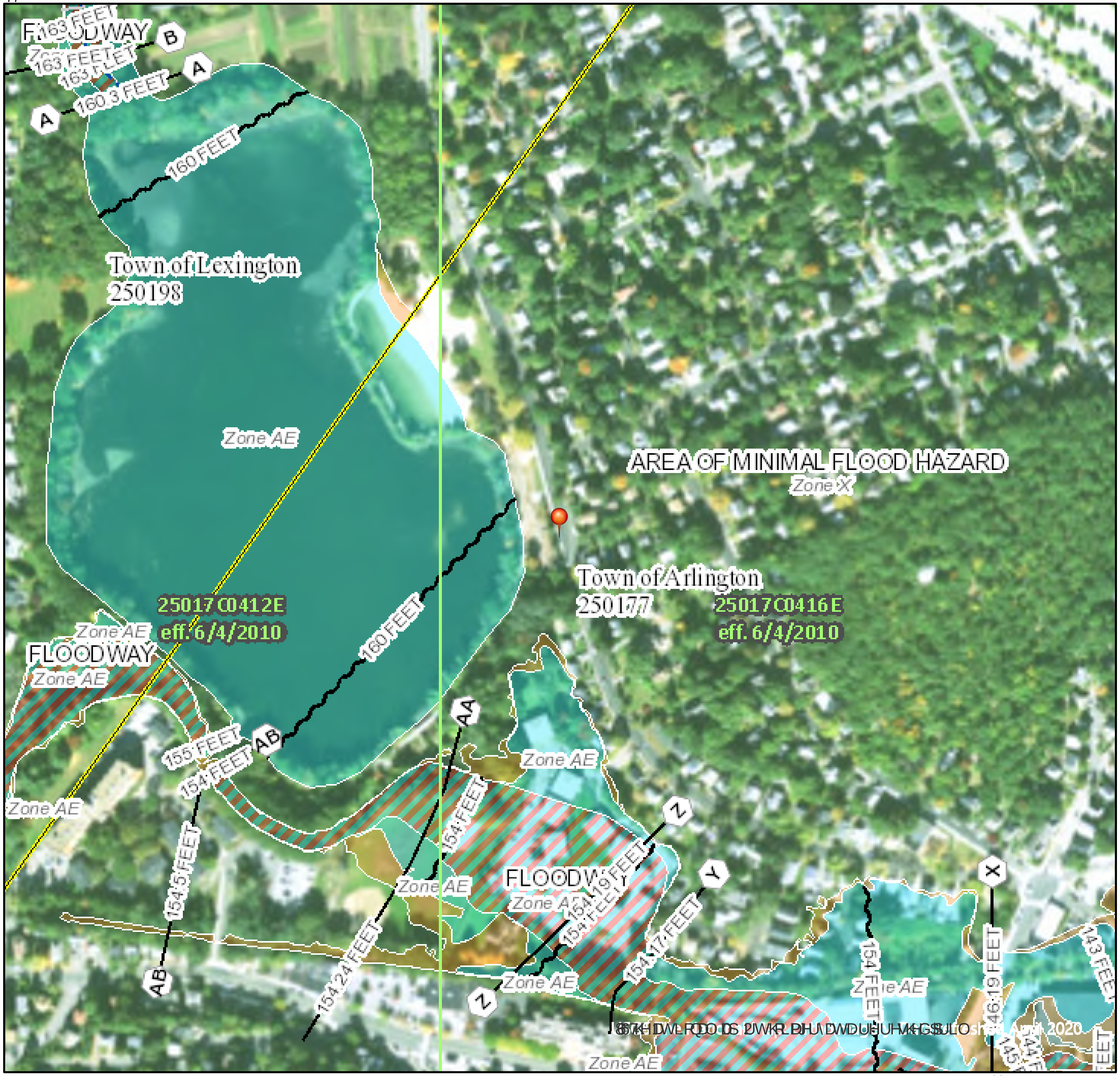
National Flood Hazard Layer FIRMette

FEMA



Feet

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) Zone A, V, A99
- With BFE or Depth Zone AE, AO, AH, VE, AR
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile Zone X
- Future Conditions 1% Annual Chance Flood Hazard Zone X
- Area with Reduced Flood Risk due to Levee. See Notes. Zone X
- Area with Flood Risk due to Levee Zone D

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard Zone X
- Effective LOMRs
- Area of Undetermined Flood Hazard Zone D

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- Cross Sections with 1% Annual Chance Water Surface Elevation
- Coastal Transect
- Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

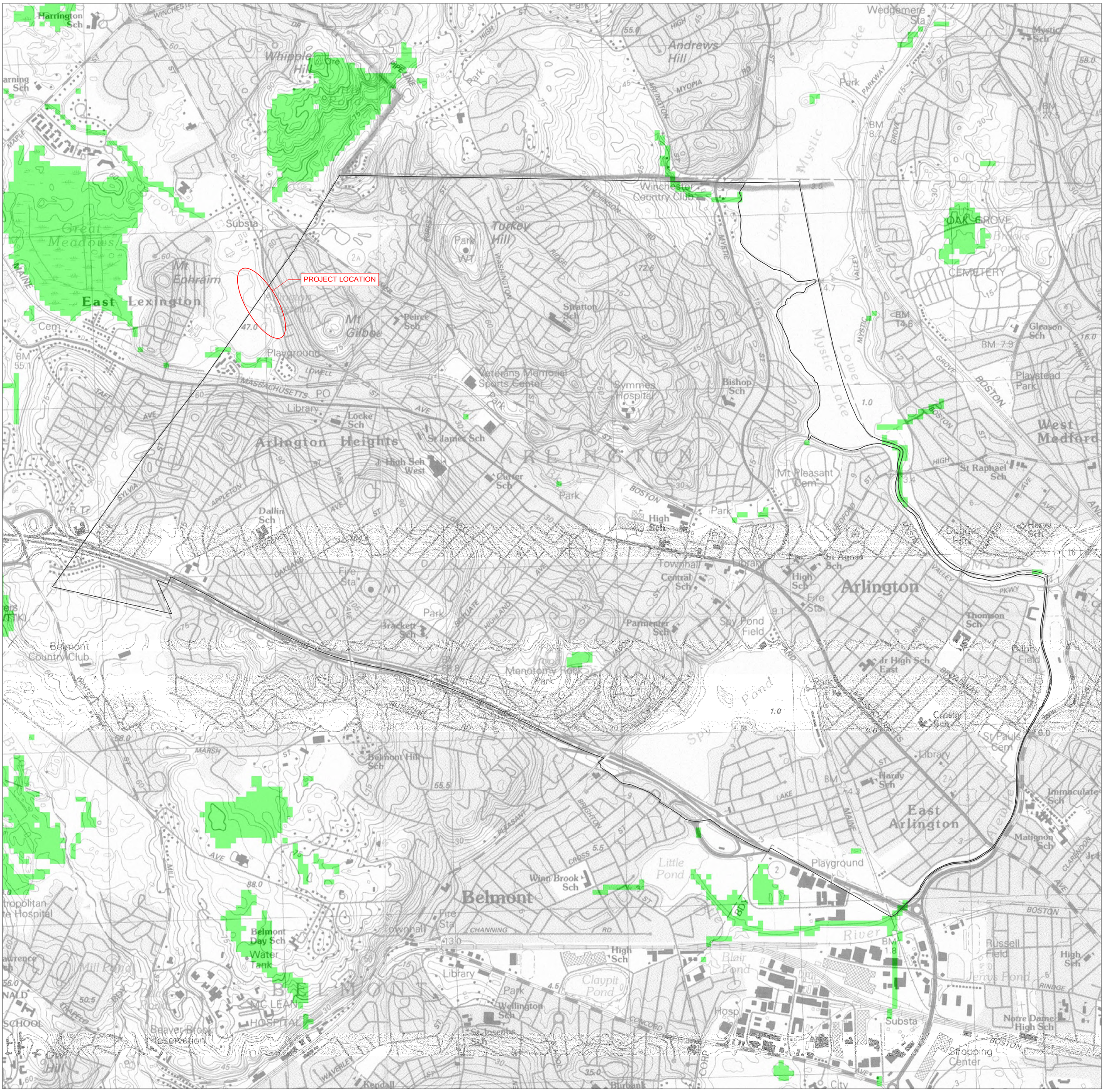
This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on [illegible] at [illegible] and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

USGS The National Map: Orthoimagery. Data refreshed April, 2020

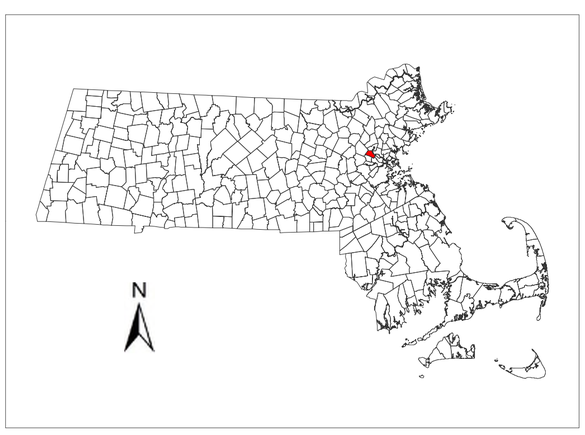
Habitat of Potential Regional or Statewide Importance
Town of ARLINGTON, MA



0 0.5 1 2 Miles

Important Wildlife Habitat

Updated November 2011



The MassDEP's Massachusetts Wildlife Habitat Protection Guidance for Inland Wetlands, June 2006 adopted a new approach for assessing wildlife habitat impacts associated with work in wetlands. This approach utilizes maps developed at the University of Massachusetts Amherst using the Conservation Assessment and Prioritization System (CAPS). The maps depict "Habitat of Potential Regional or Statewide Importance" that may trigger more intensive levels of review. For more information on how to assess wildlife habitat impacts, see Section III of the Guidance document: http://www.mass.gov/dep/water/laws/wldhab.pdf.

The CAPS model assesses the ecological integrity of Massachusetts landscape features as influenced by environmental stressor metrics (e.g. pollution, fragmentation). CAPS relies on data that are broadly available across Massachusetts. Ecological features which are not consistently surveyed or uniformly available, such as certified vernal pools, rare species, and contamination sites are not included in CAPS. When available, this more specific ecological information may be used in conjunction with the CAPS outputs to better understand particular sites in Massachusetts and support informed conservation decision-making. For more information on the statewide maps produced by the CAPS model, see: http://www.masscaps.org.

These maps are funded in part by the Massachusetts Executive Office of Energy and Environmental Affairs, the Massachusetts Department of Environmental Protection and the U.S. Environmental Protection Agency under section 104 (b)(3) of the U.S. Clean Water Act. Environmental data sources include the Office of Geographic and Environmental Information (MassGIS).

MassDEP

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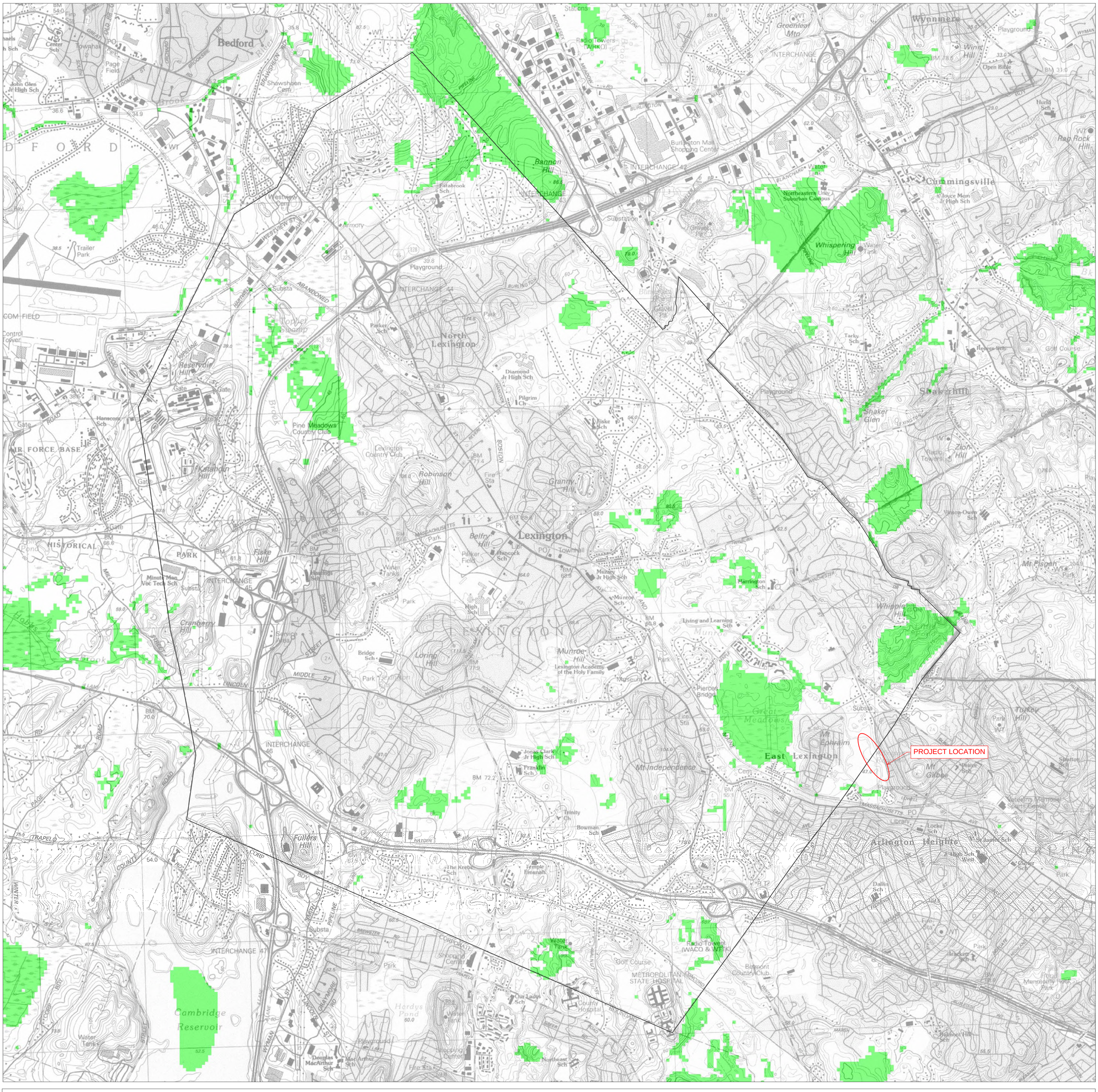
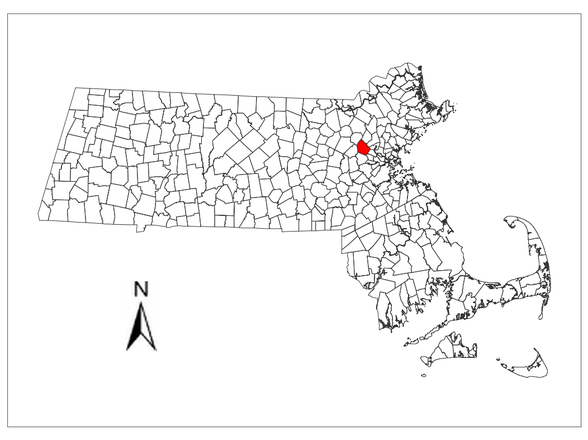
CENTER FOR AGRICULTURE

Habitat of Potential Regional or Statewide Importance
Town of LEXINGTON, MA



0 0.5 1 2 Miles

Updated November 2011



Important Wildlife Habitat

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MassDEP

UMass Extension
CENTER FOR AGRICULTURE

Extreme Precipitation Tables

Northeast Regional Climate Center

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

Smoothing	Yes
State	Massachusetts
Location	
Longitude	71.187 degrees West
Latitude	42.428 degrees North
Elevation	0 feet
Date/Time	Thu, 10 Sep 2020 11:23:56 -0400

Extreme Precipitation Estimates

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.28	0.43	0.53	0.70	0.87	1.10	**1yr**	0.75	1.04	1.28	1.63	2.08	2.67	2.90	**1yr**	2.36	2.79	3.26	3.95	4.62	**1yr**
2yr	0.35	0.53	0.67	0.88	1.10	1.39	**2yr**	0.95	1.28	1.61	2.03	2.55	3.21	3.56	**2yr**	2.84	3.42	3.92	4.66	5.31	**2yr**
5yr	0.41	0.64	0.81	1.08	1.38	1.76	**5yr**	1.19	1.60	2.05	2.58	3.24	4.07	4.53	**5yr**	3.60	4.35	4.97	5.93	6.65	**5yr**
10yr	0.47	0.73	0.93	1.26	1.64	2.10	**10yr**	1.41	1.90	2.45	3.10	3.89	4.86	5.43	**10yr**	4.31	5.22	5.95	7.11	7.88	**10yr**
25yr	0.56	0.88	1.12	1.55	2.05	2.66	**25yr**	1.77	2.39	3.11	3.94	4.95	6.17	6.92	**25yr**	5.46	6.66	7.55	9.05	9.87	**25yr**
50yr	0.62	1.00	1.29	1.81	2.43	3.19	**50yr**	2.10	2.84	3.75	4.75	5.95	7.39	8.32	**50yr**	6.54	8.00	9.04	10.87	11.71	**50yr**
100yr	0.72	1.17	1.50	2.13	2.89	3.81	**100yr**	2.50	3.37	4.48	5.69	7.13	8.85	10.00	**100yr**	7.83	9.62	10.84	13.05	13.90	**100yr**
200yr	0.82	1.34	1.74	2.49	3.44	4.56	**200yr**	2.97	4.01	5.38	6.84	8.57	10.61	12.04	**200yr**	9.39	11.57	12.99	15.68	16.50	**200yr**
500yr	1.00	1.64	2.13	3.09	4.33	5.78	**500yr**	3.74	5.05	6.85	8.72	10.91	13.49	15.38	**500yr**	11.94	14.79	16.51	20.00	20.71	**500yr**

Lower Confidence Limits

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.24	0.37	0.46	0.62	0.76	0.84	**1yr**	0.65	0.82	1.14	1.43	1.76	2.39	2.46	**1yr**	2.12	2.37	2.89	3.50	4.01	**1yr**
2yr	0.33	0.51	0.63	0.85	1.05	1.25	**2yr**	0.90	1.23	1.44	1.90	2.46	3.10	3.43	**2yr**	2.74	3.30	3.78	4.49	5.14	**2yr**
5yr	0.39	0.60	0.74	1.02	1.29	1.50	**5yr**	1.12	1.46	1.72	2.23	2.87	3.73	4.13	**5yr**	3.30	3.97	4.54	5.42	6.11	**5yr**
10yr	0.43	0.66	0.82	1.15	1.48	1.71	**10yr**	1.28	1.67	1.93	2.51	3.22	4.29	4.76	**10yr**	3.80	4.58	5.22	6.21	6.96	**10yr**
25yr	0.50	0.76	0.94	1.34	1.77	2.03	**25yr**	1.53	1.98	2.28	2.95	3.75	5.14	5.73	**25yr**	4.55	5.51	6.26	7.40	8.25	**25yr**
50yr	0.55	0.84	1.04	1.50	2.02	2.32	**50yr**	1.74	2.27	2.57	3.33	4.22	5.89	6.57	**50yr**	5.21	6.32	7.18	8.42	9.37	**50yr**
100yr	0.61	0.93	1.16	1.68	2.30	2.64	**100yr**	1.99	2.58	2.91	3.58	4.74	6.77	7.54	**100yr**	5.99	7.25	8.24	9.55	10.65	**100yr**
200yr	0.69	1.04	1.31	1.90	2.65	3.01	**200yr**	2.29	2.94	3.30	4.00	5.35	7.76	8.65	**200yr**	6.87	8.32	9.45	10.81	12.08	**200yr**
500yr	0.80	1.19	1.54	2.23	3.17	3.58	**500yr**	2.74	3.50	3.88	4.63	6.27	9.30	10.35	**500yr**	8.23	9.95	11.33	12.69	14.28	**500yr**

Upper Confidence Limits

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.31	0.48	0.59	0.79	0.97	1.13	**1yr**	0.84	1.11	1.32	1.76	2.24	2.86	3.14	**1yr**	2.53	3.02	3.50	4.29	5.02	**1yr**
2yr	0.36	0.56	0.69	0.93	1.15	1.35	**2yr**	0.99	1.32	1.56	2.06	2.66	3.34	3.71	**2yr**	2.96	3.57	4.09	4.86	5.52	**2yr**
5yr	0.45	0.69	0.86	1.18	1.50	1.78	**5yr**	1.30	1.74	2.04	2.63	3.35	4.43	4.98	**5yr**	3.92	4.79	5.42	6.45	7.20	**5yr**
10yr	0.54	0.84	1.04	1.45	1.87	2.19	**10yr**	1.62	2.14	2.54	3.19	4.02	5.51	6.24	**10yr**	4.88	6.00	6.73	8.03	8.82	**10yr**
25yr	0.71	1.07	1.34	1.91	2.51	2.88	**25yr**	2.17	2.82	3.36	4.11	5.11	7.32	8.42	**25yr**	6.48	8.09	8.97	10.76	11.55	**25yr**
50yr	0.85	1.30	1.62	2.33	3.13	3.56	**50yr**	2.70	3.48	4.16	4.99	6.13	9.11	10.57	**50yr**	8.06	10.16	11.13	13.44	14.18	**50yr**
100yr	1.04	1.58	1.98	2.85	3.92	4.39	**100yr**	3.38	4.29	5.16	6.33	7.35	11.32	13.28	**100yr**	10.02	12.77	13.82	16.82	17.43	**100yr**
200yr	1.27	1.91	2.42	3.51	4.89	5.41	**200yr**	4.22	5.29	6.41	7.73	8.81	14.10	16.70	**200yr**	12.48	16.06	17.18	21.05	21.44	**200yr**
500yr	1.65	2.46	3.17	4.60	6.54	7.13	**500yr**	5.64	6.97	8.53	10.08	11.21	18.85	22.64	**500yr**	16.68	21.77	22.89	28.39	28.21	**500yr**

Powered by ACIS Northeast Regional Climate Center

APPENDIX B: SOILS MAP AND TEST PIT LOGS

Hydrologic Soil Group—Middlesex County, Massachusetts
(Arlington Reservoir)

Map Scale: 1:2,280 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 30 60 120 180

Feet
0 100 200 400 600

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

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils

Soil Rating Polygons
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: Middlesex County, Massachusetts
Survey Area Data: Version 20, Jun 9, 2020

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

Date(s) aerial images were photographed: Sep 11, 2019—Oct 5, 2019

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

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
1	Water		7.3	47.2%
253B	Hinckley loamy sand, 3 to 8 percent slopes	A	7.2	46.4%
626B	Merrimac-Urban land complex, 0 to 8 percent slopes	A	0.8	5.4%
631C	Charlton-Urban land-Hollis complex, 3 to 15 percent slopes, rocky	A	0.2	1.1%
Totals for Area of Interest			**15.5**	**100.0%**

Description

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

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

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

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

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

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

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

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Commonwealth of Massachusetts
City/Town of Arlington

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

A. Facility Information

Town of Arlington
Owner Name

210 Lowell Street
Street Address

Map/Lot #

Arlington
City

MA
State

02474
Zip Code

B. Site Information

1. (Check one) ☐ New Construction ☐ Upgrade ☐ Repair Test pits for drainage purposes

2. Soil Survey Available? ☒ Yes ☐ No If yes: Web Soil Survey (Source) 253B (Soil Map Unit)

Hinckley Loamy Sand
Soil Name

Soil Limitations

Sandy and gravelly glaciofluvial deposits
Soil Parent material

Landform

3. Surficial Geological Report Available? ☒ Yes ☐ No If yes: MassGIS Oliver (Year Published/Source) Map Unit

Sand and gravel / till and bedrock
Description of Geologic Map Unit:

4. Flood Rate Insurance Map Within a regulatory floodway? ☐ Yes ☒ No

5. Within a velocity zone? ☐ Yes ☒ No

6. Within a Mapped Wetland Area? ☐ Yes ☒ No If yes, MassGIS Wetland Data Layer: Wetland Type

7. Current Water Resource Conditions (USGS): 08/06/20 (Month/Day/ Year) Range: ☐ Above Normal ☒ Normal ☐ Below Normal

8. Other references reviewed:

Commonwealth of Massachusetts
City/Town of Arlington

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (*minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: TP-1 (Hole #) | 08/06/20 (Date) | 7:30 AM (Time) | 70*, sunny (Weather) | _____ (Latitude) | _____ (Longitude:)

1. Land Use: Parking lot (e.g., woodland, agricultural field, vacant lot, etc.) | None (Vegetation) | Many large boulders (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | 0-2 (Slope (%))

Description of Location: See attached sketch

2. Soil Parent Material: Till | _____ (Landform) | _____ (Position on Landscape (SU, SH, BS, FS, TS))

3. Distances from: Open Water Body >25 feet | Drainage Way N/A feet | Wetlands >25 feet
Property Line >10 feet | Drinking Water Well N/A feet | Other _____ feet

4. Unsuitable Materials Present: ☐ Yes ☒ No If Yes: ☐ Disturbed Soil ☐ Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☒ Yes ☐ No If yes: 68" Depth Weeping from Pit _____ Depth Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-27	Fill										
27-38	A	Sandy Loam	10YR3/2						Massive	Friable	
38-44	B	Sandy Loam	10YR3/4						Massive	Friable	
44-84	C	Sandy Loam	10YR5/2	44"	High and Low Chroma	>2	2	10	Massive	Friable	

Additional Notes:

Commonwealth of Massachusetts
City/Town of Arlington

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (*minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: TP-2 (Hole #) | 08/06/20 (Date) | 7:45 AM (Time) | 70*, sunny (Weather) | _____ (Latitude) | _____ (Longitude:)

1. Land Use: Parking lot (e.g., woodland, agricultural field, vacant lot, etc.) | None (Vegetation) | Many large boulders (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | 0-2 (Slope (%))

Description of Location: See attached sketch

2. Soil Parent Material: Till | _____ (Landform) | _____ (Position on Landscape (SU, SH, BS, FS, TS))

3. Distances from: Open Water Body >25 feet | Drainage Way N/A feet | Wetlands >25 feet | Property Line >10 feet | Drinking Water Well N/A feet | Other _____ feet

4. Unsuitable Materials Present: ☐ Yes ☒ No If Yes: ☐ Disturbed Soil ☐ Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☐ Yes ☒ No If yes: _____ Depth Weeping from Pit _____ Depth Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-16	Fill										
16-30	A	Sandy Loam	10YR3/2						Massive	Friable	
30-43	B	Sandy Loam	10YR6/6	30"	High and Low Chroma	>2			Massive	Friable	
43-60	C	Sandy Loam	10YR5/3				2	10	Massive	Friable	

Additional Notes:

Commonwealth of Massachusetts
City/Town of Arlington

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (*minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: TP-3 (Hole #) | 08/06/20 (Date) | 8:00 AM (Time) | 70*, sunny (Weather) | _____ (Latitude) | _____ (Longitude:)

1. Land Use: Parking lot (e.g., woodland, agricultural field, vacant lot, etc.) | None (Vegetation) | Many large boulders (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | 0-2 (Slope (%))

Description of Location: See attached sketch

2. Soil Parent Material: Till | _____ (Landform) | _____ (Position on Landscape (SU, SH, BS, FS, TS))

3. Distances from: Open Water Body >25 feet | Drainage Way N/A feet | Wetlands >25 feet
Property Line >10 feet | Drinking Water Well N/A feet | Other _____ feet

4. Unsuitable Materials Present: ☐ Yes ☒ No If Yes: ☐ Disturbed Soil ☐ Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☐ Yes ☒ No If yes: _____ Depth Weeping from Pit _____ Depth Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-9	Fill										
9-25	B	Sandy Loam	10YR6/6						Massive	Friable	
25-55	C	Sandy Loam	10YR5/3	32"	High and Low Chroma	>2	2	10	Massive	Friable	

Additional Notes:

Commonwealth of Massachusetts
City/Town of Arlington

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (*minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: TP-4 (Hole #) | 08/06/20 (Date) | 8:30 AM (Time) | 70*, sunny (Weather) | _____ (Latitude) | _____ (Longitude:

1. Land Use: Parking lot (e.g., woodland, agricultural field, vacant lot, etc.) | None (Vegetation) | Many large boulders (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | 0-2 (Slope (%))

Description of Location: See attached sketch

2. Soil Parent Material: Till | _____ (Landform) | _____ (Position on Landscape (SU, SH, BS, FS, TS))

3. Distances from: Open Water Body >25 feet | Drainage Way N/A feet | Wetlands >25 feet
Property Line >10 feet | Drinking Water Well N/A feet | Other _____ feet

4. Unsuitable Materials Present: ☐ Yes ☒ No If Yes: ☐ Disturbed Soil ☐ Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☐ Yes ☒ No If yes: _____ Depth Weeping from Pit _____ Depth Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-12	Fill										
12-61	C	Sandy Loam	10YR5/3	24"	High and Low Chroma	>2	2	10	Massive	Friable	

Additional Notes:

Commonwealth of Massachusetts
City/Town of Arlington

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

F. Certification

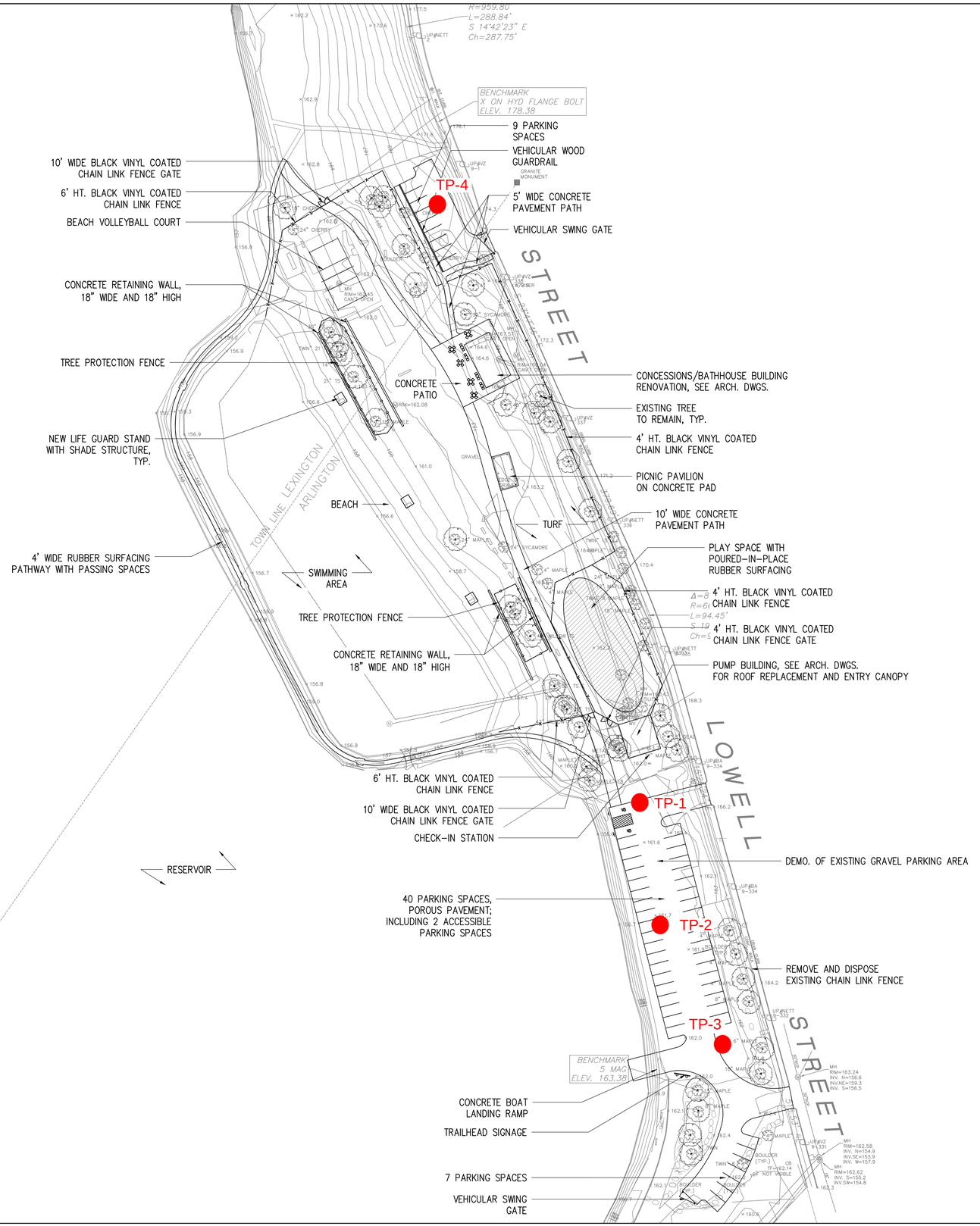
I certify that I am currently approved by the Department of Environmental Protection pursuant to 310 CMR 15.017 to conduct soil evaluations and that the above analysis has been performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017. I further certify that the results of my soil evaluation, as indicated in the attached Soil Evaluation Form, are accurate and in accordance with 310 CMR 15.100 through 15.107.

Signature of Soil Evaluator	Date: 08/06/20
William Hall, P.E., S.E. 13592	06/31/21
Typed or Printed Name of Soil Evaluator / License #	Expiration Date of License
Leyna Tobey - Woodard & Curran	N/A
Name of Approving Authority Witness	Approving Authority

Note: In accordance with 310 CMR 15.018(2) this form must be submitted to the approving authority within 60 days of the date of field testing, and to the designer and the property owner with Percolation Test Form 12.

Field Diagrams: Use this area for field diagrams:

See attached sketch



ARLINGTON RESERVOIR - PHASE 2

ARLINGTON, MASSACHUSETTS

TOWN OF ARLINGTON

NO.	REVISION	DATE

kzla
Kyle Zick Landscape Architecture, Inc.
36 Bromfield Street Suite 202 617 451-1018 Tel
Boston, MA 02108 www.kylezick.com

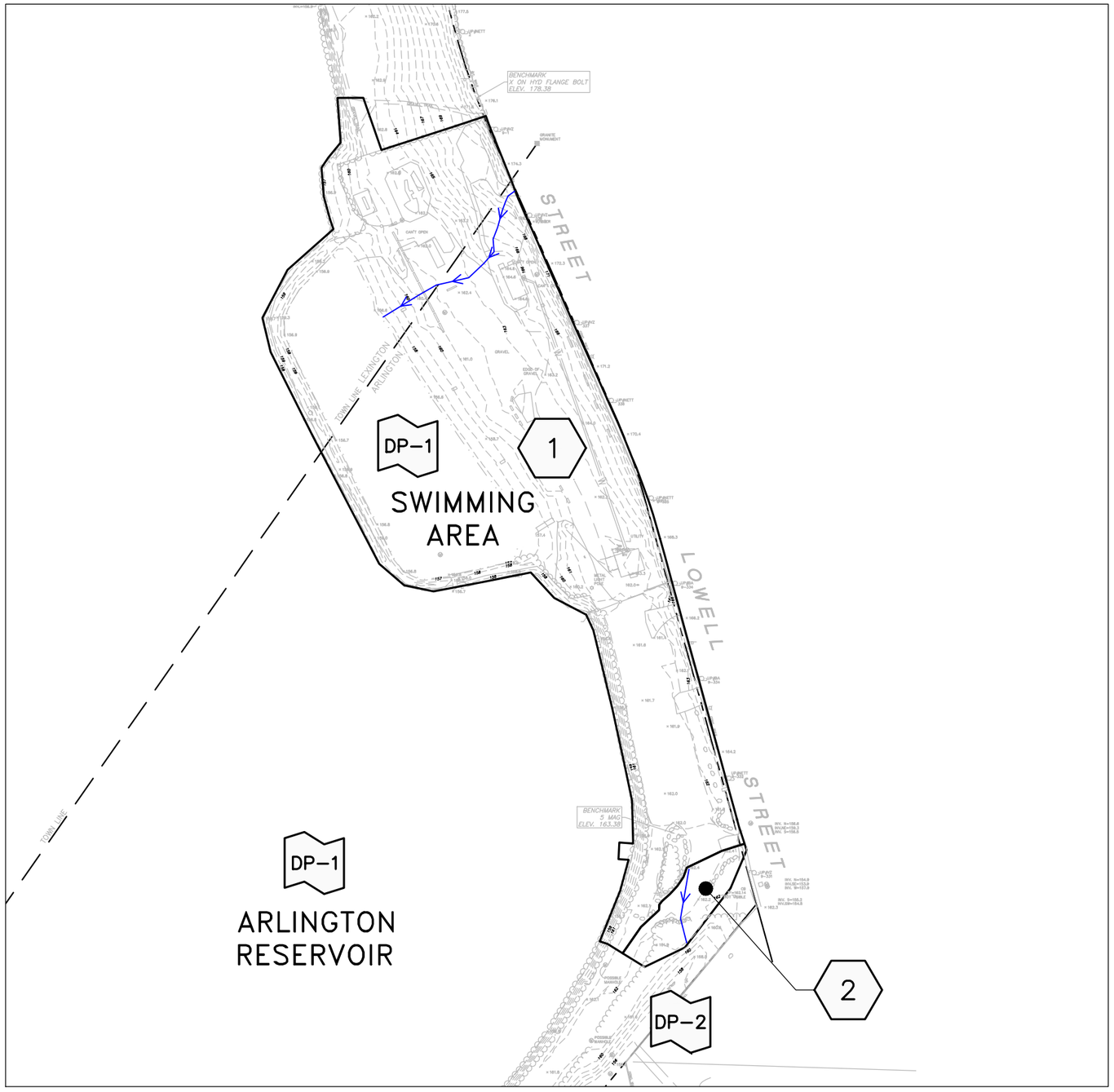
SCHEMATIC DESIGN SET

Job Number:	
Project: ARLINGTON RES.	
Drawn By: MD	**Checked By:** KZ
Date: JUNE 30, 2020	
Scale: 1"=50'-0"	
Drawing Title:	

ENLARGEMENT PLAN

LX

APPENDIX C: STORMWATER FIGURES



N

LEGEND:

- SUBCATCHMENT AREA
- DESIGN POINT
- LONGEST FLOW PATH

150' 0 150' 300'

BAR SCALE
1" = 150'
CHECK GRAPHIC SCALE BEFORE USING

40 Shattuck Road, Suite 110
Andover, Massachusetts 01810
866.702.6371 | www.woodardcurran.com

COMMITMENT & INTEGRITY DRIVE RESULTS

WOODARD & CURRAN

PRE-DEVELOPMENT CATCHMENT FIGURE

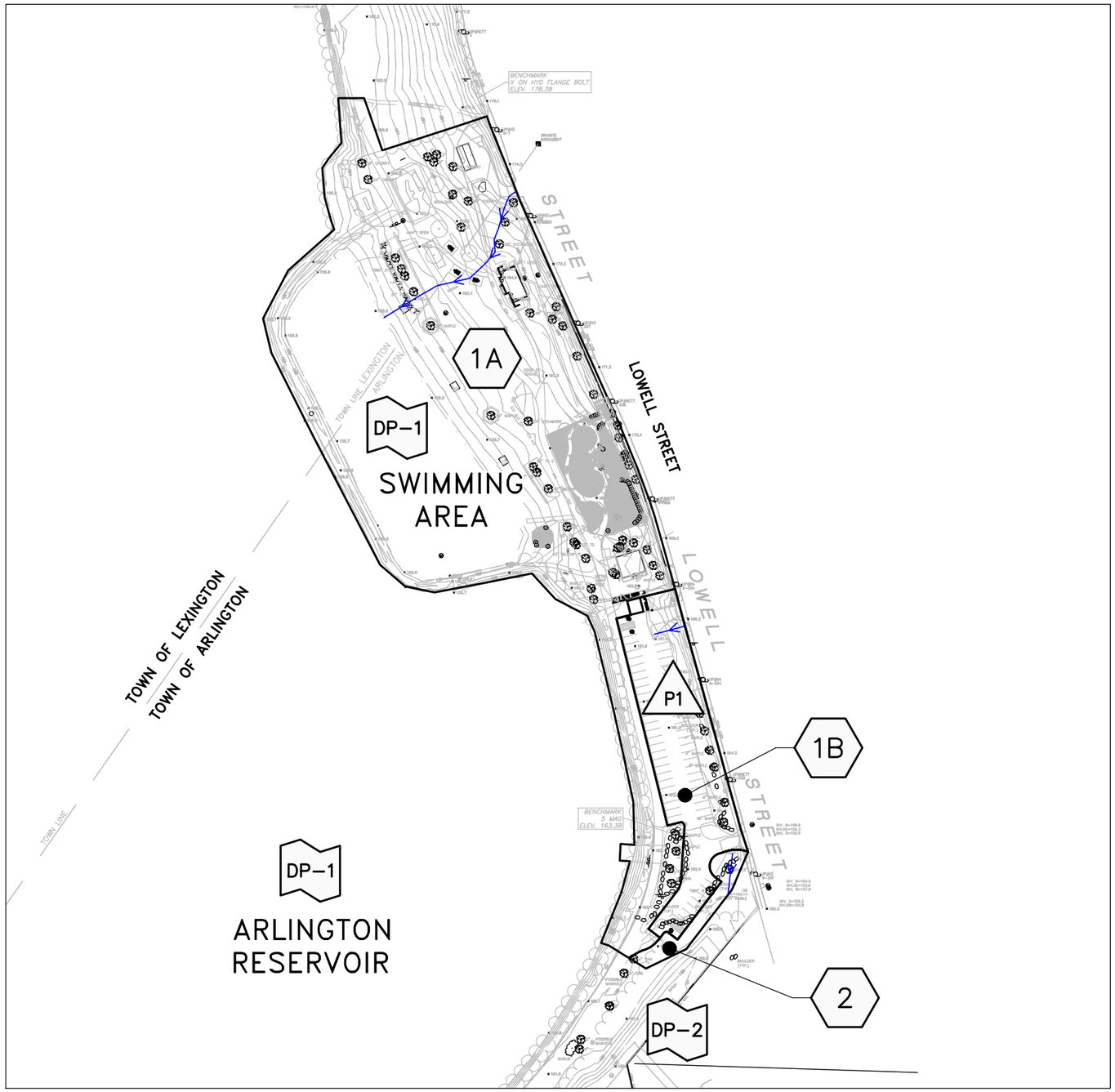
DESIGNED BY:	LLT
DRAWN BY:	LLT
CHECKED BY:	BSM
2020.10.05	0233115.00-P*.dwg

TOWN OF ARLINGTON, MASSACHUSETTS

ARLINGTON RESERVOIR – PHASE 2

JOB NO: 0233115.00
DATE: OCTOBER 2020
SCALE: AS NOTED

FIGURE 1



LEGEND:

- SUBCATCHMENT AREA
- DESIGN POINT
- POND
- LONGEST FLOW PATH

150' 0 150' 300'

BAR SCALE
1" = 150'
CHECK GRAPHIC SCALE BEFORE USING

40 Shattuck Road, Suite 110
Andover, Massachusetts 01810
866.702.6371 | www.woodardcurran.com

COMMITMENT & INTEGRITY DRIVE RESULTS

WOODARD &CURRAN

POST-DEVELOPMENT SUBCATCHMENT FIGURE

DESIGNED BY: LLT
DRAWN BY: LLT
CHECKED BY: BSM
2020.09.29 0233115.00-P*.dwg

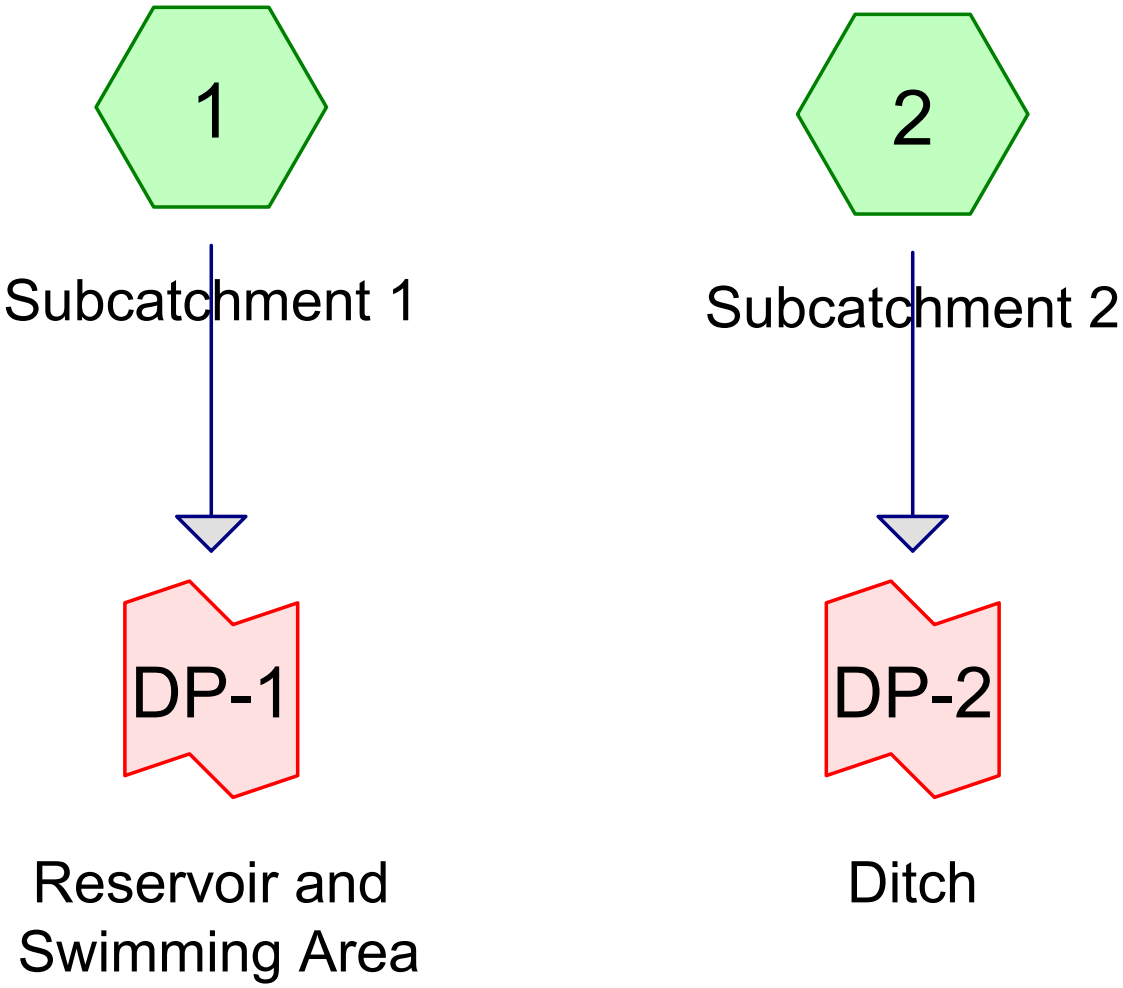
TOWN OF ARLINGTON, MASSACHUSETTS

ARLINGTON RESERVOIR - PHASE 2

JOB NO: 0233115.00
DATE: OCTOBER 2020
SCALE: AS NOTED

FIGURE 2

APPENDIX D: HYDROCAD STORMWATER MODEL REPORTS



Subcat Reach Pond Link

Routing Diagram for 2020.10.06 Existing - Arlington Res
Prepared by Woodard Curran, Printed 10/6/2020

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
1.531	49	50-75% Grass cover, Fair, HSG A (1, 2)
1.317	63	Beach Sand, HSG A (1)
0.379	30	Brush, Good, HSG A (1, 2)
0.046	96	Dense Sand Path, HSG A (1)
0.646	98	Gravel parking, HSG A (1, 2)
0.234	98	Impervious Surface, HSG A (1, 2)
0.055	39	Open Space, Good, HSG A (>75% Grass Cover) (1)
1.207	98	Water Surface, HSG A (1)
5.416	**70**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
5.416	HSG A	1, 2
0.000	HSG B	
0.000	HSG C	
0.000	HSG D	
0.000	Other	
5.416		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
1.531	0.000	0.000	0.000	0.000	1.531	50-75% Grass cover, Fair	1, 2
1.317	0.000	0.000	0.000	0.000	1.317	Beach Sand	1
0.379	0.000	0.000	0.000	0.000	0.379	Brush, Good	1, 2
0.046	0.000	0.000	0.000	0.000	0.046	Dense Sand Path	1
0.646	0.000	0.000	0.000	0.000	0.646	Gravel parking	1, 2
0.234	0.000	0.000	0.000	0.000	0.234	Impervious Surface	1, 2
0.055	0.000	0.000	0.000	0.000	0.055	Open Space, Good	1
1.207	0.000	0.000	0.000	0.000	1.207	Water Surface	1
5.416	**0.000**	**0.000**	**0.000**	**0.000**	**5.416**	**TOTAL AREA**	

Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1: Subcatchment 1 Runoff Area=227,252 sf 38.51% Impervious Runoff Depth=0.58"
Tc=6.0 min CN=71 Runoff=2.96 cfs 0.251 af

Subcatchment 2: Subcatchment 2 Runoff Area=8,681 sf 39.47% Impervious Runoff Depth=0.33"
Tc=6.0 min CN=64 Runoff=0.04 cfs 0.006 af

Link DP-1: Reservoir and Swimming Area Inflow=2.96 cfs 0.251 af
Primary=2.96 cfs 0.251 af

Link DP-2: Ditch Inflow=0.04 cfs 0.006 af
Primary=0.04 cfs 0.006 af

Total Runoff Area = 5.416 ac Runoff Volume = 0.257 af Average Runoff Depth = 0.57"
61.46% Pervious = 3.329 ac 38.54% Impervious = 2.088 ac

Summary for Subcatchment 1: Subcatchment 1

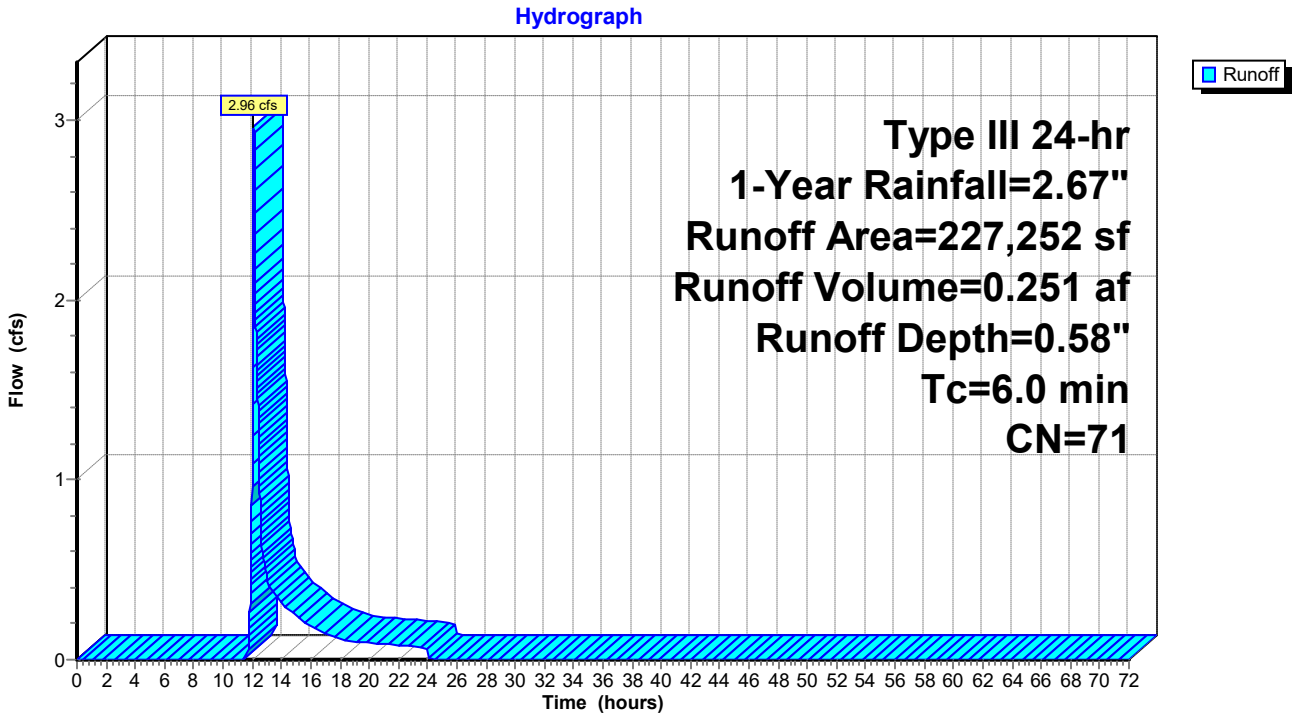
Runoff = 2.96 cfs @ 12.10 hrs, Volume= 0.251 af, Depth= 0.58"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 1-Year Rainfall=2.67"

	Area (sf)	CN	Description
	14,435	30	Brush, Good, HSG A
*	57,370	63	Beach Sand, HSG A
*	1,998	96	Dense Sand Path, HSG A
	63,530	49	50-75% Grass cover, Fair, HSG A
*	24,927	98	Gravel parking, HSG A
*	9,994	98	Impervious Surface, HSG A
	52,585	98	Water Surface, HSG A
*	2,413	39	Open Space, Good, HSG A (>75% Grass Cover)
	227,252	71	Weighted Average
	139,746		61.49% Pervious Area
	87,506		38.51% Impervious Area

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

Subcatchment 1: Subcatchment 1



Summary for Subcatchment 2: Subcatchment 2

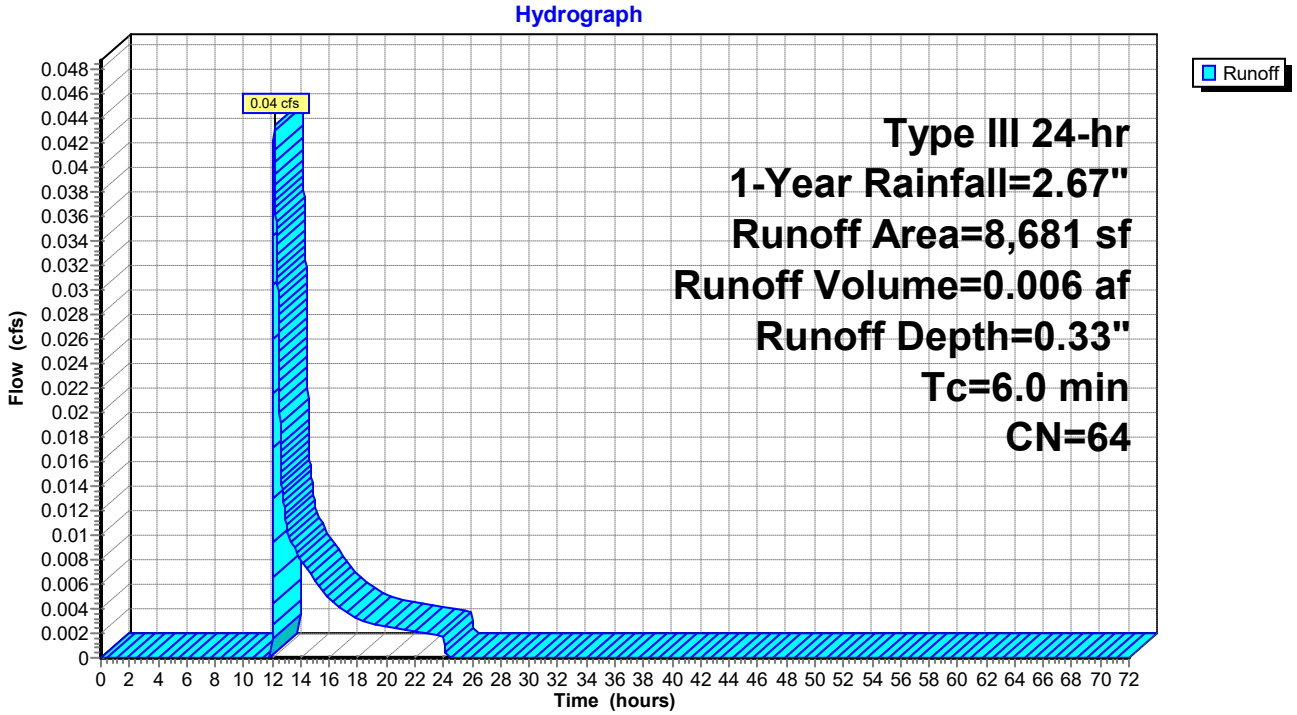
Runoff = 0.04 cfs @ 12.13 hrs, Volume= 0.006 af, Depth= 0.33"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 1-Year Rainfall=2.67"

	Area (sf)	CN	Description
	2,076	30	Brush, Good, HSG A
	3,179	49	50-75% Grass cover, Fair, HSG A
*	3,211	98	Gravel parking, HSG A
	215	98	Impervious Surface, HSG A
	8,681	64	Weighted Average
	5,255		60.53% Pervious Area
	3,426		39.47% Impervious Area

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

Subcatchment 2: Subcatchment 2

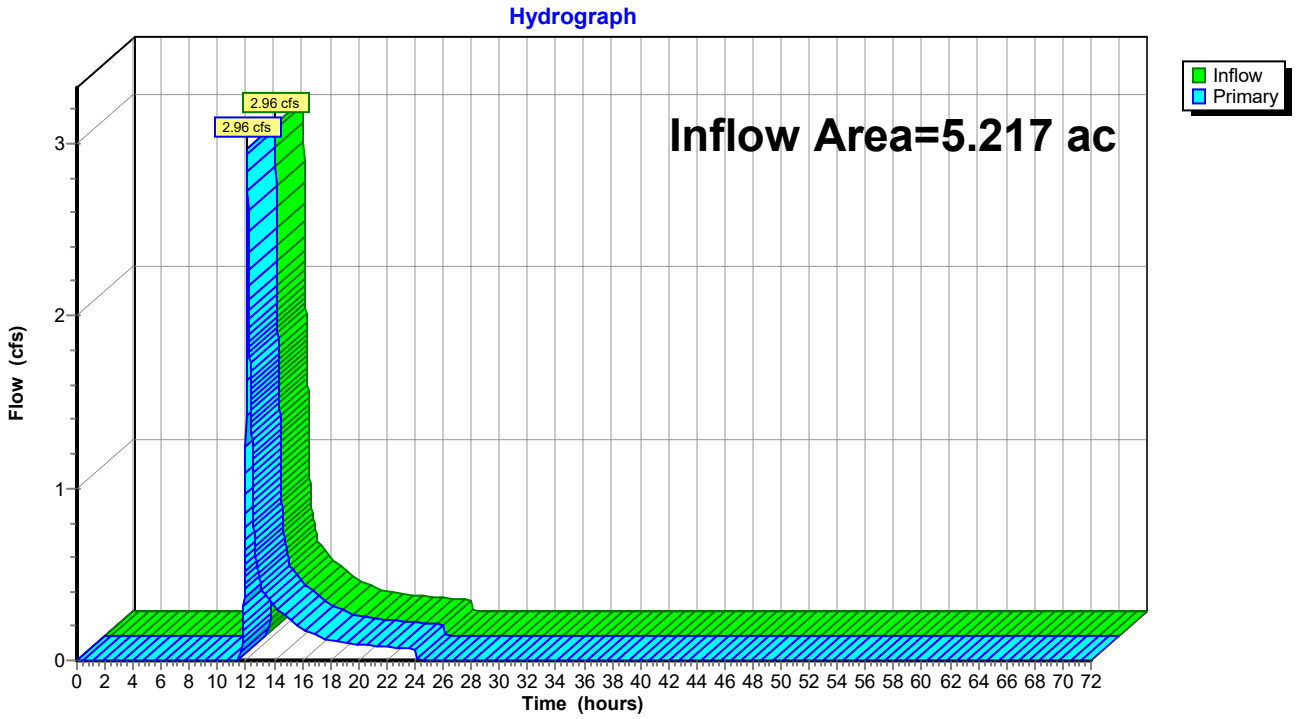


Summary for Link DP-1: Reservoir and Swimming Area

Inflow Area = 5.217 ac, 38.51% Impervious, Inflow Depth = 0.58" for 1-Year event
Inflow = 2.96 cfs @ 12.10 hrs, Volume= 0.251 af
Primary = 2.96 cfs @ 12.10 hrs, Volume= 0.251 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link DP-1: Reservoir and Swimming Area

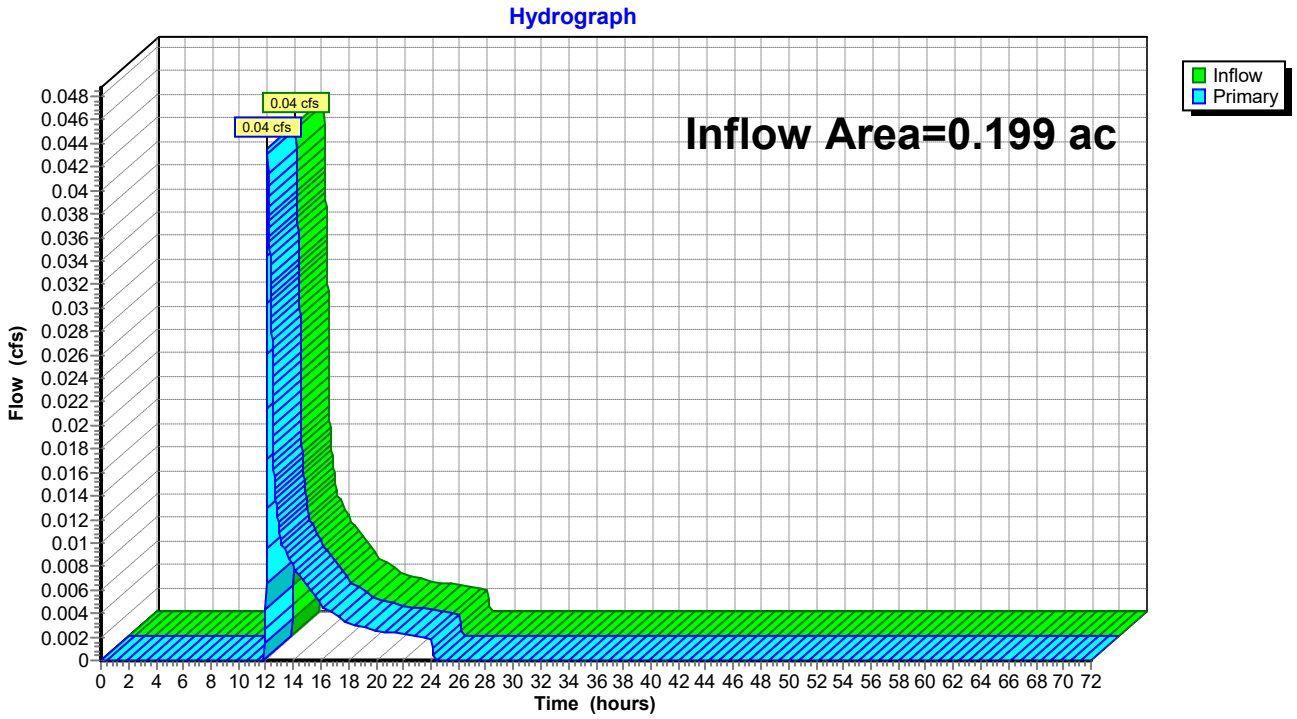


Summary for Link DP-2: Ditch

Inflow Area = 0.199 ac, 39.47% Impervious, Inflow Depth = 0.33" for 1-Year event
Inflow = 0.04 cfs @ 12.13 hrs, Volume= 0.006 af
Primary = 0.04 cfs @ 12.13 hrs, Volume= 0.006 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link DP-2: Ditch



Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1: Subcatchment 1 Runoff Area=227,252 sf 38.51% Impervious Runoff Depth=0.88"
Tc=6.0 min CN=71 Runoff=4.93 cfs 0.384 af

Subcatchment 2: Subcatchment 2 Runoff Area=8,681 sf 39.47% Impervious Runoff Depth=0.56"
Tc=6.0 min CN=64 Runoff=0.10 cfs 0.009 af

Link DP-1: Reservoir and Swimming Area Inflow=4.93 cfs 0.384 af
Primary=4.93 cfs 0.384 af

Link DP-2: Ditch Inflow=0.10 cfs 0.009 af
Primary=0.10 cfs 0.009 af

Total Runoff Area = 5.416 ac Runoff Volume = 0.394 af Average Runoff Depth = 0.87"
61.46% Pervious = 3.329 ac 38.54% Impervious = 2.088 ac

Summary for Subcatchment 1: Subcatchment 1

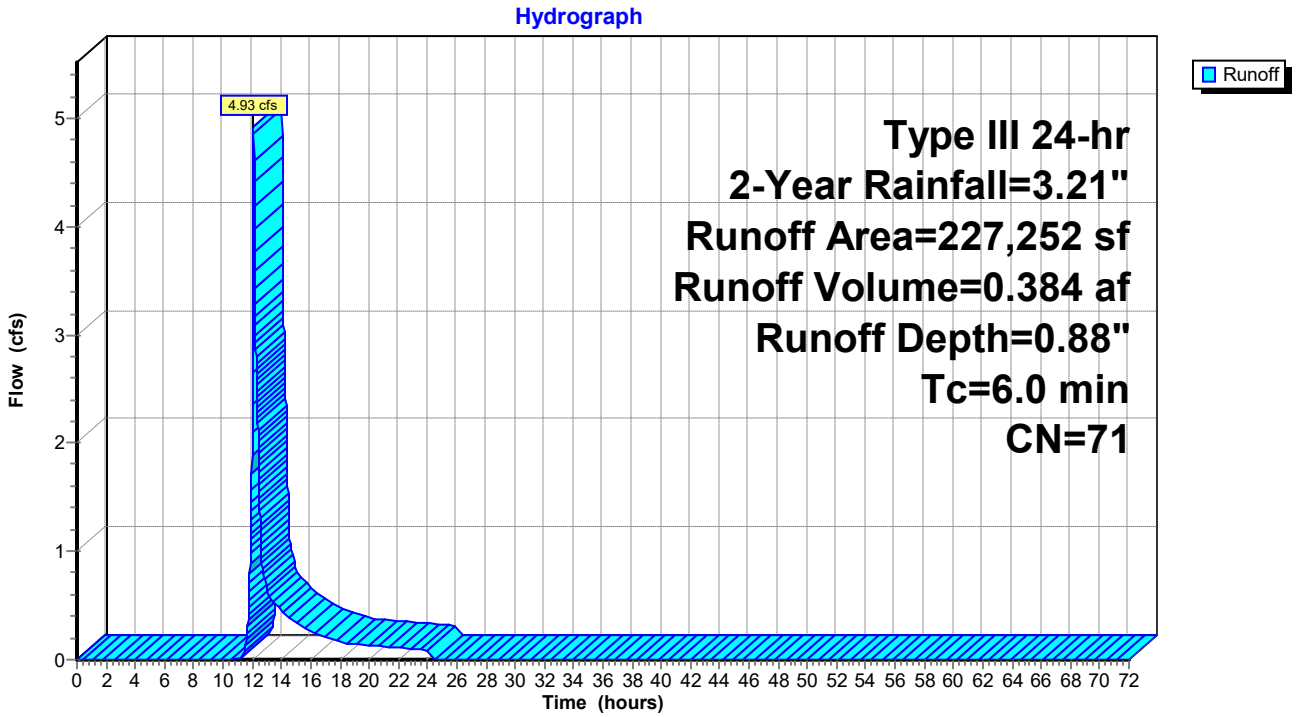
Runoff = 4.93 cfs @ 12.10 hrs, Volume= 0.384 af, Depth= 0.88"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.21"

	Area (sf)	CN	Description
	14,435	30	Brush, Good, HSG A
*	57,370	63	Beach Sand, HSG A
*	1,998	96	Dense Sand Path, HSG A
	63,530	49	50-75% Grass cover, Fair, HSG A
*	24,927	98	Gravel parking, HSG A
*	9,994	98	Impervious Surface, HSG A
	52,585	98	Water Surface, HSG A
*	2,413	39	Open Space, Good, HSG A (>75% Grass Cover)
	227,252	71	Weighted Average
	139,746		61.49% Pervious Area
	87,506		38.51% Impervious Area

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

Subcatchment 1: Subcatchment 1



Summary for Subcatchment 2: Subcatchment 2

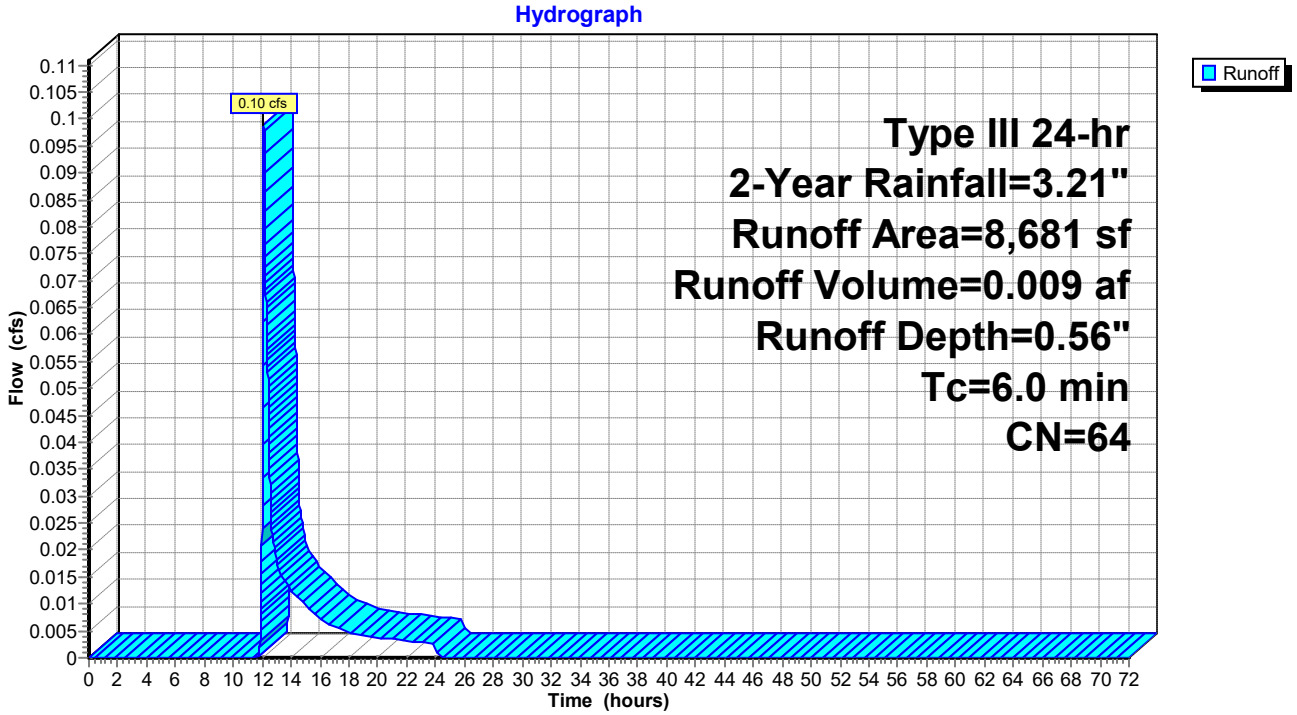
Runoff = 0.10 cfs @ 12.11 hrs, Volume= 0.009 af, Depth= 0.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.21"

	Area (sf)	CN	Description
	2,076	30	Brush, Good, HSG A
	3,179	49	50-75% Grass cover, Fair, HSG A
*	3,211	98	Gravel parking, HSG A
	215	98	Impervious Surface, HSG A
	8,681	64	Weighted Average
	5,255		60.53% Pervious Area
	3,426		39.47% Impervious Area

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

Subcatchment 2: Subcatchment 2

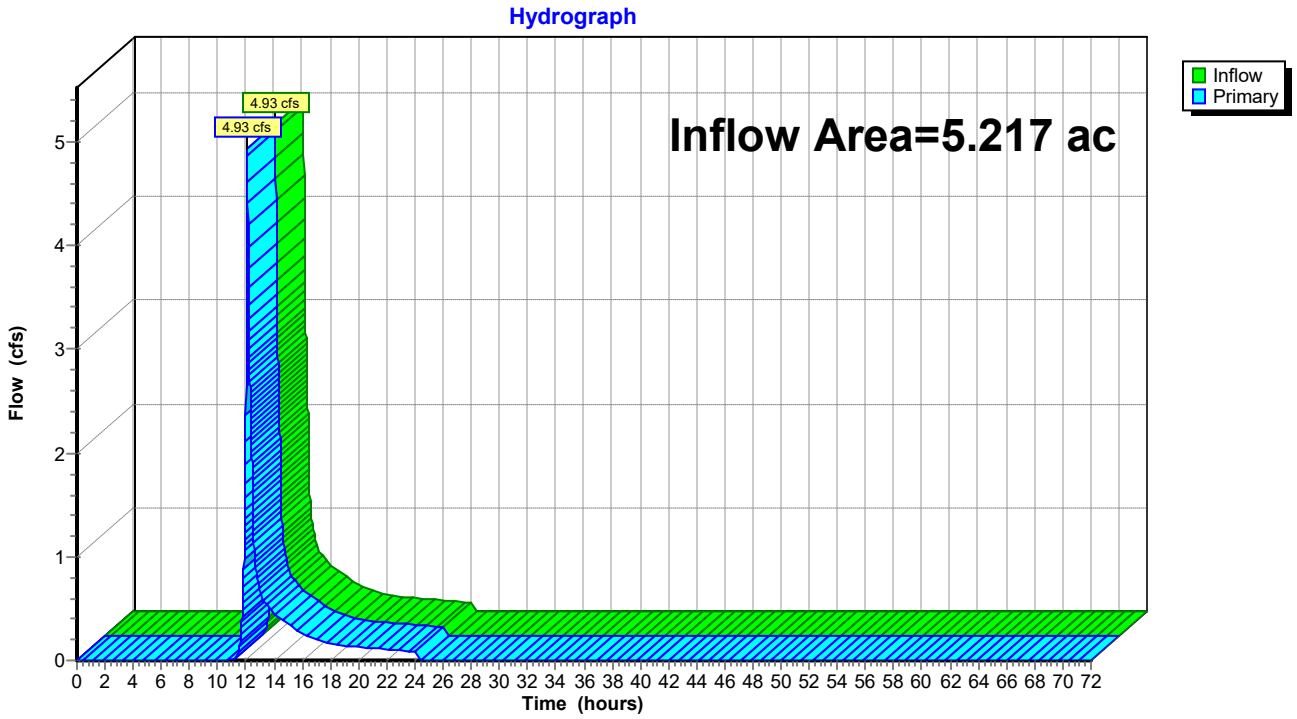


Summary for Link DP-1: Reservoir and Swimming Area

Inflow Area = 5.217 ac, 38.51% Impervious, Inflow Depth = 0.88" for 2-Year event
Inflow = 4.93 cfs @ 12.10 hrs, Volume= 0.384 af
Primary = 4.93 cfs @ 12.10 hrs, Volume= 0.384 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link DP-1: Reservoir and Swimming Area

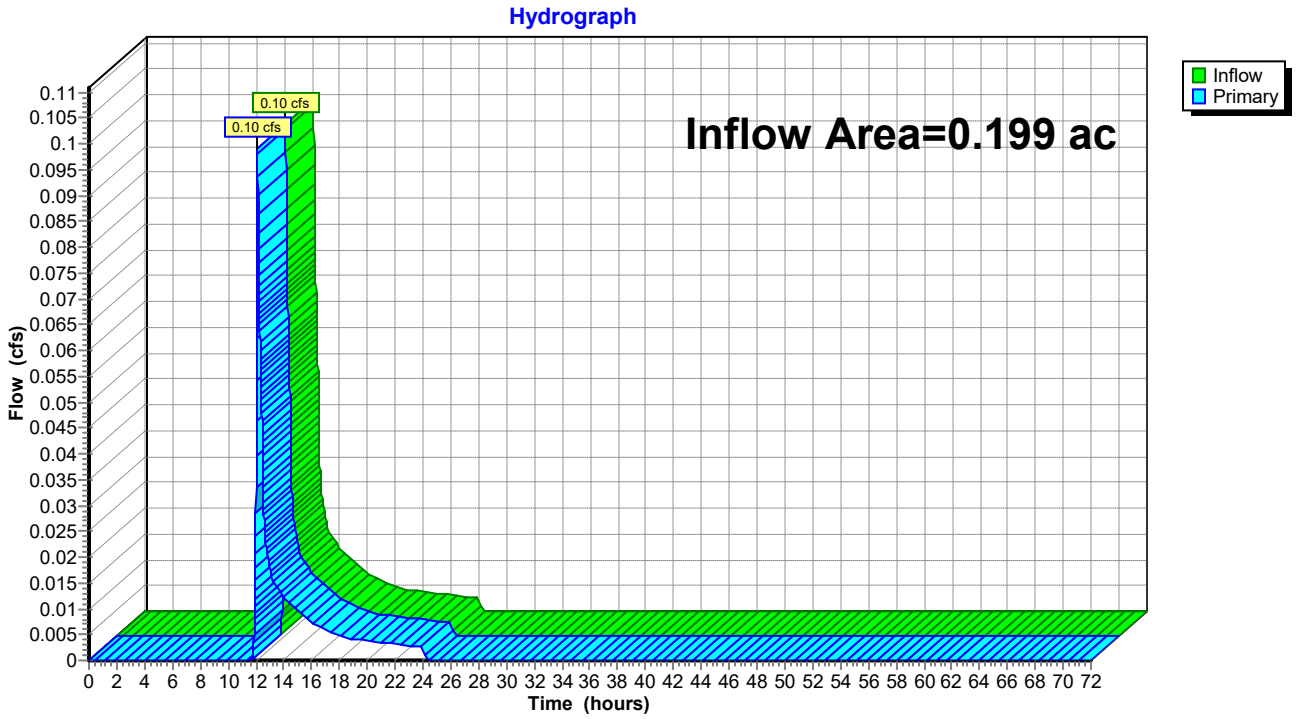


Summary for Link DP-2: Ditch

Inflow Area = 0.199 ac, 39.47% Impervious, Inflow Depth = 0.56" for 2-Year event
Inflow = 0.10 cfs @ 12.11 hrs, Volume= 0.009 af
Primary = 0.10 cfs @ 12.11 hrs, Volume= 0.009 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link DP-2: Ditch



Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1: Subcatchment 1 Runoff Area=227,252 sf 38.51% Impervious Runoff Depth=2.01"
Tc=6.0 min CN=71 Runoff=12.11 cfs 0.874 af

Subcatchment 2: Subcatchment 2 Runoff Area=8,681 sf 39.47% Impervious Runoff Depth=1.49"
Tc=6.0 min CN=64 Runoff=0.33 cfs 0.025 af

Link DP-1: Reservoir and Swimming Area Inflow=12.11 cfs 0.874 af
Primary=12.11 cfs 0.874 af

Link DP-2: Ditch Inflow=0.33 cfs 0.025 af
Primary=0.33 cfs 0.025 af

Total Runoff Area = 5.416 ac Runoff Volume = 0.899 af Average Runoff Depth = 1.99"
61.46% Pervious = 3.329 ac 38.54% Impervious = 2.088 ac

Summary for Subcatchment 1: Subcatchment 1

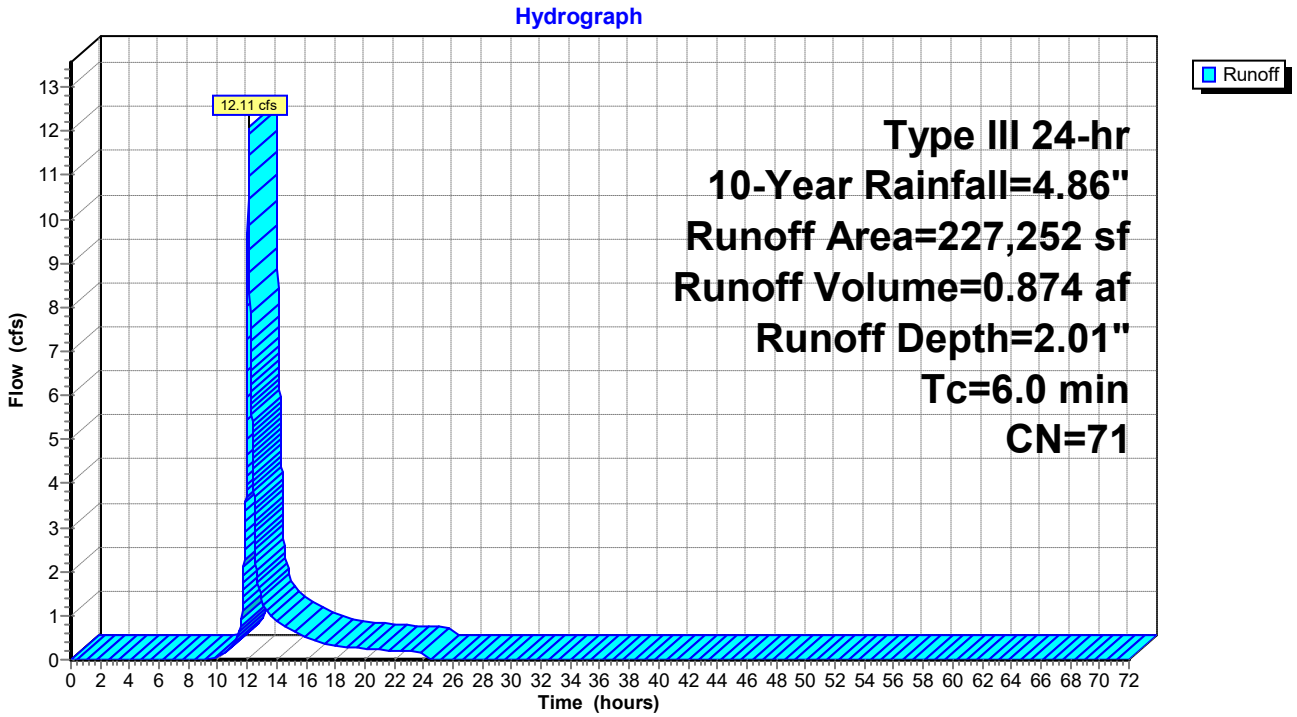
Runoff = 12.11 cfs @ 12.09 hrs, Volume= 0.874 af, Depth= 2.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.86"

	Area (sf)	CN	Description
	14,435	30	Brush, Good, HSG A
*	57,370	63	Beach Sand, HSG A
*	1,998	96	Dense Sand Path, HSG A
	63,530	49	50-75% Grass cover, Fair, HSG A
*	24,927	98	Gravel parking, HSG A
*	9,994	98	Impervious Surface, HSG A
	52,585	98	Water Surface, HSG A
*	2,413	39	Open Space, Good, HSG A (>75% Grass Cover)
	227,252	71	Weighted Average
	139,746		61.49% Pervious Area
	87,506		38.51% Impervious Area

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

Subcatchment 1: Subcatchment 1



Summary for Subcatchment 2: Subcatchment 2

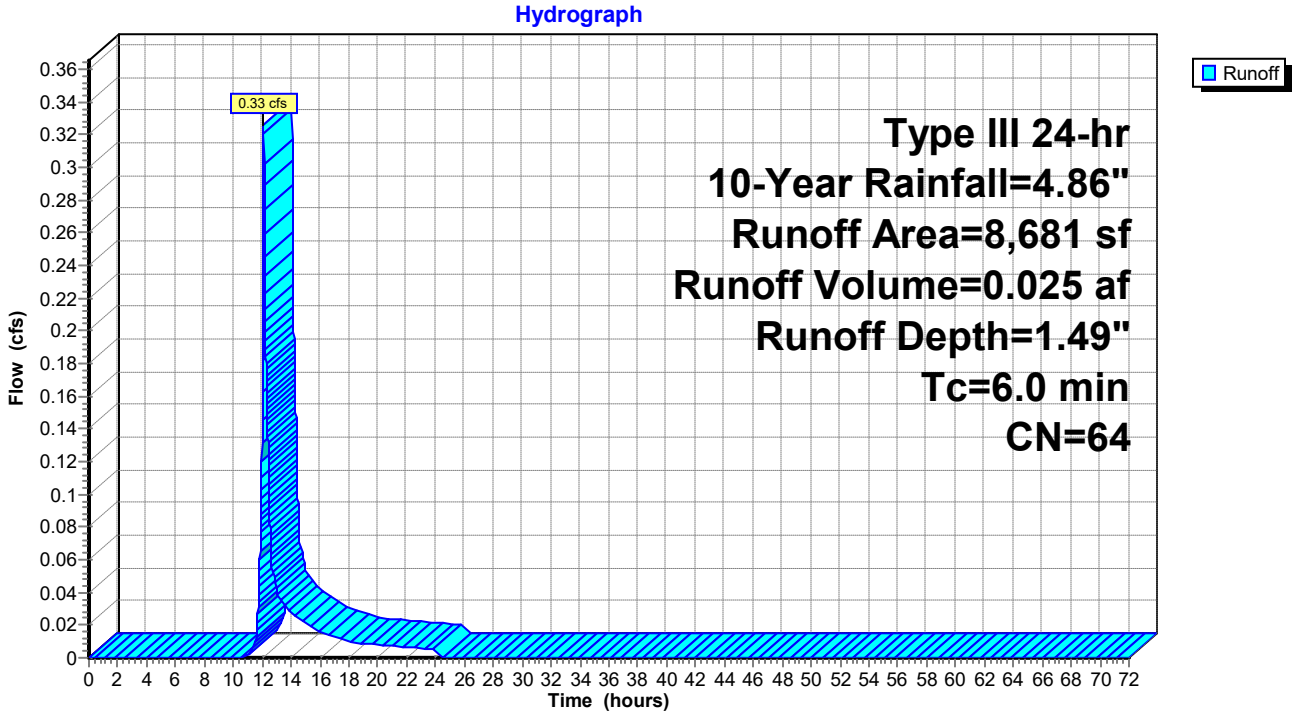
Runoff = 0.33 cfs @ 12.10 hrs, Volume= 0.025 af, Depth= 1.49"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.86"

	Area (sf)	CN	Description
	2,076	30	Brush, Good, HSG A
	3,179	49	50-75% Grass cover, Fair, HSG A
*	3,211	98	Gravel parking, HSG A
	215	98	Impervious Surface, HSG A
	8,681	64	Weighted Average
	5,255		60.53% Pervious Area
	3,426		39.47% Impervious Area

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

Subcatchment 2: Subcatchment 2

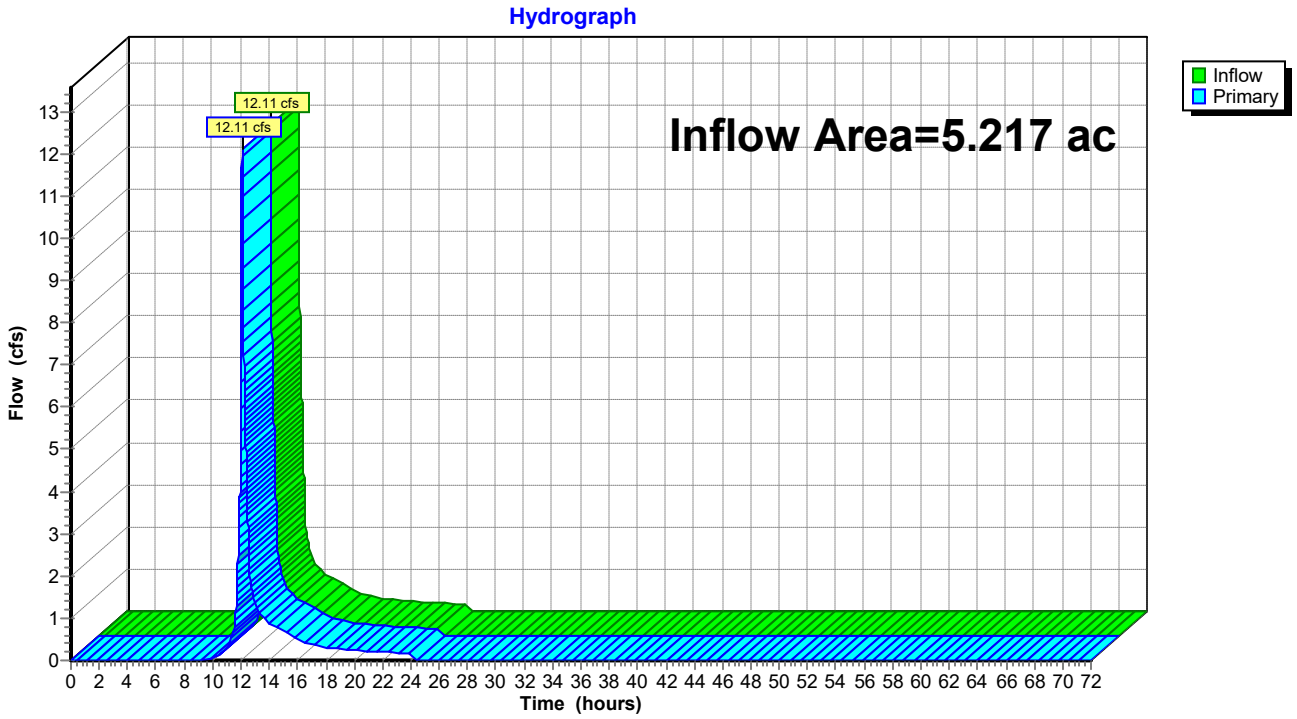


Summary for Link DP-1: Reservoir and Swimming Area

Inflow Area = 5.217 ac, 38.51% Impervious, Inflow Depth = 2.01" for 10-Year event
Inflow = 12.11 cfs @ 12.09 hrs, Volume= 0.874 af
Primary = 12.11 cfs @ 12.09 hrs, Volume= 0.874 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link DP-1: Reservoir and Swimming Area

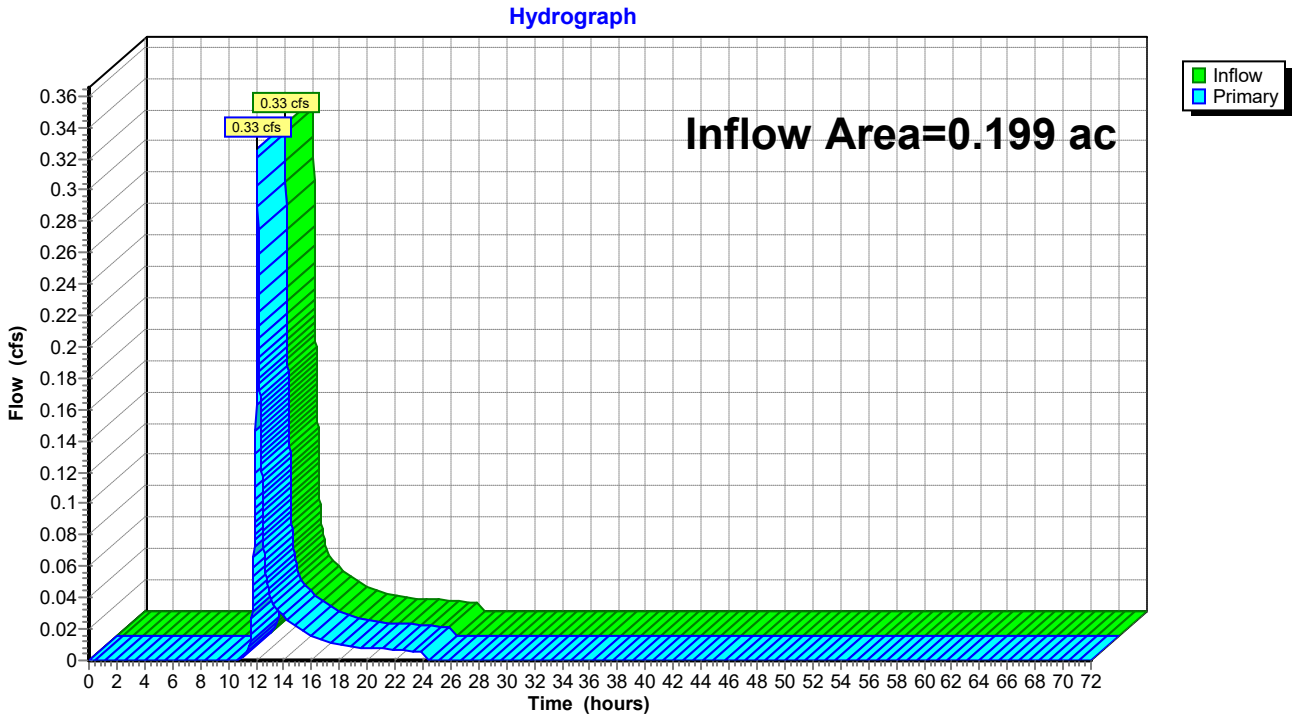


Summary for Link DP-2: Ditch

Inflow Area = 0.199 ac, 39.47% Impervious, Inflow Depth = 1.49" for 10-Year event
Inflow = 0.33 cfs @ 12.10 hrs, Volume= 0.025 af
Primary = 0.33 cfs @ 12.10 hrs, Volume= 0.025 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link DP-2: Ditch



Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1: Subcatchment 1 Runoff Area=227,252 sf 38.51% Impervious Runoff Depth=3.04"
Tc=6.0 min CN=71 Runoff=18.53 cfs 1.320 af

Subcatchment 2: Subcatchment 2 Runoff Area=8,681 sf 39.47% Impervious Runoff Depth=2.39"
Tc=6.0 min CN=64 Runoff=0.54 cfs 0.040 af

Link DP-1: Reservoir and Swimming Area Inflow=18.53 cfs 1.320 af
Primary=18.53 cfs 1.320 af

Link DP-2: Ditch Inflow=0.54 cfs 0.040 af
Primary=0.54 cfs 0.040 af

Total Runoff Area = 5.416 ac Runoff Volume = 1.360 af Average Runoff Depth = 3.01"
61.46% Pervious = 3.329 ac 38.54% Impervious = 2.088 ac

Summary for Subcatchment 1: Subcatchment 1

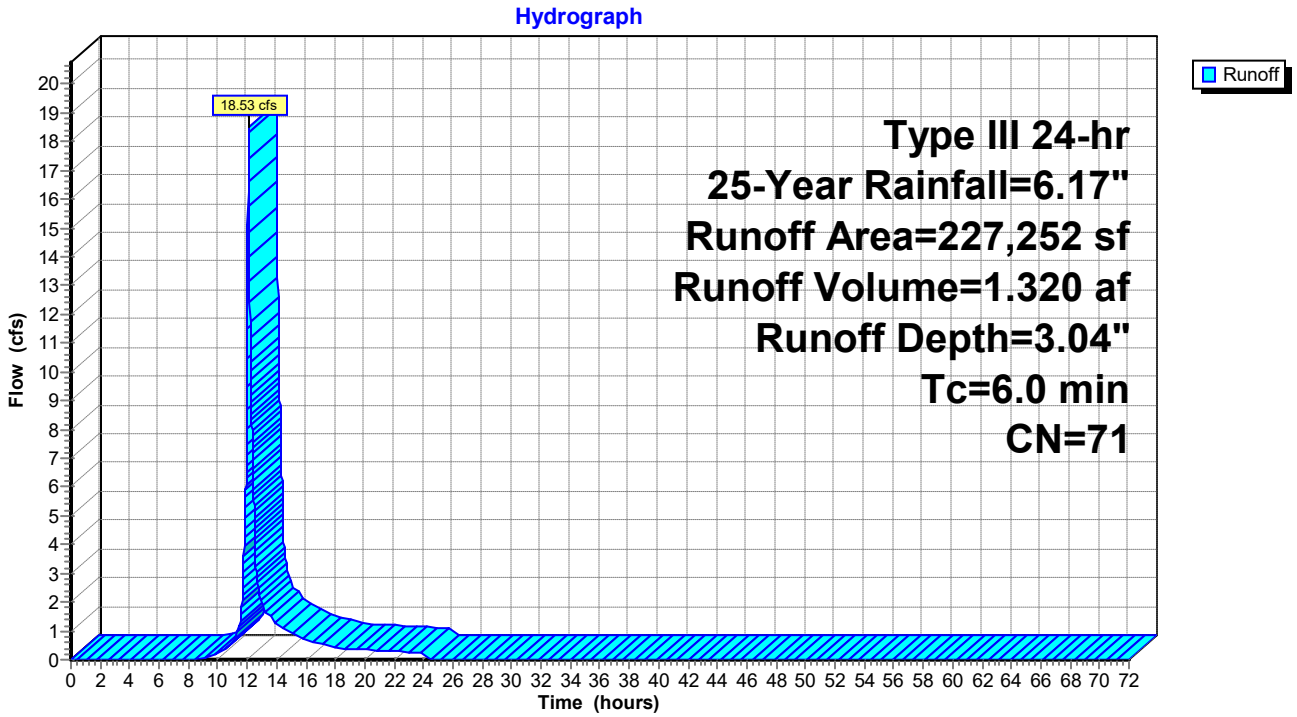
Runoff = 18.53 cfs @ 12.09 hrs, Volume= 1.320 af, Depth= 3.04"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=6.17"

	Area (sf)	CN	Description
	14,435	30	Brush, Good, HSG A
*	57,370	63	Beach Sand, HSG A
*	1,998	96	Dense Sand Path, HSG A
	63,530	49	50-75% Grass cover, Fair, HSG A
*	24,927	98	Gravel parking, HSG A
*	9,994	98	Impervious Surface, HSG A
	52,585	98	Water Surface, HSG A
*	2,413	39	Open Space, Good, HSG A (>75% Grass Cover)
	227,252	71	Weighted Average
	139,746		61.49% Pervious Area
	87,506		38.51% Impervious Area

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

Subcatchment 1: Subcatchment 1



Summary for Subcatchment 2: Subcatchment 2

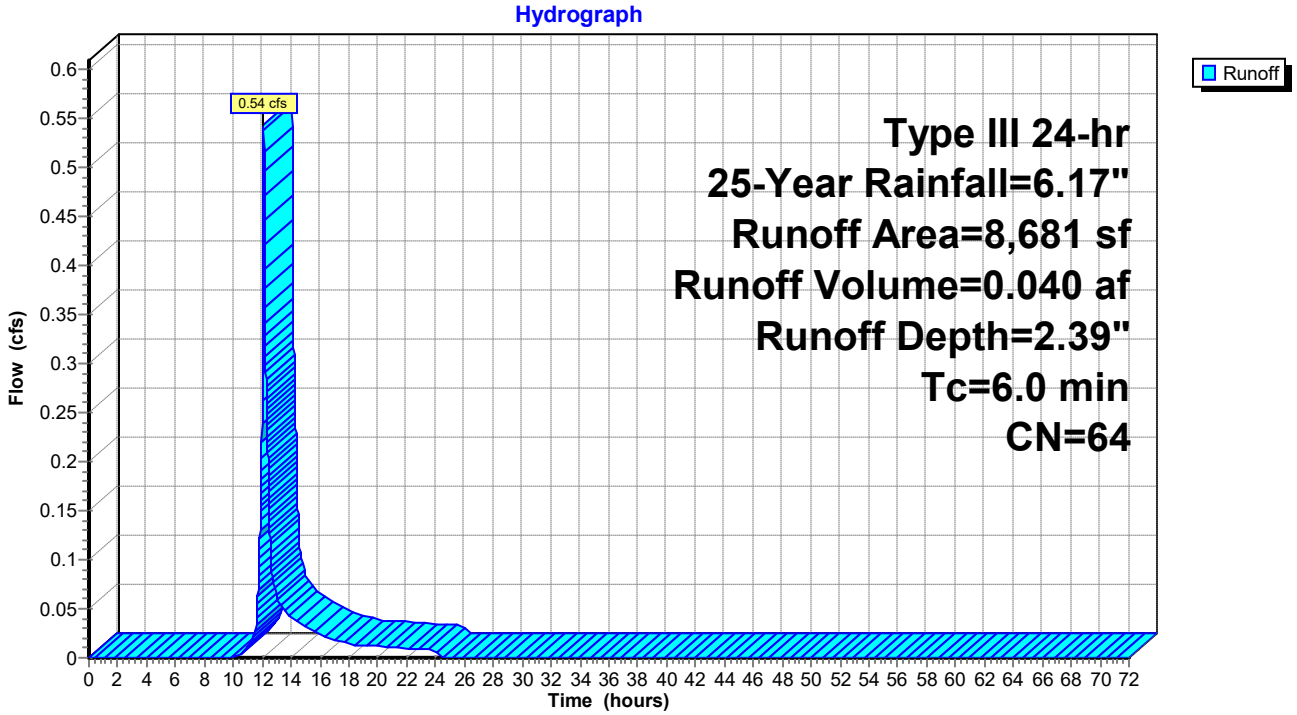
Runoff = 0.54 cfs @ 12.09 hrs, Volume= 0.040 af, Depth= 2.39"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=6.17"

	Area (sf)	CN	Description
	2,076	30	Brush, Good, HSG A
	3,179	49	50-75% Grass cover, Fair, HSG A
*	3,211	98	Gravel parking, HSG A
	215	98	Impervious Surface, HSG A
	8,681	64	Weighted Average
	5,255		60.53% Pervious Area
	3,426		39.47% Impervious Area

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

Subcatchment 2: Subcatchment 2

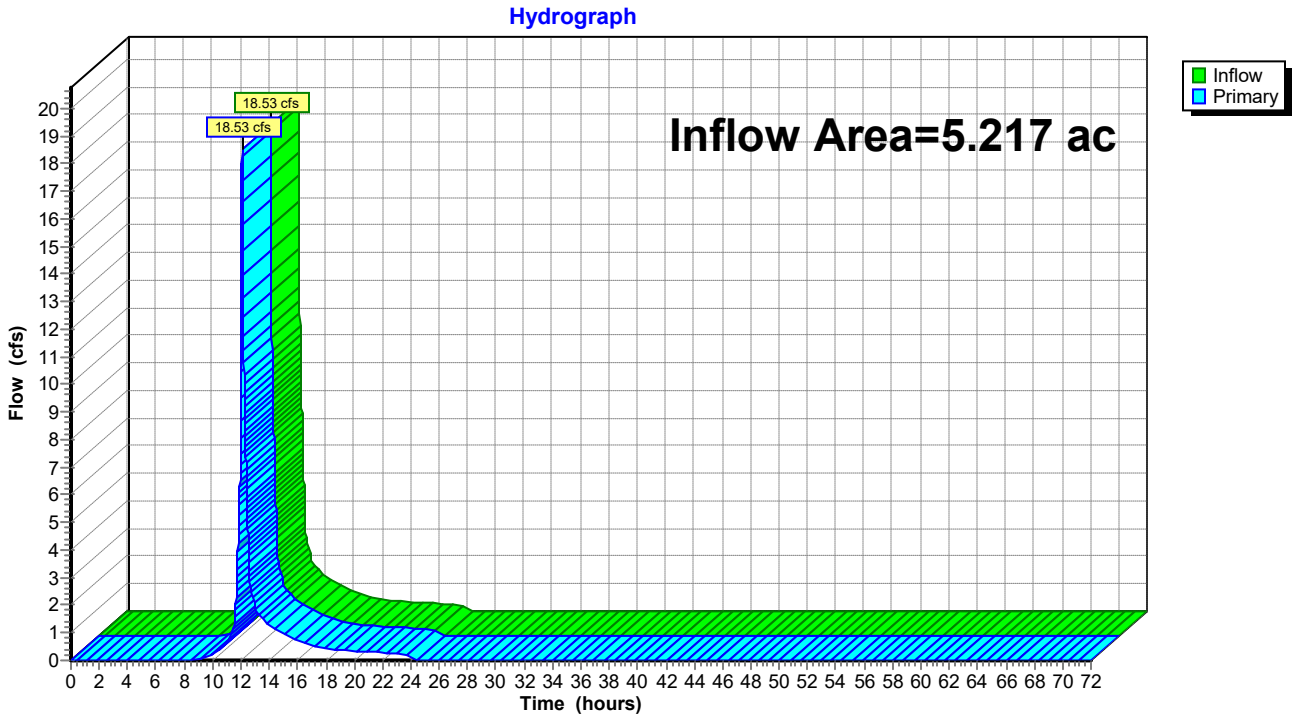


Summary for Link DP-1: Reservoir and Swimming Area

Inflow Area = 5.217 ac, 38.51% Impervious, Inflow Depth = 3.04" for 25-Year event
Inflow = 18.53 cfs @ 12.09 hrs, Volume= 1.320 af
Primary = 18.53 cfs @ 12.09 hrs, Volume= 1.320 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link DP-1: Reservoir and Swimming Area

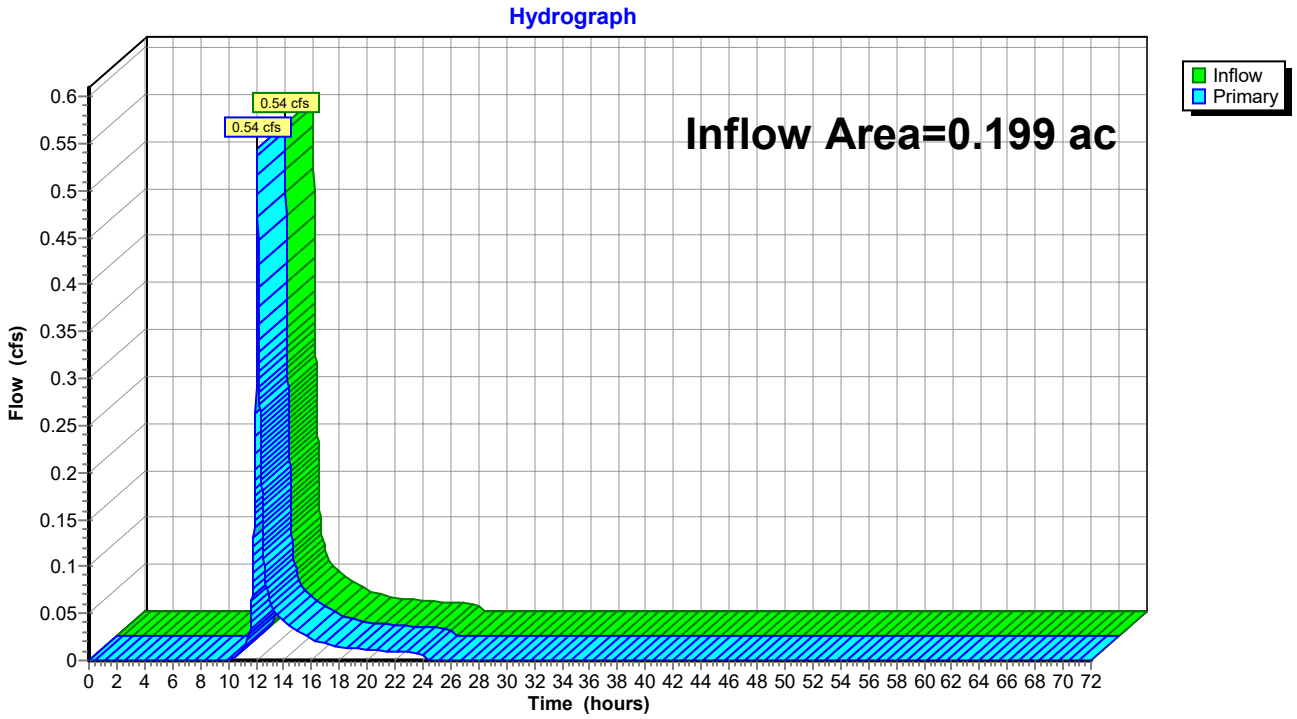


Summary for Link DP-2: Ditch

Inflow Area = 0.199 ac, 39.47% Impervious, Inflow Depth = 2.39" for 25-Year event
Inflow = 0.54 cfs @ 12.09 hrs, Volume= 0.040 af
Primary = 0.54 cfs @ 12.09 hrs, Volume= 0.040 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link DP-2: Ditch



Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1: Subcatchment 1 Runoff Area=227,252 sf 38.51% Impervious Runoff Depth=5.33"
Tc=6.0 min CN=71 Runoff=32.53 cfs 2.315 af

Subcatchment 2: Subcatchment 2 Runoff Area=8,681 sf 39.47% Impervious Runoff Depth=4.47"
Tc=6.0 min CN=64 Runoff=1.04 cfs 0.074 af

Link DP-1: Reservoir and Swimming Area Inflow=32.53 cfs 2.315 af
Primary=32.53 cfs 2.315 af

Link DP-2: Ditch Inflow=1.04 cfs 0.074 af
Primary=1.04 cfs 0.074 af

Total Runoff Area = 5.416 ac Runoff Volume = 2.389 af Average Runoff Depth = 5.29"
61.46% Pervious = 3.329 ac 38.54% Impervious = 2.088 ac

Summary for Subcatchment 1: Subcatchment 1

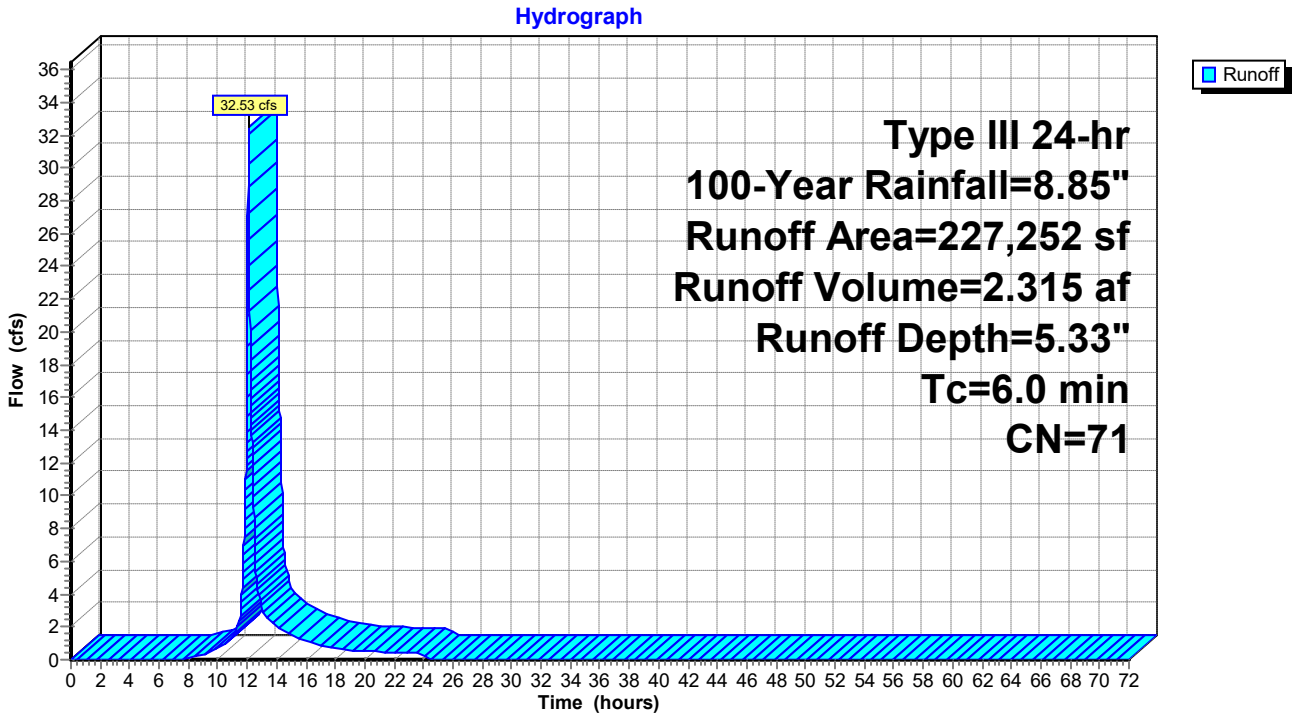
Runoff = 32.53 cfs @ 12.09 hrs, Volume= 2.315 af, Depth= 5.33"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.85"

	Area (sf)	CN	Description
	14,435	30	Brush, Good, HSG A
*	57,370	63	Beach Sand, HSG A
*	1,998	96	Dense Sand Path, HSG A
	63,530	49	50-75% Grass cover, Fair, HSG A
*	24,927	98	Gravel parking, HSG A
*	9,994	98	Impervious Surface, HSG A
	52,585	98	Water Surface, HSG A
*	2,413	39	Open Space, Good, HSG A (>75% Grass Cover)
	227,252	71	Weighted Average
	139,746		61.49% Pervious Area
	87,506		38.51% Impervious Area

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

Subcatchment 1: Subcatchment 1



Summary for Subcatchment 2: Subcatchment 2

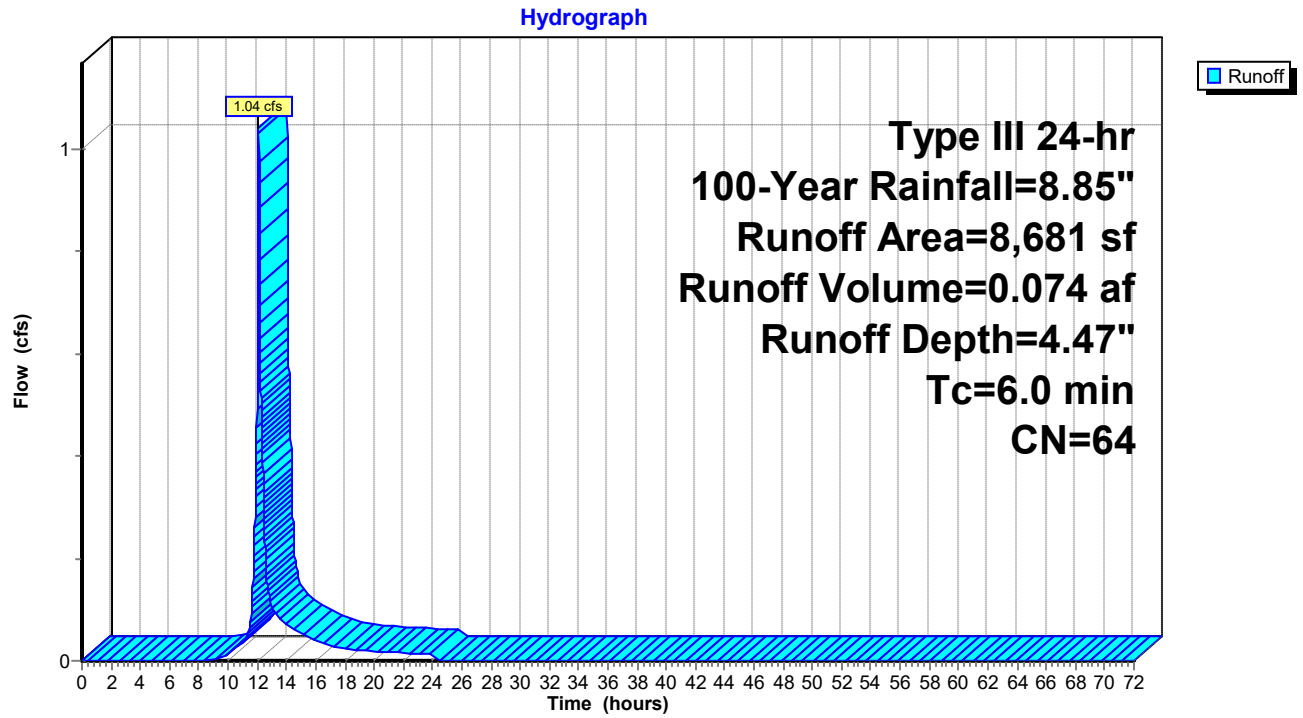
Runoff = 1.04 cfs @ 12.09 hrs, Volume= 0.074 af, Depth= 4.47"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.85"

	Area (sf)	CN	Description
	2,076	30	Brush, Good, HSG A
	3,179	49	50-75% Grass cover, Fair, HSG A
*	3,211	98	Gravel parking, HSG A
	215	98	Impervious Surface, HSG A
	8,681	64	Weighted Average
	5,255		60.53% Pervious Area
	3,426		39.47% Impervious Area

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

Subcatchment 2: Subcatchment 2

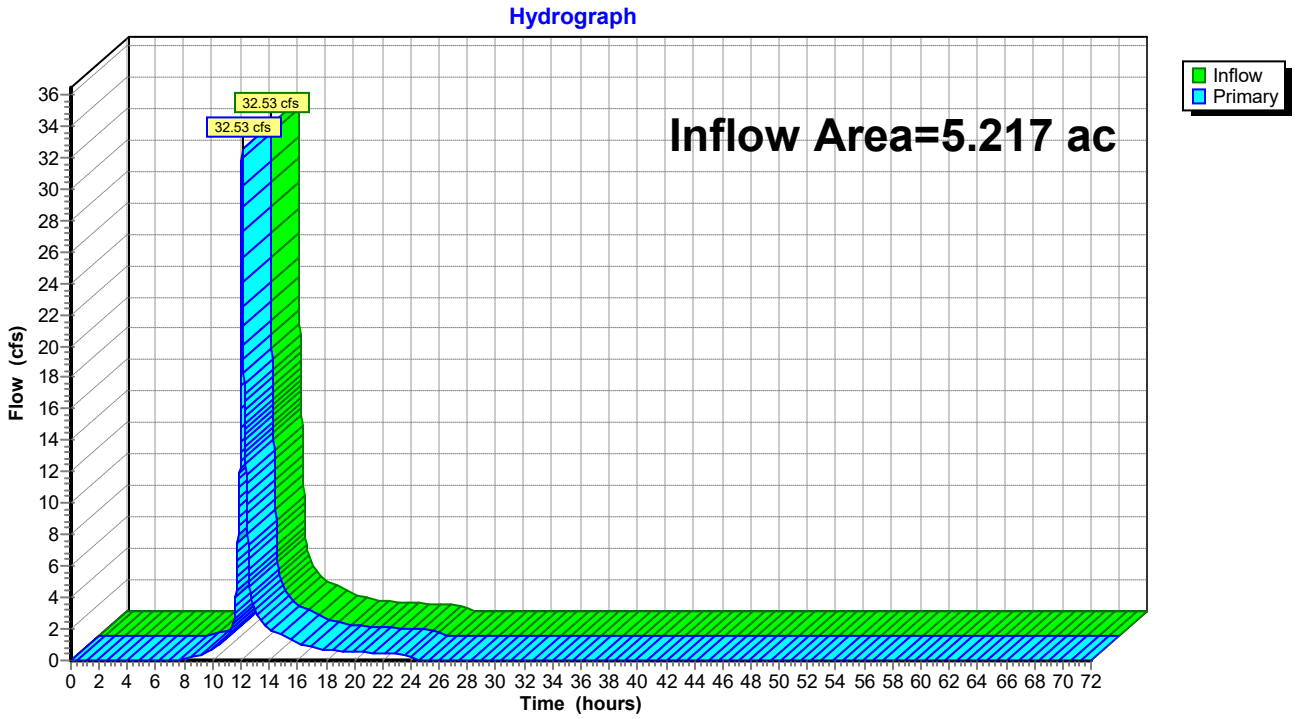


Summary for Link DP-1: Reservoir and Swimming Area

Inflow Area = 5.217 ac, 38.51% Impervious, Inflow Depth = 5.33" for 100-Year event
Inflow = 32.53 cfs @ 12.09 hrs, Volume= 2.315 af
Primary = 32.53 cfs @ 12.09 hrs, Volume= 2.315 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link DP-1: Reservoir and Swimming Area

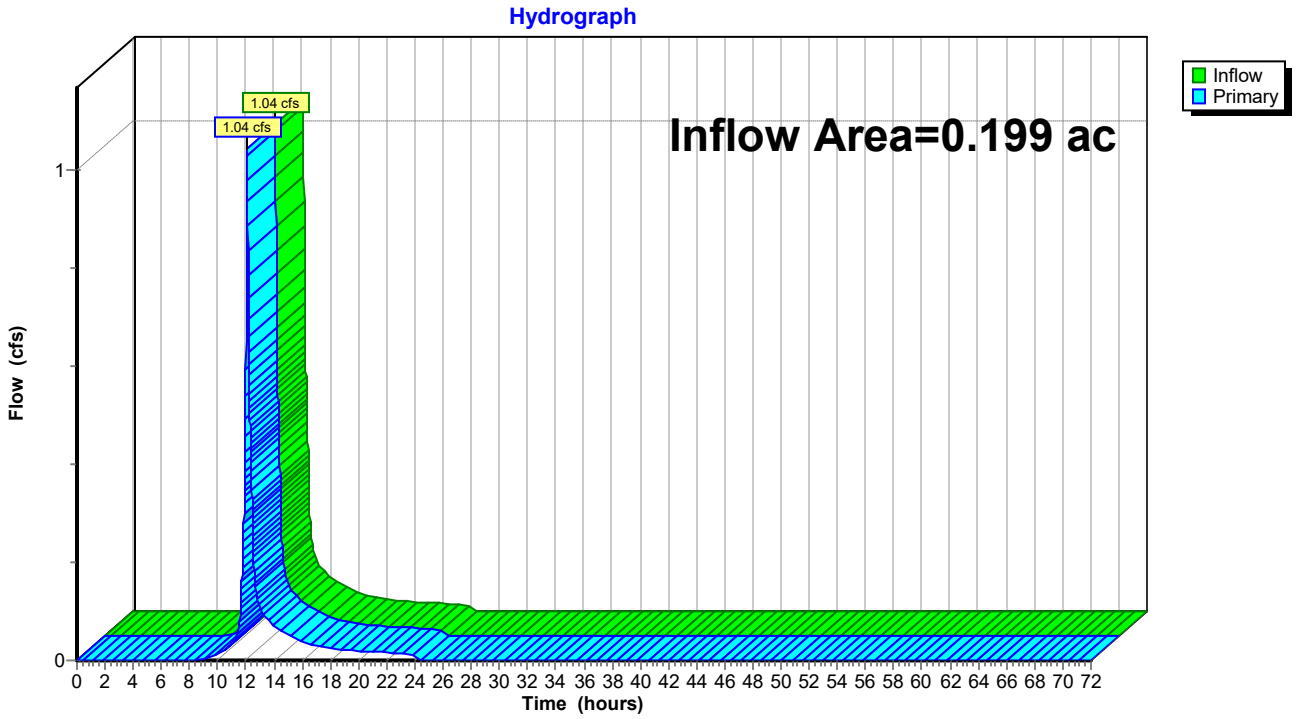


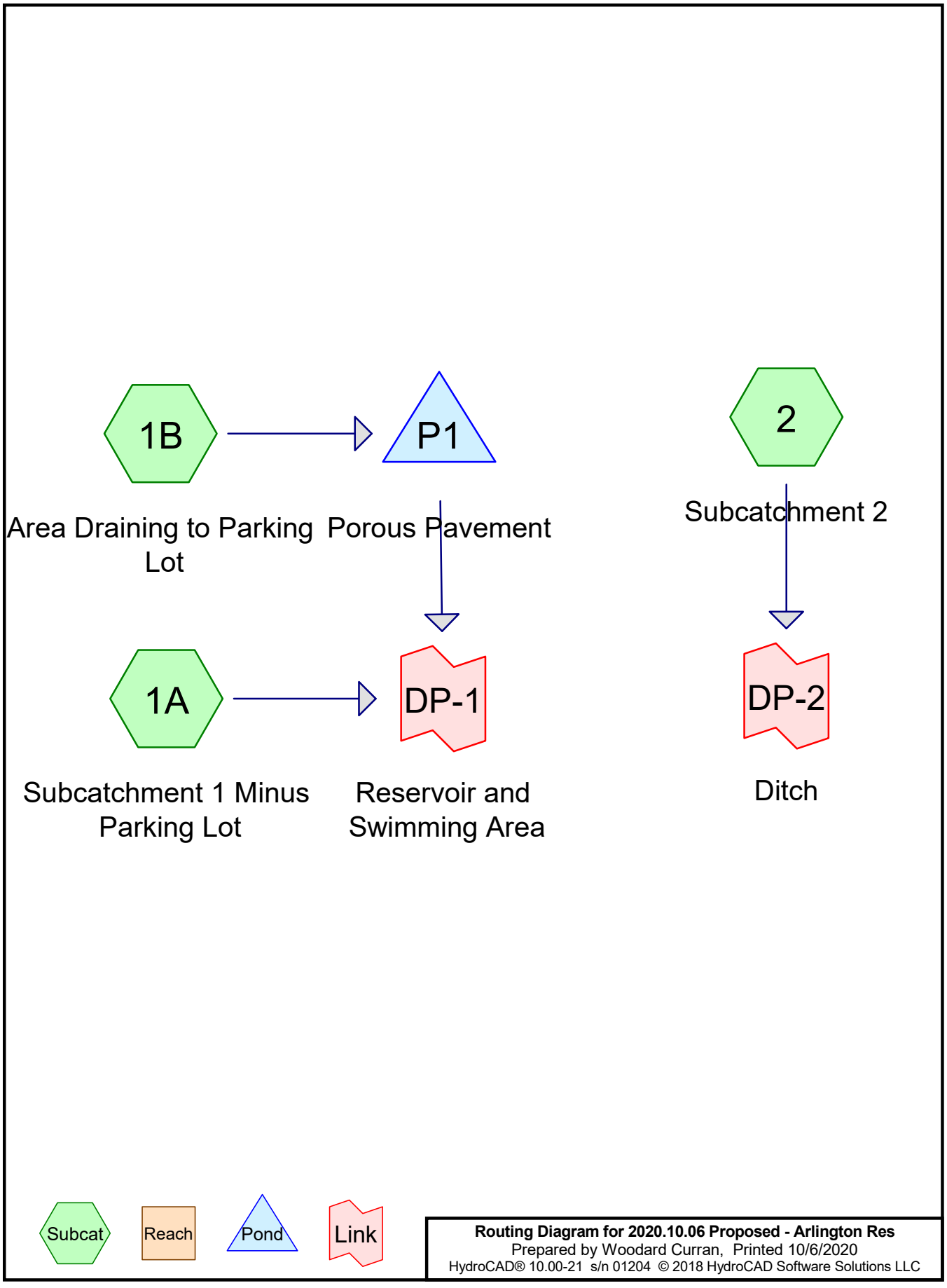
Summary for Link DP-2: Ditch

Inflow Area = 0.199 ac, 39.47% Impervious, Inflow Depth = 4.47" for 100-Year event
Inflow = 1.04 cfs @ 12.09 hrs, Volume= 0.074 af
Primary = 1.04 cfs @ 12.09 hrs, Volume= 0.074 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link DP-2: Ditch





Routing Diagram for 2020.10.06 Proposed - Arlington Res
Prepared by Woodard Curran, Printed 10/6/2020

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
1.573	39	>75% Grass cover, Good, HSG A (1A, 1B, 2)
1.029	63	Beach Sand, HSG A (1A)
0.304	30	Brush, Good, HSG A (1A)
0.467	98	Impervious Surface, HSG A (1A, 1B)
0.184	39	Permeable Playground Surface, Good, HSG A (1A)
0.521	98	Porous Pavement, HSG A (1A, 1B)
0.138	96	Stone Dust, HSG A (1A)
1.200	98	Water Surface, HSG A (1A)
5.416	**68**	**TOTAL AREA**

Soil Listing (selected nodes)

Area (acres)	Soil Group	Subcatchment Numbers
5.416	HSG A	1A, 1B, 2
0.000	HSG B	
0.000	HSG C	
0.000	HSG D	
0.000	Other	
5.416		**TOTAL AREA**

Ground Covers (selected nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatch Numbers
1.573	0.000	0.000	0.000	0.000	1.573	>75% Grass cover, Good	
1.029	0.000	0.000	0.000	0.000	1.029	Beach Sand	
0.304	0.000	0.000	0.000	0.000	0.304	Brush, Good	
0.467	0.000	0.000	0.000	0.000	0.467	Impervious Surface	
0.184	0.000	0.000	0.000	0.000	0.184	Permeable Playground Surface, Good	
0.521	0.000	0.000	0.000	0.000	0.521	Porous Pavement	
0.138	0.000	0.000	0.000	0.000	0.138	Stone Dust	
1.200	0.000	0.000	0.000	0.000	1.200	Water Surface	
5.416	**0.000**	**0.000**	**0.000**	**0.000**	**5.416**	**TOTAL AREA**	

Pipe Listing (selected nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	P1	162.15	162.05	20.0	0.0050	0.013	12.0	0.0	0.0

Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1A: Subcatchment 1 Runoff Area=201,945 sf 36.57% Impervious Runoff Depth=0.43"
Tc=6.0 min CN=67 Runoff=1.65 cfs 0.166 af

Subcatchment 1B: Area Draining to Runoff Area=29,873 sf 71.84% Impervious Runoff Depth=1.07"
Tc=6.0 min CN=81 Runoff=0.84 cfs 0.061 af

Subcatchment 2: Subcatchment 2 Runoff Area=4,115 sf 0.00% Impervious Runoff Depth=0.00"
Tc=6.0 min CN=39 Runoff=0.00 cfs 0.000 af

Pond P1: Porous Pavement Peak Elev=161.40' Storage=0 cf Inflow=0.84 cfs 0.061 af
Discarded=0.84 cfs 0.061 af Primary=0.00 cfs 0.000 af Outflow=0.84 cfs 0.061 af

Link DP-1: Reservoir and Swimming Area Inflow=1.65 cfs 0.166 af
Primary=1.65 cfs 0.166 af

Link DP-2: Ditch Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Total Runoff Area = 5.416 ac Runoff Volume = 0.227 af Average Runoff Depth = 0.50"
59.60% Pervious = 3.228 ac 40.40% Impervious = 2.188 ac

Summary for Subcatchment 1A: Subcatchment 1 Minus Parking Lot

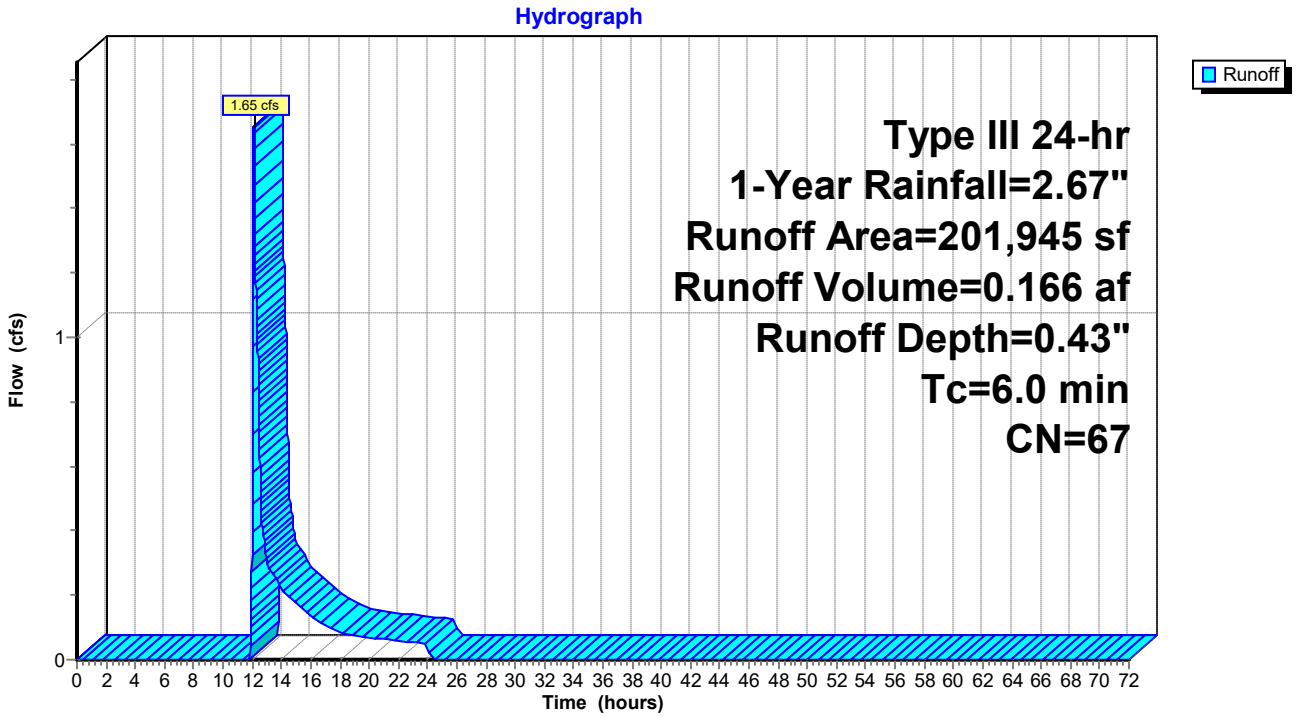
Runoff = 1.65 cfs @ 12.11 hrs, Volume= 0.166 af, Depth= 0.43"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 1-Year Rainfall=2.67"

	Area (sf)	CN	Description
	13,237	30	Brush, Good, HSG A
*	44,830	63	Beach Sand, HSG A
	56,001	39	>75% Grass cover, Good, HSG A
	19,764	98	Impervious Surface, HSG A
*	1,800	98	Porous Pavement, HSG A
	52,292	98	Water Surface, HSG A
*	6,010	96	Stone Dust, HSG A
*	8,011	39	Permeable Playground Surface, Good, HSG A
	201,945	67	Weighted Average
	128,089		63.43% Pervious Area
	73,856		36.57% Impervious Area

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

Subcatchment 1A: Subcatchment 1 Minus Parking Lot



Summary for Subcatchment 1B: Area Draining to Parking Lot

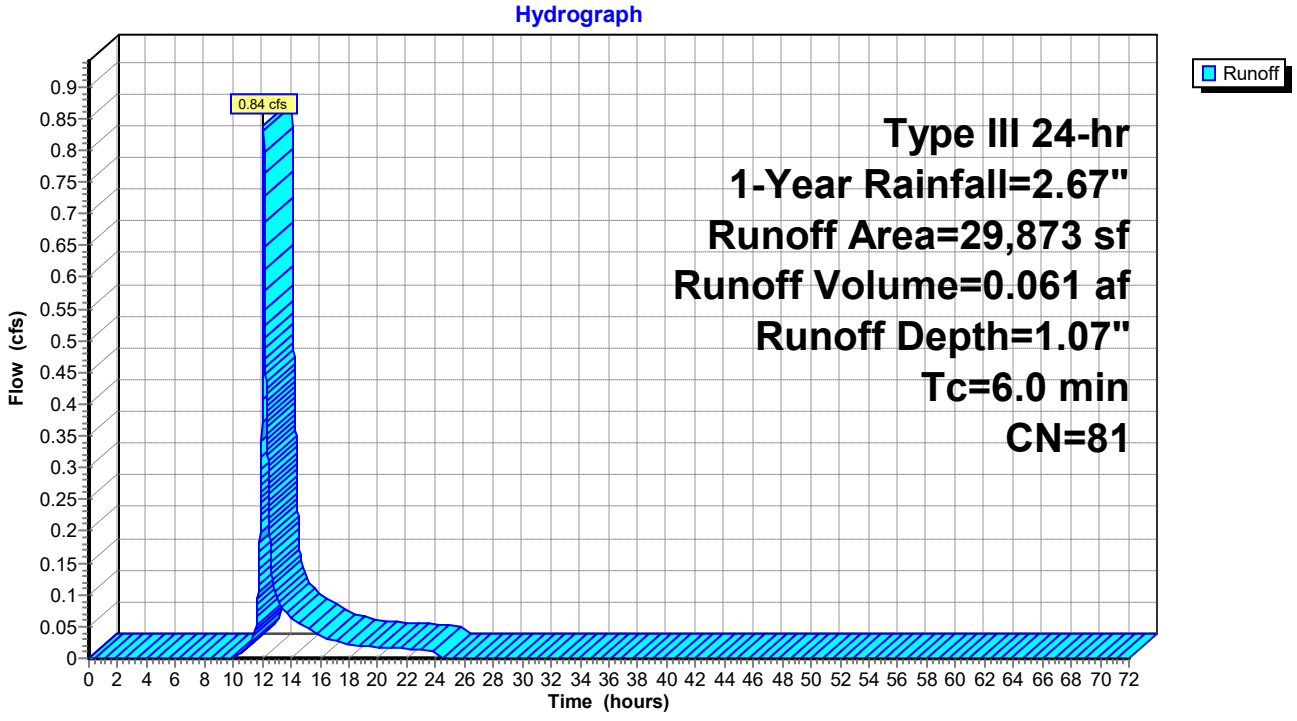
Runoff = 0.84 cfs @ 12.09 hrs, Volume= 0.061 af, Depth= 1.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 1-Year Rainfall=2.67"

	Area (sf)	CN	Description
	8,411	39	>75% Grass cover, Good, HSG A
	574	98	Impervious Surface, HSG A
*	20,888	98	Porous Pavement, HSG A
	29,873	81	Weighted Average
	8,411		28.16% Pervious Area
	21,462		71.84% Impervious Area

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

Subcatchment 1B: Area Draining to Parking Lot



Summary for Subcatchment 2: Subcatchment 2

[45] Hint: Runoff=Zero

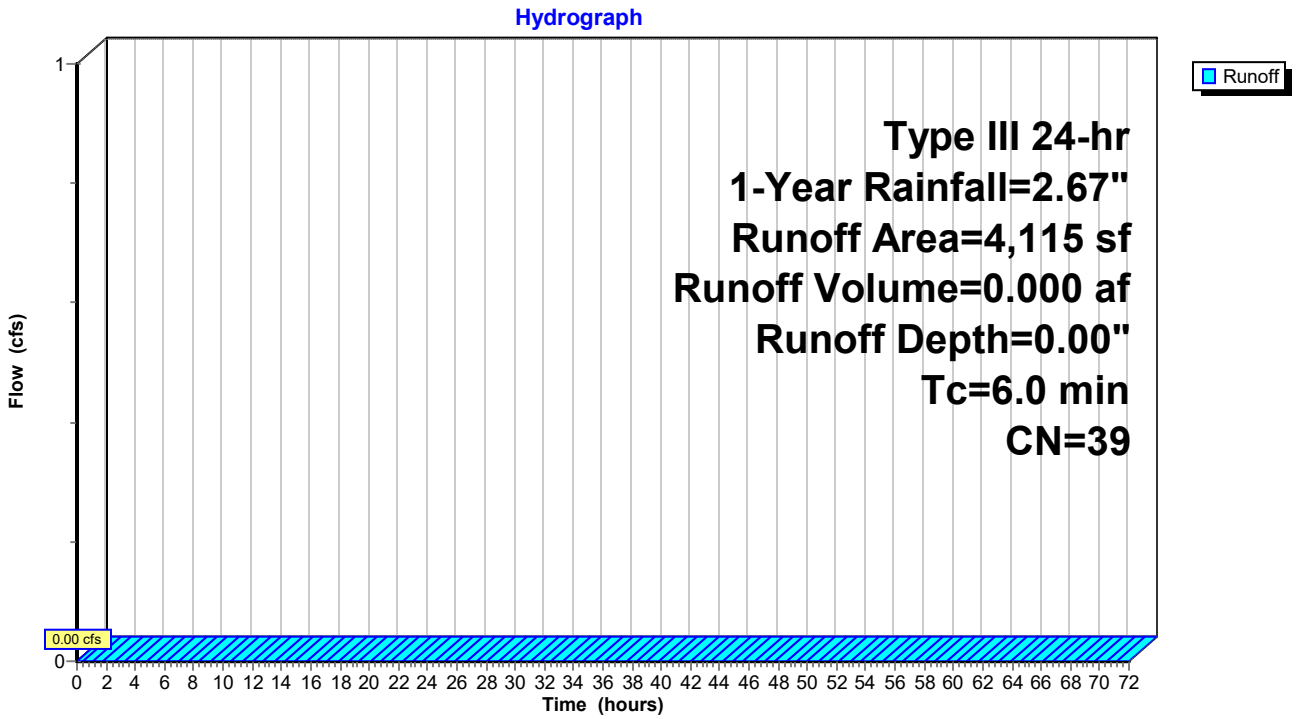
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 1-Year Rainfall=2.67"

Area (sf)	CN	Description
4,115	39	>75% Grass cover, Good, HSG A
4,115		100.00% Pervious Area

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

Subcatchment 2: Subcatchment 2



Summary for Pond P1: Porous Pavement

Inflow Area = 0.686 ac, 71.84% Impervious, Inflow Depth = 1.07" for 1-Year event
Inflow = 0.84 cfs @ 12.09 hrs, Volume= 0.061 af
Outflow = 0.84 cfs @ 12.09 hrs, Volume= 0.061 af, Atten= 0%, Lag= 0.0 min
Discarded = 0.84 cfs @ 12.09 hrs, Volume= 0.061 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 161.40' @ 12.09 hrs Surf.Area= 21,411 sf Storage= 0 cf
Flood Elev= 164.00' Surf.Area= 42,822 sf Storage= 11,383 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.0 min (849.0 - 849.0)

Volume	Invert	Avail.Storage	Storage Description
#1	161.40'	7,099 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) 17,771 cf Overall - 23 cf Embedded = 17,749 cf x 40.0% Voids
#2	162.23'	4,261 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)
#3	161.73'	23 cf	**4.0" Round Pipe Storage** Inside #1 L= 258.0'
		11,383 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
161.40	21,411	0	0
162.23	21,411	17,771	17,771

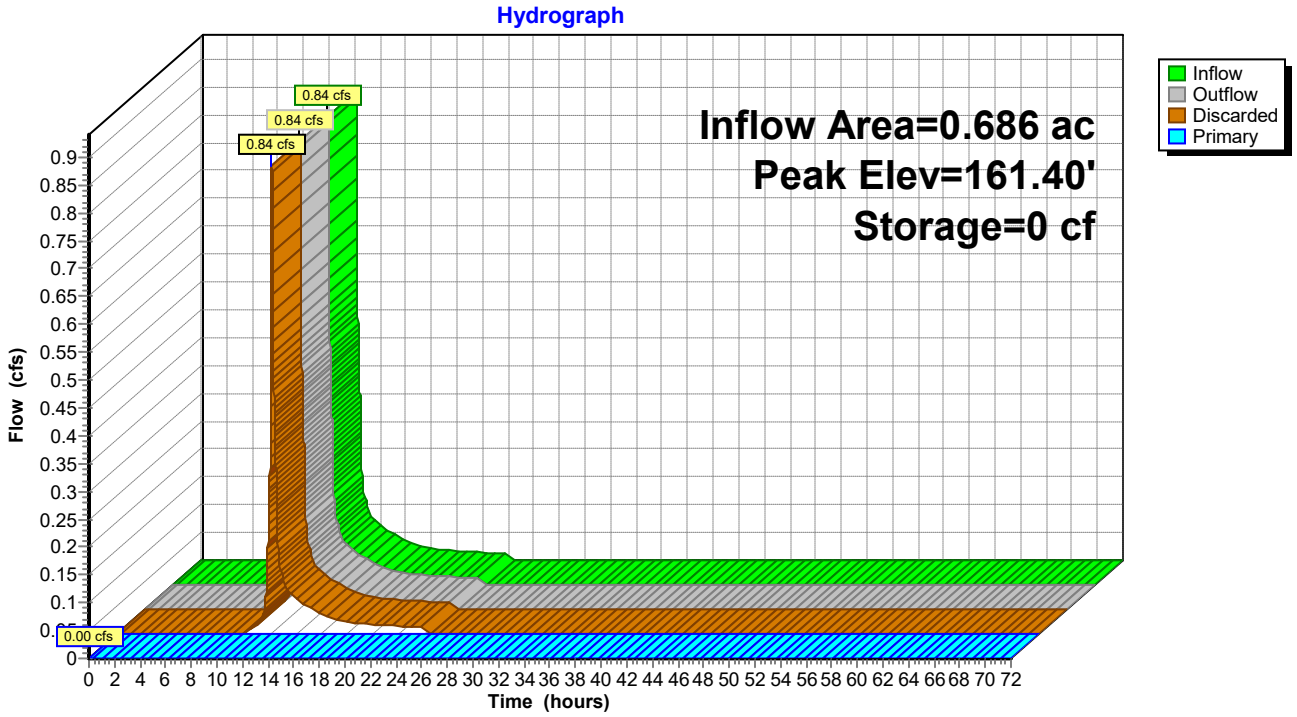
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
162.23	21,411	0.0	0	0
162.48	21,411	40.0	2,141	2,141
162.81	21,411	30.0	2,120	4,261

Device	Routing	Invert	Outlet Devices
#1	Primary	162.15'	**12.0" Round Culvert** L= 20.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 162.15' / 162.05' S= 0.0050 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	161.73'	**4.0" Vert. Orifice/Grate** C= 0.600
#3	Discarded	161.40'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=1.19 cfs @ 12.09 hrs HW=161.40' (Free Discharge)
↑└**3=Exfiltration** (Exfiltration Controls 1.19 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=161.40' TW=0.00' (Dynamic Tailwater)
↑└**1=Culvert** (Controls 0.00 cfs)
↑└**2=Orifice/Grate** (Controls 0.00 cfs)

Pond P1: Porous Pavement

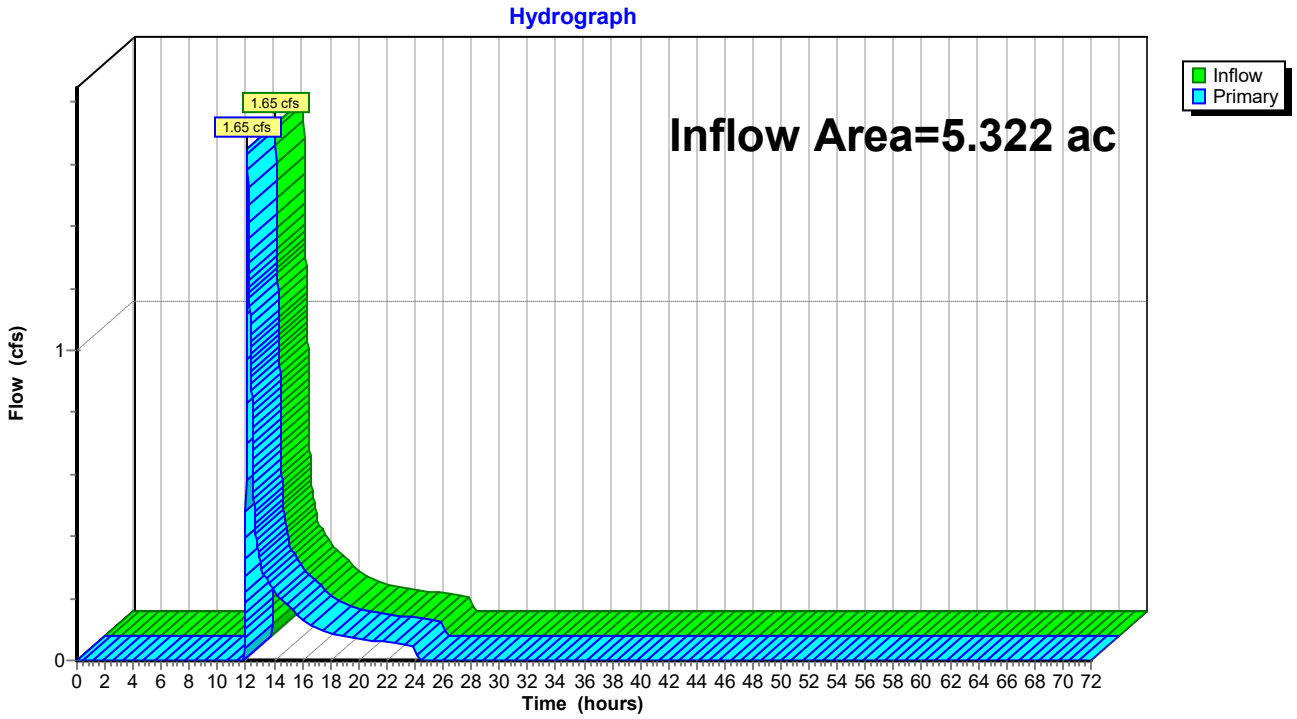


Summary for Link DP-1: Reservoir and Swimming Area

Inflow Area = 5.322 ac, 41.12% Impervious, Inflow Depth = 0.37" for 1-Year event
Inflow = 1.65 cfs @ 12.11 hrs, Volume= 0.166 af
Primary = 1.65 cfs @ 12.11 hrs, Volume= 0.166 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link DP-1: Reservoir and Swimming Area

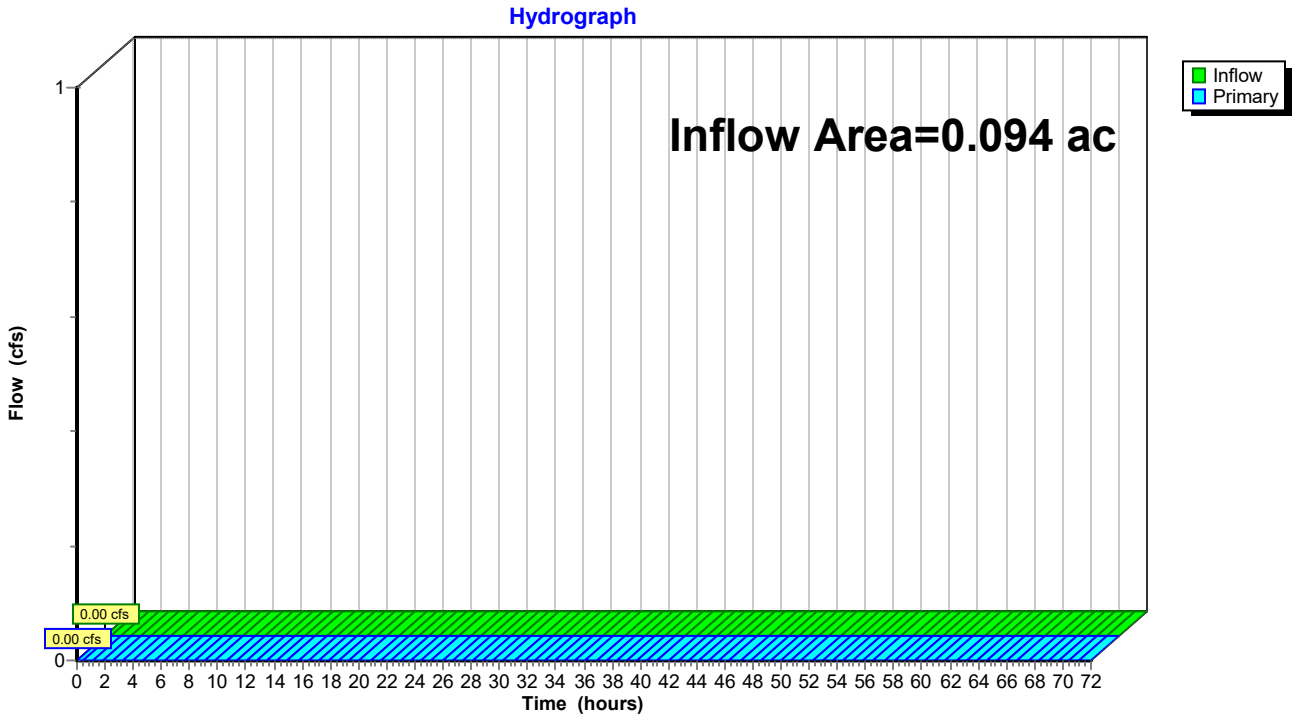


Summary for Link DP-2: Ditch

Inflow Area = 0.094 ac, 0.00% Impervious, Inflow Depth = 0.00" for 1-Year event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link DP-2: Ditch



Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1A: Subcatchment 1 Runoff Area=201,945 sf 36.57% Impervious Runoff Depth=0.69"
Tc=6.0 min CN=67 Runoff=3.15 cfs 0.267 af

Subcatchment 1B: Area Draining to Runoff Area=29,873 sf 71.84% Impervious Runoff Depth=1.48"
Tc=6.0 min CN=81 Runoff=1.18 cfs 0.084 af

Subcatchment 2: Subcatchment 2 Runoff Area=4,115 sf 0.00% Impervious Runoff Depth=0.00"
Tc=6.0 min CN=39 Runoff=0.00 cfs 0.000 af

Pond P1: Porous Pavement Peak Elev=161.40' Storage=1 cf Inflow=1.18 cfs 0.084 af
Discarded=1.17 cfs 0.084 af Primary=0.00 cfs 0.000 af Outflow=1.17 cfs 0.084 af

Link DP-1: Reservoir and Swimming Area Inflow=3.15 cfs 0.267 af
Primary=3.15 cfs 0.267 af

Link DP-2: Ditch Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Total Runoff Area = 5.416 ac Runoff Volume = 0.352 af Average Runoff Depth = 0.78"
59.60% Pervious = 3.228 ac 40.40% Impervious = 2.188 ac

Summary for Subcatchment 1A: Subcatchment 1 Minus Parking Lot

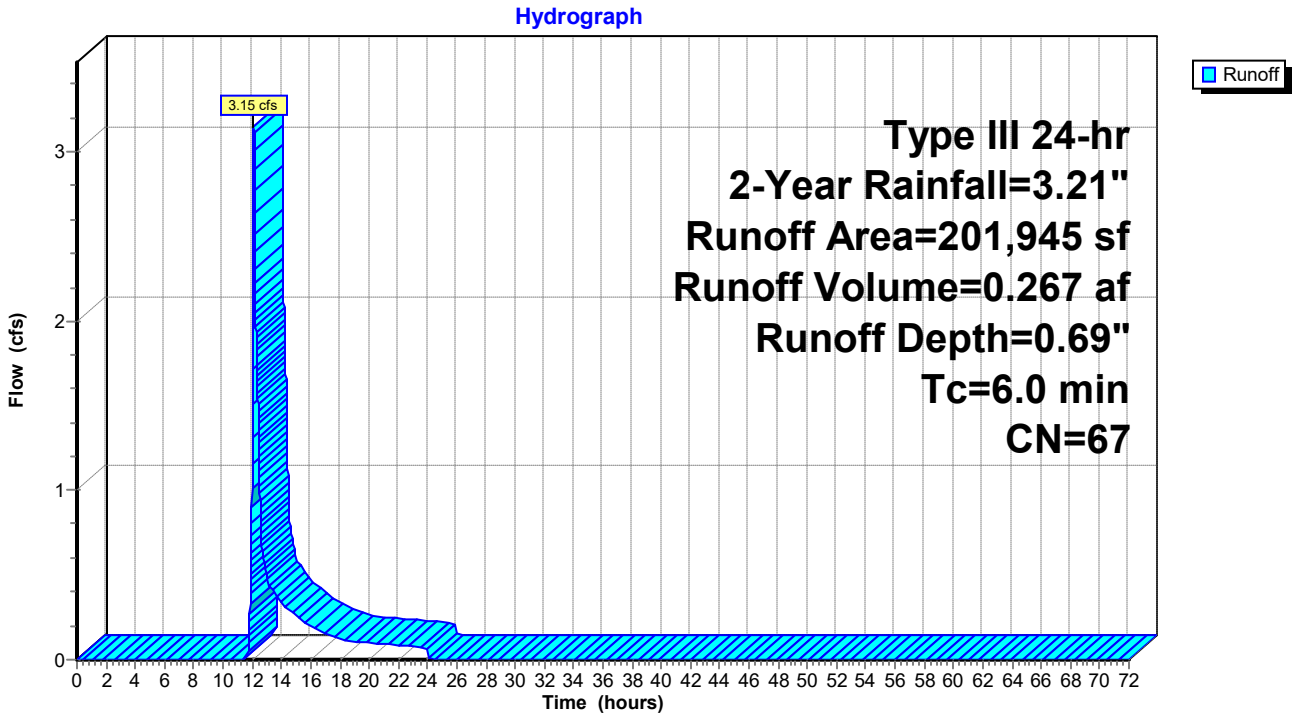
Runoff = 3.15 cfs @ 12.10 hrs, Volume= 0.267 af, Depth= 0.69"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.21"

	Area (sf)	CN	Description
	13,237	30	Brush, Good, HSG A
*	44,830	63	Beach Sand, HSG A
	56,001	39	>75% Grass cover, Good, HSG A
	19,764	98	Impervious Surface, HSG A
*	1,800	98	Porous Pavement, HSG A
	52,292	98	Water Surface, HSG A
*	6,010	96	Stone Dust, HSG A
*	8,011	39	Permeable Playground Surface, Good, HSG A
	201,945	67	Weighted Average
	128,089		63.43% Pervious Area
	73,856		36.57% Impervious Area

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

Subcatchment 1A: Subcatchment 1 Minus Parking Lot



Summary for Subcatchment 1B: Area Draining to Parking Lot

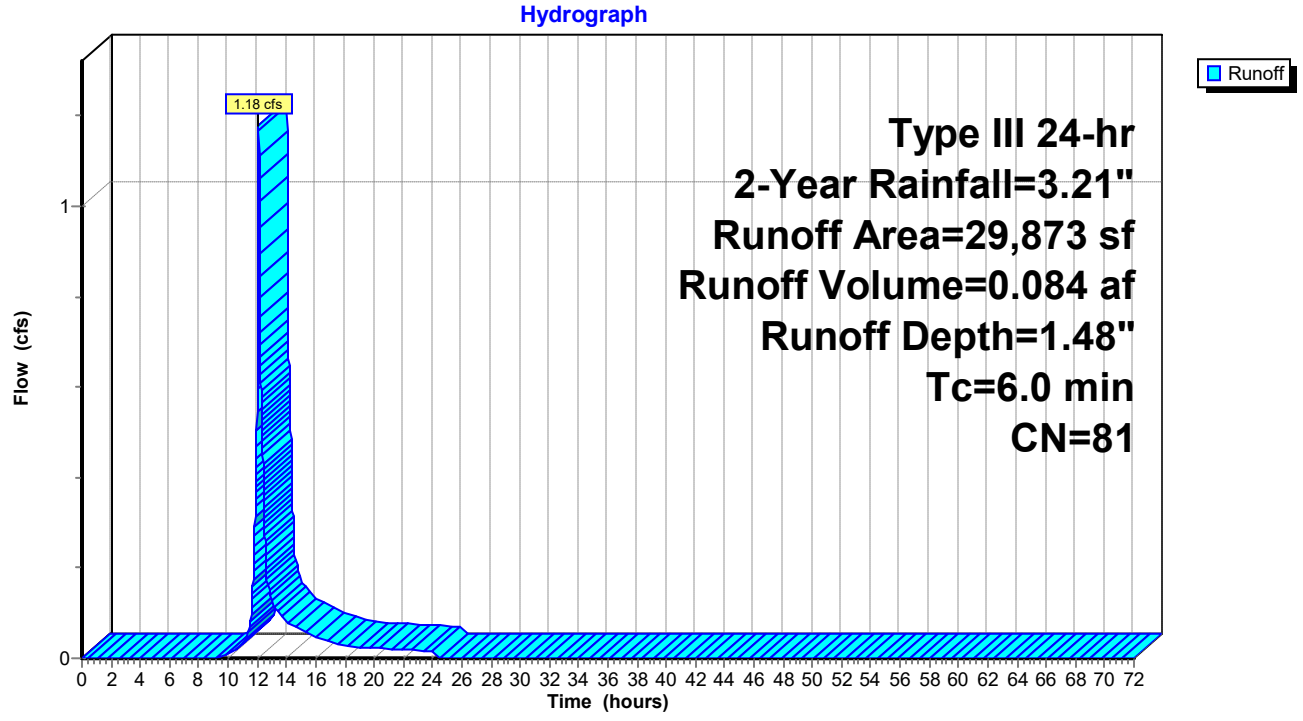
Runoff = 1.18 cfs @ 12.09 hrs, Volume= 0.084 af, Depth= 1.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.21"

	Area (sf)	CN	Description
	8,411	39	>75% Grass cover, Good, HSG A
	574	98	Impervious Surface, HSG A
*	20,888	98	Porous Pavement, HSG A
	29,873	81	Weighted Average
	8,411		28.16% Pervious Area
	21,462		71.84% Impervious Area

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

Subcatchment 1B: Area Draining to Parking Lot



Summary for Subcatchment 2: Subcatchment 2

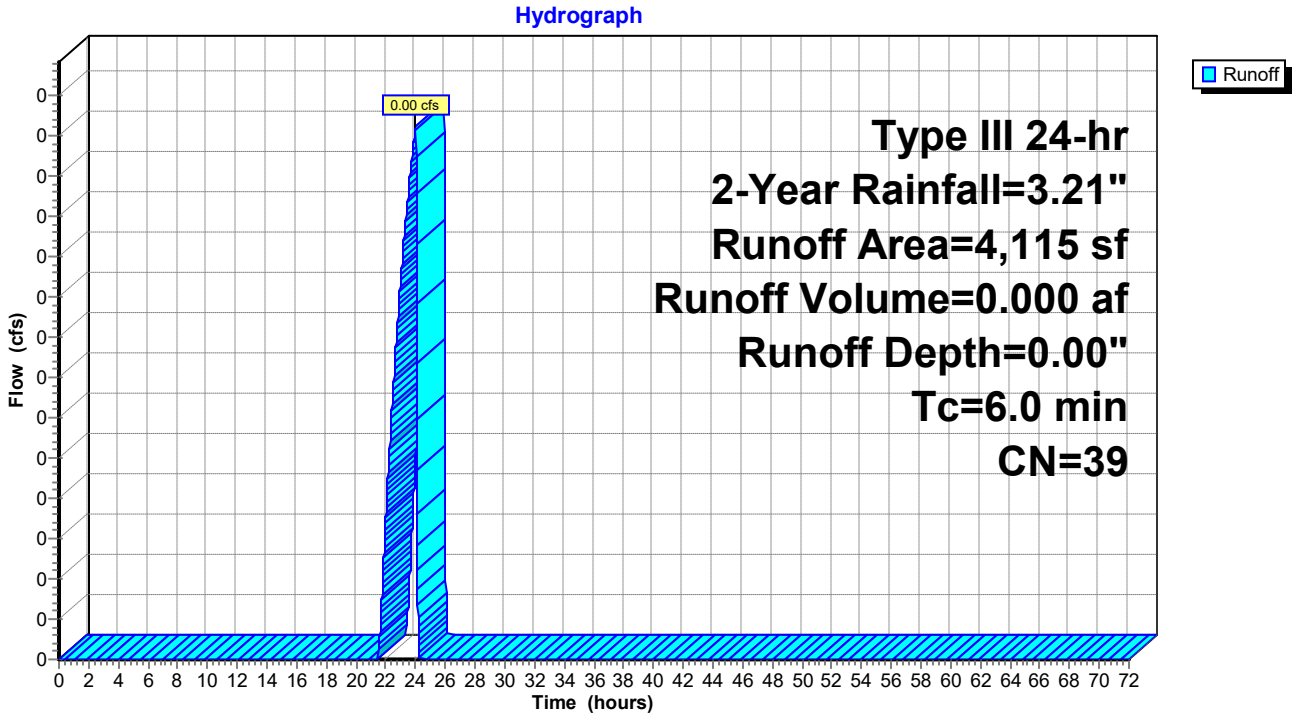
Runoff = 0.00 cfs @ 24.01 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.21"

Area (sf)	CN	Description
4,115	39	>75% Grass cover, Good, HSG A
4,115		100.00% Pervious Area

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

Subcatchment 2: Subcatchment 2



Summary for Pond P1: Porous Pavement

[87] Warning: Oscillations may require smaller dt or Finer Routing (severity=547)

Inflow Area = 0.686 ac, 71.84% Impervious, Inflow Depth = 1.48" for 2-Year event
Inflow = 1.18 cfs @ 12.09 hrs, Volume= 0.084 af
Outflow = 1.17 cfs @ 12.10 hrs, Volume= 0.084 af, Atten= 0%, Lag= 0.4 min
Discarded = 1.17 cfs @ 12.10 hrs, Volume= 0.084 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 161.40' @ 12.10 hrs Surf.Area= 21,411 sf Storage= 1 cf
Flood Elev= 164.00' Surf.Area= 42,822 sf Storage= 11,383 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.0 min (839.4 - 839.4)

Volume	Invert	Avail.Storage	Storage Description
#1	161.40'	7,099 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) 17,771 cf Overall - 23 cf Embedded = 17,749 cf x 40.0% Voids
#2	162.23'	4,261 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)
#3	161.73'	23 cf	**4.0" Round Pipe Storage** Inside #1 L= 258.0'
		11,383 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
161.40	21,411	0	0
162.23	21,411	17,771	17,771

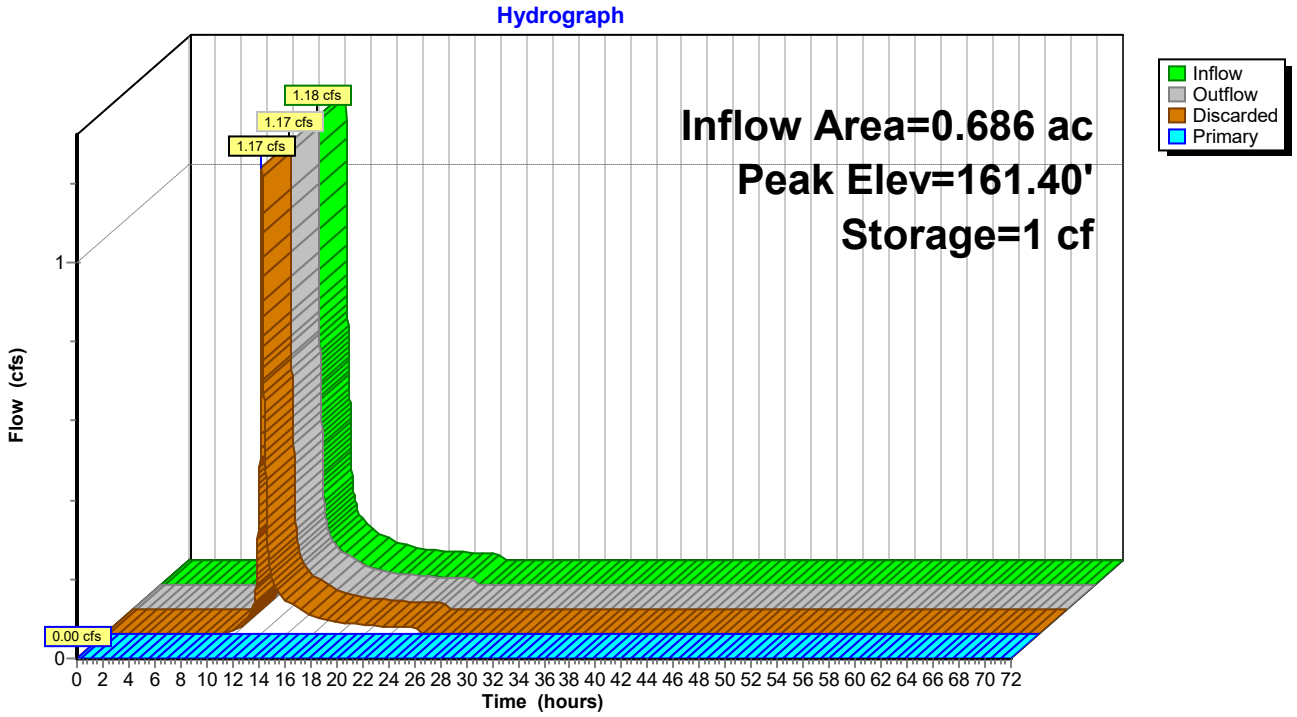
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
162.23	21,411	0.0	0	0
162.48	21,411	40.0	2,141	2,141
162.81	21,411	30.0	2,120	4,261

Device	Routing	Invert	Outlet Devices
#1	Primary	162.15'	**12.0" Round Culvert** L= 20.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 162.15' / 162.05' S= 0.0050 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	161.73'	**4.0" Vert. Orifice/Grate** C= 0.600
#3	Discarded	161.40'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=1.19 cfs @ 12.10 hrs HW=161.40' (Free Discharge)
└**3=Exfiltration** (Exfiltration Controls 1.19 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=161.40' TW=0.00' (Dynamic Tailwater)
└**1=Culvert** (Controls 0.00 cfs)
└**2=Orifice/Grate** (Controls 0.00 cfs)

Pond P1: Porous Pavement

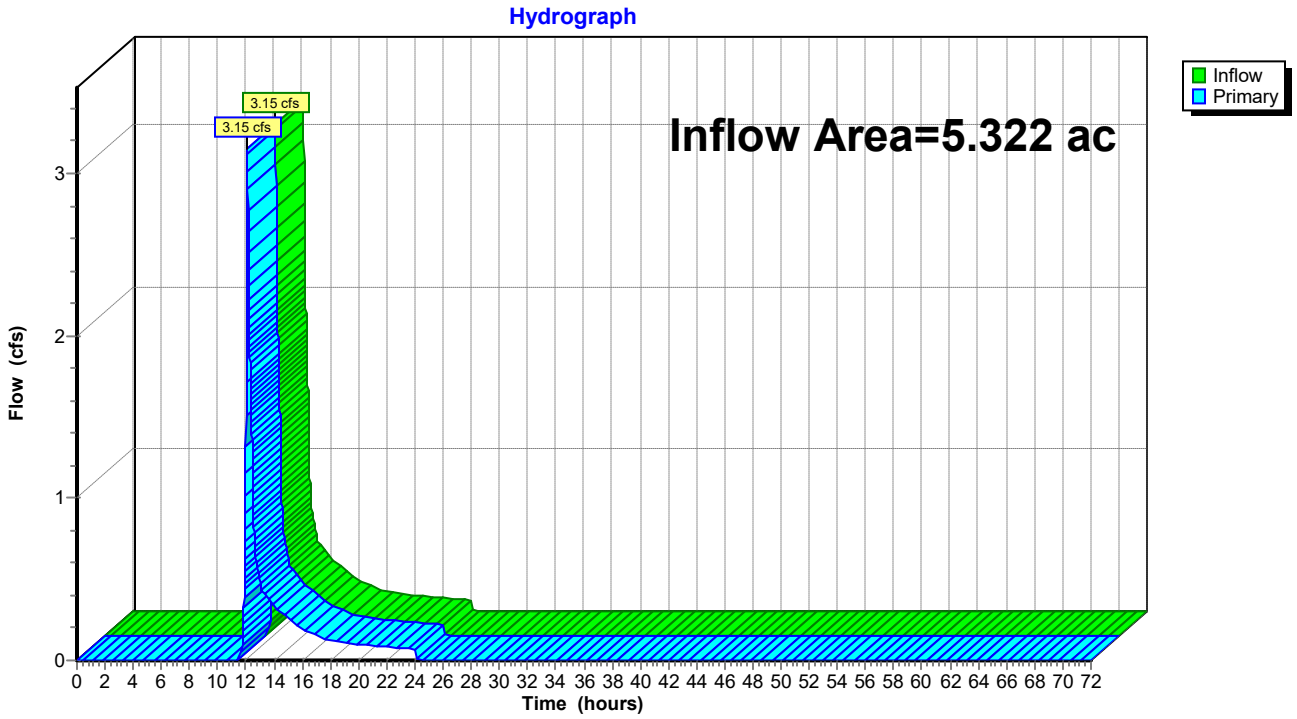


Summary for Link DP-1: Reservoir and Swimming Area

Inflow Area = 5.322 ac, 41.12% Impervious, Inflow Depth = 0.60" for 2-Year event
Inflow = 3.15 cfs @ 12.10 hrs, Volume= 0.267 af
Primary = 3.15 cfs @ 12.10 hrs, Volume= 0.267 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link DP-1: Reservoir and Swimming Area

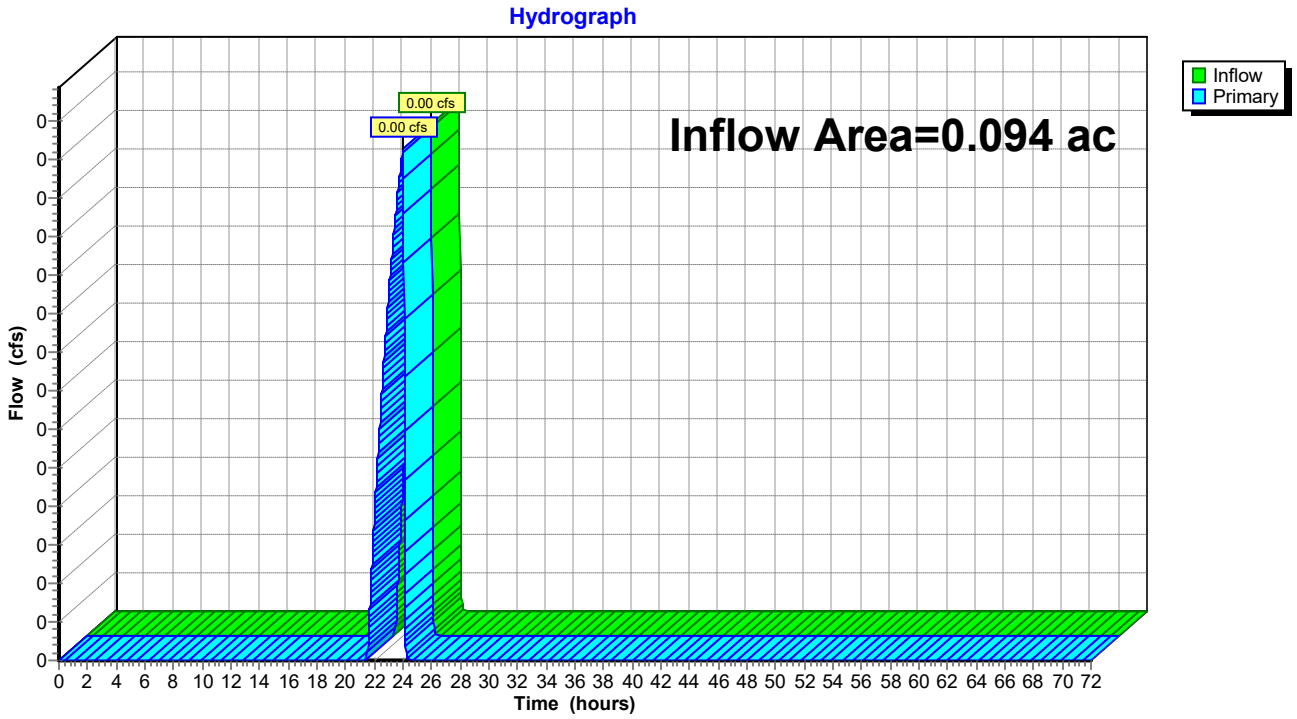


Summary for Link DP-2: Ditch

Inflow Area = 0.094 ac, 0.00% Impervious, Inflow Depth = 0.00" for 2-Year event
Inflow = 0.00 cfs @ 24.01 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 24.01 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link DP-2: Ditch



Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1A: Subcatchment 1 Runoff Area=201,945 sf 36.57% Impervious Runoff Depth=1.71"
Tc=6.0 min CN=67 Runoff=8.92 cfs 0.659 af

Subcatchment 1B: Area Draining to Runoff Area=29,873 sf 71.84% Impervious Runoff Depth=2.86"
Tc=6.0 min CN=81 Runoff=2.30 cfs 0.164 af

Subcatchment 2: Subcatchment 2 Runoff Area=4,115 sf 0.00% Impervious Runoff Depth=0.17"
Tc=6.0 min CN=39 Runoff=0.00 cfs 0.001 af

Pond P1: Porous Pavement Peak Elev=161.46' Storage=515 cf Inflow=2.30 cfs 0.164 af
Discarded=1.19 cfs 0.164 af Primary=0.00 cfs 0.000 af Outflow=1.19 cfs 0.164 af

Link DP-1: Reservoir and Swimming Area Inflow=8.92 cfs 0.659 af
Primary=8.92 cfs 0.659 af

Link DP-2: Ditch Inflow=0.00 cfs 0.001 af
Primary=0.00 cfs 0.001 af

Total Runoff Area = 5.416 ac Runoff Volume = 0.824 af Average Runoff Depth = 1.83"
59.60% Pervious = 3.228 ac 40.40% Impervious = 2.188 ac

Summary for Subcatchment 1A: Subcatchment 1 Minus Parking Lot

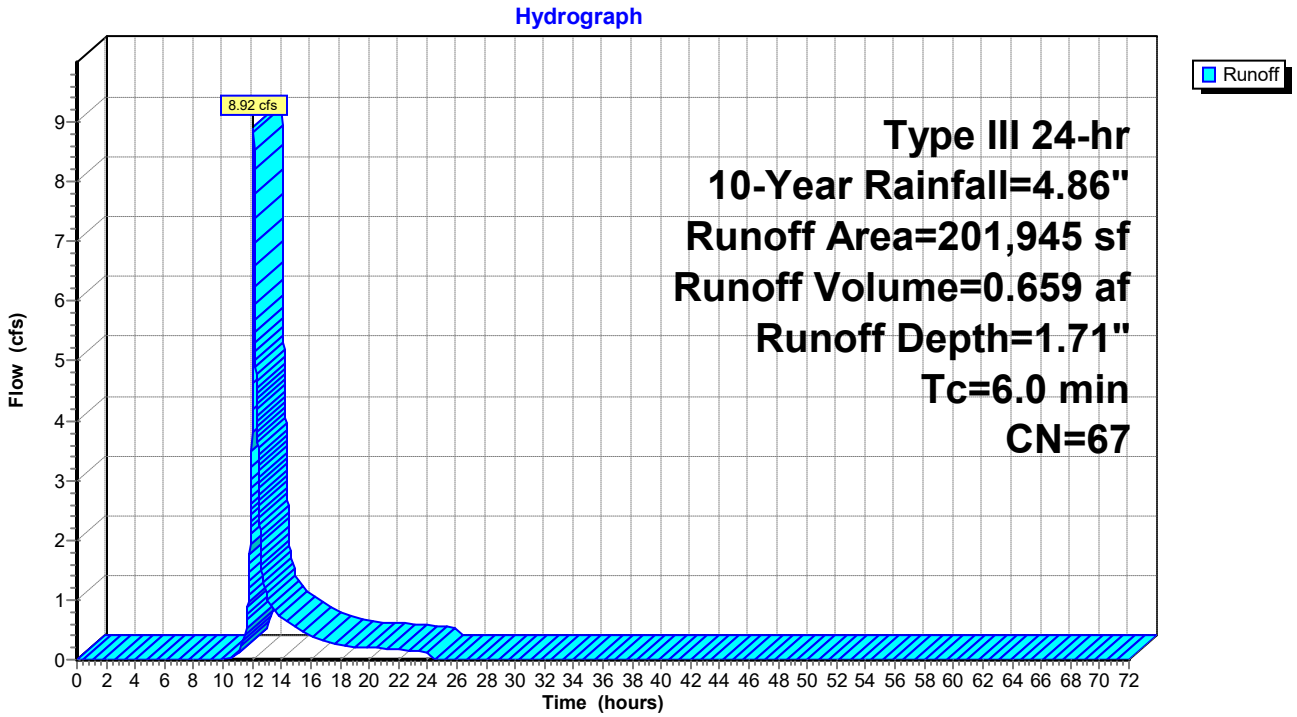
Runoff = 8.92 cfs @ 12.09 hrs, Volume= 0.659 af, Depth= 1.71"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.86"

	Area (sf)	CN	Description
	13,237	30	Brush, Good, HSG A
*	44,830	63	Beach Sand, HSG A
	56,001	39	>75% Grass cover, Good, HSG A
	19,764	98	Impervious Surface, HSG A
*	1,800	98	Porous Pavement, HSG A
	52,292	98	Water Surface, HSG A
*	6,010	96	Stone Dust, HSG A
*	8,011	39	Permeable Playground Surface, Good, HSG A
	201,945	67	Weighted Average
	128,089		63.43% Pervious Area
	73,856		36.57% Impervious Area

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

Subcatchment 1A: Subcatchment 1 Minus Parking Lot



Summary for Subcatchment 1B: Area Draining to Parking Lot

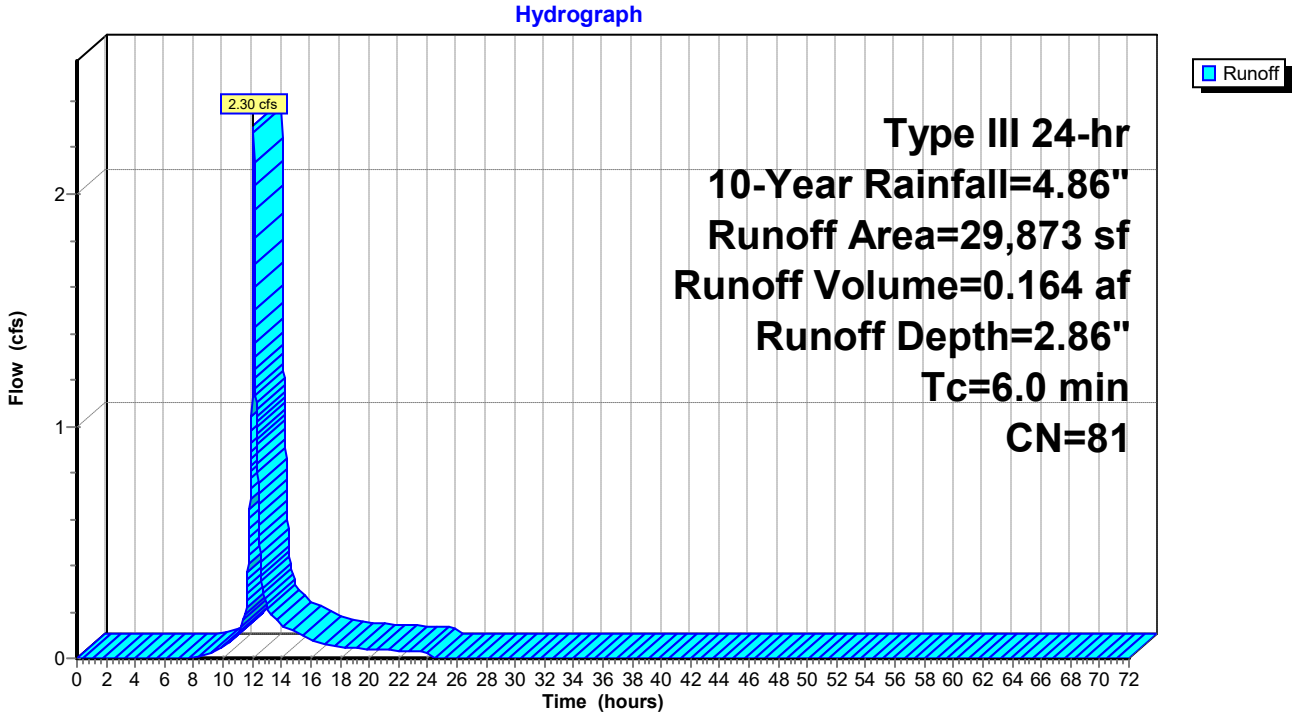
Runoff = 2.30 cfs @ 12.09 hrs, Volume= 0.164 af, Depth= 2.86"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.86"

	Area (sf)	CN	Description
	8,411	39	>75% Grass cover, Good, HSG A
	574	98	Impervious Surface, HSG A
*	20,888	98	Porous Pavement, HSG A
	29,873	81	Weighted Average
	8,411		28.16% Pervious Area
	21,462		71.84% Impervious Area

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

Subcatchment 1B: Area Draining to Parking Lot



Summary for Subcatchment 2: Subcatchment 2

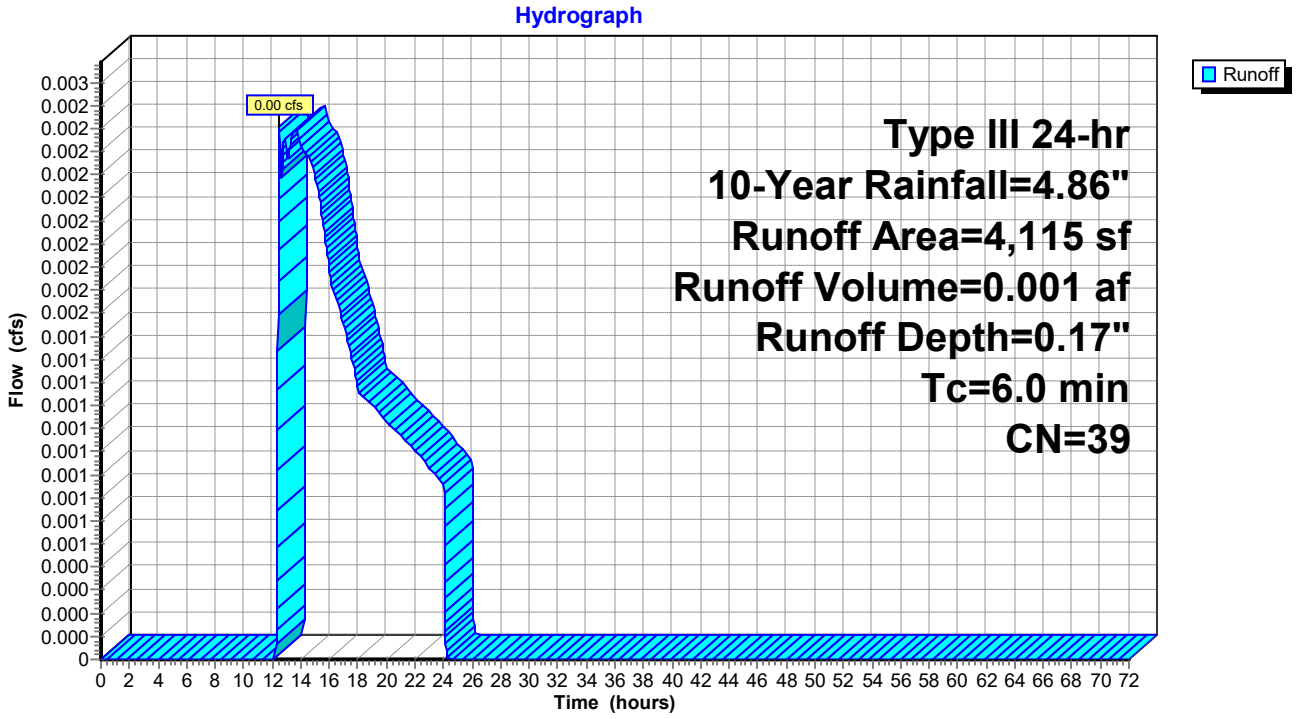
Runoff = 0.00 cfs @ 12.51 hrs, Volume= 0.001 af, Depth= 0.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.86"

Area (sf)	CN	Description
4,115	39	>75% Grass cover, Good, HSG A
4,115		100.00% Pervious Area

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

Subcatchment 2: Subcatchment 2



Summary for Pond P1: Porous Pavement

[87] Warning: Oscillations may require smaller dt or Finer Routing (severity=576)

Inflow Area = 0.686 ac, 71.84% Impervious, Inflow Depth = 2.86" for 10-Year event
Inflow = 2.30 cfs @ 12.09 hrs, Volume= 0.164 af
Outflow = 1.19 cfs @ 12.09 hrs, Volume= 0.164 af, Atten= 48%, Lag= 0.1 min
Discarded = 1.19 cfs @ 12.09 hrs, Volume= 0.164 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 161.46' @ 12.23 hrs Surf.Area= 21,411 sf Storage= 515 cf
Flood Elev= 164.00' Surf.Area= 42,822 sf Storage= 11,383 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 1.6 min (821.9 - 820.3)

Volume	Invert	Avail.Storage	Storage Description
#1	161.40'	7,099 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) 17,771 cf Overall - 23 cf Embedded = 17,749 cf x 40.0% Voids
#2	162.23'	4,261 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)
#3	161.73'	23 cf	**4.0" Round Pipe Storage** Inside #1 L= 258.0'
		11,383 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
161.40	21,411	0	0
162.23	21,411	17,771	17,771

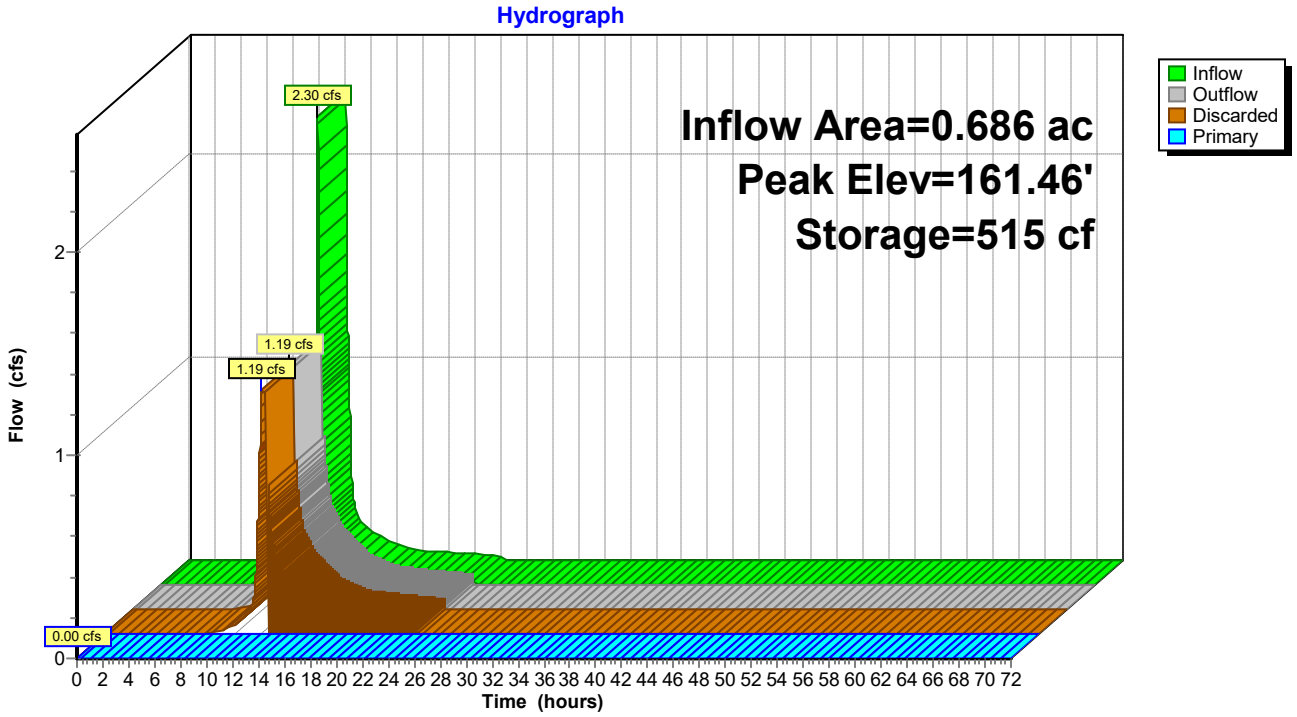
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
162.23	21,411	0.0	0	0
162.48	21,411	40.0	2,141	2,141
162.81	21,411	30.0	2,120	4,261

Device	Routing	Invert	Outlet Devices
#1	Primary	162.15'	**12.0" Round Culvert** L= 20.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 162.15' / 162.05' S= 0.0050 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	161.73'	**4.0" Vert. Orifice/Grate** C= 0.600
#3	Discarded	161.40'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=1.19 cfs @ 12.09 hrs HW=161.43' (Free Discharge)
└**3=Exfiltration** (Exfiltration Controls 1.19 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=161.40' TW=0.00' (Dynamic Tailwater)
└**1=Culvert** (Controls 0.00 cfs)
└**2=Orifice/Grate** (Controls 0.00 cfs)

Pond P1: Porous Pavement

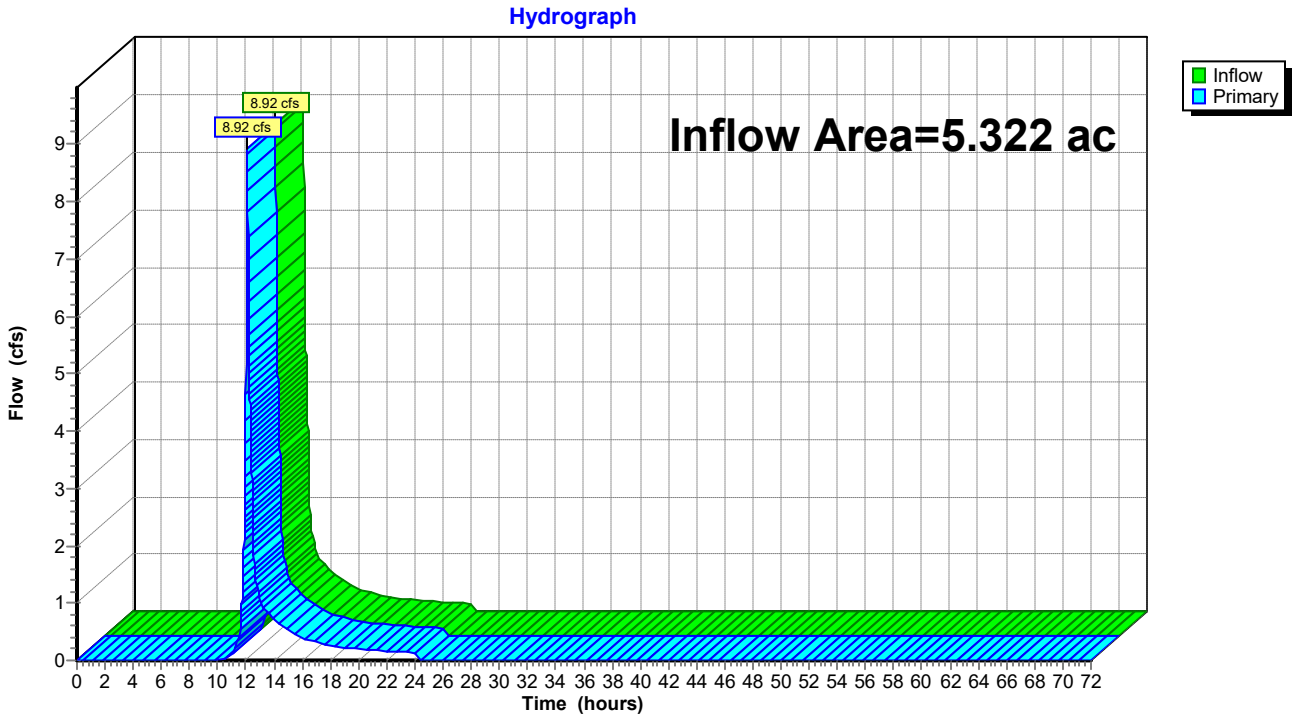


Summary for Link DP-1: Reservoir and Swimming Area

Inflow Area = 5.322 ac, 41.12% Impervious, Inflow Depth = 1.49" for 10-Year event
Inflow = 8.92 cfs @ 12.09 hrs, Volume= 0.659 af
Primary = 8.92 cfs @ 12.09 hrs, Volume= 0.659 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link DP-1: Reservoir and Swimming Area

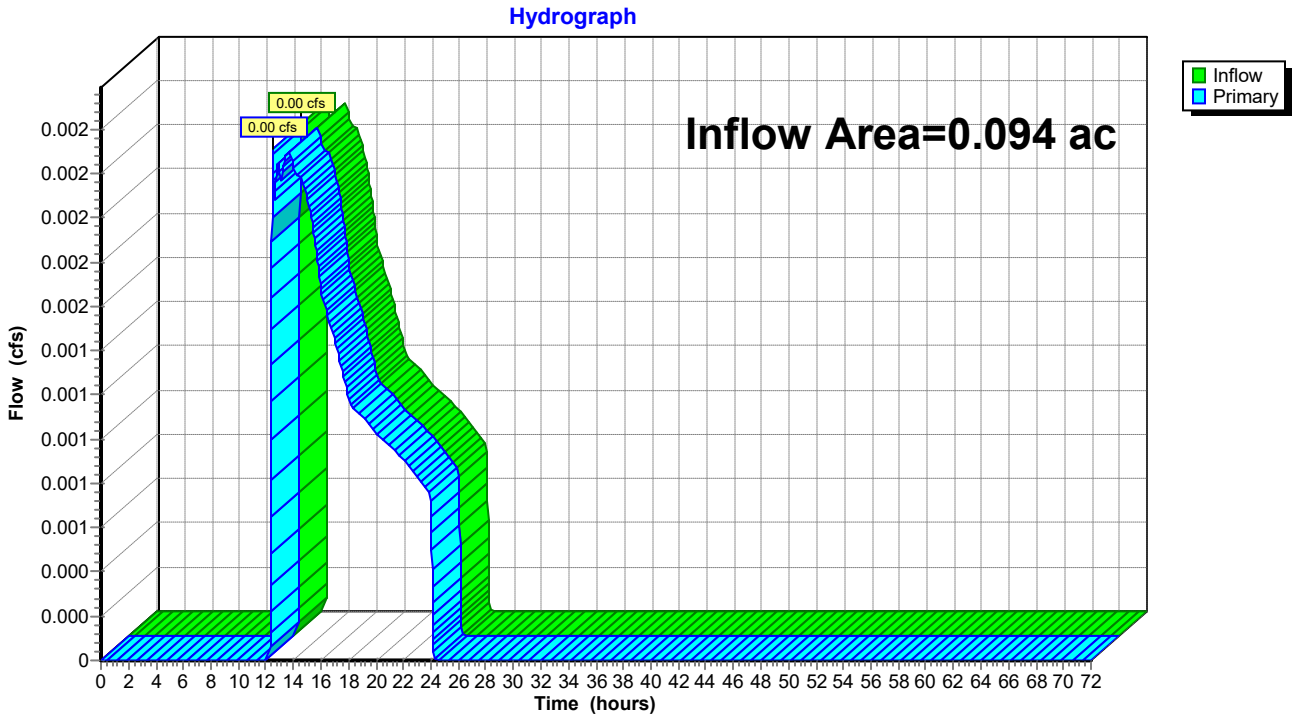


Summary for Link DP-2: Ditch

Inflow Area = 0.094 ac, 0.00% Impervious, Inflow Depth = 0.17" for 10-Year event
Inflow = 0.00 cfs @ 12.51 hrs, Volume= 0.001 af
Primary = 0.00 cfs @ 12.51 hrs, Volume= 0.001 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link DP-2: Ditch



Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1A: Subcatchment 1 Runoff Area=201,945 sf 36.57% Impervious Runoff Depth=2.66"
Tc=6.0 min CN=67 Runoff=14.29 cfs 1.027 af

Subcatchment 1B: Area Draining to Runoff Area=29,873 sf 71.84% Impervious Runoff Depth=4.04"
Tc=6.0 min CN=81 Runoff=3.22 cfs 0.231 af

Subcatchment 2: Subcatchment 2 Runoff Area=4,115 sf 0.00% Impervious Runoff Depth=0.50"
Tc=6.0 min CN=39 Runoff=0.02 cfs 0.004 af

Pond P1: Porous Pavement Peak Elev=161.55' Storage=1,280 cf Inflow=3.22 cfs 0.231 af
Discarded=1.19 cfs 0.231 af Primary=0.00 cfs 0.000 af Outflow=1.19 cfs 0.231 af

Link DP-1: Reservoir and Swimming Area Inflow=14.29 cfs 1.027 af
Primary=14.29 cfs 1.027 af

Link DP-2: Ditch Inflow=0.02 cfs 0.004 af
Primary=0.02 cfs 0.004 af

Total Runoff Area = 5.416 ac Runoff Volume = 1.262 af Average Runoff Depth = 2.80"
59.60% Pervious = 3.228 ac 40.40% Impervious = 2.188 ac

Summary for Subcatchment 1A: Subcatchment 1 Minus Parking Lot

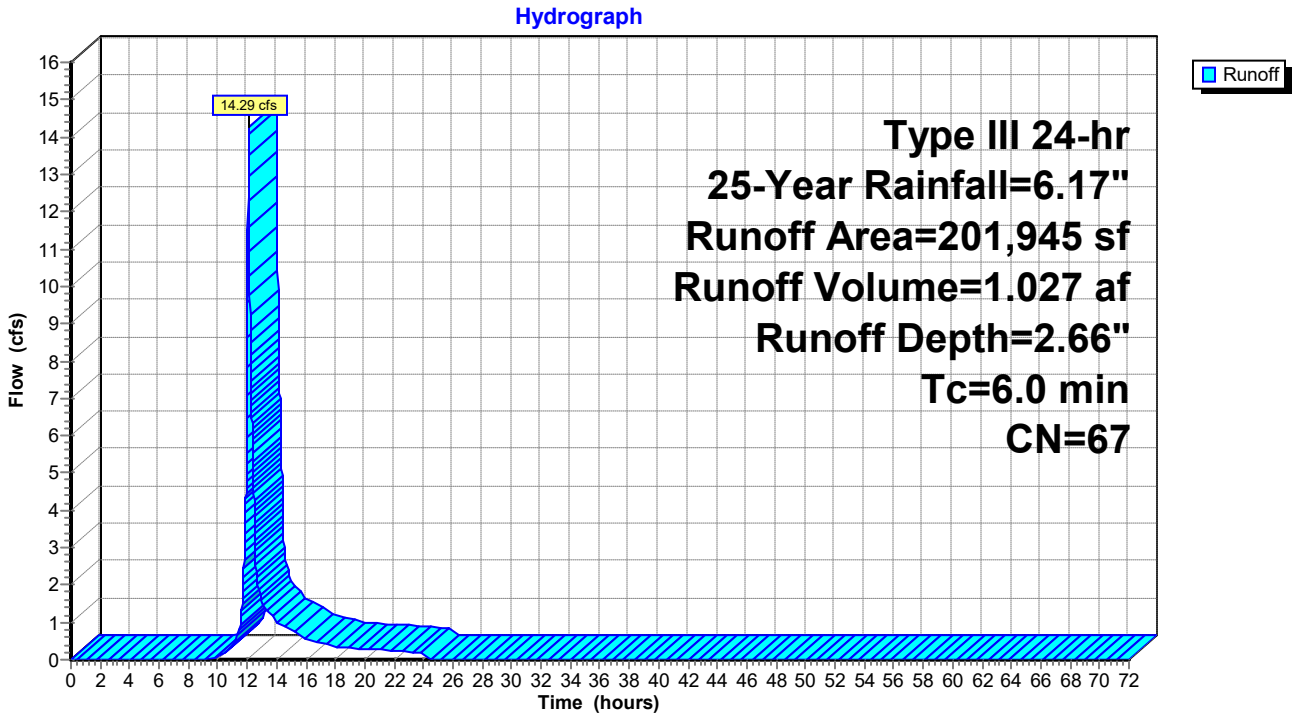
Runoff = 14.29 cfs @ 12.09 hrs, Volume= 1.027 af, Depth= 2.66"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=6.17"

	Area (sf)	CN	Description
	13,237	30	Brush, Good, HSG A
*	44,830	63	Beach Sand, HSG A
	56,001	39	>75% Grass cover, Good, HSG A
	19,764	98	Impervious Surface, HSG A
*	1,800	98	Porous Pavement, HSG A
	52,292	98	Water Surface, HSG A
*	6,010	96	Stone Dust, HSG A
*	8,011	39	Permeable Playground Surface, Good, HSG A
	201,945	67	Weighted Average
	128,089		63.43% Pervious Area
	73,856		36.57% Impervious Area

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

Subcatchment 1A: Subcatchment 1 Minus Parking Lot



Summary for Subcatchment 1B: Area Draining to Parking Lot

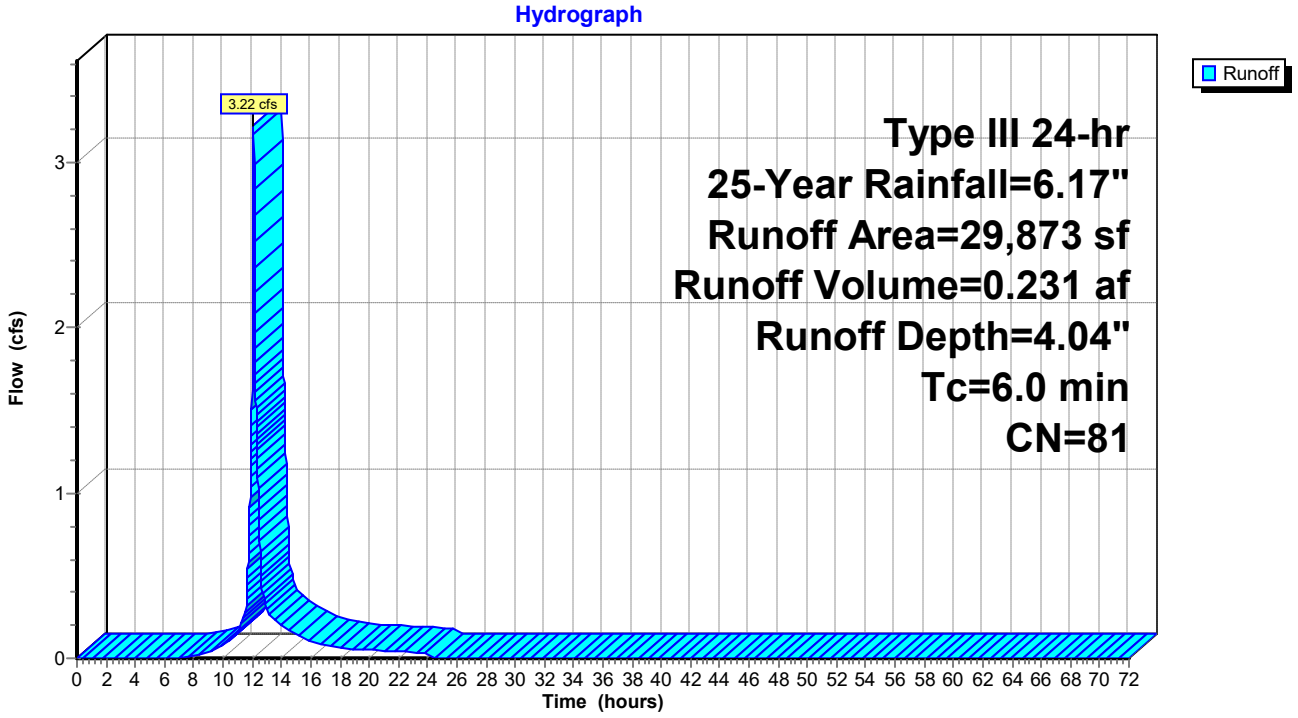
Runoff = 3.22 cfs @ 12.09 hrs, Volume= 0.231 af, Depth= 4.04"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=6.17"

	Area (sf)	CN	Description
	8,411	39	>75% Grass cover, Good, HSG A
	574	98	Impervious Surface, HSG A
*	20,888	98	Porous Pavement, HSG A
	29,873	81	Weighted Average
	8,411		28.16% Pervious Area
	21,462		71.84% Impervious Area

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

Subcatchment 1B: Area Draining to Parking Lot



Summary for Subcatchment 2: Subcatchment 2

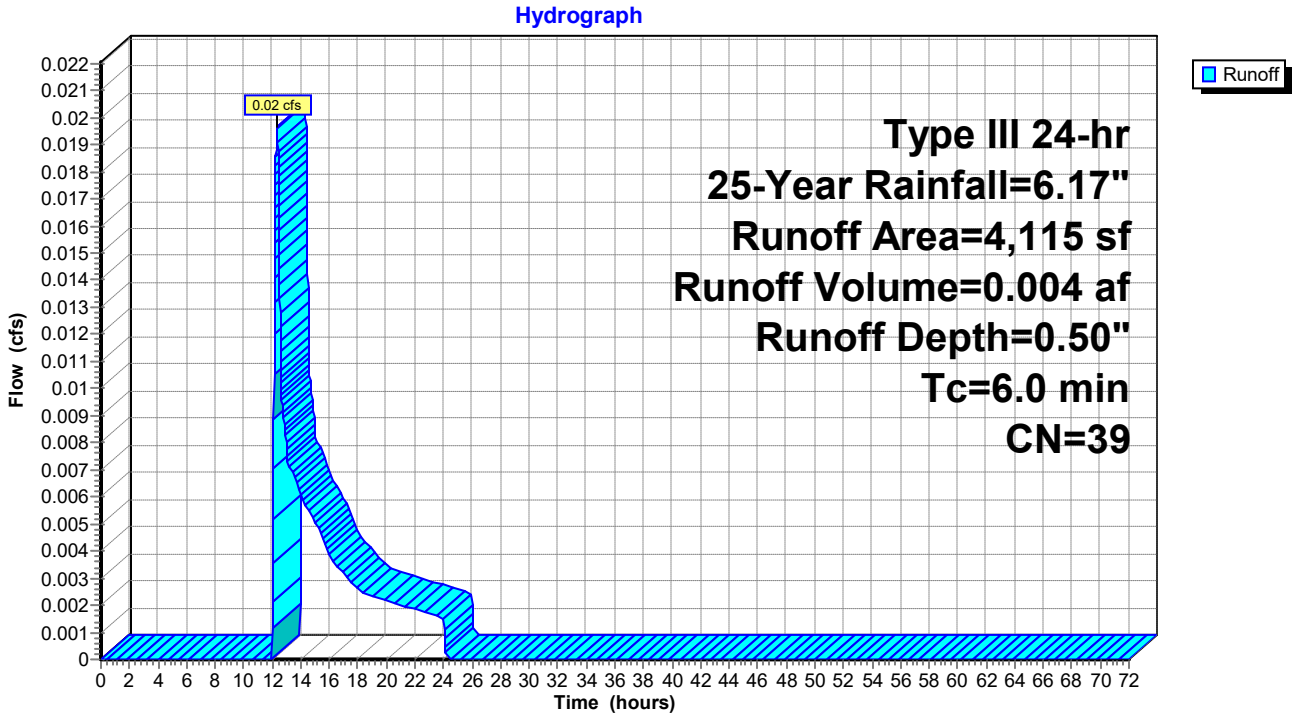
Runoff = 0.02 cfs @ 12.33 hrs, Volume= 0.004 af, Depth= 0.50"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=6.17"

Area (sf)	CN	Description
4,115	39	>75% Grass cover, Good, HSG A
4,115		100.00% Pervious Area

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

Subcatchment 2: Subcatchment 2



Summary for Pond P1: Porous Pavement

[87] Warning: Oscillations may require smaller dt or Finer Routing (severity=560)

Inflow Area = 0.686 ac, 71.84% Impervious, Inflow Depth = 4.04" for 25-Year event
Inflow = 3.22 cfs @ 12.09 hrs, Volume= 0.231 af
Outflow = 1.19 cfs @ 12.04 hrs, Volume= 0.231 af, Atten= 63%, Lag= 0.0 min
Discarded = 1.19 cfs @ 12.04 hrs, Volume= 0.231 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 161.55' @ 12.35 hrs Surf.Area= 21,411 sf Storage= 1,280 cf
Flood Elev= 164.00' Surf.Area= 42,822 sf Storage= 11,383 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 4.6 min (815.0 - 810.4)

Volume	Invert	Avail.Storage	Storage Description
#1	161.40'	7,099 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) 17,771 cf Overall - 23 cf Embedded = 17,749 cf x 40.0% Voids
#2	162.23'	4,261 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)
#3	161.73'	23 cf	**4.0" Round Pipe Storage** Inside #1 L= 258.0'
		11,383 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
161.40	21,411	0	0
162.23	21,411	17,771	17,771

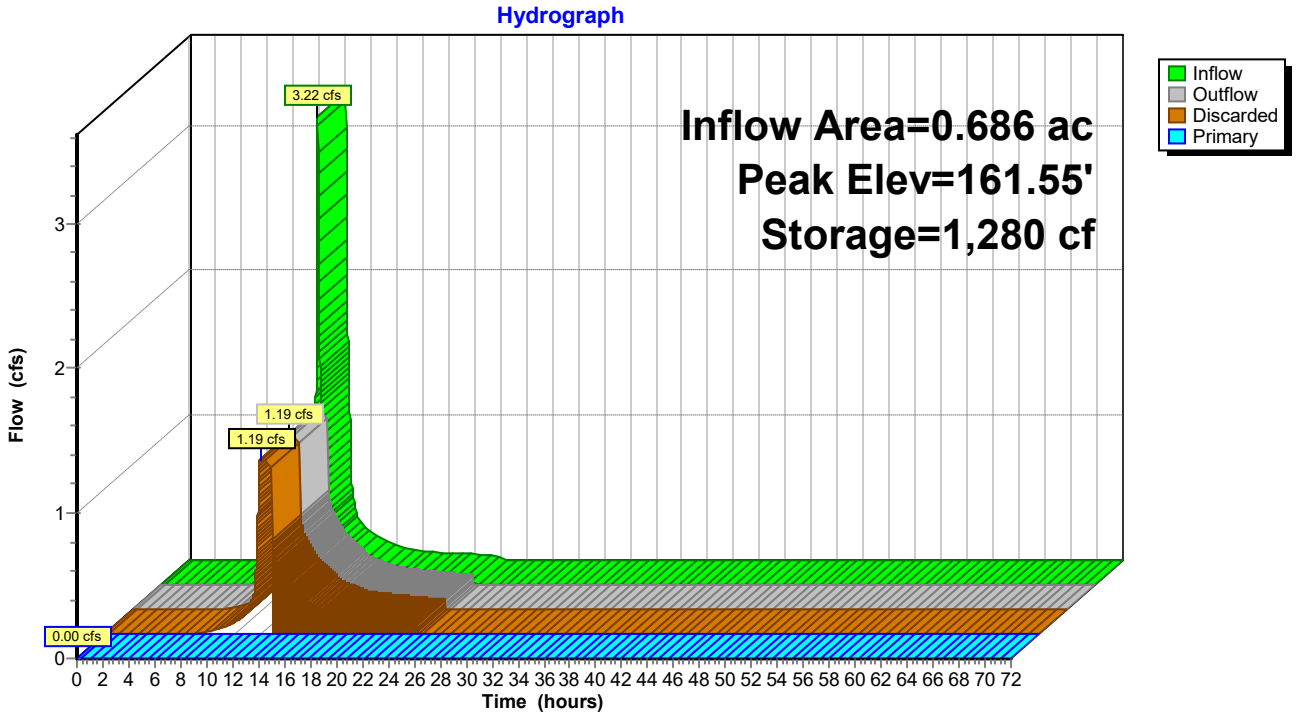
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
162.23	21,411	0.0	0	0
162.48	21,411	40.0	2,141	2,141
162.81	21,411	30.0	2,120	4,261

Device	Routing	Invert	Outlet Devices
#1	Primary	162.15'	**12.0" Round Culvert** L= 20.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 162.15' / 162.05' S= 0.0050 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	161.73'	**4.0" Vert. Orifice/Grate** C= 0.600
#3	Discarded	161.40'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=1.19 cfs @ 12.04 hrs HW=161.43' (Free Discharge)
└**3=Exfiltration** (Exfiltration Controls 1.19 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=161.40' TW=0.00' (Dynamic Tailwater)
└**1=Culvert** (Controls 0.00 cfs)
└**2=Orifice/Grate** (Controls 0.00 cfs)

Pond P1: Porous Pavement

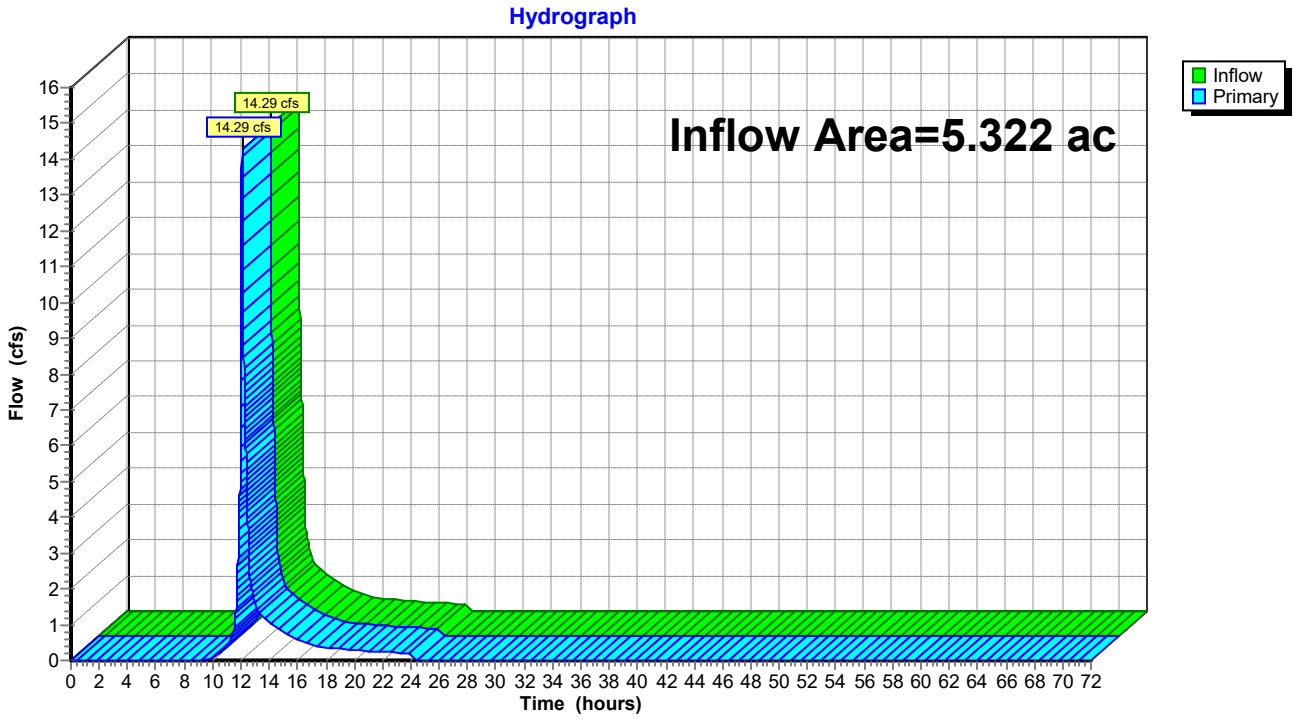


Summary for Link DP-1: Reservoir and Swimming Area

Inflow Area = 5.322 ac, 41.12% Impervious, Inflow Depth = 2.32" for 25-Year event
Inflow = 14.29 cfs @ 12.09 hrs, Volume= 1.027 af
Primary = 14.29 cfs @ 12.09 hrs, Volume= 1.027 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link DP-1: Reservoir and Swimming Area

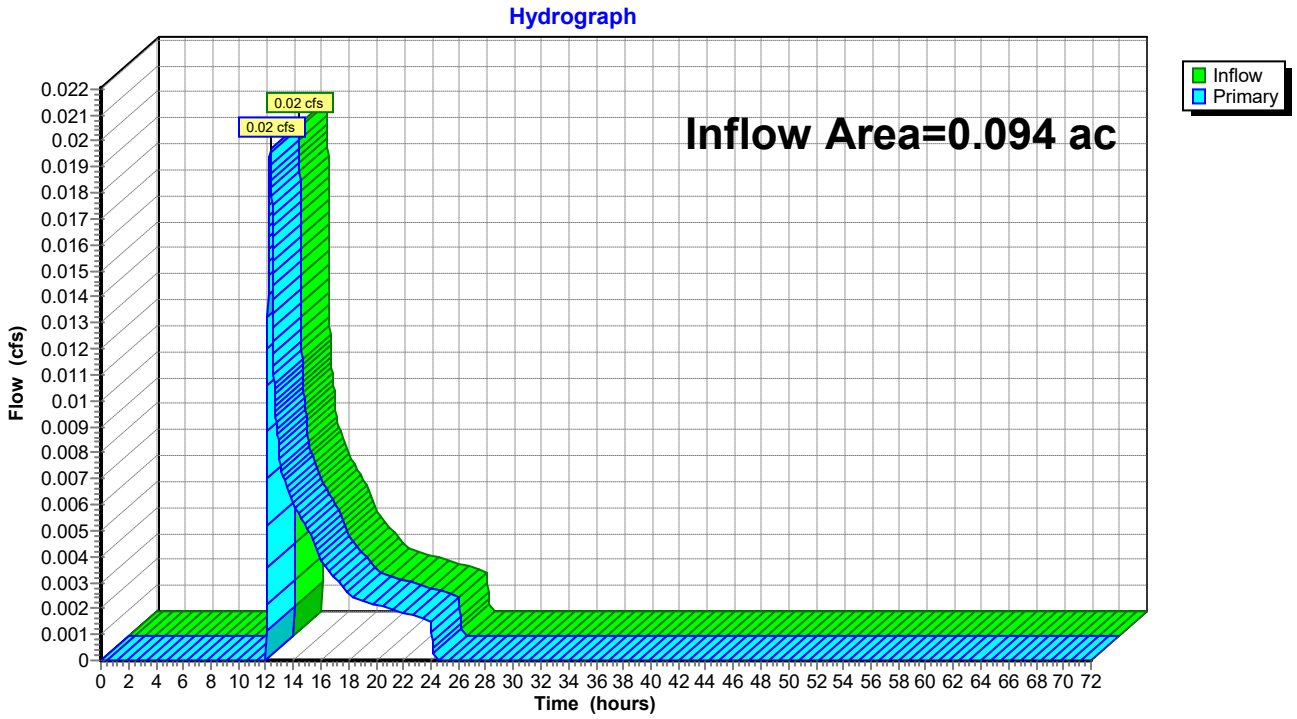


Summary for Link DP-2: Ditch

Inflow Area = 0.094 ac, 0.00% Impervious, Inflow Depth = 0.50" for 25-Year event
Inflow = 0.02 cfs @ 12.33 hrs, Volume= 0.004 af
Primary = 0.02 cfs @ 12.33 hrs, Volume= 0.004 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link DP-2: Ditch



Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1A: Subcatchment 1 Runoff Area=201,945 sf 36.57% Impervious Runoff Depth=4.84"
Tc=6.0 min CN=67 Runoff=26.30 cfs 1.868 af

Subcatchment 1B: Area Draining to Runoff Area=29,873 sf 71.84% Impervious Runoff Depth=6.55"
Tc=6.0 min CN=81 Runoff=5.13 cfs 0.374 af

Subcatchment 2: Subcatchment 2 Runoff Area=4,115 sf 0.00% Impervious Runoff Depth=1.53"
Tc=6.0 min CN=39 Runoff=0.13 cfs 0.012 af

Pond P1: Porous Pavement Peak Elev=161.81' Storage=3,521 cf Inflow=5.13 cfs 0.374 af
Discarded=1.19 cfs 0.374 af Primary=0.00 cfs 0.000 af Outflow=1.19 cfs 0.374 af

Link DP-1: Reservoir and Swimming Area Inflow=26.30 cfs 1.868 af
Primary=26.30 cfs 1.868 af

Link DP-2: Ditch Inflow=0.13 cfs 0.012 af
Primary=0.13 cfs 0.012 af

Total Runoff Area = 5.416 ac Runoff Volume = 2.255 af Average Runoff Depth = 5.00"
59.60% Pervious = 3.228 ac 40.40% Impervious = 2.188 ac

Summary for Subcatchment 1A: Subcatchment 1 Minus Parking Lot

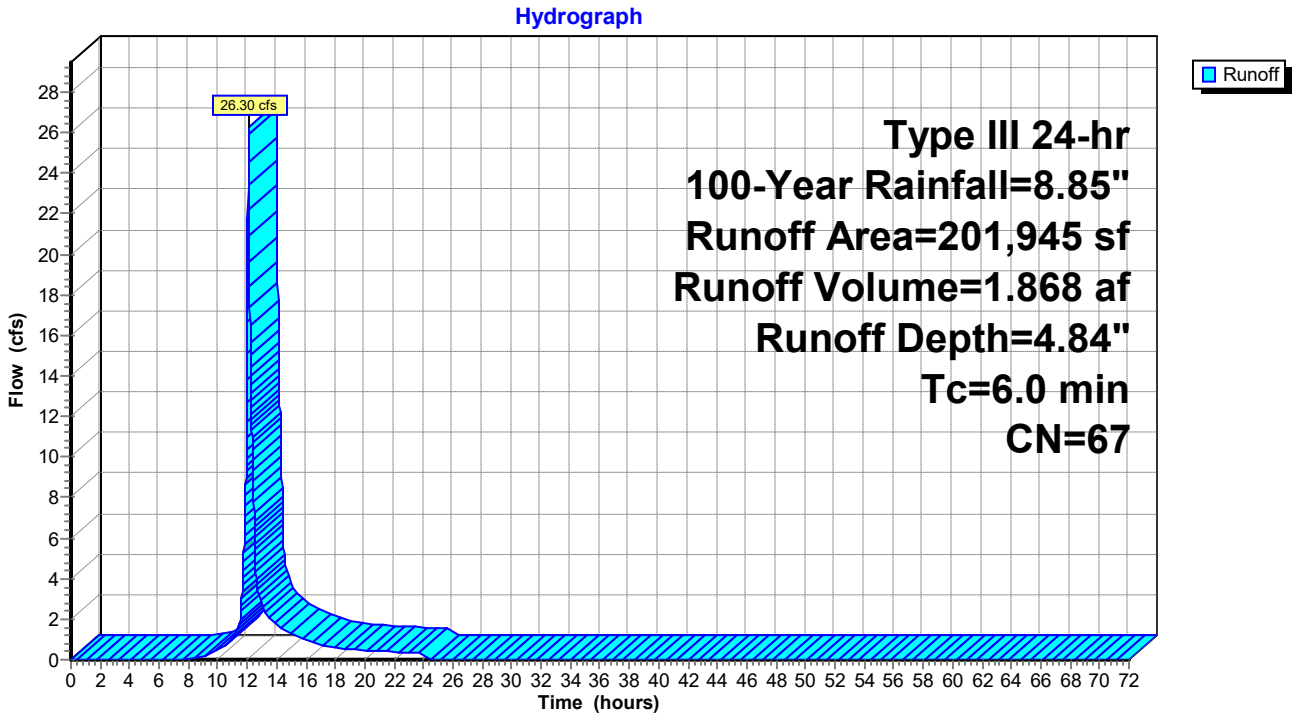
Runoff = 26.30 cfs @ 12.09 hrs, Volume= 1.868 af, Depth= 4.84"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.85"

	Area (sf)	CN	Description
	13,237	30	Brush, Good, HSG A
*	44,830	63	Beach Sand, HSG A
	56,001	39	>75% Grass cover, Good, HSG A
	19,764	98	Impervious Surface, HSG A
*	1,800	98	Porous Pavement, HSG A
	52,292	98	Water Surface, HSG A
*	6,010	96	Stone Dust, HSG A
*	8,011	39	Permeable Playground Surface, Good, HSG A
	201,945	67	Weighted Average
	128,089		63.43% Pervious Area
	73,856		36.57% Impervious Area

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

Subcatchment 1A: Subcatchment 1 Minus Parking Lot



Summary for Subcatchment 1B: Area Draining to Parking Lot

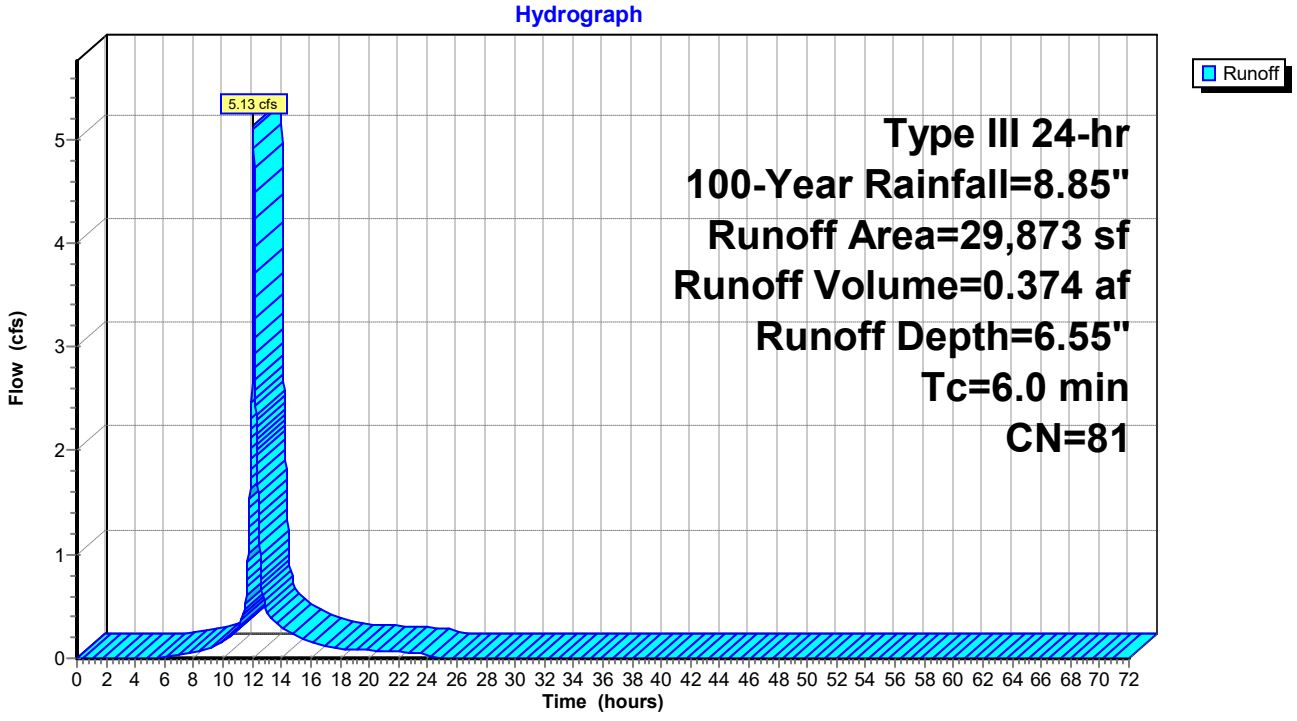
Runoff = 5.13 cfs @ 12.09 hrs, Volume= 0.374 af, Depth= 6.55"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.85"

	Area (sf)	CN	Description
	8,411	39	>75% Grass cover, Good, HSG A
	574	98	Impervious Surface, HSG A
*	20,888	98	Porous Pavement, HSG A
	29,873	81	Weighted Average
	8,411		28.16% Pervious Area
	21,462		71.84% Impervious Area

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

Subcatchment 1B: Area Draining to Parking Lot



Summary for Subcatchment 2: Subcatchment 2

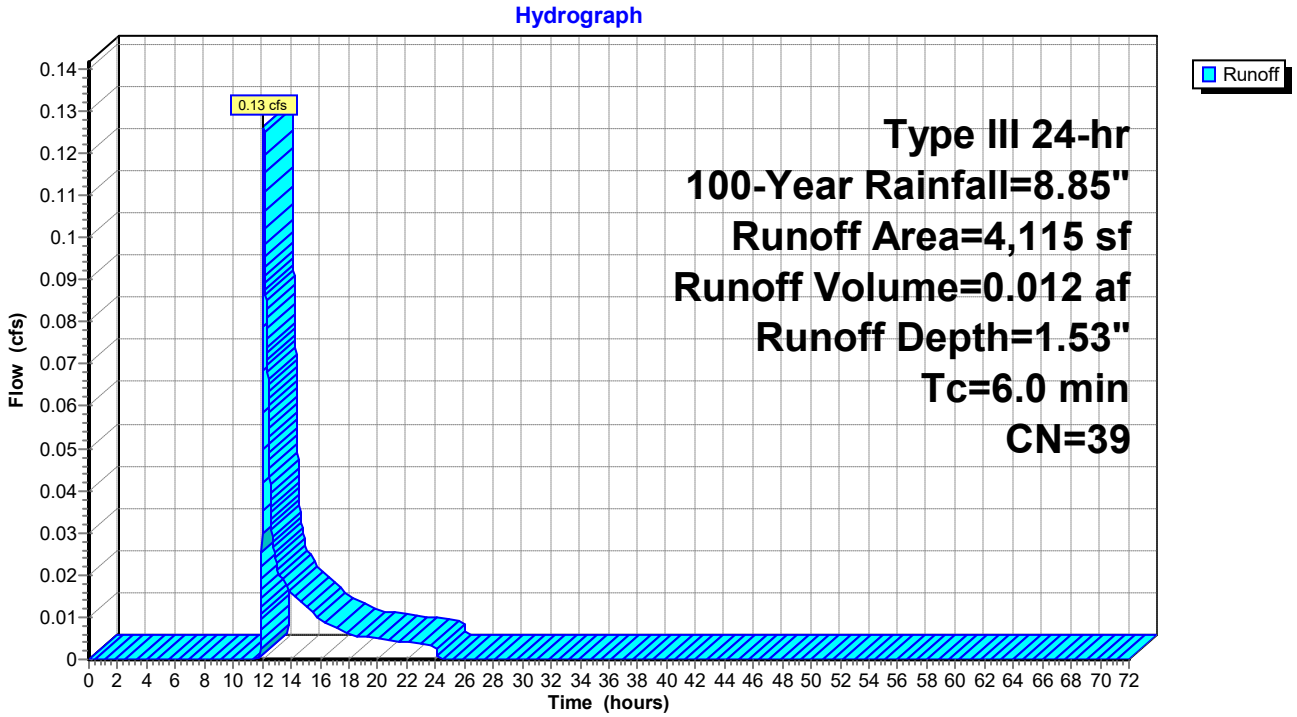
Runoff = 0.13 cfs @ 12.11 hrs, Volume= 0.012 af, Depth= 1.53"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.85"

Area (sf)	CN	Description
4,115	39	>75% Grass cover, Good, HSG A
4,115		100.00% Pervious Area

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

Subcatchment 2: Subcatchment 2



Summary for Pond P1: Porous Pavement

[87] Warning: Oscillations may require smaller dt or Finer Routing (severity=514)

Inflow Area = 0.686 ac, 71.84% Impervious, Inflow Depth = 6.55" for 100-Year event
Inflow = 5.13 cfs @ 12.09 hrs, Volume= 0.374 af
Outflow = 1.19 cfs @ 11.92 hrs, Volume= 0.374 af, Atten= 77%, Lag= 0.0 min
Discarded = 1.19 cfs @ 11.92 hrs, Volume= 0.374 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 161.81' @ 12.48 hrs Surf.Area= 21,411 sf Storage= 3,521 cf
Flood Elev= 164.00' Surf.Area= 42,822 sf Storage= 11,383 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 14.9 min (811.7 - 796.9)

Volume	Invert	Avail.Storage	Storage Description
#1	161.40'	7,099 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) 17,771 cf Overall - 23 cf Embedded = 17,749 cf x 40.0% Voids
#2	162.23'	4,261 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)
#3	161.73'	23 cf	**4.0" Round Pipe Storage** Inside #1 L= 258.0'
		11,383 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
161.40	21,411	0	0
162.23	21,411	17,771	17,771

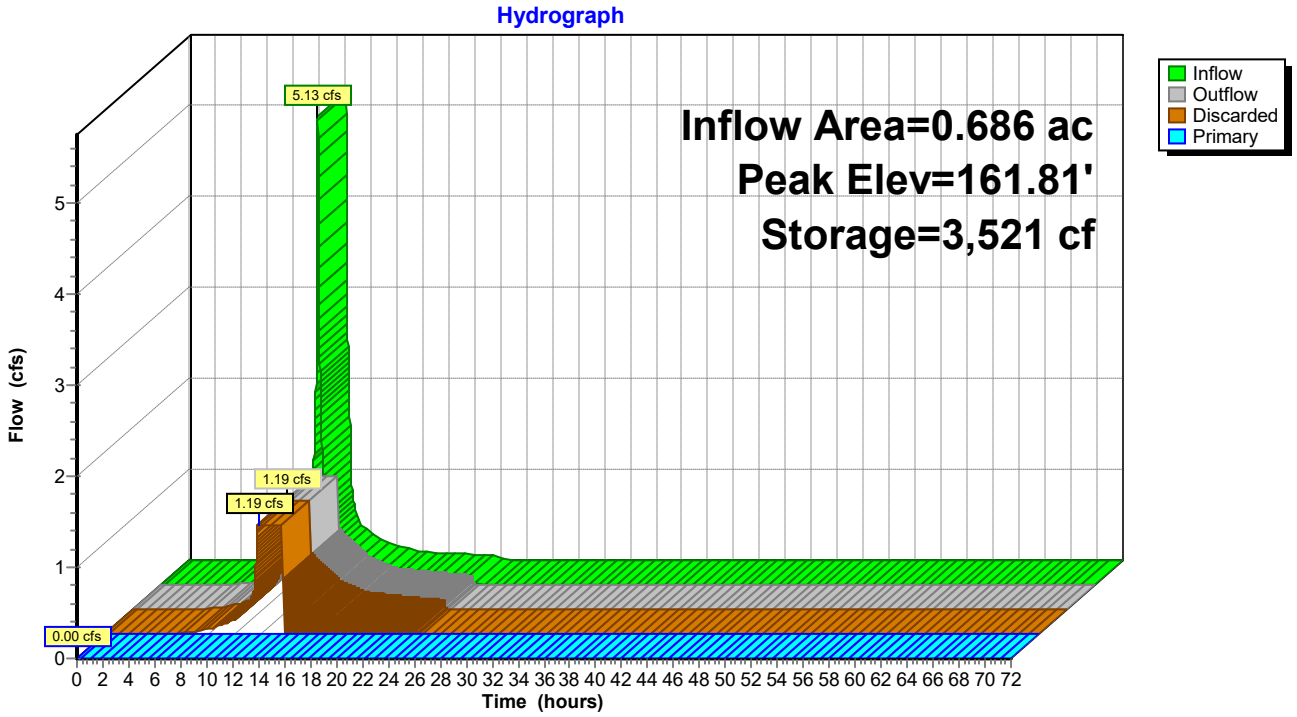
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
162.23	21,411	0.0	0	0
162.48	21,411	40.0	2,141	2,141
162.81	21,411	30.0	2,120	4,261

Device	Routing	Invert	Outlet Devices
#1	Primary	162.15'	**12.0" Round Culvert** L= 20.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 162.15' / 162.05' S= 0.0050 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	161.73'	**4.0" Vert. Orifice/Grate** C= 0.600
#3	Discarded	161.40'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=1.19 cfs @ 11.92 hrs HW=161.43' (Free Discharge)
└**3=Exfiltration** (Exfiltration Controls 1.19 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=161.40' TW=0.00' (Dynamic Tailwater)
└**1=Culvert** (Controls 0.00 cfs)
└**2=Orifice/Grate** (Controls 0.00 cfs)

Pond P1: Porous Pavement

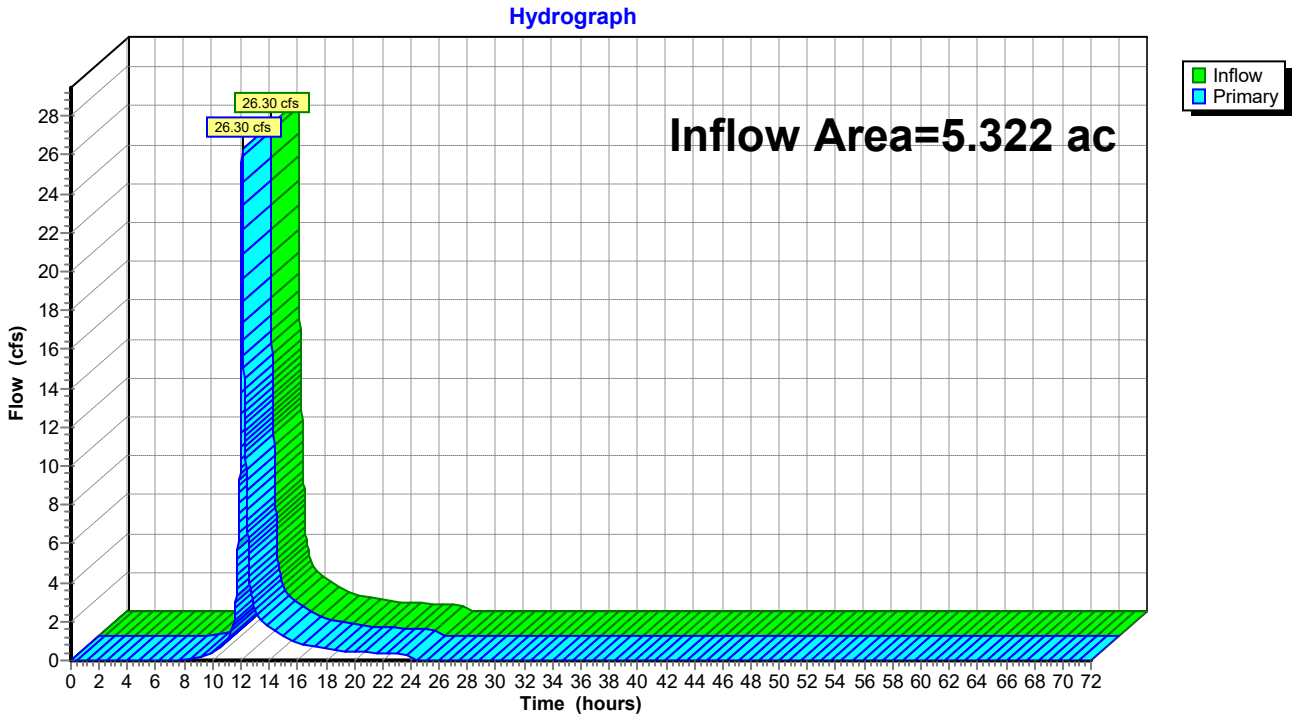


Summary for Link DP-1: Reservoir and Swimming Area

Inflow Area = 5.322 ac, 41.12% Impervious, Inflow Depth = 4.21" for 100-Year event
Inflow = 26.30 cfs @ 12.09 hrs, Volume= 1.868 af
Primary = 26.30 cfs @ 12.09 hrs, Volume= 1.868 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link DP-1: Reservoir and Swimming Area

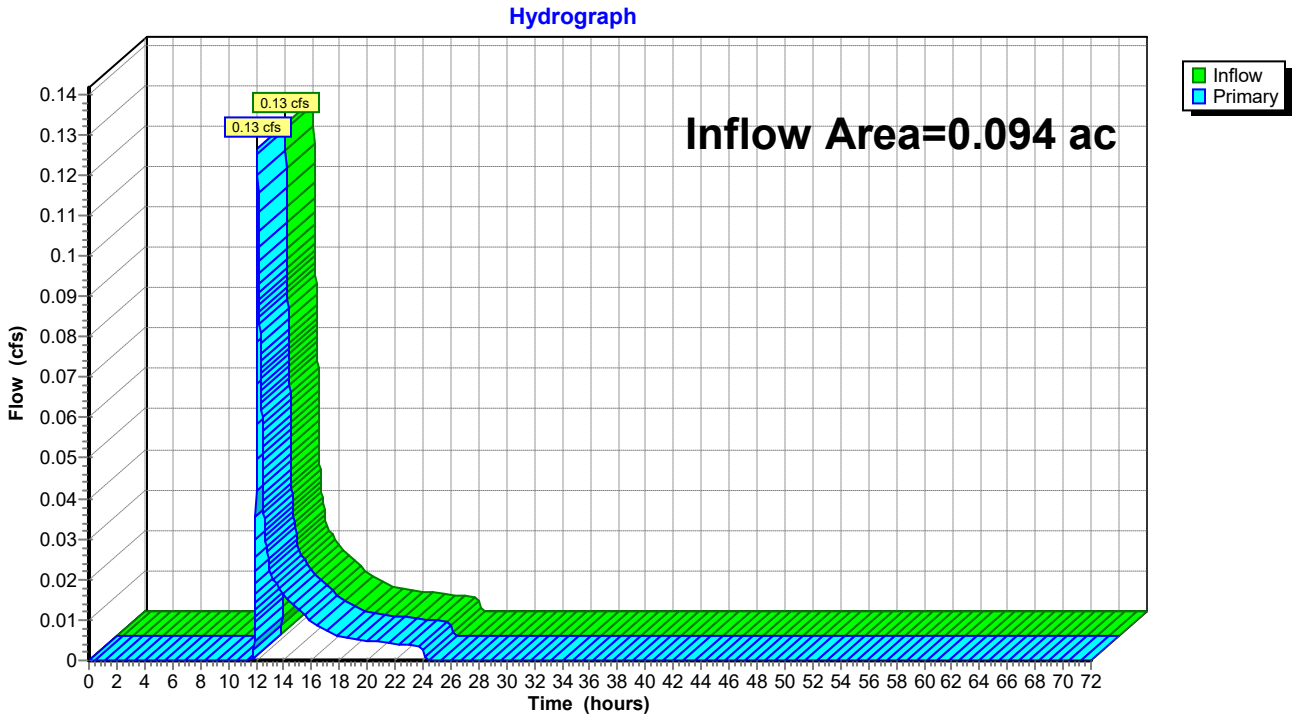


Summary for Link DP-2: Ditch

Inflow Area = 0.094 ac, 0.00% Impervious, Inflow Depth = 1.53" for 100-Year event
Inflow = 0.13 cfs @ 12.11 hrs, Volume= 0.012 af
Primary = 0.13 cfs @ 12.11 hrs, Volume= 0.012 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link DP-2: Ditch



APPENDIX E: OPERATIONS & MAINTENANCE PLAN

STORMWATER MANAGEMENT SYSTEM
OPERATION & MAINTENANCE PLAN

This Stormwater Management System Operations & Maintenance Plan (the Plan) outlines measures that are essential for maintaining an effective stormwater management system at the Arlington Reservoir, located at 210 Lowell Street in Arlington, Massachusetts (the Site). Periodic and scheduled inspections and maintenance measures are recommended to prevent deficiencies and for proper performance of the stormwater management system. Failure to implement these measures can reduce the hydraulic capacity and the pollutant removal efficiency of stormwater measures resulting in a poor quality of stormwater runoff discharging from the Site.

RESPONSIBLE PARTY & ESTIMATED ANNUAL BUDGET

The party responsible for implementing this Plan and identifying the source of necessary funds is as follows:

Town of Arlington, Massachusetts – Department of Public Works
51 Grove Street
Arlington, MA 02476
Telephone: (781) 316-3301

GOOD HOUSEKEEPING

The Site will be maintained as clean and orderly. Routine inspections of the Site for debris and sediment accumulations shall be performed. Debris and sediment shall be disposed of in accordance with local and State requirements.

INSPECTIONS & MAINTENANCE MEASURES

Stormwater management is provided by porous pavement sections, as illustrated on the Site Plans. Routine inspections and maintenance of the stormwater management system shall be performed in accordance with this Operation & Maintenance Plan. These measures are recommended to prevent deficiencies within the system that may result in poor quality of stormwater runoff.

A sample Inspection Form is attached and is recommended for use during inspections of the stormwater management system. The form includes a table that outlines specific inspection and maintenance measures, in addition to the following information that can be recorded by the inspector during the inspection. Completed Inspections Forms shall be kept at the Site to enable both Department of Public Works staff members and regulatory agencies to ensure that operation of the system is in compliance with this Operation & Maintenance Plan.

SOLID WASTE CONTAINMENT

Trash and recycling receptacles will be provided throughout the Site, as necessary. Receptacles should remain covered to prevent exposure with stormwater and to ensure waste will remain inside the receptacle. Waste collection must be performed regularly.

LANDSCAPE MANAGEMENT

Lawn and landscaped areas shall be inspected for patches of dead vegetation and erosion. If these conditions are observed, affected areas shall be stabilized and replanted with vegetation to prevent sediment from entering the stormwater management system.

The following measures shall be followed to minimize the potential for stormwater runoff pollution due to overwatering, dead vegetation and erosion, direct disposal of lawn clippings, and over-application of materials such as fertilizers and pesticides.

<u>Lawn Mowing</u>

The following mowing practices are recommended:

- Maintain sharp mower blades.

- Typically, avoid cutting grass shorter than 2 to 3 inches in height, to minimize weed growth. Grass can be cut lower in the spring and fall to stimulate root growth but should not be cut shorter than $1^1/_2$ inches.
- Do not dispose of grass clippings within the stormwater management system.
- Employ practices to minimize the potential for grass clippings to enter the stormwater management system.

Fertilizers & Pesticides

Use of pesticides and fertilizers should be minimized to the extent practicable. Application of these materials may degrade the quality of stormwater runoff and should therefore be applied cautiously. In addition, fertilizers and pesticides shall not be applied prior to rain events. These materials should be stored under cover to prevent their exposure to stormwater.

PERVIOUS AREA MANAGEMENT

Winter Operations

Remove accumulated snow after winter storm events to keep the site's parking lots open for operations and maintenance activities. Snow shall not be stored within pervious areas.

Plows with poly cutting blades are required for snow removal. With their use, no alterations to typical snow removal activities are required. Sand will prematurely clog the porous pavement system and should not be used for deicing. Magnesium Chloride is an alternative material that can be used for deicing, if necessary. Snow melts faster on porous pavement than traditional pavement, as melting water does not remain on the surface to insulate the remaining ice.

Pervious Pavement

The pervious pavement system shall be monitored for permeability and maintained with an industrial wet vacuum sweeper at east twice a year or more frequently, as needed. The frequency of cleanings will vary depending on Site conditions including frequency of traffic, local climate, and surrounding environment but should be performed once in the Spring and once in the Fall (after leaves have fallen but before the first snow fall) to assure the pavement's long function life.

Damage to the surface of the porous pavement can be repaired by using a concrete saw to remove the damaged area and installing new porous pavement in its place.

STORMWATER MANAGEMENT SYSTEM INSPECTION FORM

Town of Arlington, Massachusetts
Arlington Reservoir
210 Lowell Street
Arlington, MA 02474

Name of Inspector: _____

Date/Time: _____

Weather: _____

Date of Last Inspection: _____

Items Inspected (refer to Table 1 and provide additional sheets if necessary):

_____

_____

_____

_____

_____

_____

_____

_____

_____

Comments & Corrective Actions Taken (provide additional sheets if necessary):

_____

_____

_____

_____

_____

_____

_____

_____

Table 1 – Operations & Maintenance Measures

Porous Pavement	
Objective: *Maintain the infiltration and storage capacity of the porous pavement section.*	
Frequency	***Measure***
Ongoing/As Needed	• Monitor the surface of the porous pavement to proper drainage is achieved during storm events.
Quarterly	• Remove sediment and organic debris on the porous pavement surface using a vacuum sweeper.
Bi-Annually (once in Spring and once in Fall)	• Inspect the surface of the porous pavement for deterioration or clogging. • Assess the infiltration capacity of the porous pavement sections.
Additional Comments	• Do not stockpile snow on porous pavement surface. This will require additional maintenance and vacuuming. • Do not sand over porous pavement surface.

APPENDIX F: STORMWATER POLLUTION PREVENTION PLAN

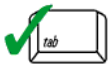
APPENDIX G: MASSDEP CHECKLIST FOR STORMWATER REPORT

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

Checklist for Stormwater Report

A. Introduction

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



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

The Stormwater Report must include:

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

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

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

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

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

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

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

Checklist for Stormwater Report

B. Stormwater Checklist and Certification

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

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

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

Registered Professional Engineer's Certification

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

Registered Professional Engineer Block and Signature

Signature and Date

Checklist

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

☐ New development

☒ Redevelopment

☐ Mix of New Development and Redevelopment

Checklist for Stormwater Report

Checklist (continued)

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

- ☐ No disturbance to any Wetland Resource Areas
- ☐ Site Design Practices (e.g. clustered development, reduced frontage setbacks)
- ☒ Reduced Impervious Area (Redevelopment Only)
- ☒ Minimizing disturbance to existing trees and shrubs
- ☐ LID Site Design Credit Requested:
  - ☐ Credit 1
  - ☐ Credit 2
  - ☐ Credit 3
- ☒ Use of “country drainage” versus curb and gutter conveyance and pipe
- ☐ Bioretention Cells (includes Rain Gardens)
- ☐ Constructed Stormwater Wetlands (includes Gravel Wetlands designs)
- ☐ Treebox Filter
- ☐ Water Quality Swale
- ☐ Grass Channel
- ☐ Green Roof
- ☐ Other (describe): _____

Standard 1: No New Untreated Discharges

- ☒ No new untreated discharges
- ☐ Outlets have been designed so there is no erosion or scour to wetlands and waters of the Commonwealth
- ☐ Supporting calculations specified in Volume 3 of the Massachusetts Stormwater Handbook included.

Checklist for Stormwater Report

Checklist (continued)

Standard 2: Peak Rate Attenuation

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

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

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

Standard 3: Recharge

☒ Soil Analysis provided.

☐ Required Recharge Volume calculation provided.

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

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

☐ Static ☒ Simple Dynamic ☐ Dynamic Field[1]

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

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

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

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

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

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

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

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

Checklist for Stormwater Report

Checklist (continued)

Standard 3: Recharge (continued)

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

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

Standard 4: Water Quality

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

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

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

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

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

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

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

Checklist for Stormwater Report

Checklist (continued)

Standard 4: Water Quality (continued)

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

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

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

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

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

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

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

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

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

☐ All exposure has been eliminated.

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

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

Standard 6: Critical Areas

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

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

Checklist for Stormwater Report

Checklist (continued)

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

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

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

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

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

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

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

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

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

Checklist for Stormwater Report

Checklist (continued)

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

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

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

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

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

Standard 9: Operation and Maintenance Plan

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

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

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

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

Standard 10: Prohibition of Illicit Discharges

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

☐ An Illicit Discharge Compliance Statement is attached;

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

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