TECHNICAL NARRATIVE &
STORMWATER MANAGEMENT REPORT
THE REGENCY AT LYNNFIELD

LOCATED AT

1301 MAIN STREET
LYNNFIELD, MASSACHUSETTS

NOVEMBER 30, 2023

APPLICANT:

TOLL BROS., INC.
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I. EXECUTIVE SUMMARY

Toll Bros, Inc., the project proponent, proposes to develop a 66-unit age-restricted, active adult community on a 36+/- acre parcel (the "Project Site") located 1301 Main Street in Lynnfield, Massachusetts. The land is currently owned by Sagamore Spring Real Estate Trust (the "Trust") who has agreed to a purchase and sale contract with the project proponent. The Trust owns the entire 168-acre tract of land on the east and west side of Main Street known as Sagamore Spring Golf Club. The 36-acre project site will be conveyed out of the larger tract for the development of the detached single-family dwellings. All 66 of these dwellings will be restricted to at least one (1) occupant over the age of 55 to qualify as housing for the elderly. The project will also include an accessory community building, pool and outdoor amenity space. The new neighborhood will be supported by a private drive, stormwater management systems, electric and communications utilities, onsite wastewater disposal and a public water supply. The public water supply will be extended up Main Street through the project up to Friendship Lane. It will also be looped back to Lowell Street via a new easement across the golf course to existing water easements. A large portion of the parcel will be preserved as permanent open space. The dwellings, associated improvements and open space on the property described herein will be known as The Regency at Lynnfield.

The Regency at Lynnfield was designed in accordance with the Town of Lynnfield Zoning Bylaw, the Massachusetts Stormwater Handbook and Lynnfield Stormwater Bylaw, the Wetlands Protection Act and its Regulations promulgated through 310 CMR 10.00 ("WPA"), the Lynnfield Wetlands Protection Bylaw and Regulations ("LWPB") and the Lynnfield Tree Protection Bylaw. The project will require a Special Permit from the Lynnfield Planning Board for the Elderly Housing use, an Order of Conditions from the Lynnfield Conservation Commission, an onsite wastewater disposal system approval from the Lynnfield Board of Health, a public water supply extension permit from the Lynnfield Center Water District (LCWD), a scenic road permit, a tree protection bylaw permit and a variance from the Zoning Board of Appeals for the proposed roadway cross section and signage.

II. EXISTING SITE DESCRIPTION

The Project Site consists of a single parcel with a total land area of 36.093-acres which was split off the Sagamore Golf Course parcel through a Form A: Approval Not Required Plan (Southern Essex Registry of Deeds Plan Book 40797, Plan 69). It is identified by the Lynnfield Assessor's Department on Map 13 as Lot 1000. The Project Site has 803.85± feet of frontage along Main Street. The property is situated entirely within the Elderly Housing Zoning District which was adopted at the November 2022 Lynnfield Town Meeting. The project also falls within the Lynnfield Groundwater Protection Overlay District and partially within the Wetlands Buffer District.

The parcel is mostly wooded with a portion of the property consisting of the driving range associated with the golf course use. Refer to Figure 1: USGS Map and Figure 2 Ortho Map for an aerial depiction of the property. A bordering vegetated wetland ("BVW") extends from the easterly lot line near the Peabody municipal boundary to the westerly lot line at Main Street. There is also a small, isolated wetland near Main Street and the driving range. The wetland boundary was approved by the Lynnfield Conservation Commission in an Order of Resource Area Determination, Mass DEP File No. 209-0672 dated October 3, 2023. The BVW has a 100-foot buffer zone of jurisdiction under the WPA and LWPB. The LWPB also adds a 25-foot no-disturbance zone and a 50-foot no-build zone from the BVW.

The property slopes from a high elevation of 208 near the Peabody boundary to the east to a low elevation of 89 at Main Street. Grades on the property vary from 2% to 20%.

Extensive soil testing was conducted by MCG and the project proponent throughout the upland portion of the property, outside the 100-foot buffer zone. In total, 53 test holes were excavated, the results of are included herewith in the plan set. Most of the soil on the property can be described as a moderately compacted gravelly loamy sand till. Soil consistency varies from a loamy sand to sandy loam. The hydrologic soil group ("HSG") includes 25%, well-drained, HSG-B, 50% HSG-C and 25% poorly-drained, HSG-D. The Natural Resource Conservation Service (NRCS) soil maps were also evaluated throughout the entire property. Soils within the property consist of poorly drained Ridgebury extremely stony, fine sandy loam (71B), poorly drained Whitman extremely stony, fine sandy loam (73A), Montauk very stony, fine sandy loam (301C), Paxton Sandy Loam (306B), Scituate, very stony, fine sandy loam (316B), well drained Canton, very stony fine sandy loam (420B, 421B, 422D) and Paxton Urban land complex (622C). Refer to Figure 3 for the NRCS Soil boundaries.

There is no flood zone on the property according to the FEMA Federal Insurance Rate Map (FIRM) #25009C00391F with an effective date of July 3, 2012 (See Figure 4: FEMA Map).

There are no endangered species habitats mapped on the property (See Figure 5: NHESP Map).

III. PROPOSED PROJECT DESCRIPTION

A. Dwelling Units & Amenities

The Regency at Lynnfield will consist of 66 single-family dwellings for use by persons meeting the criteria of the Elderly Housing ("EH") Zoning District. The EH District requires at least one person to be 55-years of age and prohibits children under the age of 18 from residing in any of the dwelling units on a permanent basis. While the exterior appearance of each dwelling will following a similar New England vernacular, homeowners will have the ability to choose from three (3) different elevations and six (6) floor plans. The unit floor plans will be configured to include a ground level master bedroom and at grade access to the front of each home. Livable floor area will vary between 1,880-2,800 square feet per home, including the second-floor guest

bed/study area. Each home will also have the ability to finish the basement for an additional 1,500 square feet of usable area. Each home will have a dedicated driveway, a two-car garage facing the street, and a patio or deck in the rear. Landscaping around each unit is illustrated on the landscape plans included with this report. Homeowners will have the ability to customize and expand their rear landscape area to include features such as larger planting or vegetable beds, grill area, firepits, larger patio or pergolas. There will be a neighborhood clubhouse with a pool and open space amenity areas for exclusive use by residents of The Regency at Lynnfield and their guests.

B. Private Drive, Sidewalks & Emergency Access

A twenty-four-foot-wide private road network will be constructed to provide access to the dwelling units and amenity spaces. "Road A" is the primary access drive off Main Street and is 715-feet long. Road B is 425-feet long and connects Road A to Road A2 with a cul-de-sac turnaround at the northerly end. Road A2 extends from Friendship Lane to a cul-de-sac turnaround and is 1,863-feet long. Road C is 409-feet long and extends from Road A2 to a cul-de-sac turnaround. The total length of new private roadway is 3,412 linear feet. The maximum road slope is 7.9% on Road A however most of the roads are designed to be less than 6% slope. Vertical curves were designed to accommodate a 30 MPH design speed which is a safer design speed than the posted speed of 25 MPH on Main Street, the intersecting collector road.

Sidewalks will be constructed along one side of the road. The sidewalks will provide a pedestrian route throughout the neighborhood and connect to the amenities including the clubhouse and open space. Crosswalks will be provided at all crossings and intersections. The slope of the sidewalk will match the slope of the road.

All vehicular surfaces will be paved with bituminous asphalt and a cobble stone curb. The road will have a crown along the centerline and a gutter at the curb to efficiently convey stormwater runoff to a closed drainage network of catch basins, manholes and pipes. This stormwater management collection system will direct stormwater to best management practices for treatment and infiltration prior to leaving the project site. All dwelling driveways slope back to the roads so that stormwater runoff from all paved areas will be directed to the closed drainage system. Effectively 100% of the impervious surfaces from the development will pass through the stormwater management system with the exception being a de-minimis area of driveway at the Main Street intersection.

Emergency access will be accommodated through the extension of Road A2 to Friendship Lane. This will provide vehicular access and also the extension of the public water supply main up to Friendship Lane. This will be ended with a hydrant, providing critical fire protection water supply that does not exist today.

The extension to Friendship Lane requires construction of the road through the BVW. To minimize the area of impact to the wetland, the Road will be retained with modular walls instead of a gradual shoulder slope. There are two (2) wetland crossings along Road A2. These

streams will be spanned with a 15' wide, four-sided (4) box culvert meeting the Massachusetts River and Stream Crossing Guidance published by Mass DEP. Some of the features of this design include an openness ratio exceeding 1, embedment of the culvert at least 2 feet below the adjacent grade to protect it against scour and a natural bottom substrate consisting of native field stones and soil excavated from the wetland crossing area and replaced within the culvert to replicate the stream channel. The culverts will maintain wildlife passage and the hydrology of the wetland system by incorporation of these best design practices. The total area of permanent BVW impacted by the road crossing will be 3,145 square feet with an additional 598 square feet of temporary alteration along the edge of work. The temporarily altered wetland will be replaced in kind. The permanently altered BVW will be replicated within the same wetland system near Main Street. The total replicated BVW area is 3,611 square feet for a ratio of 1.15 to 1.

C. Earthwork and Land Disturbance

The limit of work for the Project Site is approximately 22.7 acres. A portion of this area was previously altered for the golf course driving range and will only require stripping and stockpiling of loam. The remaining portion is wooded and will require clearing of trees, removal and grinding of stumps and stripping and screening of loam. The work area will undergo earth cuts and fills to achieve the proposed finished grades. The project has been designed to balance cut and fill volumes to minimize the export and import of soil material from the property. Boulders and stones will be crushed and reused on site as structural fill. Screened loam will be stockpiled and reapplied to the finished site for seeding and stabilization. Bedrock was encountered during soil investigations in a few areas. While blasting is not anticipated there could be potential for some mechanical rock removal. Brush, stumps and solid organic materials will be ground. These grindings will be stockpiled on site and used for erosion control. Implementation of these measures will reduce vehicular truck trips to and from the site, thereby minimizing nuisance from noise, reducing carbon emissions and reducing the time of construction.

D. Stormwater Management Overview

The stormwater management system was designed in full compliance with the Massachusetts Stormwater Handbook and Lynnfield Stormwater Bylaw. The entire site is tributary to Main Street where it passes through an existing 30" concrete culvert. The entire tributary watershed associated with this culvert was analyzed to ensure that there will be no impacts to the culvert because of developing the site. The primary measure implemented for stormwater management was to spread out infiltration basins throughout the development area to maximize groundwater recharge and the time it takes for stormwater to pass through the site. Treatment measures were also implemented to improve water quality.

The treatment train implemented for the project consists of deep-sump hooded catch basins, hydrodynamic treatment systems, sediment forebays, infiltration basins and a detention basins. A closed-drainage system will be installed in the roadway, which will convey runoff to best management practices to provide storage and infiltration of stormwater runoff from effectively

the entire impervious footprint of the development. Collector drains will also be constructed throughout the site to manage surface runoff from landscaped areas and groundwater from the dwellings and areas of cut. Final stabilization measures were designed to minimize the area of manicured lawn in favor of more densely rooted meadows, which will improve groundwater recharge and plant root uptake. Further explanation of the stormwater management system and design methodology can be found later in this report.

E. Open Space and Preservation of Natural Features

Of the 36.1-acre project site, 22.7-acres (62.8%) will be disturbed for the development of the homes, leaving 13.4 acres of forested land untouched as passive open space. Additionally, as part of the development agreement between Sagamore Spring Realty Trust and the Town of Lynnfield, The Trust agreed to the following:

- Granting of an easement across the golf course to Lynnfield Center Water District to allow for connecting Water Station 2 to Water Station 4.
- Granting of an easement to the Lynnfield Center Water District across the west side of the golf course between the project site and an existing, adjacent water easement that loops the water main back to Lowell Street.
- Restricting the west side of the golf course from development for 25-years.
- Donation of 9.4 acres of the golf course land to the Town of Lynnfield, adjacent to the recently acquired Richardson Parcel.

The proposed site design incorporates the principals of clustered development practices in minimizing the separation between dwellings, minimizing pavement footprints and consolidation the limit of work. The project density works out to 1 dwelling unit per 15,000 square feet of developed land. This approach maximizes land use efficiency by filling the need for senior housing while maximizing the preservation of open space. In total, 22.7-acres of land will be developed and 22.8-acres of land will be preserved as passive, natural woodland.

F. Utilities

The project will require public water supply which will be extended from the Lynnfield Center Water District in Main Street. The development parcel was accepted into the district in November 2022. As part of the water main extension, the project proponent will extend the water main along Main Street to the site driveway. The main will be extended up to Friendship Lane providing fire protection to that neighborhood and the potential for the town to extend the main out to Main Street in the future. The water main will also be looped through the golf course to via a new easement to connect with one of the existing water main easements on adjacent streets. This connection loops the water main back to Lowell Street, improving water quality and pressure to residents in the Lowell Street neighborhood.

The project will also include an onsite wastewater disposal system which will be designed in accordance with 310 CMR 15.00: Title 5 and the Lynnfield Board of Health Regulations. Total wastewater loading within the Zone II will be 9,900 gallons per day ("GPD"). According to 310 CMR 15.00, the minimum area of land required for this wastewater flow is 20.7 acres. The 36.09-

acre development parcel satisfies this requirement. The wastewater will be collected in a sanitary sewer system to a series of septic tanks and a pump. The pump will distribute wastewater to an innovative technology approved by MassDEP for general use known as a Presby Wastewater Treatment System. The Presby system will provide enhanced treatment of the wastewater from the project.

There will not be natural gas at this project as this utility is not available on Main Street. Homeowners will have the option to add a 500-gallon buried propane tank if they would like gas energy for their home. Electric service will be provided by Reading Municipal Light Department ("RMLD"). Cable, fiber optic and other communications services will be coordinated with the individual utility providers.

G. Zoning

The project use is a special permit use in the Elderly Housing District. The special permit criteria is defined in Section 10.5 of the Lynnfield Zoning Bylaw and includes six (6) criteria in which the Planning Board determines if the projects impacts outweigh the benefits it provides to the Town or the neighborhood.

1. *Social, economic, or community needs which are served by the proposal.*
   The specific social, economic and community needs were previously addressed in 2022 in which the Town voted in super majority to adopt the Elderly Housing District zoning to allow the project. In summary, the age-restricted use provides much needed housing to our greatest population of persons over the age of 55. School aged children are not permitted to reside in the development, and it is a private development so there are no public maintenance costs associated with the infrastructure. Therefore, there is no impact on the school or department of public works budgets and almost an entirely positive source of tax revenue for the community. Water usage fees will offset the cost of maintaining the new public water main.

2. *Traffic flow and safety, including parking and loading.*

   Traffic flow to and from the site is addressed in more detail in the traffic report prepared by McMahon, a Bowman Company under separate cover. The site driveway is designed in conformance with the Lynnfield Zoning Bylaw and exceeds the Stopping Sight Distance requirements of AASHTO. Parking requirements are exceeded for each dwelling in accordance with the Zoning Bylaw with 2 garage spaces and 1 driveway space per dwelling unit provided. Parking is also provided for the community building. There is no loading requirements for this use so none is provided.

3. *Adequacy of utilities and other public services;*

   All utilities servicing the site will meet or exceed the respective requirements for design and construction. Stormwater management will be addressed later in this report. Sanitary sewer known as wastewater, will be collected and treated with an enhanced,

innovated treatment system known as Presby wastewater treatment system. There is no natural gas proposed for this development. Water supply has been previously evaluated by Lynnfield Center Water District and was determined to be adequate for the proposed use as described above. Electric and communication services will be provided by private utility providers and has no impact on the town of Lynnfield.

4. *Impacts on neighborhood character;*

   The dwellings are architecturally designed in a traditional new England vernacular that is fitting with the Town of Lynnfield. The project will be a private neighborhood with a preserved woodland buffer along the northerly boundary and most of Main Street frontage, minimizing view corridors of the site from the public ways.

5. *Impacts on the natural environment; and*

   As discussed above, the project has been designed to meet and exceed environmental regulations and implements best design practices to minimize the impact on the natural environment. Measures incorporated include enhanced stormwater treatment, infiltration of all impervious areas of the site, select surface coverages with deeper rooted, meadow instead of manicured lawns. This measure will improve plant root uptake and reduce the reliance on fertilizer and mowing (carbon) emissions. The wastewater system will provide enhanced treatment with the use of an innovative Presby treatment system and preservation of land to further mitigate nitrogen loading. Site construction practices of process in place and earthwork balancing will minimize carbon emissions and the time of construction. The impervious footprint of pavement has been minimized by including a sidewalk on only 1 side of the road and minimizing the width and length of the dwelling driveways. The dwelling construction will comply with the current Massachusetts Building Code which incorporates the new stretch code..

6. *Potential fiscal impact on Town services, tax base, and employment taking into account any proposed mitigation.*

   As discussed above, the project will result in a positive source of tax revenue as a result of the restriction on school aged children and no public works obligations for the roadway infrastructure. The construction of the project will create several years of employment opportunities for consultants, contractors, and the trades. The development proposal was previously reviewed by the Lynnfield Finance Committee as part of the adoption of the Elderly Housing District at the November 2022 Town Meeting.

H. Schedule

Construction of the proposed development is anticipated to start in Fall of 2024 and will take approximately 5 years to complete.

IV. STORMWATER MANAGEMENT

The proposed stormwater management system for the project will consist of various Best Management Practice (BMP) techniques in both mitigating and renovating stormwater runoff. The entire stormwater system was designed in accordance with the Massachusetts Stormwater Management Handbook. A comprehensive Grading and Drainage Plan is included in the Comprehensive Permit plan set. The existing watershed characteristics, flow paths and drainage patterns were matched to the extent practicable in the proposed condition to ensure that there are no adverse impacts to adjacent properties or wetland resource areas.

A. Existing Watershed Description

Drainage on site has been divided into four distinct sub-catchment areas, as shown on Figure 7: Existing Conditions Watershed Figure.

Summary of Existing Subcatchments

Existing Subcatchment	Total Area (SF)	% Impervious
ES1	1,493,872	0.39
ES2	22,292	0.00
ES3	106,081	0.00
ES4	782,989	33.52
Totals	**2,405,234**	**11.16%**

- **Subcatchment ES1:** ES1 encompasses most of the project site. It includes all of the woodlands and wetlands on the property, most of the driving range area and is tributary to Design Point 1 (DP1).
- **Subcatchment ES2:** ES2 is a small wooded area that drains to the south towards the golf course. It is tributary to Design Point 2 (DP2) and was separated out to evaluate localized impacts to the golf course.
- **Subcatchment ES3:** ES3 is a small wooded area to the south east of the property that drains south towards the golf course. It is tributary to Design Point 3 (DP3) and was separated out to evaluate localized impacts to the golf course.
- **Subcatchment ES4**: ES4 consists of offsite land including Catherine Drive in Peabody, Friendship Lane, and frontage lots on Main Street. This area is tributary to Design Point 1 (DP1) and was included in the calculation to evaluate the existing concrete culvert under Main Street.

B. Proposed Watershed Description

The proposed post development drainage analysis was performed by dividing the study area into fourteen distinct sub-catchment areas (See Figure 8: Proposed Conditions Watershed Figure). The table below shows the total area for each subcatchment.

Summary of Proposed Subcatchments

Proposed Subcatchment	Total Area (SF)	% Impervious
PS1	617,148	0.92
PS2	167,949	16.69
PS3	13,646	44.33
PS4	99,519	30.07
PS5	63,875	56.24
PS6	6,550	0.00
PS7	58,298	7.21
PS8	13,992	0.00
PS9	29,587	50.13
PS10	29,494	8.32
PS11	64,352	16.63
PS12	20,216	61.06
PS13	3,949	0.00
PS14	42,549	4.11
PS15	17,922	41.79
PS16	81,403	36.51
PS17	58,074	42.43
PS18	27,660	4.39
PS19	782,989	33.76
R1-R19	206,062	100.00
TOTALS	**2,405,234**	**28.49**

- **Subcatchments PS1-PS5, PS7 & PS9-18:** These subcatchments encompass the majority of the site development area and consist of the yards, meadows, dwellings, road, sidewalks, driveways and stormwater basins. These subcatchments are tributary to Design Point 1 (DP1).
- **Subcatchments R1-R19:** These subcatchments consist of the dwelling roofs and are tributary to Design Point 1 (DP1).
- **Subcatchment PS6:** PS6 is a small, wooded area that drains to the south towards the golf course. It is tributary to Design Point 2 (DP2) and was separated out to evaluate localized impacts to the golf course.
- **Subcatchment PS8:** PS8 is a small, wooded area to the south east of the property that drains south towards the golf course. It is tributary to Design Point 3 (DP3) and was separated out to evaluate localized impacts to the golf course.
- **Subcatchment PS19**: PS19 consists of offsite land including Catherine Drive in Peabody, Friendship Lane, and frontage lots on Main Street. This area is tributary to Design Point 1 (DP1) and was included in the calculation to evaluate the existing concrete culvert under Main Street.

C. Hydrologic Analysis

The purpose of the stormwater analysis is to demonstrate that the proposed development will not adversely impact either the on-site or surrounding land. The industry standard for stormwater management design in Massachusetts is governed by the Massachusetts Stormwater Management Handbook ("Handbook") published by the Mass Department of Environmental Protection, January 2008. The Regulations require applicants to comply with the Handbook standards for development projects. The Handbook lists 10 standards covering both mitigation and renovation of stormwater runoff. A full discussion on the project compliance with the standards can be found at the end of this report. However, the following section will summarize the project's compliance with the mitigation standards 1 and 2 of the Handbook relating to reducing peak rates of runoff and creating no adverse down gradient impacts.

To demonstrate that there will be no downstream impacts because of developing the site, a stormwater analysis was performed using the U.S. Soil Conservation Service (S.C.S) method of analysis contained in Technical Release #20 (TR-20) published by the U.S. Conservation Service, along with the extreme precipitation values published by the Northeast Regional Climate Center. The software application HydroCAD was utilized to analyze the pre and post-development watershed conditions. This analysis allows the engineer to verify that a given drainage system is adequate for the area under consideration, and further allows the engineer to predict where flooding or erosion are most likely to occur. The HydroCAD model was used to analyze the storm drainage system designed for the development to demonstrate that the drainage system complies with the State's Stormwater Management Standards. In order to more accurately represent the runoff generated from the variety of surface covers and hydrologic soil groups, the HydroCAD analysis was performed using a weighted flow rate generated from each subcatchment.

The HydroCAD analysis was performed by examining three (3) design points that were previously described. The following is a listing of the total pre-and post-development rates of stormwater runoff for the proposed development for the 2, 10, and 100-year rainfall events:

Comparison of Existing and Proposed Rates of Runoff

Design Point	Storm Event (Years)	Existing Conditions (Peak CFS)	Proposed Conditions (Peak CFS)	Change in Peak (CFS)
DP-1	2	37.1	37.0	-0.1
	10	66.6	66.6	0
	100	201.4	197.5	-3.9
DP-2	2	0.0	0.0	0
	10	0.4	0.1	-0.3
	100	1.8	0.6	-1.2

DP-3	2	0.4	0.1	-0.3
	10	1.7	0.3	-1.4
	100	7.4	5.8	-1.6

As shown in the table above the proposed development will maintain or reduce peak flow rates to DP 1, 2 and 3 for the 2, 10 and 100-year design storms as required by the Massachusetts Stormwater Management Handbook.

Analysis of Main Street Culvert

Design Point 1 was evaluated at an existing 30" RCP culvert that conveys water runoff from the east to west side of Main Street. Almost the entire site and tributary land drain to this culvert via intermittent stream channels in the wetland. To evaluate impacts to this culvert, the basin at Main Street was modelled as a pond "0P" in HydroCAD. The outlet to this pond is the 30" RCP culvert. The peak water elevation in various storm events was evaluated at Main Street. This water elevation represents the hydrostatic water pressure on Main Street which in this case functions as a berm for this pond. The results of the analysis are as follows:

Storm Event (Years)	Existing Condition (Peak Elevation)	Proposed Condition (Peak Elevation)	Change in Peak (Elevation)
2	**92.8**	**92.8**	**0**
10	**98.3**	**98.3**	**0**
100	**99.1**	**99.1**	**0**

The stormwater bioretention ponds, meadow surface treatment in lieu of manicured lawns, extensive landscaping including a robust tree planting plan and flattening grades in the post development condition effectively mitigate stormwater runoff from the development site. There will be no change in the peak water elevation for the 2, 10 and 100-year storm event at the Main Street culvert.

D. Stormwater Management Standards

The proposed site development will comply with all Stormwater Management Standards. Measures will also be implemented to provide the required total suspended solids (TSS) removal to ensure the stormwater runoff from the site is renovated prior to discharge. The following is an assessment of each Standard:

1. **STANDARD:** No stormwater conveyance system discharges untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth.

   SUMMARY OF MITIGATING MEASURES: All stormwater runoff from the site will pass through a treatment train consisting of catch basins with hooded outlets and 4' sumps, hydrodynamic treatment and/or sediment forebays and infiltration basins. All outlets from the retention basins have been designed to minimize the velocity of stormwater as it passes through a stabilized rip-rap apron. Meadow seeding will ensure a deeper root

base and further prevention against erosion. These measures will ensure no erosion occurs in or around the wetlands.

CONCLUSION: The proposed development meets this standard.

2. **STANDARD:** The stormwater management system shall be designed such that post-development peak rates of stormwater runoff do not exceed pre-development rates for the 2- and 10-year storm events.

   SUMMARY OF MITIGATING MEASURES: The peak rate of runoff is reduced at the design point for all storm events.

   CONCLUSION: The proposed development meets this standard.

3. **STANDARD:** 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 Standard is met when the stormwater management system is designed to infiltrate the required recharge volume as determined in accordance with the Massachusetts Stormwater handbook.

   SUMMARY OF MITIGATING MEASURES: To promote groundwater recharge, the site has been designed to include numerous surface recharge systems. The systems were throughout the site to evenly distribute groundwater recharge and maximize the infiltration capability of the post-construction site. Surface treatment with meadows will also improve the grounds ability to receive stormwater runoff into the ground.

   CONCLUSION: The proposed development meets this standard.

4. **STANDARD:** Stormwater management systems shall be designed to remove 80% of the average annual post-construction load of Total Suspended Solids (TSS).

   SUMMARY OF MITIGATING MEASURES: The stormwater management system will use treatment trains of deep sump hooded catch basins, hydrodynamic treatment and infiltrating bioretention ponds. Pre-treatment of stormwater is provided for all systems. All stormwater will be treated to a minimum of 80% TSS removal prior to discharging to the wetland.

   CONCLUSION: The proposed development meets this standard.

5. **STANDARD:** 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.

   SUMMARY OF MITIGATING MEASURES: None.

   CONCLUSION: The proposed development meets this standard as it does not apply to this project.

6. **STANDARD:** Stormwater discharges within a Zone II 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 Management handbook.

   SUMMARY OF MITIGATING MEASURES: A combination of deep-sump, hooded catch basins, hydrodynamic seperators and sediment forebays will ensure a minimum of 44% pretreatment of stormwater runoff prior to entering the bioretention basins. This enhanced treatment of runoff for the 1" water quality volume satisfies the enhanced treatment requirement of this standard.

   CONCLUSION: The proposed development meets this standard.

7. **STANDARD:** 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.

   SUMMARY OF MITIGATING MEASURES: None.

   CONCLUSION: The proposed development meets this standard as it does not apply to this project.

8. **STANDARD:** 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).

   SUMMARY OF MITIGATING MEASURES: Refer to the Construction Phase Best Management Practices Plan prepared by MCG, dated November 30, 2023. Since the project will disturb greater than one acre of land a SWPPP will be prepared and a NPDES Construction General Permit will be obtained prior to commencement of land disturbing activities on site.

   CONCLUSION: The proposed development meets this standard.

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

   SUMMARY OF MITIGATING MEASURES: Refer to the Long-Term Best Management Practices Operation and Maintenance Plan prepared by MCG, dated November 30, 2023.

   CONCLUSION: The proposed development meets this standard.

10. **STANDARD:** There shall be no new illicit discharges created as a result of the project.

    SUMMARY OF MITIGATING MEASURES: To the best of our knowledge and belief there are no illicit discharges being created as a result of the proposed project. An illicit discharge statement is included herein.

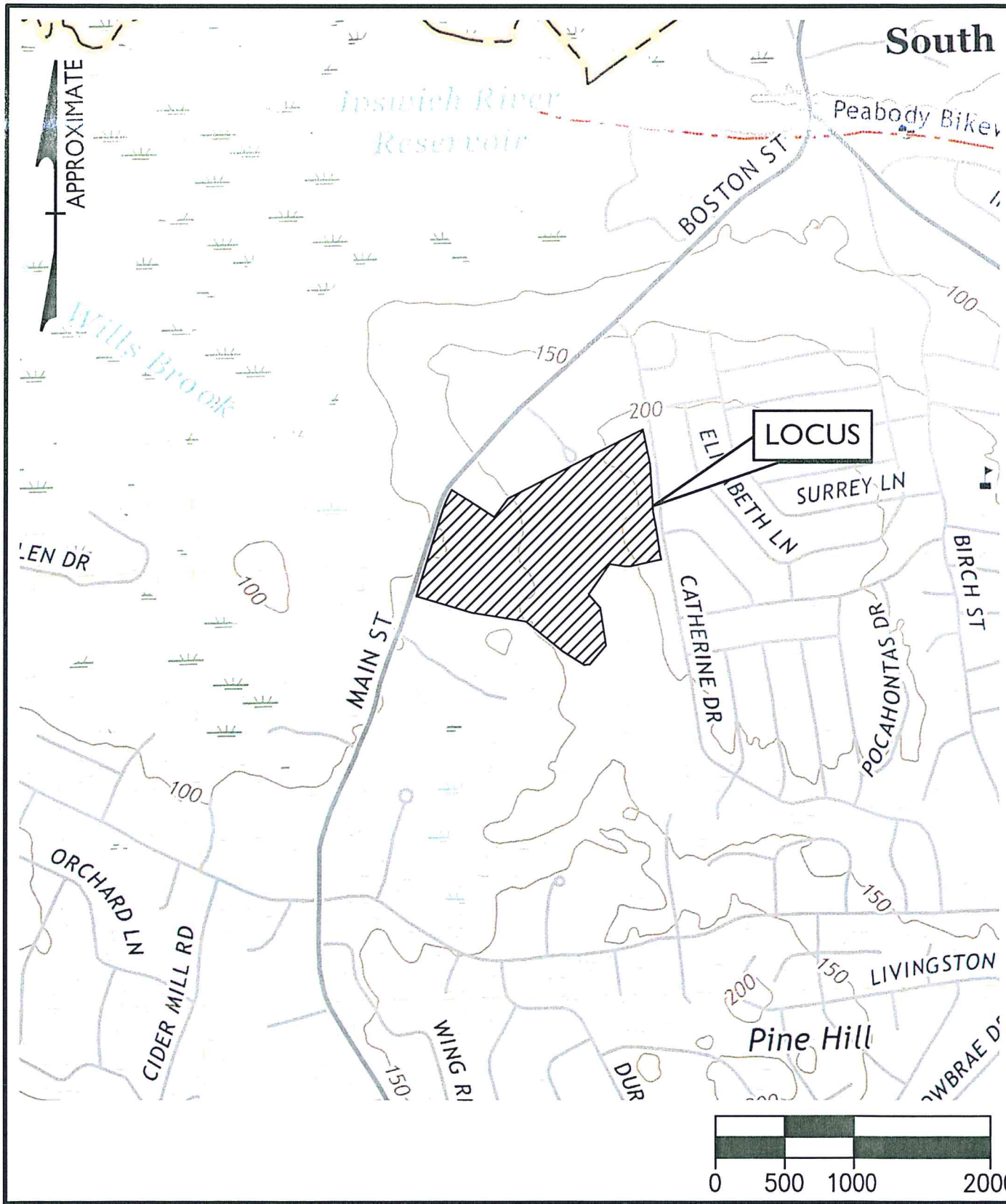
CONCLUSION: The proposed development meets this standard.

V. CONCLUSION

The proposed site development project for The Regency at Lynnfield, as proposed, is in full compliance with the MassDEP Stormwater Management Handbook and Lynnfield Regulations. The design implements generally accepted engineering practices for site development. Peak rates of stormwater runoff leaving the site under proposed conditions are no greater than under existing conditions. Recharge to groundwater will be managed with surface bioretention ponds and improved vegetated meadow surfaces. All stormwater leaving the proposed development will be fully treated and there are no illicit discharges to the waters of the Commonwealth.

For questions regarding this report, please contact The Morin-Cameron Group, Inc. between the hours of 7:30am to 4:30pm at (978) 777-8586.

FIGURES



THE MORIN-CAMERON GROUP, INC.
66 ELM STREET, DANVERS, MA 01923
P | 978.777.8586
WWW.MORINCAMERON.COM

USGS MAP
1301 MAIN STREET
IN
LYNNFIELD, MA

DATE: NOVEMBER 30, 2023 | SCALE: 1" = 1,000' | **FIGURE 1**

0 500 1000 2000

ORTHO IMAGERY OBTAINED FROM MASS GIS

THE MORIN-CAMERON GROUP, INC.
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ORTHO MAP
1301 MAIN STREET
IN
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FIGURE 2

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Essex County, Massachusetts, Southern Part

November 30, 2023

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require

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Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

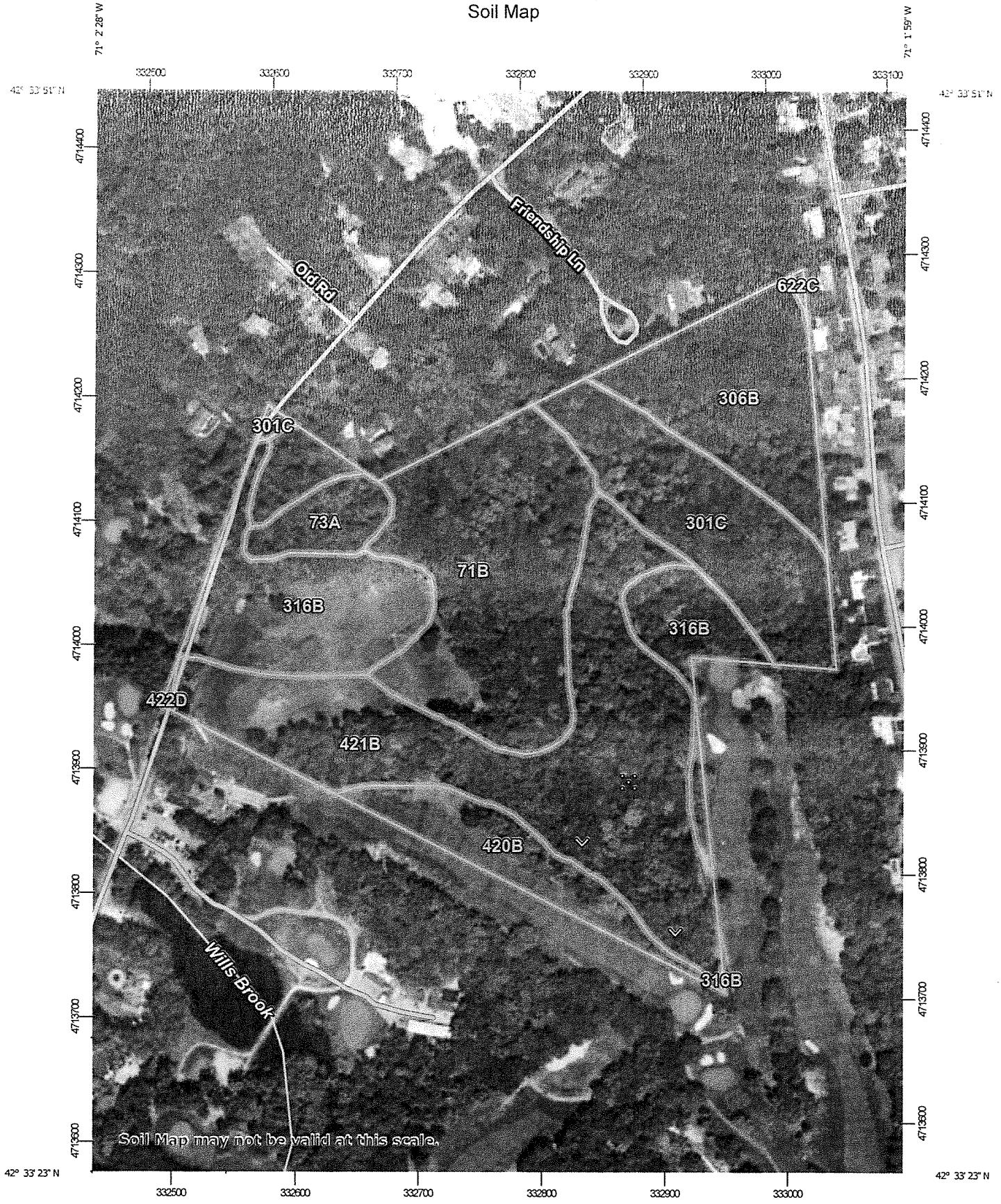
Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.



Map Scale: 1:4,240 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 50 100 200 300

Feet
0 200 400 800 1200

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

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features

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

Water Features

- Streams and Canals

Transportation

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

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

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: Essex County, Massachusetts, Southern Part
Survey Area Data: Version 20, Sep 10, 2023

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

Date(s) aerial images were photographed: May 22, 2022—Jun 5, 2022

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
71B	Ridgebury fine sandy loam, 3 to 8 percent slopes, extremely stony	9.5	22.2%
73A	Whitman fine sandy loam, 0 to 3 percent slopes, extremely stony	1.3	3.1%
301C	Montauk fine sandy loam, 8 to 15 percent slopes, very stony	5.5	12.8%
306B	Paxton fine sandy loam, 0 to 8 percent slopes, very stony	4.8	11.3%
316B	Scituate fine sandy loam, 3 to 8 percent slopes, very stony	6.5	15.1%
420B	Canton fine sandy loam, 3 to 8 percent slopes	2.6	6.1%
421B	Canton fine sandy loam, 0 to 8 percent slopes, very stony	12.5	29.2%
422D	Canton fine sandy loam, 15 to 35 percent slopes, extremely stony	0.0	0.1%
622C	Paxton-Urban land complex, 3 to 15 percent slopes	0.1	0.1%
Totals for Area of Interest		**42.8**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties

and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Essex County, Massachusetts, Southern Part

71B—Ridgebury fine sandy loam, 3 to 8 percent slopes, extremely stony

Map Unit Setting

National map unit symbol: 2w69c
Elevation: 0 to 1,290 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Ridgebury, Extremely Stony

Setting

Landform: Drumlins, depressions, ground moraines, hills, drainageways
Landform position (two-dimensional): Footslope, toeslope
Landform position (three-dimensional): Head slope, base slope
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Coarse-loamy lodgment till derived from gneiss, granite, and/or schist

Typical profile

Oe - 0 to 1 inches: moderately decomposed plant material
A - 1 to 6 inches: fine sandy loam
Bw - 6 to 10 inches: sandy loam
Bg - 10 to 19 inches: gravelly sandy loam
Cd - 19 to 66 inches: gravelly sandy loam

Properties and qualities

Slope: 3 to 8 percent
Surface area covered with cobbles, stones or boulders: 9.0 percent
Depth to restrictive feature: 15 to 35 inches to densic material
Drainage class: Poorly drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)
Depth to water table: About 0 to 6 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 3.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Ecological site: F144AY009CT - Wet Till Depressions
Hydric soil rating: Yes

Minor Components

Woodbridge, extremely stony

Percent of map unit: 10 percent
Landform: Ground moraines, hills, drumlins
Landform position (two-dimensional): Summit, backslope, footslope
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: No

Whitman, extremely stony

Percent of map unit: 8 percent
Landform: Depressions
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Paxton, extremely stony

Percent of map unit: 2 percent
Landform: Ground moraines, hills, drumlins
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Linear, convex
Hydric soil rating: No

73A—Whitman fine sandy loam, 0 to 3 percent slopes, extremely stony

Map Unit Setting

National map unit symbol: 2w695
Elevation: 0 to 1,580 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Whitman, extremely stony, and similar soils: 81 percent
Minor components: 19 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Whitman, Extremely Stony

Setting

Landform: Drumlins, ground moraines, hills, drainageways, depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Concave

Parent material: Coarse-loamy lodgment till derived from gneiss, granite, and/or schist

Typical profile

Oi - 0 to 1 inches: peat
A - 1 to 10 inches: fine sandy loam
Bg - 10 to 17 inches: gravelly fine sandy loam
Cdg - 17 to 61 inches: fine sandy loam

Properties and qualities

Slope: 0 to 3 percent
Surface area covered with cobbles, stones or boulders: 9.0 percent
Depth to restrictive feature: 7 to 38 inches to densic material
Drainage class: Very poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)
Depth to water table: About 0 to 6 inches
Frequency of flooding: None
Frequency of ponding: Frequent
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 3.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Ecological site: F144AY041MA - Very Wet Till Depressions
Hydric soil rating: Yes

Minor Components

Ridgebury, extremely stony

Percent of map unit: 10 percent
Landform: Drumlins, depressions, ground moraines, hills, drainageways
Landform position (two-dimensional): Footslope, toeslope
Landform position (three-dimensional): Head slope, base slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Scarboro

Percent of map unit: 5 percent
Landform: Drainageways, depressions, outwash terraces, outwash deltas
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Swansea

Percent of map unit: 3 percent
Landform: Marshes, bogs, swamps
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Woodbridge, extremely stony

Percent of map unit: 1 percent

Landform: Ground moraines, hills, drumlins
Landform position (two-dimensional): Summit, backslope, footslope
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

301C—Montauk fine sandy loam, 8 to 15 percent slopes, very stony

Map Unit Setting

National map unit symbol: 2w80w
Elevation: 0 to 1,120 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Montauk, very stony, and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Montauk, Very Stony

Setting

Landform: Hills, recessionial moraines, ground moraines, drumlins
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex, linear
Across-slope shape: Convex
Parent material: Coarse-loamy over sandy lodgment till derived from gneiss, granite, and/or schist

Typical profile

Oe - 0 to 2 inches: moderately decomposed plant material
A - 2 to 6 inches: fine sandy loam
Bw1 - 6 to 28 inches: fine sandy loam
Bw2 - 28 to 36 inches: sandy loam
2Cd - 36 to 74 inches: gravelly loamy sand

Properties and qualities

Slope: 8 to 15 percent
Surface area covered with cobbles, stones or boulders: 1.6 percent
Depth to restrictive feature: 20 to 43 inches to densic material
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 1.42 in/hr)
Depth to water table: About 18 to 37 inches
Frequency of flooding: None

Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 5.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: C
Ecological site: F144AY007CT - Well Drained Dense Till Uplands
Hydric soil rating: No

Minor Components

Scituate, very stony

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

Canton, very stony

Percent of map unit: 5 percent
Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex, linear
Across-slope shape: Convex
Hydric soil rating: No

Ridgebury, very stony

Percent of map unit: 4 percent
Landform: Depressions, ground moraines, hills, drainageways
Landform position (two-dimensional): Footslope, toeslope
Landform position (three-dimensional): Head slope, base slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

306B—Paxton fine sandy loam, 0 to 8 percent slopes, very stony

Map Unit Setting

National map unit symbol: 2w673
Elevation: 0 to 1,340 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Paxton, very stony, and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Paxton, Very Stony

Setting

Landform: Ground moraines, hills, drumlins
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Linear, convex
Parent material: Coarse-loamy lodgment till derived from gneiss, granite, and/or schist

Typical profile

Oe - 0 to 2 inches: moderately decomposed plant material
A - 2 to 10 inches: fine sandy loam
Bw1 - 10 to 17 inches: fine sandy loam
Bw2 - 17 to 28 inches: fine sandy loam
Cd - 28 to 67 inches: gravelly fine sandy loam

Properties and qualities

Slope: 0 to 8 percent
Surface area covered with cobbles, stones or boulders: 1.6 percent
Depth to restrictive feature: 20 to 43 inches to densic material
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)
Depth to water table: About 18 to 37 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 4.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: C
Ecological site: F144AY007CT - Well Drained Dense Till Uplands
Hydric soil rating: No

Minor Components

Woodbridge, very stony

Percent of map unit: 8 percent
Landform: Ground moraines, hills, drumlins
Landform position (two-dimensional): Summit, backslope, footslope
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

Ridgebury, very stony

Percent of map unit: 4 percent
Landform: Drumlins, drainageways, depressions, hills, ground moraines
Landform position (two-dimensional): Footslope, toeslope
Landform position (three-dimensional): Head slope, base slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Charlton, very stony

Percent of map unit: 3 percent
Landform: Hills
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

316B—Scituate fine sandy loam, 3 to 8 percent slopes, very stony

Map Unit Setting

National map unit symbol: vkhg
Elevation: 0 to 200 feet
Mean annual precipitation: 45 to 54 inches
Mean annual air temperature: 43 to 54 degrees F
Frost-free period: 145 to 240 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Scituate and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Scituate

Setting

Landform: Hills
Landform position (two-dimensional): Shoulder, footslope
Landform position (three-dimensional): Head slope, base slope
Down-slope shape: Linear
Across-slope shape: Concave
Parent material: Friable coarse-loamy eolian deposits over dense sandy lodgment till derived from granite and gneiss

Typical profile

H1 - 0 to 9 inches: fine sandy loam
H2 - 9 to 34 inches: gravelly fine sandy loam
H3 - 34 to 60 inches: gravelly loamy sand

Properties and qualities

Slope: 3 to 8 percent
Surface area covered with cobbles, stones or boulders: 1.6 percent
Depth to restrictive feature: 18 to 34 inches to densic material
Drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 18 to 36 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 4.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: C
Ecological site: F144AY037MA - Moist Dense Till Uplands
Hydric soil rating: No

Minor Components

Ridgebury

Percent of map unit: 7 percent
Landform: Depressions
Hydric soil rating: Yes

Whitman

Percent of map unit: 3 percent
Landform: Depressions
Hydric soil rating: Yes

420B—Canton fine sandy loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2w81b
Elevation: 0 to 1,180 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: All areas are prime farmland

Map Unit Composition

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

Description of Canton

Setting

Landform: Hills, moraines, ridges

Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Nose slope, side slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Convex
Parent material: Coarse-loamy over sandy melt-out till derived from gneiss, granite, and/or schist

Typical profile

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

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: 19 to 39 inches to strongly contrasting textural stratification
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 2.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2s
Hydrologic Soil Group: B
Ecological site: F144AY034CT - Well Drained Till Uplands
Hydric soil rating: No

Minor Components

Scituate

Percent of map unit: 10 percent
Landform: Hills, drumlins, ground moraines
Landform position (two-dimensional): Summit, backslope, footslope
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Convex
Hydric soil rating: No

Montauk

Percent of map unit: 5 percent
Landform: Moraines, ground moraines, hills, drumlins
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Convex
Hydric soil rating: No

Charlton

Percent of map unit: 4 percent
Landform: Ridges, ground moraines, hills
Landform position (two-dimensional): Summit, shoulder, backslope

Landform position (three-dimensional): Side slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Convex
Hydric soil rating: No

Swansea

Percent of map unit: 1 percent
Landform: Marshes, depressions, bogs, swamps, kettles
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

421B—Canton fine sandy loam, 0 to 8 percent slopes, very stony

Map Unit Setting

National map unit symbol: 2w81l
Elevation: 0 to 1,180 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

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

Description of Canton, Very Stony

Setting

Landform: Moraines, hills, ridges
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Nose slope, side slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Convex
Parent material: Coarse-loamy over sandy melt-out till derived from gneiss, granite, and/or schist

Typical profile

Oi - 0 to 2 inches: slightly decomposed plant material
A - 2 to 5 inches: fine sandy loam
Bw1 - 5 to 16 inches: fine sandy loam
Bw2 - 16 to 22 inches: gravelly fine sandy loam
2C - 22 to 67 inches: gravelly loamy sand

Properties and qualities

Slope: 0 to 8 percent
Surface area covered with cobbles, stones or boulders: 1.6 percent
Depth to restrictive feature: 19 to 39 inches to strongly contrasting textural stratification
Drainage class: Well drained

Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 3.4 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: B
Ecological site: F144AY034CT - Well Drained Till Uplands
Hydric soil rating: No

Minor Components

Scituate, very stony
Percent of map unit: 9 percent
Landform: Hills, drumlins, ground moraines
Landform position (two-dimensional): Summit, backslope, footslope
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Convex
Hydric soil rating: No

Montauk, very stony
Percent of map unit: 5 percent
Landform: Recessionial moraines, ground moraines, hills, drumlins
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Convex
Hydric soil rating: No

Gloucester, very stony
Percent of map unit: 4 percent
Landform: Moraines, hills, ridges
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Convex
Hydric soil rating: No

Swansea
Percent of map unit: 2 percent
Landform: Marshes, depressions, bogs, swamps, kettles
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

422D—Canton fine sandy loam, 15 to 35 percent slopes, extremely stony

Map Unit Setting

National map unit symbol: 2w81j
Elevation: 0 to 1,340 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 145 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Canton, Extremely Stony

Setting

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

Typical profile

Oi - 0 to 2 inches: slightly decomposed plant material
A - 2 to 5 inches: fine sandy loam
Bw1 - 5 to 16 inches: fine sandy loam
Bw2 - 16 to 22 inches: gravelly fine sandy loam
2C - 22 to 67 inches: gravelly loamy sand

Properties and qualities

Slope: 15 to 35 percent
Surface area covered with cobbles, stones or boulders: 9.0 percent
Depth to restrictive feature: 19 to 39 inches to strongly contrasting textural stratification
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 3.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: B
Ecological site: F144AY034CT - Well Drained Till Uplands
Hydric soil rating: No

Minor Components

Charlton, extremely stony
Percent of map unit: 6 percent
Landform: Ridges, ground moraines, hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex, linear
Across-slope shape: Convex
Hydric soil rating: No

Montauk, extremely stony
Percent of map unit: 6 percent
Landform: Recessionial moraines, ground moraines, hills, drumlins
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex, linear
Across-slope shape: Convex
Hydric soil rating: No

Scituate, extremely stony
Percent of map unit: 4 percent
Landform: Ground moraines, hills, drumlins
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex, linear
Across-slope shape: Convex
Hydric soil rating: No

Hollis, extremely stony
Percent of map unit: 4 percent
Landform: Ridges, hills
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Nose slope, side slope, crest
Down-slope shape: Convex
Across-slope shape: Linear, convex
Hydric soil rating: No

622C—Paxton-Urban land complex, 3 to 15 percent slopes

Map Unit Setting
National map unit symbol: 2w67k
Elevation: 0 to 930 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 145 to 240 days

Farmland classification: Not prime farmland

Map Unit Composition

Paxton and similar soils: 45 percent
Urban land: 35 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Paxton

Setting

Landform: Ground moraines, hills, drumlins
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Convex
Parent material: Coarse-loamy lodgment till derived from gneiss, granite, and/or schist

Typical profile

Ap - 0 to 8 inches: fine sandy loam
Bw1 - 8 to 15 inches: fine sandy loam
Bw2 - 15 to 26 inches: fine sandy loam
Cd - 26 to 65 inches: gravelly fine sandy loam

Properties and qualities

Slope: 3 to 15 percent
Depth to restrictive feature: 20 to 39 inches to densic material
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)
Depth to water table: About 18 to 37 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 4.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Ecological site: F144AY007CT - Well Drained Dense Till Uplands
Hydric soil rating: No

Description of Urban Land

Typical profile

M - 0 to 10 inches: cemented material

Properties and qualities

Slope: 3 to 15 percent
Depth to restrictive feature: 0 inches to manufactured layer
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)
Available water supply, 0 to 60 inches: Very low (about 0.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydrologic Soil Group: D
Hydric soil rating: Unranked

Minor Components

Woodbridge

Percent of map unit: 9 percent
Landform: Ground moraines, hills, drumlins
Landform position (two-dimensional): Summit, backslope, footslope
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

Charlton

Percent of map unit: 6 percent
Landform: Hills
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Udorthents

Percent of map unit: 4 percent
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Ridgebury

Percent of map unit: 1 percent
Landform: Drumlins, depressions, ground moraines, hills, drainageways
Landform position (two-dimensional): Footslope, toeslope
Landform position (three-dimensional): Head slope, base slope
Down-slope shape: Concave, linear
Across-slope shape: Concave, linear
Hydric soil rating: Yes

Soil Information for All Uses

Soil Properties and Qualities

The Soil Properties and Qualities section includes various soil properties and qualities displayed as thematic maps with a summary table for the soil map units in the selected area of interest. A single value or rating for each map unit is generated by aggregating the interpretive ratings of individual map unit components. This aggregation process is defined for each property or quality.

Soil Qualities and Features

Soil qualities are behavior and performance attributes that are not directly measured, but are inferred from observations of dynamic conditions and from soil properties. Example soil qualities include natural drainage, and frost action. Soil features are attributes that are not directly part of the soil. Example soil features include slope and depth to restrictive layer. These features can greatly impact the use and management of the soil.

Hydrologic Soil Group

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:

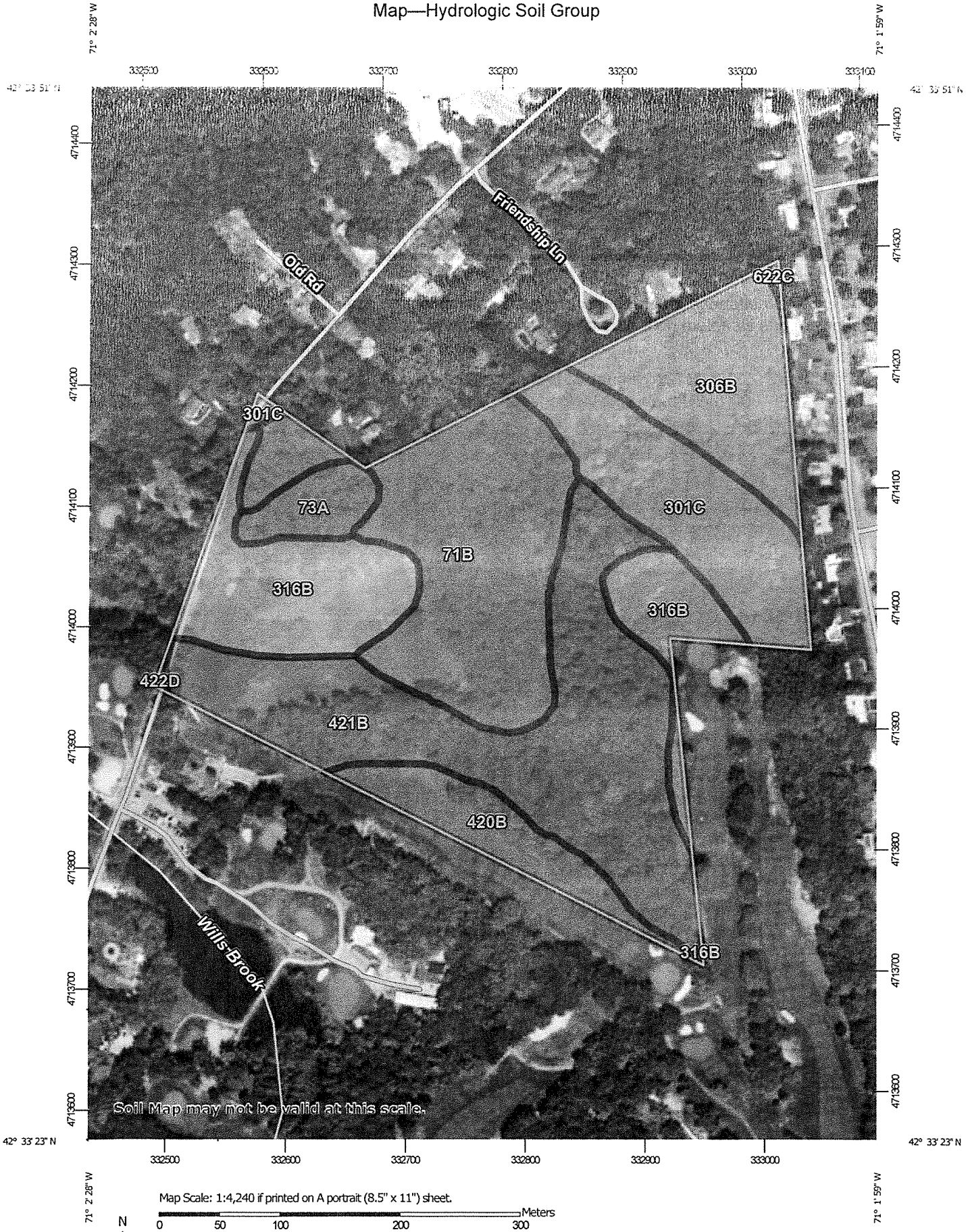
Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

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.



Map Scale: 1:4,240 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 50 100 200 300

Feet
0 200 400 800 1200

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 1:15,800.

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: Essex County, Massachusetts, Southern Part
Survey Area Data: Version 20, Sep 10, 2023

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

Date(s) aerial images were photographed: May 22, 2022—Jun 5, 2022

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.

Table—Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
71B	Ridgebury fine sandy loam, 3 to 8 percent slopes, extremely stony	D	9.5	22.2%
73A	Whitman fine sandy loam, 0 to 3 percent slopes, extremely stony	D	1.3	3.1%
301C	Montauk fine sandy loam, 8 to 15 percent slopes, very stony	C	5.5	12.8%
306B	Paxton fine sandy loam, 0 to 8 percent slopes, very stony	C	4.8	11.3%
316B	Scituate fine sandy loam, 3 to 8 percent slopes, very stony	C	6.5	15.1%
420B	Canton fine sandy loam, 3 to 8 percent slopes	B	2.6	6.1%
421B	Canton fine sandy loam, 0 to 8 percent slopes, very stony	B	12.5	29.2%
422D	Canton fine sandy loam, 15 to 35 percent slopes, extremely stony	B	0.0	0.1%
622C	Paxton-Urban land complex, 3 to 15 percent slopes	C	0.1	0.1%
Totals for Area of Interest			**42.8**	**100.0%**

Rating Options—Hydrologic Soil Group

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

References

American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.

American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deep-water habitats of the United States. U.S. Fish and Wildlife Service FWS/OBS-79/31.

Federal Register. July 13, 1994. Changes in hydric soils of the United States.

Federal Register. September 18, 2002. Hydric soils of the United States.

Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.

National Research Council. 1995. Wetlands: Characteristics and boundaries.

Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_054262

Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service, U.S. Department of Agriculture Handbook 436. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053577

Soil Survey Staff. 2010. Keys to soil taxonomy. 11th edition. U.S. Department of Agriculture, Natural Resources Conservation Service. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053580

Tiner, R.W., Jr. 1985. Wetlands of Delaware. U.S. Fish and Wildlife Service and Delaware Department of Natural Resources and Environmental Control, Wetlands Section.

United States Army Corps of Engineers, Environmental Laboratory. 1987. Corps of Engineers wetlands delineation manual. Waterways Experiment Station Technical Report Y-87-1.

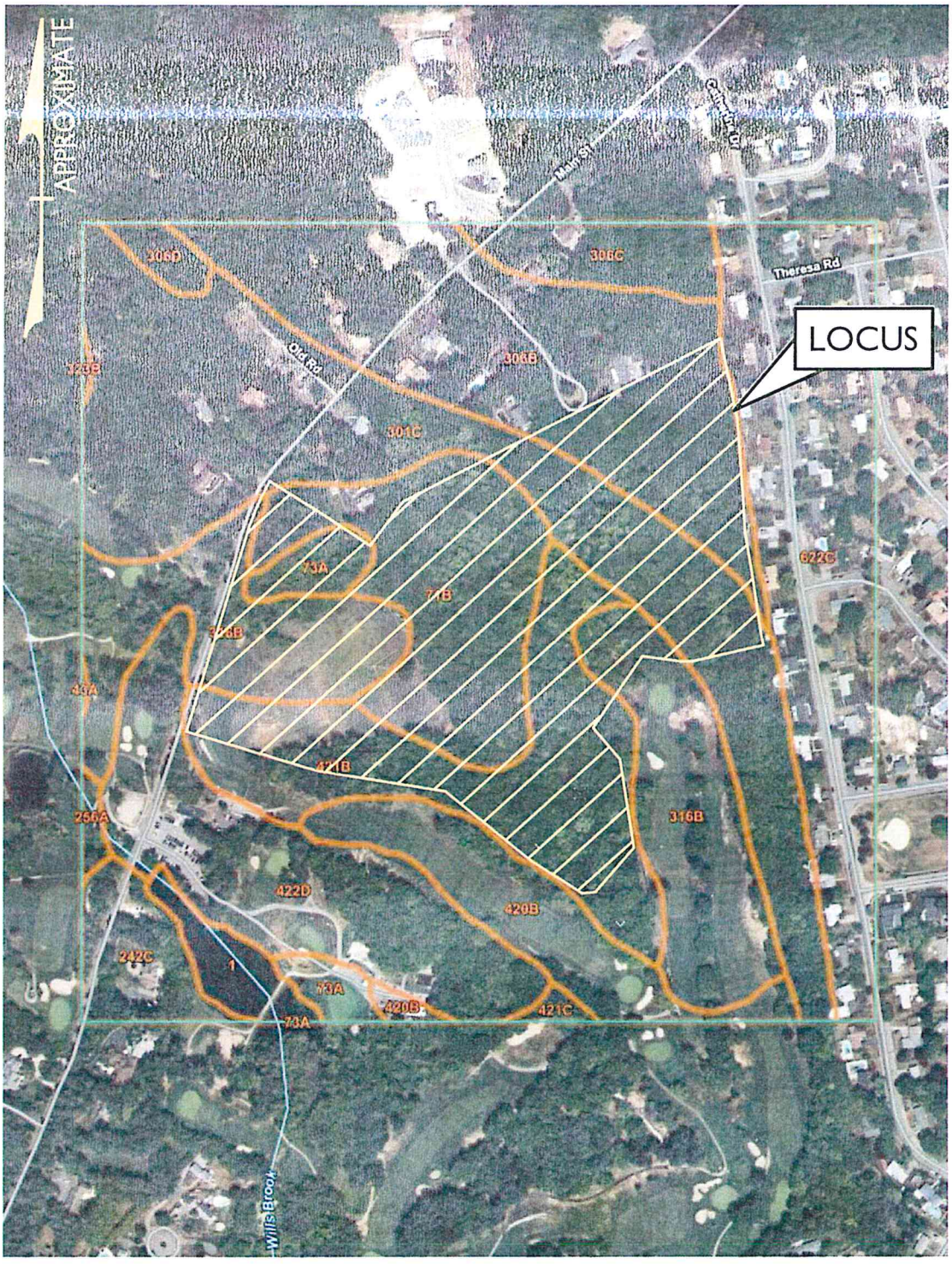
United States Department of Agriculture, Natural Resources Conservation Service. National forestry manual. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/home/?cid=nrcs142p2_053374

United States Department of Agriculture, Natural Resources Conservation Service. National range and pasture handbook. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/landuse/rangepasture/?cid=stelprdb1043084

United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/scientists/?cid=nrcs142p2_054242

United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053624

United States Department of Agriculture, Soil Conservation Service. 1961. Land capability classification. U.S. Department of Agriculture Handbook 210. http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_052290.pdf



THE MORIN-CAMERON GROUP, INC. 66 ELM STREET, DANVERS, MA 01923 **P | 978.777.8586** WWW.MORINCAMERON.COM		SCS SOILS MAP 1301 MAIN STREET IN LYNNFIELD, MA
DATE: NOVEMBER 30, 2023	SCALE: 1" = 100'	**FIGURE 3**

FEMA MAP No: 25009C0391F

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66 ELM STREET, DANVERS, MA 01923

P | 978.777.8586

WWW.MORINCAMERON.COM

FEMA FLOOD MAP
1301 MAIN STREET
IN
LYNNFIELD, MA

DATE: NOVEMBER 30, 2023

Scale: 1" = 1,000'

FIGURE 4

0 500 1000 2000

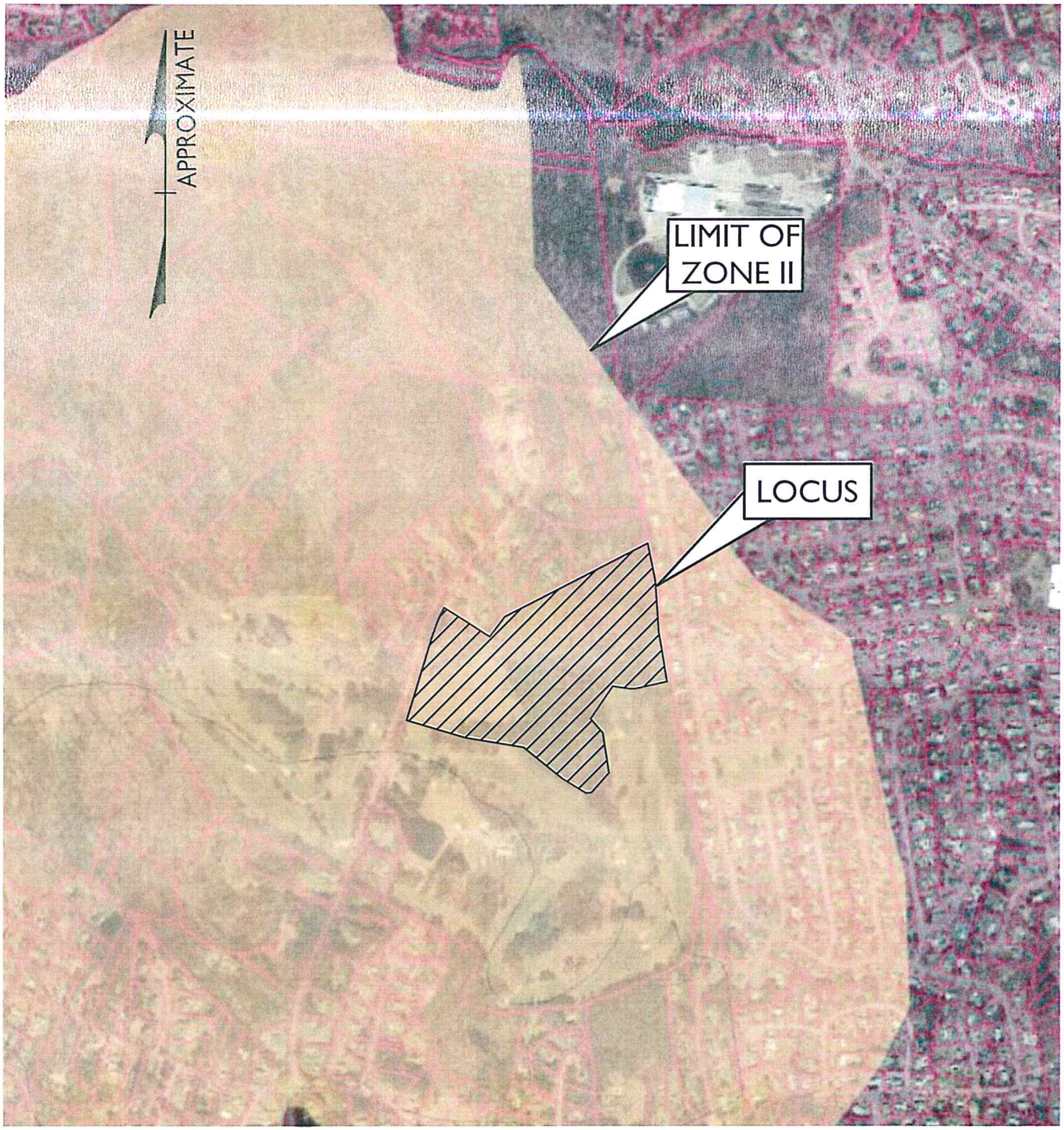
ORTHO IMAGERY OBTAINED FROM MASS GIS

NOTE: NO NHESP HABITATS OF RARE WILDLIFE OR SPECIES EXIST WITHIN THE SITE

THE MORIN-CAMERON GROUP, INC.
66 ELM STREET, DANVERS, MA 01923
P | 978.777.8586
WWW.MORINCAMERON.COM

NHESP MAP
1301 MAIN STREET
IN
LYNNFIELD, MA

DATE: NOVEMBER 30, 2023 | Scale: 1" = 1,000' | **FIGURE 5**



0 500 1000 2000

ZONE II MAPPING OBTAINED FROM MASS GIS

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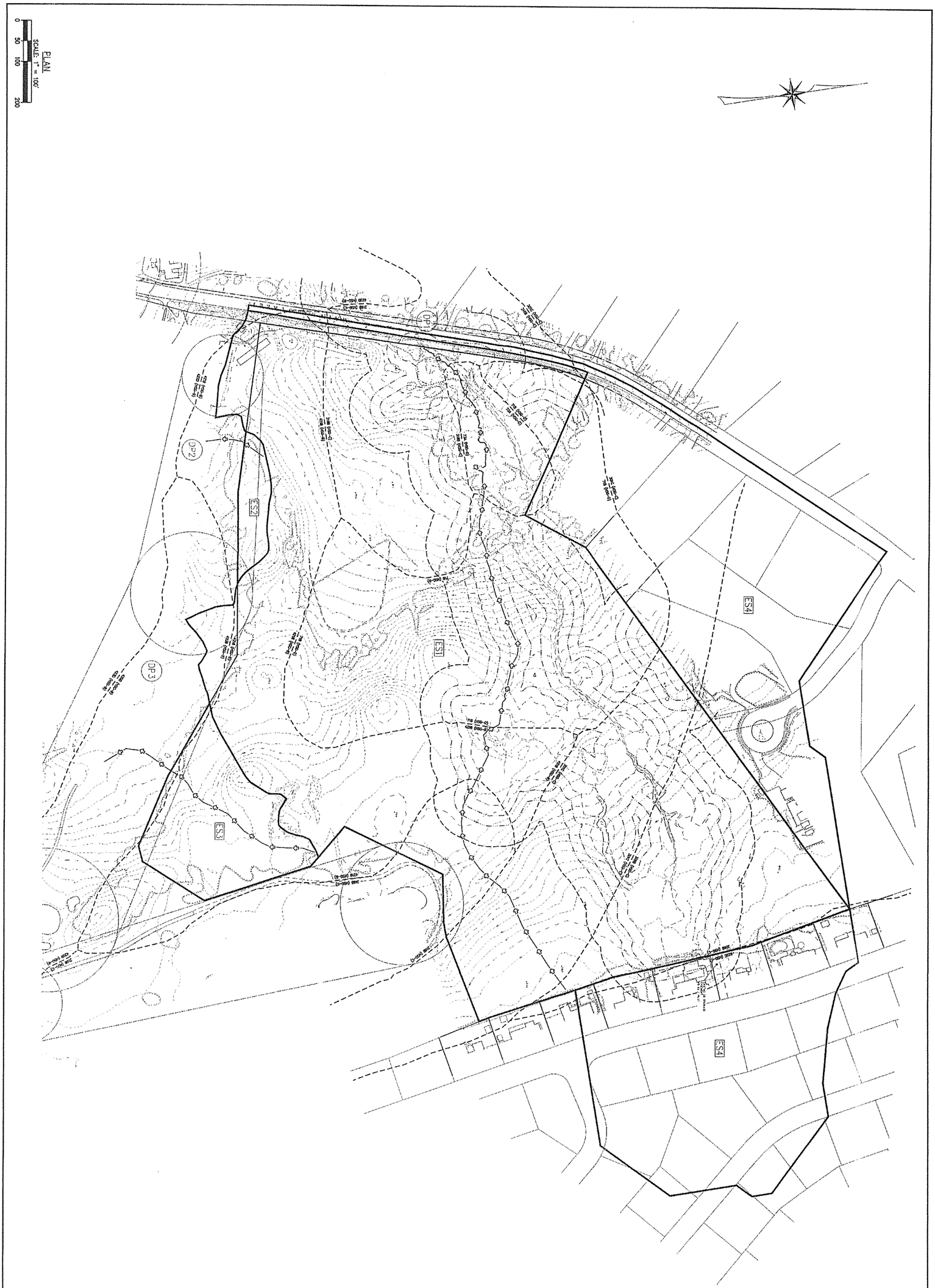
WPA ZONE II MAP
1301 MAIN STREET
IN
LYNNFIELD, MA

DATE: NOVEMBER 30, 2023 | Scale: 1" = 1,000' | **FIGURE 6**



EXISTING CONDITIONS WATERSHEDS

FIGURE 7

EXISTING CONDITIONS WATERSHED FIGURE

LOCATED AT
1301 MAIN STREET
LYNNFIELD, MASSACHUSETTS
(PORTION OF ASSESSOR'S MAP 13, PARCEL 1000)
PREPARED FOR:
TOLL BROS., INC.

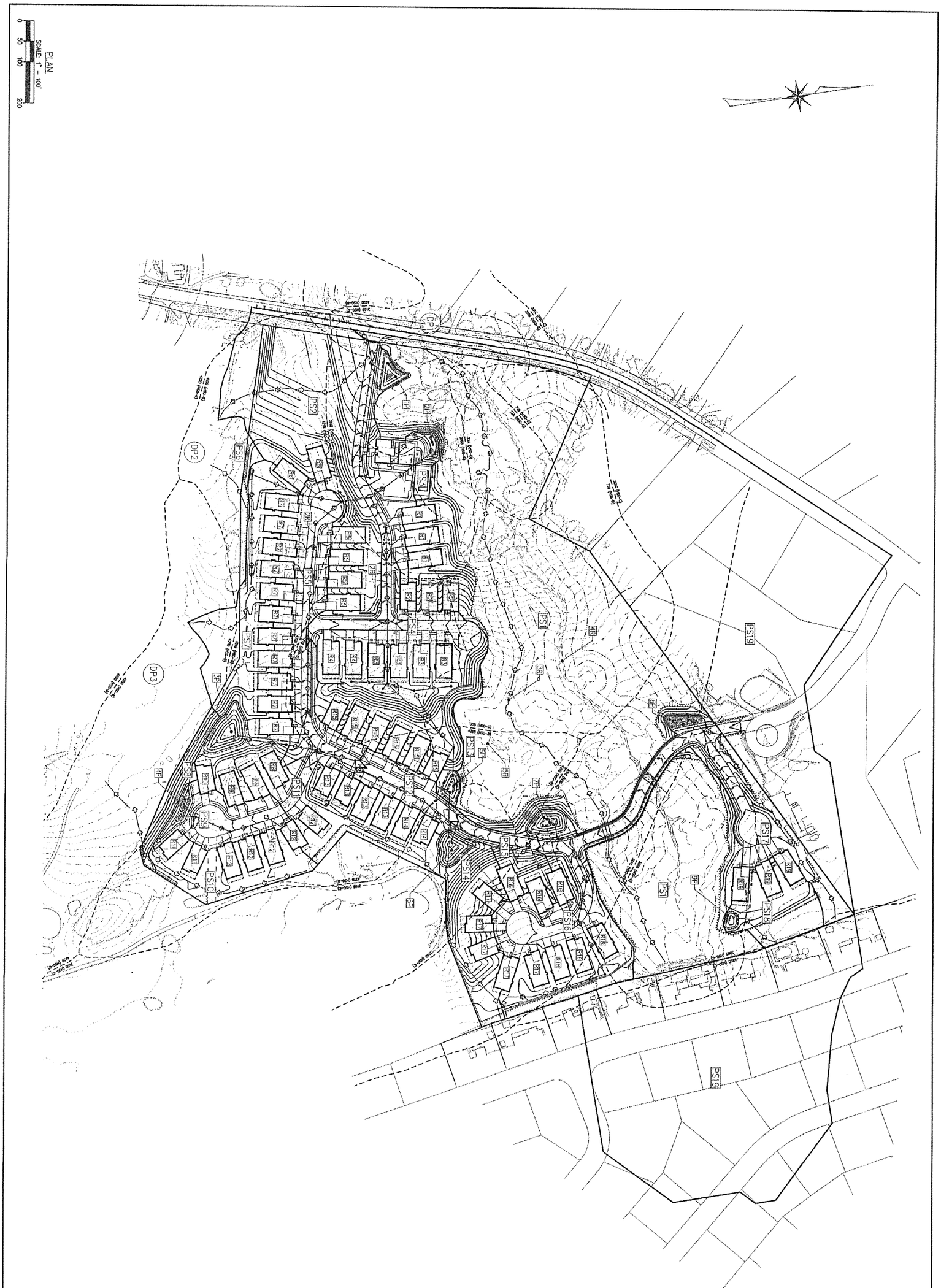
REVISIONS		
NO.	DESCRIPTION	DATE

SURVEY BY: ESE
DRAFTED BY: DJP
CHECKED BY: SPC
APPROVED BY: SPC
SCALE: AS NOTED
DATE: NOVEMBER 30, 2023

SCOTT E. CAMERON
CIVIL
No. 47601
REGISTERED
PROFESSIONAL ENGINEER
COMMONWEALTH OF MASSACHUSETTS
11/30/23

The Morin-Cameron GROUP, INC.
CIVIL ENGINEERS | ENVIRONMENTAL CONSULTANTS
LAND SURVEYORS | LAND USE PLANNERS
66 ELM STREET, DANVERS, MASSACHUSETTS 01923
P: 978-777-8586, W: WWW.MORINCAMERON.COM

PROJ. #471



PROPOSED CONDITIONS WATERSHEDS FIGURE 8	PROPOSED CONDITIONS WATERSHED FIGURE LOCATED AT 1301 MAIN STREET LYNNFIELD, MASSACHUSETTS (PORTION OF ASSESSOR'S MAP 13, PARCEL 1000) PREPARED FOR: TOLL BROS., INC.	REVISIONS NO. DESCRIPTION DATE	SURVEY BY: FSF DRAFTED BY: DJP CHECKED BY: SPC APPROVED BY: SPC SCALE: AS NOTED DATE: NOVEMBER 30, 2023	SCOTT P. CAMERON CIVIL NO. 47601 REGISTERED PROFESSIONAL ENGINEER 11/30/23	The Morin-Cameron GROUP, INC. CIVIL ENGINEERS | ENVIRONMENTAL CONSULTANTS LAND SURVEYORS | LAND USE PLANNERS 66 ELM STREET, DANVERS, MASSACHUSETTS 01923 P: 978-777-0586, W: WWW.MORINCAMERON.COM

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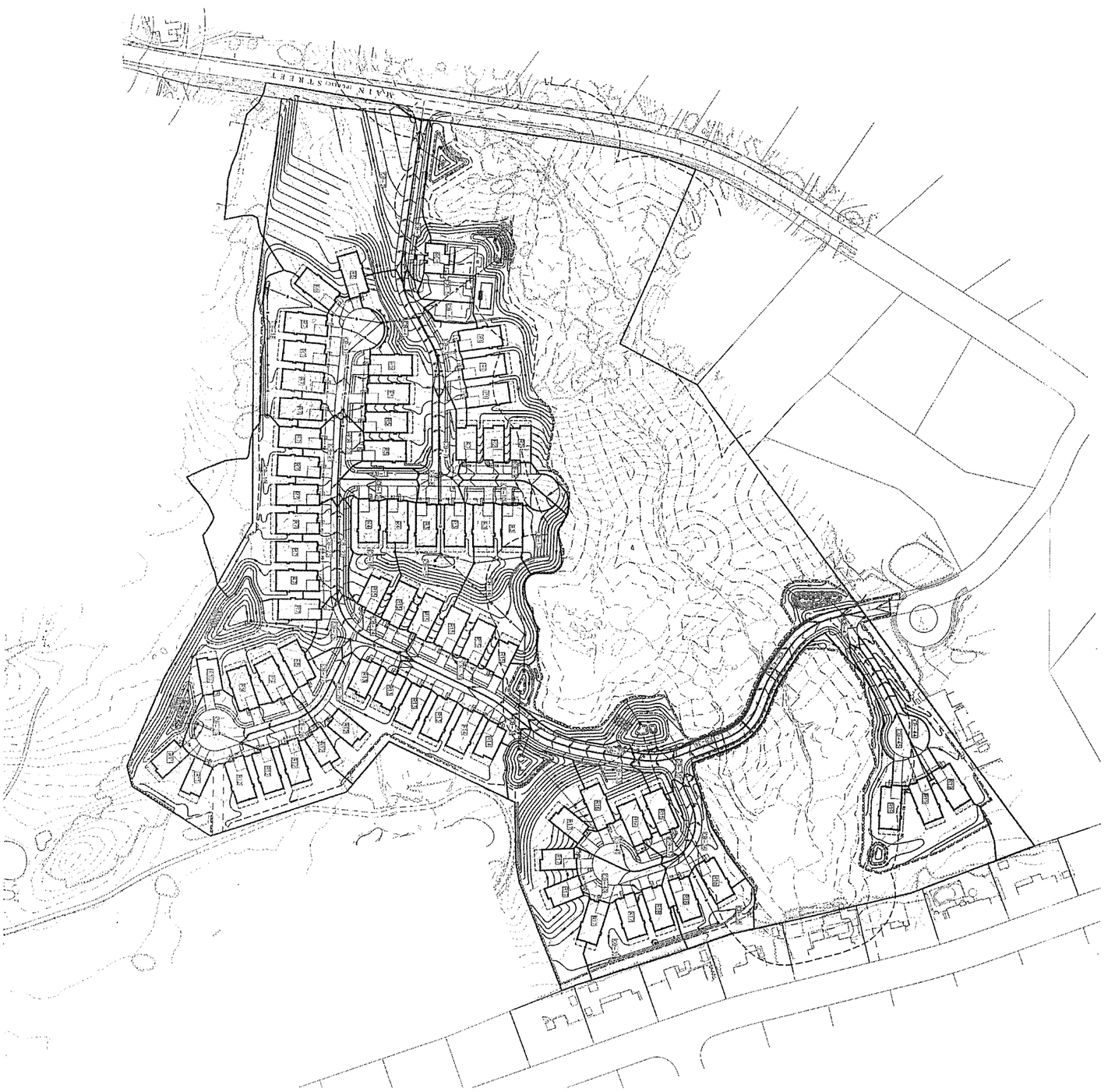
PLAN
SCALE: 1" = 100'
0 50 100 200



PIPE SIZING WATERSHEDS FIGURE 9	PIPE SIZING CALCULATION WATERSHED FIGURE LOCATED AT 1301 MAIN STREET LYNNFIELD, MASSACHUSETTS (PORTION OF ASSESSOR'S MAP 13, PARCEL 1000) PREPARED FOR: TOLL BROS., INC.	REVISIONS NO. DESCRIPTION DATE	SURVEY BY: ESE DRAFTED BY: DJP CHECKED BY: SPC APPROVED BY: SPC SCALE: AS NOTED DATE: NOVEMBER 30, 2023	SCOTT P. CAMERON CIVIL No. 47601 REGISTERED COMMONWEALTH OF MASSACHUSETTS PROFESSIONAL ENGINEER	The Morin-Cameron GROUP, INC. CIVIL ENGINEERS | ENVIRONMENTAL CONSULTANTS LAND SURVEYORS | LAND USE PLANNERS 66 ELM STREET, DANVERS, MASSACHUSETTS 01923 P: 978-777-8586, W: WWW.MORINCAMERON.COM

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APPENDIX A:

MASSDEP STORMWATER

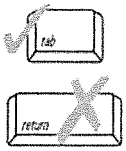
MANAGEMENT REPORT CHECKLIST

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.

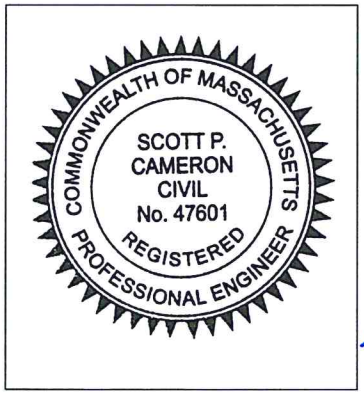
Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the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



11/30/23

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) (Reduced Pavement)
- ☐ 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): Hydrodynamic Separators

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;

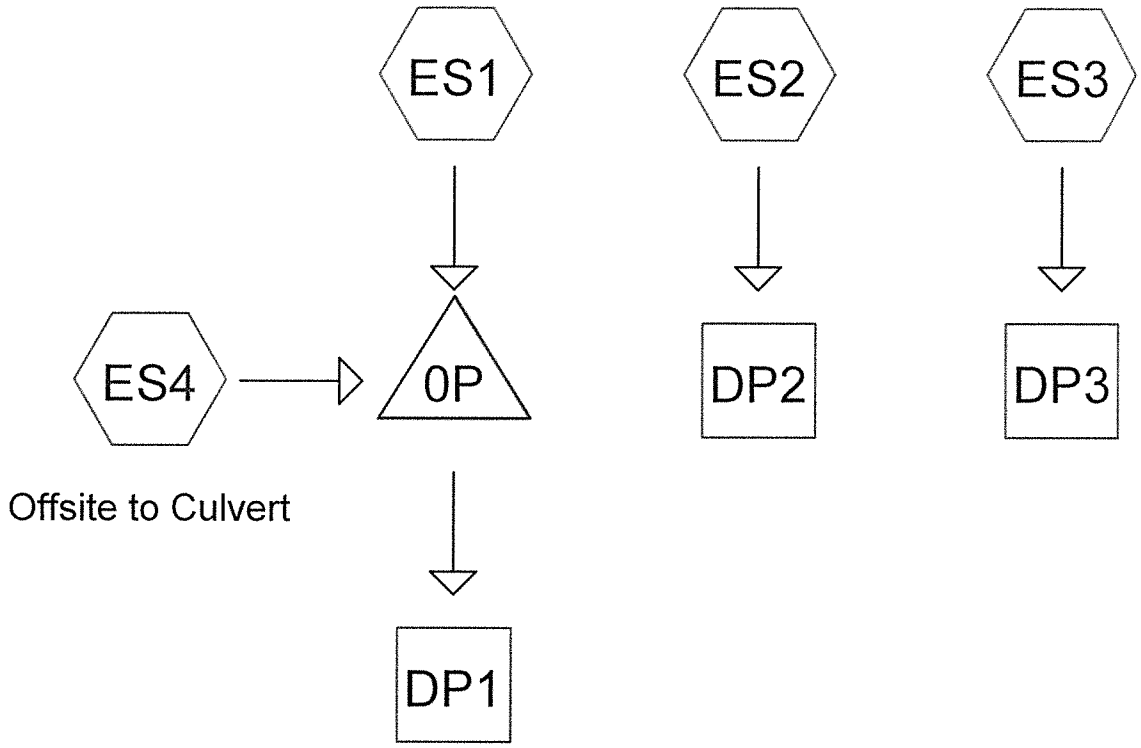
☒ An Illicit Discharge Compliance Statement is attached;

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

APPENDIX B:

EXISTING CONDITIONS

HYDROLOGIC ANALYSIS



Subcat Reach Pond Link

Routing Diagram for Sagamore Existing Hydrologic Analysis
Prepared by The Morin-Cameron Group, Inc, Printed 11/30/2023

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
515,359	83	1/4 acre lots, 38% imp, HSG C (ES4)
40,722	87	1/4 acre lots, 38% imp, HSG D (ES4)
148,438	61	>75% Grass cover, Good, HSG B (ES1, ES2, ES3)
168,793	74	>75% Grass cover, Good, HSG C (ES1)
70,258	80	>75% Grass cover, Good, HSG D (ES1)
2,730	98	Paved roads w/curbs & sewers, HSG B (ES4)
48,408	98	Paved roads w/curbs & sewers, HSG C (ES4)
3,062	98	Unconnected pavement, HSG B (ES1)
2,622	98	Unconnected pavement, HSG C (ES1)
76	98	Unconnected pavement, HSG D (ES1)
125	98	Unconnected roofs, HSG B (ES1)
29,959	98	Water Surface, 0% imp, HSG B (ES1)
105,583	98	Water Surface, 0% imp, HSG C (ES1)
102,060	98	Water Surface, 0% imp, HSG D (ES1)
310,383	55	Woods, Good, HSG B (ES1, ES2, ES3)
540,483	70	Woods, Good, HSG C (ES1, ES4)
316,173	77	Woods, Good, HSG D (ES1, ES4)
2,405,234	**76**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
0	HSG A	
494,697	HSG B	ES1, ES2, ES3, ES4
1,381,248	HSG C	ES1, ES4
529,289	HSG D	ES1, ES4
0	Other	
2,405,234		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover
0	0	515,359	40,722	0	556,081	1/4 acre lots, 38% imp
0	148,438	168,793	70,258	0	387,489	>75% Grass cover, Good
0	2,730	48,408	0	0	51,138	Paved roads w/curbs & sewers
0	3,062	2,622	76	0	5,760	Unconnected pavement
0	125	0	0	0	125	Unconnected roofs
0	29,959	105,583	102,060	0	237,602	Water Surface, 0% imp
0	310,383	540,483	316,173	0	1,167,039	Woods, Good
0	**494,697**	**1,381,248**	**529,289**	**0**	**2,405,234**	**TOTAL AREA**

Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 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 ES1: Runoff Area=1,493,872 sf 0.39% Impervious Runoff Depth=1.00"
Flow Length=1,834' Tc=18.2 min CN=74 Runoff=24.1 cfs 125,084 cf

Subcatchment ES2: Runoff Area=22,292 sf 0.00% Impervious Runoff Depth=0.26"
Flow Length=152' Tc=8.5 min CN=56 Runoff=0.0 cfs 491 cf

Subcatchment ES3: Runoff Area=106,081 sf 0.00% Impervious Runoff Depth=0.26"
Flow Length=607' Tc=12.6 min CN=56 Runoff=0.2 cfs 2,335 cf

Subcatchment ES4: Offsite to Culvert Runoff Area=782,989 sf 33.52% Impervious Runoff Depth=1.50"
Tc=30.0 min CN=82 Runoff=15.4 cfs 97,744 cf

Reach DP1: Inflow=37.1 cfs 222,827 cf
Outflow=37.1 cfs 222,827 cf

Reach DP2: Inflow=0.0 cfs 491 cf
Outflow=0.0 cfs 491 cf

Reach DP3: Inflow=0.2 cfs 2,335 cf
Outflow=0.2 cfs 2,335 cf

Pond 0P: Peak Elev=92.79' Storage=355 cf Inflow=37.1 cfs 222,827 cf
Outflow=37.1 cfs 222,827 cf

Total Runoff Area = 2,405,234 sf Runoff Volume = 225,653 cf Average Runoff Depth = 1.13"
88.84% Pervious = 2,136,900 sf 11.16% Impervious = 268,334 sf

Summary for Subcatchment ES1:

Runoff = 24.1 cfs @ 12.28 hrs, Volume= 125,084 cf, Depth= 1.00"
Routed to Pond 0P :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 2-Year Rainfall=3.15"

Area (sf)	CN	Description
130,733	61	>75% Grass cover, Good, HSG B
168,793	74	>75% Grass cover, Good, HSG C
70,258	80	>75% Grass cover, Good, HSG D
199,715	55	Woods, Good, HSG B
400,575	70	Woods, Good, HSG C
280,311	77	Woods, Good, HSG D
125	98	Unconnected roofs, HSG B
3,062	98	Unconnected pavement, HSG B
2,622	98	Unconnected pavement, HSG C
76	98	Unconnected pavement, HSG D
29,959	98	Water Surface, 0% imp, HSG B
105,583	98	Water Surface, 0% imp, HSG C
102,060	98	Water Surface, 0% imp, HSG D
1,493,872	74	Weighted Average
1,487,987		99.61% Pervious Area
5,885		0.39% Impervious Area
5,885		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	50	0.0400	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
0.5	77	0.0260	2.60		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.0	302	0.0990	5.07		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
2.9	392	0.0200	2.28		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.4	417	0.1010	5.12		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
2.9	596	0.0450	3.42		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
18.2	1,834	Total			

Summary for Subcatchment ES2:

Runoff = 0.0 cfs @ 12.23 hrs, Volume= 491 cf, Depth= 0.26"
Routed to Reach DP2 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 2-Year Rainfall=3.15"

Area (sf)	CN	Description
3,056	61	>75% Grass cover, Good, HSG B
19,236	55	Woods, Good, HSG B
22,292	56	Weighted Average
22,292		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.1	50	0.0600	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
0.4	102	0.0686	4.22		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
8.5	152	Total			

Summary for Subcatchment ES3:

Runoff = 0.2 cfs @ 12.31 hrs, Volume= 2,335 cf, Depth= 0.26"
Routed to Reach DP3 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 2-Year Rainfall=3.15"

Area (sf)	CN	Description
14,649	61	>75% Grass cover, Good, HSG B
91,432	55	Woods, Good, HSG B
106,081	56	Weighted Average
106,081		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	50	0.0400	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
1.2	189	0.0260	2.60		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.7	181	0.0660	4.14		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.2	187	0.0260	2.60		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
12.6	607	Total			

Summary for Subcatchment ES4: Offsite to Culvert

Runoff = 15.4 cfs @ 12.43 hrs, Volume= 97,744 cf, Depth= 1.50"
Routed to Pond 0P :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 2-Year Rainfall=3.15"

Area (sf)	CN	Description
2,730	98	Paved roads w/curbs & sewers, HSG B
48,408	98	Paved roads w/curbs & sewers, HSG C
515,359	83	1/4 acre lots, 38% imp, HSG C
40,722	87	1/4 acre lots, 38% imp, HSG D
139,908	70	Woods, Good, HSG C
35,862	77	Woods, Good, HSG D
782,989	82	Weighted Average
520,540		66.48% Pervious Area
262,449		33.52% Impervious Area

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

Summary for Reach DP1:

Inflow Area = 2,276,861 sf, 11.79% Impervious, Inflow Depth = 1.17" for 2-Year event
Inflow = 37.1 cfs @ 12.33 hrs, Volume= 222,827 cf
Outflow = 37.1 cfs @ 12.33 hrs, Volume= 222,827 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Summary for Reach DP2:

Inflow Area = 22,292 sf, 0.00% Impervious, Inflow Depth = 0.26" for 2-Year event
Inflow = 0.0 cfs @ 12.23 hrs, Volume= 491 cf
Outflow = 0.0 cfs @ 12.23 hrs, Volume= 491 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Summary for Reach DP3:

Inflow Area = 106,081 sf, 0.00% Impervious, Inflow Depth = 0.26" for 2-Year event
Inflow = 0.2 cfs @ 12.31 hrs, Volume= 2,335 cf
Outflow = 0.2 cfs @ 12.31 hrs, Volume= 2,335 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Summary for Pond 0P:

Inflow Area = 2,276,861 sf, 11.79% Impervious, Inflow Depth = 1.17" for 2-Year event
Inflow = 37.1 cfs @ 12.32 hrs, Volume= 222,827 cf
Outflow = 37.1 cfs @ 12.33 hrs, Volume= 222,827 cf, Atten= 0%, Lag= 0.5 min
Primary = 37.1 cfs @ 12.33 hrs, Volume= 222,827 cf
Routed to Reach DP1 :

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Peak Elev= 92.79' @ 12.33 hrs Surf.Area= 229 sf Storage= 355 cf

Plug-Flow detention time= 0.1 min calculated for 222,766 cf (100% of inflow)
Center-of-Mass det. time= 0.1 min (897.9 - 897.8)

Volume	Invert	Avail.Storage	Storage Description
#1	89.08'	452,475 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
89.08	10	10.0	0	0	10
93.00	250	50.0	405	405	234
94.00	904	185.2	543	948	2,768
96.00	2,293	261.0	3,091	4,039	5,496
98.00	6,945	557.5	8,819	12,858	24,825
100.00	23,209	885.0	28,567	41,425	62,447
102.00	37,519	1,050.6	60,158	101,583	88,028
104.00	50,433	1,310.8	87,634	189,217	136,980
106.00	65,230	1,557.1	115,346	304,563	193,264
108.00	83,039	1,761.9	147,911	452,475	247,457

Device	Routing	Invert	Outlet Devices
#1	Primary	89.08'	**30.0" Round Culvert** L= 60.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 89.08' / 87.52' S= 0.0260 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 4.91 sf
#2	Primary	98.50'	**100.0' long x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=37.1 cfs @ 12.33 hrs HW=92.79' TW=0.00' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 37.1 cfs @ 7.55 fps)
└—**2=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 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 ES1: Runoff Area=1,493,872 sf 0.39% Impervious Runoff Depth=2.23"
Flow Length=1,834' Tc=18.2 min CN=74 Runoff=56.1 cfs 277,539 cf

Subcatchment ES2: Runoff Area=22,292 sf 0.00% Impervious Runoff Depth=0.96"
Flow Length=152' Tc=8.5 min CN=56 Runoff=0.4 cfs 1,775 cf

Subcatchment ES3: Runoff Area=106,081 sf 0.00% Impervious Runoff Depth=0.96"
Flow Length=607' Tc=12.6 min CN=56 Runoff=1.7 cfs 8,444 cf

Subcatchment ES4: Offsite to Culvert Runoff Area=782,989 sf 33.52% Impervious Runoff Depth=2.93"
Tc=30.0 min CN=82 Runoff=30.3 cfs 191,015 cf

Reach DP1: Inflow=66.6 cfs 468,554 cf
Outflow=66.6 cfs 468,554 cf

Reach DP2: Inflow=0.4 cfs 1,775 cf
Outflow=0.4 cfs 1,775 cf

Reach DP3: Inflow=1.7 cfs 8,444 cf
Outflow=1.7 cfs 8,444 cf

Pond 0P: Peak Elev=98.27' Storage=14,941 cf Inflow=81.4 cfs 468,554 cf
Outflow=66.6 cfs 468,554 cf

Total Runoff Area = 2,405,234 sf Runoff Volume = 478,774 cf Average Runoff Depth = 2.39"
88.84% Pervious = 2,136,900 sf 11.16% Impervious = 268,334 sf

Summary for Subcatchment ES1:

Runoff = 56.1 cfs @ 12.27 hrs, Volume= 277,539 cf, Depth= 2.23"
Routed to Pond 0P :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 10-Year Rainfall=4.83"

Area (sf)	CN	Description
130,733	61	>75% Grass cover, Good, HSG B
168,793	74	>75% Grass cover, Good, HSG C
70,258	80	>75% Grass cover, Good, HSG D
199,715	55	Woods, Good, HSG B
400,575	70	Woods, Good, HSG C
280,311	77	Woods, Good, HSG D
125	98	Unconnected roofs, HSG B
3,062	98	Unconnected pavement, HSG B
2,622	98	Unconnected pavement, HSG C
76	98	Unconnected pavement, HSG D
29,959	98	Water Surface, 0% imp, HSG B
105,583	98	Water Surface, 0% imp, HSG C
102,060	98	Water Surface, 0% imp, HSG D
1,493,872	74	Weighted Average
1,487,987		99.61% Pervious Area
5,885		0.39% Impervious Area
5,885		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	50	0.0400	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
0.5	77	0.0260	2.60		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.0	302	0.0990	5.07		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
2.9	392	0.0200	2.28		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.4	417	0.1010	5.12		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
2.9	596	0.0450	3.42		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
18.2	1,834	Total			

Summary for Subcatchment ES2:

Runoff = 0.4 cfs @ 12.17 hrs, Volume= 1,775 cf, Depth= 0.96"
Routed to Reach DP2 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 10-Year Rainfall=4.83"

Area (sf)	CN	Description
3,056	61	>75% Grass cover, Good, HSG B
19,236	55	Woods, Good, HSG B
22,292	56	Weighted Average
22,292		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.1	50	0.0600	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
0.4	102	0.0686	4.22		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
8.5	152	Total			

Summary for Subcatchment ES3:

Runoff = 1.7 cfs @ 12.22 hrs, Volume= 8,444 cf, Depth= 0.96"
Routed to Reach DP3 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 10-Year Rainfall=4.83"

Area (sf)	CN	Description
14,649	61	>75% Grass cover, Good, HSG B
91,432	55	Woods, Good, HSG B
106,081	56	Weighted Average
106,081		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	50	0.0400	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
1.2	189	0.0260	2.60		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.7	181	0.0660	4.14		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.2	187	0.0260	2.60		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
12.6	607	Total			

Summary for Subcatchment ES4: Offsite to Culvert

Runoff = 30.3 cfs @ 12.43 hrs, Volume= 191,015 cf, Depth= 2.93"
Routed to Pond 0P :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 10-Year Rainfall=4.83"

Area (sf)	CN	Description
2,730	98	Paved roads w/curbs & sewers, HSG B
48,408	98	Paved roads w/curbs & sewers, HSG C
515,359	83	1/4 acre lots, 38% imp, HSG C
40,722	87	1/4 acre lots, 38% imp, HSG D
139,908	70	Woods, Good, HSG C
35,862	77	Woods, Good, HSG D
782,989	82	Weighted Average
520,540		66.48% Pervious Area
262,449		33.52% Impervious Area

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

Summary for Reach DP1:

Inflow Area = 2,276,861 sf, 11.79% Impervious, Inflow Depth = 2.47" for 10-Year event
Inflow = 66.6 cfs @ 12.45 hrs, Volume= 468,554 cf
Outflow = 66.6 cfs @ 12.45 hrs, Volume= 468,554 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Summary for Reach DP2:

Inflow Area = 22,292 sf, 0.00% Impervious, Inflow Depth = 0.96" for 10-Year event
Inflow = 0.4 cfs @ 12.17 hrs, Volume= 1,775 cf
Outflow = 0.4 cfs @ 12.17 hrs, Volume= 1,775 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Summary for Reach DP3:

Inflow Area = 106,081 sf, 0.00% Impervious, Inflow Depth = 0.96" for 10-Year event
Inflow = 1.7 cfs @ 12.22 hrs, Volume= 8,444 cf
Outflow = 1.7 cfs @ 12.22 hrs, Volume= 8,444 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Summary for Pond 0P:

Inflow Area = 2,276,861 sf, 11.79% Impervious, Inflow Depth = 2.47" for 10-Year event
Inflow = 81.4 cfs @ 12.31 hrs, Volume= 468,554 cf
Outflow = 66.6 cfs @ 12.45 hrs, Volume= 468,554 cf, Atten= 18%, Lag= 8.7 min
Primary = 66.6 cfs @ 12.45 hrs, Volume= 468,554 cf
Routed to Reach DP1 :

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Peak Elev= 98.27' @ 12.45 hrs Surf.Area= 8,577 sf Storage= 14,941 cf

Plug-Flow detention time= 0.8 min calculated for 468,424 cf (100% of inflow)
Center-of-Mass det. time= 0.8 min (871.2 - 870.4)

Volume	Invert	Avail.Storage	Storage Description
#1	89.08'	452,475 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
89.08	10	10.0	0	0	10
93.00	250	50.0	405	405	234
94.00	904	185.2	543	948	2,768
96.00	2,293	261.0	3,091	4,039	5,496
98.00	6,945	557.5	8,819	12,858	24,825
100.00	23,209	885.0	28,567	41,425	62,447
102.00	37,519	1,050.6	60,158	101,583	88,028
104.00	50,433	1,310.8	87,634	189,217	136,980
106.00	65,230	1,557.1	115,346	304,563	193,264
108.00	83,039	1,761.9	147,911	452,475	247,457

Device	Routing	Invert	Outlet Devices
#1	Primary	89.08'	**30.0" Round Culvert** L= 60.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 89.08' / 87.52' S= 0.0260 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 4.91 sf
#2	Primary	98.50'	**100.0' long x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=66.6 cfs @ 12.45 hrs HW=98.27' TW=0.00' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 66.6 cfs @ 13.57 fps)
└—**2=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 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 ES1: Runoff Area=1,493,872 sf 0.39% Impervious Runoff Depth=5.77"
Flow Length=1,834' Tc=18.2 min CN=74 Runoff=145.2 cfs 718,843 cf

Subcatchment ES2: Runoff Area=22,292 sf 0.00% Impervious Runoff Depth=3.57"
Flow Length=152' Tc=8.5 min CN=56 Runoff=1.8 cfs 6,625 cf

Subcatchment ES3: Runoff Area=106,081 sf 0.00% Impervious Runoff Depth=3.57"
Flow Length=607' Tc=12.6 min CN=56 Runoff=7.4 cfs 31,524 cf

Subcatchment ES4: Offsite to Culvert Runoff Area=782,989 sf 33.52% Impervious Runoff Depth=6.76"
Tc=30.0 min CN=82 Runoff=68.0 cfs 440,846 cf

Reach DP1: Inflow=201.4 cfs 1,159,688 cf
Outflow=201.4 cfs 1,159,688 cf

Reach DP2: Inflow=1.8 cfs 6,625 cf
Outflow=1.8 cfs 6,625 cf

Reach DP3: Inflow=7.4 cfs 31,524 cf
Outflow=7.4 cfs 31,524 cf

Pond 0P: Peak Elev=99.12' Storage=24,784 cf Inflow=201.8 cfs 1,159,688 cf
Outflow=201.4 cfs 1,159,688 cf

Total Runoff Area = 2,405,234 sf Runoff Volume = 1,197,837 cf Average Runoff Depth = 5.98"
88.84% Pervious = 2,136,900 sf 11.16% Impervious = 268,334 sf

Summary for Subcatchment ES1:

Runoff = 145.2 cfs @ 12.27 hrs, Volume= 718,843 cf, Depth= 5.77"
Routed to Pond 0P :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 100-Year Rainfall=8.94"

Area (sf)	CN	Description
130,733	61	>75% Grass cover, Good, HSG B
168,793	74	>75% Grass cover, Good, HSG C
70,258	80	>75% Grass cover, Good, HSG D
199,715	55	Woods, Good, HSG B
400,575	70	Woods, Good, HSG C
280,311	77	Woods, Good, HSG D
125	98	Unconnected roofs, HSG B
3,062	98	Unconnected pavement, HSG B
2,622	98	Unconnected pavement, HSG C
76	98	Unconnected pavement, HSG D
29,959	98	Water Surface, 0% imp, HSG B
105,583	98	Water Surface, 0% imp, HSG C
102,060	98	Water Surface, 0% imp, HSG D
1,493,872	74	Weighted Average
1,487,987		99.61% Pervious Area
5,885		0.39% Impervious Area
5,885		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	50	0.0400	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
0.5	77	0.0260	2.60		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.0	302	0.0990	5.07		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
2.9	392	0.0200	2.28		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.4	417	0.1010	5.12		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
2.9	596	0.0450	3.42		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
18.2	1,834	Total			

Summary for Subcatchment ES2:

Runoff = 1.8 cfs @ 12.16 hrs, Volume= 6,625 cf, Depth= 3.57"
Routed to Reach DP2 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 100-Year Rainfall=8.94"

Area (sf)	CN	Description
3,056	61	>75% Grass cover, Good, HSG B
19,236	55	Woods, Good, HSG B
22,292	56	Weighted Average
22,292		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.1	50	0.0600	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
0.4	102	0.0686	4.22		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
8.5	152	Total			

Summary for Subcatchment ES3:

Runoff = 7.4 cfs @ 12.21 hrs, Volume= 31,524 cf, Depth= 3.57"
Routed to Reach DP3 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 100-Year Rainfall=8.94"

Area (sf)	CN	Description
14,649	61	>75% Grass cover, Good, HSG B
91,432	55	Woods, Good, HSG B
106,081	56	Weighted Average
106,081		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	50	0.0400	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
1.2	189	0.0260	2.60		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.7	181	0.0660	4.14		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.2	187	0.0260	2.60		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
12.6	607	Total			

Summary for Subcatchment ES4: Offsite to Culvert

Runoff = 68.0 cfs @ 12.41 hrs, Volume= 440,846 cf, Depth= 6.76"
Routed to Pond 0P :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 100-Year Rainfall=8.94"

Area (sf)	CN	Description
2,730	98	Paved roads w/curbs & sewers, HSG B
48,408	98	Paved roads w/curbs & sewers, HSG C
515,359	83	1/4 acre lots, 38% imp, HSG C
40,722	87	1/4 acre lots, 38% imp, HSG D
139,908	70	Woods, Good, HSG C
35,862	77	Woods, Good, HSG D
782,989	82	Weighted Average
520,540		66.48% Pervious Area
262,449		33.52% Impervious Area

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

Summary for Reach DP1:

Inflow Area = 2,276,861 sf, 11.79% Impervious, Inflow Depth = 6.11" for 100-Year event
Inflow = 201.4 cfs @ 12.31 hrs, Volume= 1,159,688 cf
Outflow = 201.4 cfs @ 12.31 hrs, Volume= 1,159,688 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Summary for Reach DP2:

Inflow Area = 22,292 sf, 0.00% Impervious, Inflow Depth = 3.57" for 100-Year event
Inflow = 1.8 cfs @ 12.16 hrs, Volume= 6,625 cf
Outflow = 1.8 cfs @ 12.16 hrs, Volume= 6,625 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Summary for Reach DP3:

Inflow Area = 106,081 sf, 0.00% Impervious, Inflow Depth = 3.57" for 100-Year event
Inflow = 7.4 cfs @ 12.21 hrs, Volume= 31,524 cf
Outflow = 7.4 cfs @ 12.21 hrs, Volume= 31,524 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Summary for Pond 0P:

Inflow Area = 2,276,861 sf, 11.79% Impervious, Inflow Depth = 6.11" for 100-Year event
Inflow = 201.8 cfs @ 12.29 hrs, Volume= 1,159,688 cf
Outflow = 201.4 cfs @ 12.31 hrs, Volume= 1,159,688 cf, Atten= 0%, Lag= 0.8 min
Primary = 201.4 cfs @ 12.31 hrs, Volume= 1,159,688 cf
Routed to Reach DP1 :

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Peak Elev= 99.12' @ 12.31 hrs Surf.Area= 14,869 sf Storage= 24,784 cf

Plug-Flow detention time= 1.1 min calculated for 1,159,366 cf (100% of inflow)
Center-of-Mass det. time= 1.1 min (838.5 - 837.4)

Volume	Invert	Avail.Storage	Storage Description
#1	89.08'	452,475 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
89.08	10	10.0	0	0	10
93.00	250	50.0	405	405	234
94.00	904	185.2	543	948	2,768
96.00	2,293	261.0	3,091	4,039	5,496
98.00	6,945	557.5	8,819	12,858	24,825
100.00	23,209	885.0	28,567	41,425	62,447
102.00	37,519	1,050.6	60,158	101,583	88,028
104.00	50,433	1,310.8	87,634	189,217	136,980
106.00	65,230	1,557.1	115,346	304,563	193,264
108.00	83,039	1,761.9	147,911	452,475	247,457

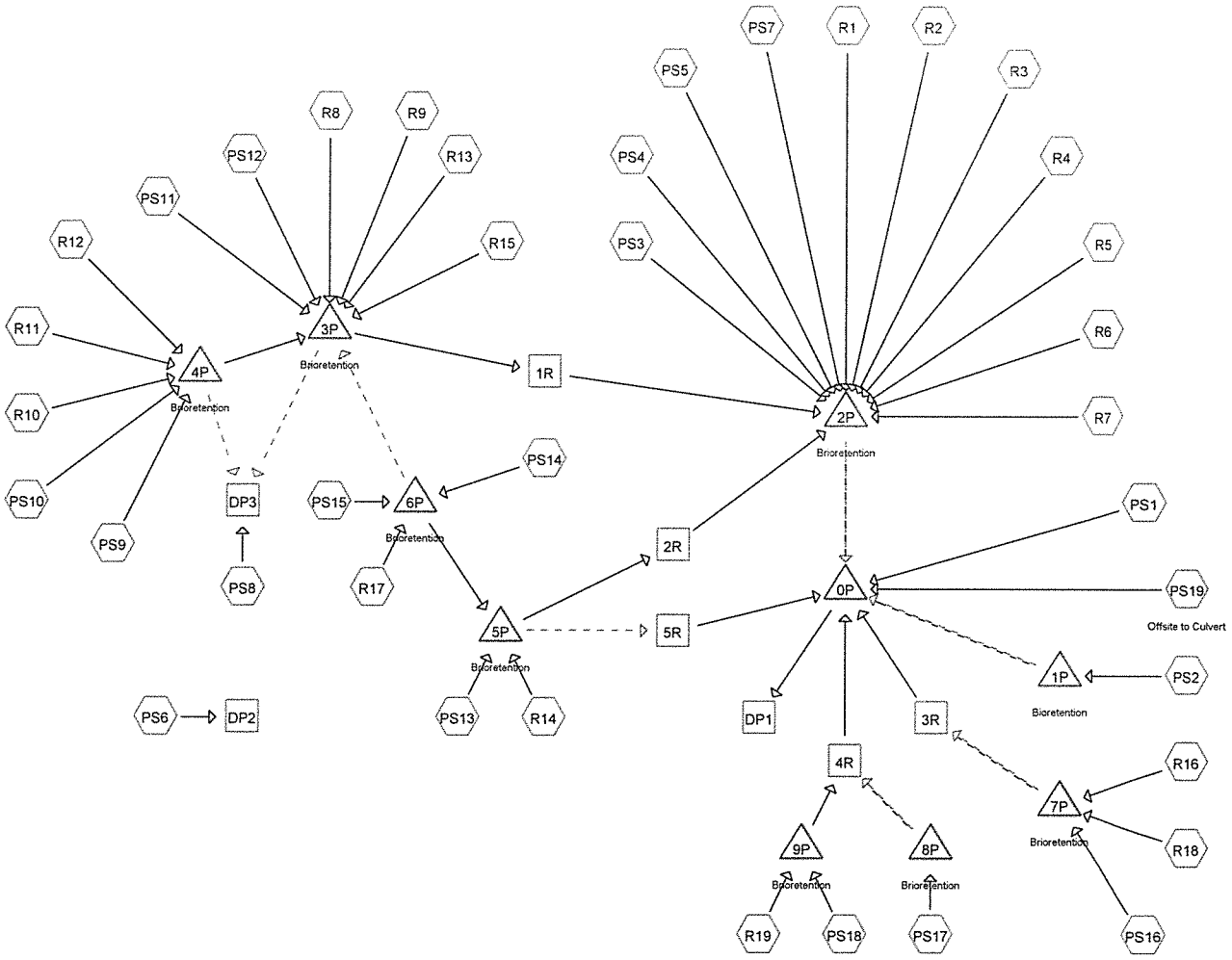
Device	Routing	Invert	Outlet Devices
#1	Primary	89.08'	**30.0" Round Culvert** L= 60.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 89.08' / 87.52' S= 0.0260 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 4.91 sf
#2	Primary	98.50'	**100.0' long x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=201.3 cfs @ 12.31 hrs HW=99.12' TW=0.00' (Dynamic Tailwater)
↑
├─**1=Culvert** (Inlet Controls 70.1 cfs @ 14.27 fps)
└─**2=Broad-Crested Rectangular Weir** (Weir Controls 131.3 cfs @ 2.12 fps)

APPENDIX C:

PROPOSED CONDITIONS

HYDROLOGIC ANALYSIS



Subcat Reach Pond Link

Routing Diagram for Sagamore Proposed Hydrologic Analysis
Prepared by The Morin-Cameron Group, Inc, Printed 11/30/2023

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
515,359	83	1/4 acre lots, 38% imp, HSG C (PS19)
40,722	87	1/4 acre lots, 38% imp, HSG D (PS19)
161,275	61	>75% Grass cover, Good, HSG B (PS10, PS11, PS12, PS13, PS15, PS2, PS4, PS5, PS6, PS7, PS8, PS9)
161,008	74	>75% Grass cover, Good, HSG C (PS1, PS11, PS12, PS13, PS14, PS15, PS16, PS17, PS18, PS2, PS3, PS4)
69,462	80	>75% Grass cover, Good, HSG D (PS1, PS2, PS4, PS5)
115,154	58	Meadow, non-grazed, HSG B (PS1, PS10, PS11, PS13, PS15, PS16, PS2, PS4, PS6, PS7, PS8, PS9)
127,999	71	Meadow, non-grazed, HSG C (PS1, PS11, PS12, PS13, PS14, PS15, PS16, PS17, PS18, PS2, PS3)
26,522	78	Meadow, non-grazed, HSG D (PS1, PS4)
51,288	98	Paved parking, HSG B (PS11, PS12, PS15, PS2, PS5, PS9)
86,908	98	Paved parking, HSG C (PS1, PS12, PS15, PS16, PS17, PS2, PS4, PS5)
38,086	98	Paved parking, HSG D (PS1, PS2, PS4, PS5)
2,730	98	Paved roads w/curbs & sewers, HSG B (PS19)
50,258	98	Paved roads w/curbs & sewers, HSG C (PS19)
99,242	98	Roofs, HSG B (R10, R11, R12, R13, R14, R15, R5, R6, R7, R8, R9)
59,315	98	Roofs, HSG C (PS3, R1, R14, R16, R17, R18, R19, R5)
49,803	98	Roofs, HSG D (R15, R2, R3, R4, R5, R7)
14,747	98	Unconnected pavement, HSG B (PS10, PS11, PS12, PS2, PS4, PS5, PS7, PS9)
14,164	98	Unconnected pavement, HSG C (PS1, PS11, PS12, PS14, PS15, PS16, PS17, PS18, PS2, PS3)
7,181	98	Unconnected pavement, HSG D (PS1, PS2, PS4, PS5)
244	98	Unconnected roofs, HSG C (PS2)
29,959	98	Water Surface, 0% imp, HSG B (PS1)
100,589	98	Water Surface, 0% imp, HSG C (PS1)
102,060	98	Water Surface, 0% imp, HSG D (PS1)
20,302	55	Woods, Good, HSG B (PS1, PS10, PS11, PS2, PS6, PS7, PS8)
265,404	70	Woods, Good, HSG C (PS1, PS14, PS16, PS17, PS18, PS19)
195,453	77	Woods, Good, HSG D (PS1, PS19)
2,405,234	**81**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
0	HSG A	
494,697	HSG B	PS1, PS10, PS11, PS12, PS13, PS15, PS16, PS19, PS2, PS4, PS5, PS6, PS7, PS8, PS9, R10, R11, R12, R13, R14, R15, R5, R6, R7, R8, R9
1,381,248	HSG C	PS1, PS11, PS12, PS13, PS14, PS15, PS16, PS17, PS18, PS19, PS2, PS3, PS4, PS5, R1, R14, R16, R17, R18, R19, R5
529,289	HSG D	PS1, PS19, PS2, PS4, PS5, R15, R2, R3, R4, R5, R7
0	Other	
2,405,234		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover
0	0	515,359	40,722	0	556,081	1/4 acre lots, 38% imp
0	161,275	161,008	69,462	0	391,745	>75% Grass cover, Good
0	115,154	127,999	26,522	0	269,675	Meadow, non-grazed
0	51,288	86,908	38,086	0	176,282	Paved parking
0	2,730	50,258	0	0	52,988	Paved roads w/curbs & sewers
0	99,242	59,315	49,803	0	208,360	Roofs
0	14,747	14,164	7,181	0	36,092	Unconnected pavement
0	0	244	0	0	244	Unconnected roofs
0	29,959	100,589	102,060	0	232,608	Water Surface, 0% imp
0	20,302	265,404	195,453	0	481,159	Woods, Good
0	**494,697**	**1,381,248**	**529,289**	**0**	**2,405,234**	**TOTAL AREA**

Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 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 PS1: Runoff Area=617,148 sf 0.92% Impervious Runoff Depth=1.57"
Flow Length=1,779' Tc=18.1 min CN=83 Runoff=16.4 cfs 80,653 cf

Subcatchment PS10: Runoff Area=29,494 sf 8.32% Impervious Runoff Depth=0.46"
Flow Length=502' Tc=8.5 min UI Adjusted CN=62 Runoff=0.2 cfs 1,130 cf

Subcatchment PS11: Runoff Area=64,352 sf 16.63% Impervious Runoff Depth=0.62"
Flow Length=649' Tc=6.2 min UI Adjusted CN=66 Runoff=0.9 cfs 3,314 cf

Subcatchment PS12: Runoff Area=20,216 sf 61.06% Impervious Runoff Depth=1.72"
Tc=6.0 min CN=85 Runoff=0.9 cfs 2,889 cf

Subcatchment PS13: Runoff Area=3,949 sf 0.00% Impervious Runoff Depth=0.46"
Tc=6.0 min CN=62 Runoff=0.0 cfs 151 cf

Subcatchment PS14: Runoff Area=42,549 sf 4.11% Impervious Runoff Depth=0.95"
Tc=6.0 min CN=73 Runoff=1.0 cfs 3,372 cf

Subcatchment PS15: Runoff Area=17,922 sf 41.79% Impervious Runoff Depth=1.57"
Tc=6.0 min CN=83 Runoff=0.7 cfs 2,342 cf

Subcatchment PS16: Runoff Area=81,403 sf 36.51% Impervious Runoff Depth=1.50"
Tc=6.0 min CN=82 Runoff=3.1 cfs 10,162 cf

Subcatchment PS17: Runoff Area=58,074 sf 42.43% Impervious Runoff Depth=1.57"
Flow Length=623' Tc=12.2 min CN=83 Runoff=1.8 cfs 7,589 cf

Subcatchment PS18: Runoff Area=27,660 sf 4.39% Impervious Runoff Depth=0.90"
Flow Length=120' Tc=7.4 min UI Adjusted CN=72 Runoff=0.6 cfs 2,072 cf

Subcatchment PS19: Offsite to Culvert Runoff Area=782,989 sf 33.76% Impervious Runoff Depth=1.50"
Tc=30.0 min CN=82 Runoff=15.4 cfs 97,744 cf

Subcatchment PS2: Runoff Area=167,949 sf 16.69% Impervious Runoff Depth=0.85"
Flow Length=550' Tc=7.5 min CN=71 Runoff=3.2 cfs 11,871 cf

Subcatchment PS3: Runoff Area=13,646 sf 44.33% Impervious Runoff Depth=1.64"
Tc=6.0 min CN=84 Runoff=0.6 cfs 1,866 cf

Subcatchment PS4: Runoff Area=99,519 sf 30.07% Impervious Runoff Depth=1.57"
Flow Length=816' Tc=6.2 min CN=83 Runoff=4.0 cfs 13,006 cf

Subcatchment PS5: Runoff Area=63,875 sf 56.24% Impervious Runoff Depth=1.64"
Tc=6.0 min CN=84 Runoff=2.7 cfs 8,733 cf

Subcatchment PS6: Runoff Area=6,550 sf 0.00% Impervious Runoff Depth=0.29"
Flow Length=122' Tc=6.4 min CN=57 Runoff=0.0 cfs 160 cf

Subcatchment PS7: Runoff Area=58,298 sf 7.21% Impervious Runoff Depth=0.46"
Tc=6.0 min UI Adjusted CN=62 Runoff=0.5 cfs 2,234 cf

Subcatchment PS8: Runoff Area=13,992 sf 0.00% Impervious Runoff Depth=0.32"
Tc=6.0 min CN=58 Runoff=0.1 cfs 378 cf

Subcatchment PS9: Runoff Area=29,587 sf 50.13% Impervious Runoff Depth=1.30"
Tc=6.0 min CN=79 Runoff=1.0 cfs 3,203 cf

Subcatchment R1: Runoff Area=9,853 sf 100.00% Impervious Runoff Depth=2.92"
Tc=6.0 min CN=98 Runoff=0.6 cfs 2,396 cf

Subcatchment R10: Runoff Area=2,616 sf 100.00% Impervious Runoff Depth=2.92"
Tc=6.0 min CN=98 Runoff=0.2 cfs 636 cf

Subcatchment R11: Runoff Area=5,231 sf 100.00% Impervious Runoff Depth=2.92"
Tc=6.0 min CN=98 Runoff=0.3 cfs 1,272 cf

Subcatchment R12: Runoff Area=15,084 sf 100.00% Impervious Runoff Depth=2.92"
Tc=6.0 min CN=98 Runoff=1.0 cfs 3,668 cf

Subcatchment R13: Runoff Area=11,800 sf 100.00% Impervious Runoff Depth=2.92"
Tc=6.0 min CN=98 Runoff=0.8 cfs 2,869 cf

Subcatchment R14: Runoff Area=5,900 sf 100.00% Impervious Runoff Depth=2.92"
Tc=6.0 min CN=98 Runoff=0.4 cfs 1,435 cf

Subcatchment R15: Runoff Area=18,368 sf 100.00% Impervious Runoff Depth=2.92"
Tc=6.0 min CN=98 Runoff=1.2 cfs 4,466 cf

Subcatchment R16: Runoff Area=9,853 sf 100.00% Impervious Runoff Depth=2.92"
Tc=6.0 min CN=98 Runoff=0.6 cfs 2,396 cf

Subcatchment R17: Runoff Area=14,416 sf 100.00% Impervious Runoff Depth=2.92"
Tc=6.0 min CN=98 Runoff=0.9 cfs 3,505 cf

Subcatchment R18: Runoff Area=9,853 sf 100.00% Impervious Runoff Depth=2.92"
Tc=6.0 min CN=98 Runoff=0.6 cfs 2,396 cf

Subcatchment R19: Runoff Area=9,853 sf 100.00% Impervious Runoff Depth=2.92"
Tc=6.0 min CN=98 Runoff=0.6 cfs 2,396 cf

Subcatchment R2: Runoff Area=7,847 sf 100.00% Impervious Runoff Depth=2.92"
Tc=6.0 min CN=98 Runoff=0.5 cfs 1,908 cf

Subcatchment R3: Runoff Area=13,137 sf 100.00% Impervious Runoff Depth=2.92"
Tc=6.0 min CN=98 Runoff=0.9 cfs 3,194 cf

Subcatchment R4: Runoff Area=6,568 sf 100.00% Impervious Runoff Depth=2.92"
Tc=6.0 min CN=98 Runoff=0.4 cfs 1,597 cf

Subcatchment R5: Runoff Area=13,137 sf 100.00% Impervious Runoff Depth=2.92"
Tc=6.0 min CN=98 Runoff=0.9 cfs 3,194 cf

Subcatchment R6: Runoff Area=6,568 sf 100.00% Impervious Runoff Depth=2.92"
Tc=6.0 min CN=98 Runoff=0.4 cfs 1,597 cf

Subcatchment R7: Runoff Area=36,126 sf 100.00% Impervious Runoff Depth=2.92"
Tc=6.0 min CN=98 Runoff=2.3 cfs 8,784 cf

Subcatchment R8: Runoff Area=3,284 sf 100.00% Impervious Runoff Depth=2.92"
Tc=6.0 min CN=98 Runoff=0.2 cfs 798 cf

Subcatchment R9: Runoff Area=6,568 sf 100.00% Impervious Runoff Depth=2.92"
Tc=6.0 min CN=98 Runoff=0.4 cfs 1,597 cf

Reach 1R: Avg. Flow Depth=0.14' Max Vel=5.24 fps Inflow=0.5 cfs 6,481 cf
24.0" Round Pipe n=0.012 L=860.0' S=0.0442 '/' Capacity=51.5 cfs Outflow=0.5 cfs 6,481 cf

Reach 2R: Avg. Flow Depth=0.13' Max Vel=5.42 fps Inflow=0.4 cfs 5,855 cf
18.0" Round Pipe n=0.012 L=865.0' S=0.0510 '/' Capacity=25.7 cfs Outflow=0.4 cfs 5,855 cf

Reach 3R: Avg. Flow Depth=0.10' Max Vel=1.94 fps Inflow=1.0 cfs 11,544 cf
n=0.040 L=1,293.0' S=0.0641 '/' Capacity=62.5 cfs Outflow=0.9 cfs 11,544 cf

Reach 4R: Avg. Flow Depth=0.10' Max Vel=1.95 fps Inflow=1.1 cfs 8,449 cf
n=0.040 L=1,263.0' S=0.0688 '/' Capacity=64.7 cfs Outflow=0.9 cfs 8,449 cf

Reach 5R: Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.0 cfs 0 cf
n=0.040 L=1,225.0' S=0.0636 '/' Capacity=62.2 cfs Outflow=0.0 cfs 0 cf

Reach DP1: Inflow=37.0 cfs 264,248 cf
Outflow=37.0 cfs 264,248 cf

Reach DP2: Inflow=0.0 cfs 160 cf
Outflow=0.0 cfs 160 cf

Reach DP3: Inflow=0.1 cfs 378 cf
Outflow=0.1 cfs 378 cf

Pond 0P: Peak Elev=92.79' Storage=354 cf Inflow=37.1 cfs 264,248 cf
Outflow=37.0 cfs 264,248 cf

Pond 1P: Bioretention Peak Elev=99.27' Storage=3,493 cf Inflow=3.2 cfs 11,871 cf
Discarded=0.1 cfs 4,256 cf Primary=0.6 cfs 7,155 cf Secondary=0.0 cfs 0 cf Outflow=0.7 cfs 11,410 cf

Pond 2P: Brioretention Peak Elev=115.36' Storage=6,705 cf Inflow=13.9 cfs 60,843 cf
Discarded=0.1 cfs 2,139 cf Primary=6.3 cfs 58,703 cf Secondary=0.0 cfs 0 cf Outflow=6.4 cfs 60,843 cf

Pond 3P: Brioretention Peak Elev=153.89' Storage=7,635 cf Inflow=5.0 cfs 18,239 cf
Discarded=0.2 cfs 11,753 cf Primary=0.5 cfs 6,481 cf Secondary=0.0 cfs 0 cf Outflow=0.7 cfs 18,235 cf

Pond 4P: Brioretention Peak Elev=160.86' Storage=2,378 cf Inflow=2.6 cfs 9,909 cf
Discarded=0.3 cfs 7,604 cf Primary=1.0 cfs 2,305 cf Secondary=0.0 cfs 0 cf Outflow=1.3 cfs 9,909 cf

Pond 5P: Brioretention Peak Elev=165.35' Storage=1,201 cf Inflow=0.6 cfs 7,350 cf
Discarded=0.0 cfs 1,492 cf Primary=0.4 cfs 5,855 cf Secondary=0.0 cfs 0 cf Outflow=0.4 cfs 7,347 cf

Pond 6P: Brioretention Peak Elev=168.24' Storage=3,302 cf Inflow=2.7 cfs 9,219 cf
Discarded=0.1 cfs 3,268 cf Primary=0.5 cfs 5,764 cf Secondary=0.0 cfs 0 cf Outflow=0.5 cfs 9,032 cf

Pond 7P: Brioretention Peak Elev=179.78' Storage=5,159 cf Inflow=4.4 cfs 14,953 cf
Discarded=0.1 cfs 3,176 cf Primary=1.0 cfs 11,544 cf Secondary=0.0 cfs 0 cf Outflow=1.0 cfs 14,720 cf

Pond 8P: Brioretention Peak Elev=180.09' Storage=1,830 cf Inflow=1.8 cfs 7,589 cf
Discarded=0.1 cfs 1,000 cf Primary=0.7 cfs 6,589 cf Secondary=0.0 cfs 0 cf Outflow=0.7 cfs 7,589 cf

Pond 9P: Brioretention Peak Elev=198.64' Storage=1,425 cf Inflow=1.2 cfs 4,467 cf
Discarded=0.0 cfs 2,048 cf Primary=0.7 cfs 1,860 cf Outflow=0.7 cfs 3,907 cf

Total Runoff Area = 2,405,234 sf Runoff Volume = 302,970 cf Average Runoff Depth = 1.51"
71.51% Pervious = 1,719,957 sf 28.49% Impervious = 685,277 sf

Summary for Subcatchment PS1:

Runoff = 16.4 cfs @ 12.27 hrs, Volume= 80,653 cf, Depth= 1.57"
Routed to Pond 0P :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 2-Year Rainfall=3.15"

Area (sf)	CN	Description
44,071	74	>75% Grass cover, Good, HSG C
11,725	80	>75% Grass cover, Good, HSG D
10,632	55	Woods, Good, HSG B
105,057	70	Woods, Good, HSG C
159,591	77	Woods, Good, HSG D
3,226	98	Paved parking, HSG C
1,412	98	Unconnected pavement, HSG C
51	98	Paved parking, HSG D
960	98	Unconnected pavement, HSG D
29,959	98	Water Surface, 0% imp, HSG B
100,589	98	Water Surface, 0% imp, HSG C
102,060	98	Water Surface, 0% imp, HSG D
4,551	58	Meadow, non-grazed, HSG B
39,285	71	Meadow, non-grazed, HSG C
3,979	78	Meadow, non-grazed, HSG D
617,148	83	Weighted Average
611,499		99.08% Pervious Area
5,649		0.92% Impervious Area
2,372		41.99% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.7	50	0.0300	0.08		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
1.0	138	0.0220	2.39		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
2.6	579	0.0520	3.67		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
3.8	1,012	0.0750	4.41		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
18.1	1,779	Total			

Summary for Subcatchment PS10:

Runoff = 0.2 cfs @ 12.18 hrs, Volume= 1,130 cf, Depth= 0.46"
Routed to Pond 4P : Brioretention

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 2-Year Rainfall=3.15"

Area (sf)	CN	Adj	Description
18,930	61		>75% Grass cover, Good, HSG B
2,454	98		Unconnected pavement, HSG B
7,219	58		Meadow, non-grazed, HSG B
891	55		Woods, Good, HSG B
29,494	63	62	Weighted Average, UI Adjusted
27,040			91.68% Pervious Area
2,454			8.32% Impervious Area
2,454			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.9	50	0.0300	0.17		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.10"
3.6	452	0.0170	2.10		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
8.5	502	Total			

Summary for Subcatchment PS11:

Runoff = 0.9 cfs @ 12.14 hrs, Volume= 3,314 cf, Depth= 0.62"
Routed to Pond 3P : Brioretention

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 2-Year Rainfall=3.15"

Area (sf)	CN	Adj	Description
30,469	61		>75% Grass cover, Good, HSG B
3,648	74		>75% Grass cover, Good, HSG C
5,143	98		Paved parking, HSG B
5,079	98		Unconnected pavement, HSG B
482	98		Unconnected pavement, HSG C
14,936	58		Meadow, non-grazed, HSG B
2,705	55		Woods, Good, HSG B
1,890	71		Meadow, non-grazed, HSG C
64,352	67	66	Weighted Average, UI Adjusted
53,648			83.37% Pervious Area
10,704			16.63% Impervious Area
5,561			51.95% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.9	34	0.0500	0.19		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.10"
3.0	400	0.0187	2.20		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.0	23	0.0490	10.88	8.54	**Pipe Channel,** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012
0.1	74	0.0520	14.68	25.95	**Pipe Channel,** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.012
0.2	118	0.0230	9.77	17.26	**Pipe Channel,** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.012
6.2	649	Total			

Summary for Subcatchment PS12:

Runoff = 0.9 cfs @ 12.13 hrs, Volume= 2,889 cf, Depth= 1.72"
Routed to Pond 3P : Brioretention

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 2-Year Rainfall=3.15"

Area (sf)	CN	Description
6,186	61	>75% Grass cover, Good, HSG B
1,596	74	>75% Grass cover, Good, HSG C
9,583	98	Paved parking, HSG B
315	98	Unconnected pavement, HSG B
2,390	98	Paved parking, HSG C
55	98	Unconnected pavement, HSG C
91	71	Meadow, non-grazed, HSG C
20,216	85	Weighted Average
7,873		38.94% Pervious Area
12,343		61.06% Impervious Area
370		3.00% Unconnected

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

Summary for Subcatchment PS13:

Runoff = 0.0 cfs @ 12.15 hrs, Volume= 151 cf, Depth= 0.46"
Routed to Pond 5P : Brioretention

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 2-Year Rainfall=3.15"

Area (sf)	CN	Description
944	61	>75% Grass cover, Good, HSG B
194	74	>75% Grass cover, Good, HSG C
2,062	58	Meadow, non-grazed, HSG B
749	71	Meadow, non-grazed, HSG C
3,949	62	Weighted Average
3,949		100.00% Pervious Area

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

Summary for Subcatchment PS14:

Runoff = 1.0 cfs @ 12.14 hrs, Volume= 3,372 cf, Depth= 0.95"
Routed to Pond 6P : Brioretention

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 2-Year Rainfall=3.15"

Area (sf)	CN	Description
17,357	74	>75% Grass cover, Good, HSG C
1,750	98	Unconnected pavement, HSG C
22,520	71	Meadow, non-grazed, HSG C
922	70	Woods, Good, HSG C
42,549	73	Weighted Average
40,799		95.89% Pervious Area
1,750		4.11% Impervious Area
1,750		100.00% Unconnected

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

Summary for Subcatchment PS15:

Runoff = 0.7 cfs @ 12.13 hrs, Volume= 2,342 cf, Depth= 1.57"
Routed to Pond 6P : Brioretention

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 2-Year Rainfall=3.15"

Area (sf)	CN	Description
244	61	>75% Grass cover, Good, HSG B
5,873	74	>75% Grass cover, Good, HSG C
633	98	Paved parking, HSG B
5,985	98	Paved parking, HSG C
872	98	Unconnected pavement, HSG C
283	58	Meadow, non-grazed, HSG B
4,032	71	Meadow, non-grazed, HSG C
17,922	83	Weighted Average
10,432		58.21% Pervious Area
7,490		41.79% Impervious Area
872		11.64% Unconnected

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

Summary for Subcatchment PS16:

Runoff = 3.1 cfs @ 12.13 hrs, Volume= 10,162 cf, Depth= 1.50"
Routed to Pond 7P : Brioretention

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 2-Year Rainfall=3.15"

Area (sf)	CN	Description
35,815	74	>75% Grass cover, Good, HSG C
3,437	70	Woods, Good, HSG C
27,090	98	Paved parking, HSG C
2,627	98	Unconnected pavement, HSG C
588	58	Meadow, non-grazed, HSG B
11,846	71	Meadow, non-grazed, HSG C
81,403	82	Weighted Average
51,686		63.49% Pervious Area
29,717		36.51% Impervious Area
2,627		8.84% Unconnected

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

Summary for Subcatchment PS17:

Runoff = 1.8 cfs @ 12.20 hrs, Volume= 7,589 cf, Depth= 1.57"
Routed to Pond 8P : Brioretention

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 2-Year Rainfall=3.15"

Area (sf)	CN	Description
14,027	74	>75% Grass cover, Good, HSG C
9,589	70	Woods, Good, HSG C
24,540	98	Paved parking, HSG C
99	98	Unconnected pavement, HSG C
9,819	71	Meadow, non-grazed, HSG C
58,074	83	Weighted Average
33,435		57.57% Pervious Area
24,639		42.43% Impervious Area
99		0.40% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	50	0.0400	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
2.6	500	0.0400	3.22		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.1	49	0.0480	10.77	8.46	**Pipe Channel,** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012
0.0	24	0.0180	8.64	15.27	**Pipe Channel,** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.012
12.2	623	Total			

Summary for Subcatchment PS18:

Runoff = 0.6 cfs @ 12.15 hrs, Volume= 2,072 cf, Depth= 0.90"
Routed to Pond 9P : Brioretention

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 2-Year Rainfall=3.15"

Area (sf)	CN	Adj	Description
9,869	74		>75% Grass cover, Good, HSG C
8,341	70		Woods, Good, HSG C
8,235	71		Meadow, non-grazed, HSG C
1,215	98		Unconnected pavement, HSG C
27,660	73	72	Weighted Average, UI Adjusted
26,445			95.61% Pervious Area
1,215			4.39% Impervious Area
1,215			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.2	50	0.0800	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
0.2	70	0.0860	4.72		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
7.4	120	Total			

Summary for Subcatchment PS19: Offsite to Culvert

Runoff = 15.4 cfs @ 12.43 hrs, Volume= 97,744 cf, Depth= 1.50"
Routed to Pond 0P :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 2-Year Rainfall=3.15"

Area (sf)	CN	Description
2,730	98	Paved roads w/curbs & sewers, HSG B
50,258	98	Paved roads w/curbs & sewers, HSG C
515,359	83	1/4 acre lots, 38% imp, HSG C
40,722	87	1/4 acre lots, 38% imp, HSG D
138,058	70	Woods, Good, HSG C
35,862	77	Woods, Good, HSG D
782,989	82	Weighted Average
518,690		66.24% Pervious Area
264,299		33.76% Impervious Area

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

Summary for Subcatchment PS2:

Runoff = 3.2 cfs @ 12.15 hrs, Volume= 11,871 cf, Depth= 0.85"
Routed to Pond 1P : Bioretention

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 2-Year Rainfall=3.15"

Area (sf)	CN	Description
26,645	61	>75% Grass cover, Good, HSG B
24,124	74	>75% Grass cover, Good, HSG C
11,244	80	>75% Grass cover, Good, HSG D
244	98	Unconnected roofs, HSG C
785	98	Paved parking, HSG B
22,871	98	Paved parking, HSG C
290	98	Paved parking, HSG D
709	98	Unconnected pavement, HSG B
1,901	98	Unconnected pavement, HSG C
1,224	98	Unconnected pavement, HSG D
2,546	55	Woods, Good, HSG B
49,100	58	Meadow, non-grazed, HSG B
26,266	71	Meadow, non-grazed, HSG C
167,949	71	Weighted Average
139,925		83.31% Pervious Area
28,024		16.69% Impervious Area
4,078		14.55% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	50	0.0200	0.15		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.10"
1.3	360	0.0800	4.55		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.3	40	0.0150	2.49		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.1	53	0.0110	6.75	11.94	**Pipe Channel,** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.012
0.1	47	0.0150	9.55	30.02	**Pipe Channel,** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.012
7.5	550	Total			

Summary for Subcatchment PS3:

Runoff = 0.6 cfs @ 12.13 hrs, Volume= 1,866 cf, Depth= 1.64"
Routed to Pond 2P : Brioretention

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 2-Year Rainfall=3.15"

Area (sf)	CN	Description
4,331	74	>75% Grass cover, Good, HSG C
2,298	98	Roofs, HSG C
3,751	98	Unconnected pavement, HSG C
3,266	71	Meadow, non-grazed, HSG C
13,646	84	Weighted Average
7,597		55.67% Pervious Area
6,049		44.33% Impervious Area
3,751		62.01% Unconnected

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

Summary for Subcatchment PS4:

Runoff = 4.0 cfs @ 12.13 hrs, Volume= 13,006 cf, Depth= 1.57"
Routed to Pond 2P : Brioretention

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 2-Year Rainfall=3.15"

Area (sf)	CN	Description
5,560	61	>75% Grass cover, Good, HSG B
103	74	>75% Grass cover, Good, HSG C
37,853	80	>75% Grass cover, Good, HSG D
883	98	Unconnected pavement, HSG B
589	98	Paved parking, HSG C
23,858	98	Paved parking, HSG D
4,595	98	Unconnected pavement, HSG D
3,535	58	Meadow, non-grazed, HSG B
22,543	78	Meadow, non-grazed, HSG D
99,519	83	Weighted Average
69,594		69.93% Pervious Area
29,925		30.07% Impervious Area
5,478		18.31% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.9	50	0.0300	0.17		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.10"
0.3	108	0.1388	6.00		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.0	27	0.0570	11.73	9.21	**Pipe Channel,** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012
0.3	155	0.0140	7.62	13.46	**Pipe Channel,** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.012
0.3	221	0.0470	13.96	24.67	**Pipe Channel,** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.012
0.1	77	0.0750	21.36	67.12	**Pipe Channel,** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.012
0.3	178	0.0110	10.72	75.78	**Pipe Channel,** 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.012
6.2	816	Total			

Summary for Subcatchment PS5:

Runoff = 2.7 cfs @ 12.13 hrs, Volume= 8,733 cf, Depth= 1.64"
Routed to Pond 2P : Brioretention

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 2-Year Rainfall=3.15"

Area (sf)	CN	Description
19,311	61	>75% Grass cover, Good, HSG B
8,640	80	>75% Grass cover, Good, HSG D
20,779	98	Paved parking, HSG B
639	98	Unconnected pavement, HSG B
217	98	Paved parking, HSG C
13,887	98	Paved parking, HSG D
402	98	Unconnected pavement, HSG D
63,875	84	Weighted Average
27,951		43.76% Pervious Area
35,924		56.24% Impervious Area
1,041		2.90% Unconnected

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

Summary for Subcatchment PS6:

Runoff = 0.0 cfs @ 12.17 hrs, Volume= 160 cf, Depth= 0.29"
Routed to Reach DP2 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 2-Year Rainfall=3.15"

Area (sf)	CN	Description
486	61	>75% Grass cover, Good, HSG B
2,801	55	Woods, Good, HSG B
3,263	58	Meadow, non-grazed, HSG B
6,550	57	Weighted Average
6,550		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.1	50	0.1200	0.14		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
0.3	72	0.0560	3.81		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
6.4	122	Total			

Summary for Subcatchment PS7:

Runoff = 0.5 cfs @ 12.15 hrs, Volume= 2,234 cf, Depth= 0.46"
Routed to Pond 2P : Brioretention

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 2-Year Rainfall=3.15"

Area (sf)	CN	Adj	Description
41,173	61		>75% Grass cover, Good, HSG B
4,201	98		Unconnected pavement, HSG B
12,368	58		Meadow, non-grazed, HSG B
556	55		Woods, Good, HSG B
58,298	63	62	Weighted Average, UI Adjusted
54,097			92.79% Pervious Area
4,201			7.21% Impervious Area
4,201			100.00% Unconnected

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

Summary for Subcatchment PS8:

Runoff = 0.1 cfs @ 12.16 hrs, Volume= 378 cf, Depth= 0.32"
Routed to Reach DP3 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 2-Year Rainfall=3.15"

Area (sf)	CN	Description
1,073	61	>75% Grass cover, Good, HSG B
12,748	58	Meadow, non-grazed, HSG B
171	55	Woods, Good, HSG B
13,992	58	Weighted Average
13,992		100.00% Pervious Area

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

Summary for Subcatchment PS9:

Runoff = 1.0 cfs @ 12.13 hrs, Volume= 3,203 cf, Depth= 1.30"
Routed to Pond 4P : Brioretention

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 2-Year Rainfall=3.15"

Area (sf)	CN	Description
10,254	61	>75% Grass cover, Good, HSG B
14,365	98	Paved parking, HSG B
4,501	58	Meadow, non-grazed, HSG B
467	98	Unconnected pavement, HSG B
29,587	79	Weighted Average
14,755		49.87% Pervious Area
14,832		50.13% Impervious Area
467		3.15% Unconnected

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

Summary for Subcatchment R1:

Runoff = 0.6 cfs @ 12.13 hrs, Volume= 2,396 cf, Depth= 2.92"
Routed to Pond 2P : Brioretention

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 2-Year Rainfall=3.15"

Area (sf)	CN	Description
9,853	98	Roofs, HSG C
9,853		100.00% Impervious Area

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

Summary for Subcatchment R10:

Runoff = 0.2 cfs @ 12.13 hrs, Volume= 636 cf, Depth= 2.92"
Routed to Pond 4P : Brioretention

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 2-Year Rainfall=3.15"

Area (sf)	CN	Description
2,616	98	Roofs, HSG B
2,616		100.00% Impervious Area

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

Summary for Subcatchment R11:

Runoff = 0.3 cfs @ 12.13 hrs, Volume= 1,272 cf, Depth= 2.92"
Routed to Pond 4P : Brioretention

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 2-Year Rainfall=3.15"

Area (sf)	CN	Description
5,231	98	Roofs, HSG B
5,231		100.00% Impervious Area

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

Summary for Subcatchment R12:

Runoff = 1.0 cfs @ 12.13 hrs, Volume= 3,668 cf, Depth= 2.92"
Routed to Pond 4P : Brioretention

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 2-Year Rainfall=3.15"

Area (sf)	CN	Description
15,084	98	Roofs, HSG B
15,084		100.00% Impervious Area

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

Summary for Subcatchment R13:

Runoff = 0.8 cfs @ 12.13 hrs, Volume= 2,869 cf, Depth= 2.92"
Routed to Pond 3P : Brioretention

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 2-Year Rainfall=3.15"

Area (sf)	CN	Description
11,800	98	Roofs, HSG B
11,800		100.00% Impervious Area

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

Summary for Subcatchment R14:

Runoff = 0.4 cfs @ 12.13 hrs, Volume= 1,435 cf, Depth= 2.92"
Routed to Pond 5P : Brioretention

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 2-Year Rainfall=3.15"

Area (sf)	CN	Description
3,284	98	Roofs, HSG B
2,616	98	Roofs, HSG C
5,900	98	Weighted Average
5,900		100.00% Impervious Area

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

Summary for Subcatchment R15:

Runoff = 1.2 cfs @ 12.13 hrs, Volume= 4,466 cf, Depth= 2.92"
Routed to Pond 3P : Brioretention

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 2-Year Rainfall=3.15"

Area (sf)	CN	Description
9,193	98	Roofs, HSG B
9,175	98	Roofs, HSG D
18,368	98	Weighted Average
18,368		100.00% Impervious Area

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

Summary for Subcatchment R16:

Runoff = 0.6 cfs @ 12.13 hrs, Volume= 2,396 cf, Depth= 2.92"
Routed to Pond 7P : Brioretention

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 2-Year Rainfall=3.15"

Area (sf)	CN	Description
9,853	98	Roofs, HSG C
9,853		100.00% Impervious Area

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

Summary for Subcatchment R17:

Runoff = 0.9 cfs @ 12.13 hrs, Volume= 3,505 cf, Depth= 2.92"
Routed to Pond 6P : Brioretention

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 2-Year Rainfall=3.15"

Area (sf)	CN	Description
14,416	98	Roofs, HSG C
14,416		100.00% Impervious Area

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

Summary for Subcatchment R18:

Runoff = 0.6 cfs @ 12.13 hrs, Volume= 2,396 cf, Depth= 2.92"
Routed to Pond 7P : Brioretention

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 2-Year Rainfall=3.15"

Area (sf)	CN	Description
9,853	98	Roofs, HSG C
9,853		100.00% Impervious Area

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

Summary for Subcatchment R19:

Runoff = 0.6 cfs @ 12.13 hrs, Volume= 2,396 cf, Depth= 2.92"
Routed to Pond 9P : Brioretention

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 2-Year Rainfall=3.15"

Area (sf)	CN	Description
9,853	98	Roofs, HSG C
9,853		100.00% Impervious Area

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

Summary for Subcatchment R2:

Runoff = 0.5 cfs @ 12.13 hrs, Volume= 1,908 cf, Depth= 2.92"
Routed to Pond 2P : Brioretention

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 2-Year Rainfall=3.15"

Area (sf)	CN	Description
7,847	98	Roofs, HSG D
7,847		100.00% Impervious Area

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

Summary for Subcatchment R3:

Runoff = 0.9 cfs @ 12.13 hrs, Volume= 3,194 cf, Depth= 2.92"
Routed to Pond 2P : Brioretention

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 2-Year Rainfall=3.15"

Area (sf)	CN	Description
13,137	98	Roofs, HSG D
13,137		100.00% Impervious Area

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

Summary for Subcatchment R4:

Runoff = 0.4 cfs @ 12.13 hrs, Volume= 1,597 cf, Depth= 2.92"
Routed to Pond 2P : Brioretention

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 2-Year Rainfall=3.15"

Area (sf)	CN	Description
6,568	98	Roofs, HSG D
6,568		100.00% Impervious Area

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

Summary for Subcatchment R5:

Runoff = 0.9 cfs @ 12.13 hrs, Volume= 3,194 cf, Depth= 2.92"
Routed to Pond 2P : Brioretention

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 2-Year Rainfall=3.15"

Area (sf)	CN	Description
452	98	Roofs, HSG B
573	98	Roofs, HSG C
12,112	98	Roofs, HSG D
13,137	98	Weighted Average
13,137		100.00% Impervious Area

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

Summary for Subcatchment R6:

Runoff = 0.4 cfs @ 12.13 hrs, Volume= 1,597 cf, Depth= 2.92"
Routed to Pond 2P : Brioretention

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 2-Year Rainfall=3.15"

Area (sf)	CN	Description
6,568	98	Roofs, HSG B
6,568		100.00% Impervious Area

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

Summary for Subcatchment R7:

Runoff = 2.3 cfs @ 12.13 hrs, Volume= 8,784 cf, Depth= 2.92"
Routed to Pond 2P : Brioretention

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 2-Year Rainfall=3.15"

Area (sf)	CN	Description
35,162	98	Roofs, HSG B
964	98	Roofs, HSG D
36,126	98	Weighted Average
36,126		100.00% Impervious Area

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

Summary for Subcatchment R8:

Runoff = 0.2 cfs @ 12.13 hrs, Volume= 798 cf, Depth= 2.92"
Routed to Pond 3P : Brioretention

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 2-Year Rainfall=3.15"

Area (sf)	CN	Description
3,284	98	Roofs, HSG B
3,284		100.00% Impervious Area

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

Summary for Subcatchment R9:

Runoff = 0.4 cfs @ 12.13 hrs, Volume= 1,597 cf, Depth= 2.92"
Routed to Pond 3P : Brioretention

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 2-Year Rainfall=3.15"

Area (sf)	CN	Description
6,568	98	Roofs, HSG B
6,568		100.00% Impervious Area

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

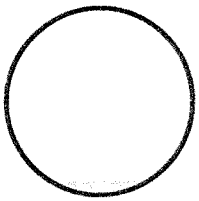
Summary for Reach 1R:

Inflow Area = 206,600 sf, 49.99% Impervious, Inflow Depth = 0.38" for 2-Year event
Inflow = 0.5 cfs @ 12.93 hrs, Volume= 6,481 cf
Outflow = 0.5 cfs @ 12.96 hrs, Volume= 6,481 cf, Atten= 0%, Lag= 1.9 min
Routed to Pond 2P : Brioretention

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Max. Velocity= 5.24 fps, Min. Travel Time= 2.7 min
Avg. Velocity = 3.24 fps, Avg. Travel Time= 4.4 min

Peak Storage= 83 cf @ 12.96 hrs
Average Depth at Peak Storage= 0.14' , Surface Width= 1.02'
Bank-Full Depth= 2.00' Flow Area= 3.1 sf, Capacity= 51.5 cfs

24.0" Round Pipe
n= 0.012
Length= 860.0' Slope= 0.0442 '/'
Inlet Invert= 150.00', Outlet Invert= 112.00'



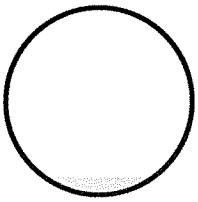
Summary for Reach 2R:

Inflow Area = 84,736 sf, 34.88% Impervious, Inflow Depth = 0.83" for 2-Year event
Inflow = 0.4 cfs @ 13.08 hrs, Volume= 5,855 cf
Outflow = 0.4 cfs @ 13.12 hrs, Volume= 5,855 cf, Atten= 0%, Lag= 1.9 min
Routed to Pond 2P : Brioretention

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Max. Velocity= 5.42 fps, Min. Travel Time= 2.7 min
Avg. Velocity = 3.36 fps, Avg. Travel Time= 4.3 min

Peak Storage= 67 cf @ 13.12 hrs
Average Depth at Peak Storage= 0.13' , Surface Width= 0.85'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 25.7 cfs

18.0" Round Pipe
n= 0.012
Length= 865.0' Slope= 0.0510 '/'
Inlet Invert= 156.10', Outlet Invert= 112.00'



Summary for Reach 3R:

Inflow Area = 101,109 sf, 48.88% Impervious, Inflow Depth = 1.37" for 2-Year event
Inflow = 1.0 cfs @ 12.39 hrs, Volume= 11,544 cf
Outflow = 0.9 cfs @ 12.64 hrs, Volume= 11,544 cf, Atten= 4%, Lag= 14.8 min
Routed to Pond 0P :

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.94 fps, Min. Travel Time= 11.1 min
Avg. Velocity = 0.86 fps, Avg. Travel Time= 25.1 min

Peak Storage= 611 cf @ 12.64 hrs
Average Depth at Peak Storage= 0.10' , Surface Width= 5.05'
Bank-Full Depth= 1.00' Flow Area= 9.0 sf, Capacity= 62.5 cfs

4.00' x 1.00' deep channel, n= 0.040 Earth, cobble bottom, clean sides
Side Slope Z-value= 5.0 '/' Top Width= 14.00'
Length= 1,293.0' Slope= 0.0641 '/'
Inlet Invert= 172.00', Outlet Invert= 89.08'

‡

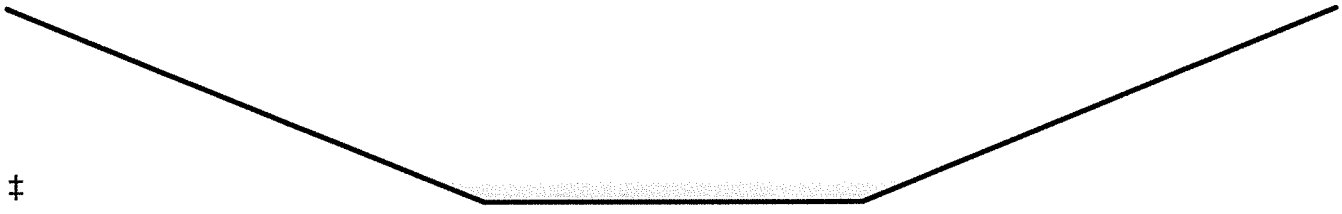
Summary for Reach 4R:

Inflow Area = 95,587 sf, 37.36% Impervious, Inflow Depth = 1.06" for 2-Year event
Inflow = 1.1 cfs @ 12.22 hrs, Volume= 8,449 cf
Outflow = 0.9 cfs @ 12.50 hrs, Volume= 8,449 cf, Atten= 18%, Lag= 16.7 min
Routed to Pond 0P :

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.95 fps, Min. Travel Time= 10.8 min
Avg. Velocity = 0.81 fps, Avg. Travel Time= 26.1 min

Peak Storage= 567 cf @ 12.50 hrs
Average Depth at Peak Storage= 0.10' , Surface Width= 5.00'
Bank-Full Depth= 1.00' Flow Area= 9.0 sf, Capacity= 64.7 cfs

4.00' x 1.00' deep channel, n= 0.040 Earth, cobble bottom, clean sides
Side Slope Z-value= 5.0 '/' Top Width= 14.00'
Length= 1,263.0' Slope= 0.0688 '/'
Inlet Invert= 176.00', Outlet Invert= 89.08'



‡

Summary for Reach 5R:

Inflow = 0.0 cfs @ 0.00 hrs, Volume= 0 cf
Outflow = 0.0 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min
Routed to Pond 0P :

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 1.00' Flow Area= 9.0 sf, Capacity= 62.2 cfs

4.00' x 1.00' deep channel, n= 0.040 Earth, cobble bottom, clean sides
Side Slope Z-value= 5.0 '/' Top Width= 14.00'
Length= 1,225.0' Slope= 0.0636 '/'
Inlet Invert= 167.00', Outlet Invert= 89.08'

‡

Summary for Reach DP1:

Inflow Area = 2,384,692 sf, 28.74% Impervious, Inflow Depth = 1.33" for 2-Year event
Inflow = 37.0 cfs @ 12.34 hrs, Volume= 264,248 cf
Outflow = 37.0 cfs @ 12.34 hrs, Volume= 264,248 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Summary for Reach DP2:

Inflow Area = 6,550 sf, 0.00% Impervious, Inflow Depth = 0.29" for 2-Year event
Inflow = 0.0 cfs @ 12.17 hrs, Volume= 160 cf
Outflow = 0.0 cfs @ 12.17 hrs, Volume= 160 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Summary for Reach DP3:

Inflow Area = 13,992 sf, 0.00% Impervious, Inflow Depth = 0.32" for 2-Year event
Inflow = 0.1 cfs @ 12.16 hrs, Volume= 378 cf
Outflow = 0.1 cfs @ 12.16 hrs, Volume= 378 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Summary for Pond 0P:

Inflow Area = 2,384,692 sf, 28.74% Impervious, Inflow Depth = 1.33" for 2-Year event
Inflow = 37.1 cfs @ 12.33 hrs, Volume= 264,248 cf
Outflow = 37.0 cfs @ 12.34 hrs, Volume= 264,248 cf, Atten= 0%, Lag= 0.4 min
Primary = 37.0 cfs @ 12.34 hrs, Volume= 264,248 cf
Routed to Reach DP1 :

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 92.79' @ 12.34 hrs Surf.Area= 229 sf Storage= 354 cf

Plug-Flow detention time= 0.1 min calculated for 264,174 cf (100% of inflow)
Center-of-Mass det. time= 0.1 min (879.9 - 879.8)

Volume	Invert	Avail.Storage	Storage Description
#1	89.08'	452,475 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
89.08	10	10.0	0	0	10
93.00	250	50.0	405	405	234
94.00	904	185.2	543	948	2,768
96.00	2,293	261.0	3,091	4,039	5,496
98.00	6,945	557.5	8,819	12,858	24,825
100.00	23,209	885.0	28,567	41,425	62,447
102.00	37,519	1,050.6	60,158	101,583	88,028
104.00	50,433	1,310.8	87,634	189,217	136,980
106.00	65,230	1,557.1	115,346	304,563	193,264
108.00	83,039	1,761.9	147,911	452,475	247,457

Device	Routing	Invert	Outlet Devices
#1	Primary	89.08'	**30.0" Round Culvert** L= 60.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 89.08' / 87.52' S= 0.0260 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 4.91 sf
#2	Primary	98.50'	**100.0' long x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=37.0 cfs @ 12.34 hrs HW=92.79' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 37.0 cfs @ 7.55 fps)
└─**2=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Summary for Pond 1P: Bioretention

Inflow Area = 167,949 sf, 16.69% Impervious, Inflow Depth = 0.85" for 2-Year event
Inflow = 3.2 cfs @ 12.15 hrs, Volume= 11,871 cf
Outflow = 0.7 cfs @ 12.63 hrs, Volume= 11,410 cf, Atten= 79%, Lag= 28.5 min
Discarded = 0.1 cfs @ 12.63 hrs, Volume= 4,256 cf
Primary = 0.6 cfs @ 12.63 hrs, Volume= 7,155 cf
Routed to Pond 0P :
Secondary = 0.0 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Pond 0P :

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Peak Elev= 99.27' @ 12.63 hrs Surf.Area= 1,881 sf Storage= 3,493 cf

Plug-Flow detention time= 190.8 min calculated for 11,410 cf (96% of inflow)
Center-of-Mass det. time= 170.6 min (1,080.8 - 910.3)

Volume	Invert	Avail.Storage	Storage Description
#1	94.00'	6,462 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
94.00	0	0.0	0	0	0
96.00	345	79.4	230	230	508
98.00	1,115	154.8	1,387	1,617	1,933
100.00	2,416	248.3	3,448	5,065	4,959
100.50	3,189	267.1	1,397	6,462	5,741

Device	Routing	Invert	Outlet Devices
#1	Primary	98.00'	**12.0" Round Culvert** L= 27.0' Ke= 0.500 Inlet / Outlet Invert= 98.00' / 97.90' S= 0.0037 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Device 1	98.10'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	98.75'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 1	99.20'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#5	Secondary	99.40'	**30.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32
#6	Discarded	94.00'	**1.020 in/hr Exfiltration over Wetted area** Phase-In= 0.01'

Discarded OutFlow Max=0.1 cfs @ 12.63 hrs HW=99.27' (Free Discharge)
└**6=Exfiltration** (Exfiltration Controls 0.1 cfs)

Primary OutFlow Max=0.6 cfs @ 12.63 hrs HW=99.27' TW=91.47' (Dynamic Tailwater)
└**1=Culvert** (Passes 0.6 cfs of 2.8 cfs potential flow)
  ├**2=Orifice/Grate** (Orifice Controls 0.2 cfs @ 4.91 fps)
  ├**3=Orifice/Grate** (Orifice Controls 0.1 cfs @ 3.01 fps)
  └**4=Broad-Crested Rectangular Weir** (Weir Controls 0.2 cfs @ 0.72 fps)

Secondary OutFlow Max=0.0 cfs @ 0.00 hrs HW=94.00' TW=89.08' (Dynamic Tailwater)
└**5=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Summary for Pond 2P: Brioretention

Inflow Area = 619,910 sf, 48.74% Impervious, Inflow Depth = 1.18" for 2-Year event
Inflow = 13.9 cfs @ 12.13 hrs, Volume= 60,843 cf
Outflow = 6.4 cfs @ 12.25 hrs, Volume= 60,843 cf, Atten= 54%, Lag= 7.0 min
Discarded = 0.1 cfs @ 12.25 hrs, Volume= 2,139 cf
Primary = 6.3 cfs @ 12.25 hrs, Volume= 58,703 cf
Routed to Pond 0P :
Secondary = 0.0 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Pond 0P :

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 115.36' @ 12.25 hrs Surf.Area= 3,158 sf Storage= 6,705 cf

Plug-Flow detention time= 13.3 min calculated for 60,826 cf (100% of inflow)
Center-of-Mass det. time= 13.4 min (854.5 - 841.1)

Volume	Invert	Avail.Storage	Storage Description
#1	110.00'	8,795 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
110.00	53	45.3	0	0	53
112.00	700	129.0	630	630	1,227
114.00	1,803	205.5	2,418	3,048	3,291
114.50	2,675	230.6	1,112	4,160	4,168
115.00	3,028	240.0	1,425	5,585	4,540
116.00	3,395	249.5	3,210	8,795	4,983

Device	Routing	Invert	Outlet Devices
#1	Primary	110.50'	**24.0" Round Culvert** L= 26.0' Ke= 0.500 Inlet / Outlet Invert= 110.50' / 110.00' S= 0.0192 '/' Cc= 0.900 n= 0.012, Flow Area= 3.14 sf
#2	Device 1	111.00'	**6.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	111.50'	**6.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 1	113.00'	**6.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#5	Device 1	114.00'	**6.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#6	Device 1	115.30'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#7	Secondary	115.50'	**88.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32
#8	Discarded	110.00'	**1.020 in/hr Exfiltration over Wetted area** Phase-In= 0.01'

Discarded OutFlow Max=0.1 cfs @ 12.25 hrs HW=115.36' (Free Discharge)
└**8=Exfiltration** (Exfiltration Controls 0.1 cfs)

Primary OutFlow Max=6.3 cfs @ 12.25 hrs HW=115.36' TW=92.43' (Dynamic Tailwater)
└**1=Culvert** (Passes 6.3 cfs of 29.7 cfs potential flow)
- **2=Orifice/Grate** (Orifice Controls 1.9 cfs @ 9.76 fps)
- **3=Orifice/Grate** (Orifice Controls 1.8 cfs @ 9.15 fps)
- **4=Orifice/Grate** (Orifice Controls 1.4 cfs @ 7.00 fps)
- **5=Orifice/Grate** (Orifice Controls 1.0 cfs @ 5.08 fps)
- **6=Broad-Crested Rectangular Weir** (Weir Controls 0.2 cfs @ 0.70 fps)

Secondary OutFlow Max=0.0 cfs @ 0.00 hrs HW=110.00' TW=89.08' (Dynamic Tailwater)
└**7=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Summary for Pond 3P: Brioretention

Inflow Area = 206,600 sf, 49.99% Impervious, Inflow Depth = 1.06" for 2-Year event
Inflow = 5.0 cfs @ 12.14 hrs, Volume= 18,239 cf
Outflow = 0.7 cfs @ 12.93 hrs, Volume= 18,235 cf, Atten= 85%, Lag= 47.4 min
Discarded = 0.2 cfs @ 12.93 hrs, Volume= 11,753 cf
Primary = 0.5 cfs @ 12.93 hrs, Volume= 6,481 cf
Routed to Reach 1R :
Secondary = 0.0 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Reach DP3 :

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 153.89' @ 12.93 hrs Surf.Area= 3,058 sf Storage= 7,635 cf

Plug-Flow detention time= 229.6 min calculated for 18,235 cf (100% of inflow)
Center-of-Mass det. time= 229.4 min (1,035.1 - 805.7)

Volume	Invert	Avail.Storage	Storage Description
#1	148.00'	31,183 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
148.00	0	0.0	0	0	0
150.00	833	121.1	555	555	1,173
152.00	1,785	173.3	2,558	3,114	2,431
154.00	3,143	233.9	4,864	7,978	4,437
156.00	4,805	287.3	7,889	15,867	6,712
158.00	6,810	347.0	11,557	27,424	9,791
158.50	8,248	372.2	3,759	31,183	11,245

Device	Routing	Invert	Outlet Devices
#1	Primary	151.00'	**24.0" Round Culvert** L= 143.0' Ke= 0.500 Inlet / Outlet Invert= 151.00' / 149.35' S= 0.0115 '/' Cc= 0.900 n= 0.012, Flow Area= 3.14 sf
#2	Device 1	151.75'	**2.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	153.00'	**4.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 1	156.60'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#5	Secondary	157.65'	**30.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32
#6	Discarded	148.00'	**2.410 in/hr Exfiltration over Wetted area** Phase-In= 0.01'

Discarded OutFlow Max=0.2 cfs @ 12.93 hrs HW=153.89' (Free Discharge)
└**6=Exfiltration** (Exfiltration Controls 0.2 cfs)

Primary OutFlow Max=0.5 cfs @ 12.93 hrs HW=153.89' TW=150.14' (Dynamic Tailwater)
└**1=Culvert** (Passes 0.5 cfs of 20.8 cfs potential flow)
  ├**2=Orifice/Grate** (Orifice Controls 0.2 cfs @ 6.90 fps)
  ├**3=Orifice/Grate** (Orifice Controls 0.4 cfs @ 4.09 fps)
  └**4=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Secondary OutFlow Max=0.0 cfs @ 0.00 hrs HW=148.00' TW=0.00' (Dynamic Tailwater)
└**5=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Summary for Pond 4P: Brioretention

Inflow Area = 82,012 sf, 49.04% Impervious, Inflow Depth = 1.45" for 2-Year event
Inflow = 2.6 cfs @ 12.13 hrs, Volume= 9,909 cf
Outflow = 1.3 cfs @ 12.24 hrs, Volume= 9,909 cf, Atten= 50%, Lag= 6.4 min
Discarded = 0.3 cfs @ 12.24 hrs, Volume= 7,604 cf
Primary = 1.0 cfs @ 12.24 hrs, Volume= 2,305 cf
Routed to Pond 3P : Brioretention
Secondary = 0.0 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Reach DP3 :

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 160.86' @ 12.24 hrs Surf.Area= 1,891 sf Storage= 2,378 cf

Plug-Flow detention time= 85.5 min calculated for 9,906 cf (100% of inflow)
Center-of-Mass det. time= 85.5 min (905.9 - 820.4)

Volume	Invert	Avail.Storage	Storage Description
#1	158.00'	6,976 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
158.00	142	68.1	0	0	142
159.00	404	96.9	262	262	529
160.00	1,234	201.9	781	1,043	3,030
162.00	2,975	321.8	4,083	5,127	8,054
162.50	4,474	382.9	1,850	6,976	11,485

Device	Routing	Invert	Outlet Devices
#1	Primary	158.00'	**12.0" Round Culvert** L= 61.0' Ke= 0.500 Inlet / Outlet Invert= 158.00' / 154.90' S= 0.0508 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Device 1	160.15'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	160.40'	**12.0" W x 4.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 1	160.90'	**12.0" W x 3.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#5	Device 1	161.40'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#6	Secondary	161.70'	**20.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32
#7	Discarded	158.00'	**2.410 in/hr Exfiltration over Wetted area** Phase-In= 0.01'

Discarded OutFlow Max=0.3 cfs @ 12.24 hrs HW=160.86' (Free Discharge)
└**7=Exfiltration** (Exfiltration Controls 0.3 cfs)

Primary OutFlow Max=1.0 cfs @ 12.24 hrs HW=160.86' TW=153.24' (Dynamic Tailwater)
└**1=Culvert** (Passes 1.0 cfs of 5.8 cfs potential flow)
  ├**2=Orifice/Grate** (Orifice Controls 0.2 cfs @ 3.68 fps)
  ├**3=Orifice/Grate** (Orifice Controls 0.9 cfs @ 2.57 fps)
  ├**4=Orifice/Grate** (Controls 0.0 cfs)
  └**5=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Secondary OutFlow Max=0.0 cfs @ 0.00 hrs HW=158.00' TW=0.00' (Dynamic Tailwater)
└**6=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Summary for Pond 5P: Brioretention

Inflow Area = 84,736 sf, 34.88% Impervious, Inflow Depth = 1.04" for 2-Year event
Inflow = 0.6 cfs @ 12.18 hrs, Volume= 7,350 cf
Outflow = 0.4 cfs @ 13.08 hrs, Volume= 7,347 cf, Atten= 29%, Lag= 54.0 min
Discarded = 0.0 cfs @ 13.08 hrs, Volume= 1,492 cf
Primary = 0.4 cfs @ 13.08 hrs, Volume= 5,855 cf
Routed to Reach 2R :
Secondary = 0.0 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Reach 5R :

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Peak Elev= 165.35' @ 13.08 hrs Surf.Area= 902 sf Storage= 1,201 cf

Plug-Flow detention time= 91.0 min calculated for 7,347 cf (100% of inflow)
Center-of-Mass det. time= 90.7 min (1,008.0 - 917.3)

Volume	Invert	Avail.Storage	Storage Description
#1	163.00'	6,415 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
163.00	192	62.9	0	0	192
164.00	445	91.6	310	310	553
166.00	1,180	141.0	1,566	1,876	1,497
168.00	2,178	184.3	3,307	5,184	2,664
168.50	2,759	203.2	1,231	6,415	3,255

Device	Routing	Invert	Outlet Devices
#1	Primary	162.00'	**12.0" Round Culvert** L= 65.0' Ke= 0.500 Inlet / Outlet Invert= 162.00' / 156.20' S= 0.0892 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Device 1	164.00'	**2.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	164.67'	**4.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 1	165.50'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#5	Device 1	166.50'	**4.0" W x 3.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#6	Device 1	168.10'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#7	Secondary	168.25'	**20.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32
#8	Discarded	163.00'	**1.020 in/hr Exfiltration over Wetted area** Phase-In= 0.01'

Discarded OutFlow Max=0.0 cfs @ 13.08 hrs HW=165.35' (Free Discharge)
└**8=Exfiltration** (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=0.4 cfs @ 13.08 hrs HW=165.35' TW=156.23' (Dynamic Tailwater)
└**1=Culvert** (Passes 0.4 cfs of 6.4 cfs potential flow)
  ├**2=Orifice/Grate** (Orifice Controls 0.1 cfs @ 5.42 fps)
  ├**3=Orifice/Grate** (Orifice Controls 0.3 cfs @ 3.45 fps)
  ├**4=Orifice/Grate** (Controls 0.0 cfs)
  ├**5=Orifice/Grate** (Controls 0.0 cfs)
  └**6=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Secondary OutFlow Max=0.0 cfs @ 0.00 hrs HW=163.00' TW=167.00' (Dynamic Tailwater)
└**7=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Summary for Pond 6P: Brioretention

Inflow Area = 74,887 sf, 31.59% Impervious, Inflow Depth = 1.48" for 2-Year event
Inflow = 2.7 cfs @ 12.13 hrs, Volume= 9,219 cf
Outflow = 0.5 cfs @ 12.49 hrs, Volume= 9,032 cf, Atten= 80%, Lag= 21.3 min
Discarded = 0.1 cfs @ 12.49 hrs, Volume= 3,268 cf
Primary = 0.5 cfs @ 12.49 hrs, Volume= 5,764 cf
Routed to Pond 5P : Brioretention
Secondary = 0.0 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Pond 3P : Brioretention

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 168.24' @ 12.49 hrs Surf.Area= 2,002 sf Storage= 3,302 cf

Plug-Flow detention time= 217.0 min calculated for 9,032 cf (98% of inflow)
Center-of-Mass det. time= 204.9 min (1,041.7 - 836.8)

Volume	Invert	Avail.Storage	Storage Description
#1	165.00'	16,396 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
165.00	177	59.1	0	0	177
166.00	643	110.0	386	386	867
168.00	1,920	162.6	2,449	2,835	2,040
170.00	2,659	207.6	4,559	7,394	3,417
172.00	4,083	254.8	6,691	14,085	5,214
172.50	5,180	283.8	2,310	16,396	6,464

Device	Routing	Invert	Outlet Devices
#1	Primary	166.50'	**12.0" Round Culvert** L= 106.0' Ke= 0.500 Inlet / Outlet Invert= 166.50' / 165.00' S= 0.0142 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Device 1	166.75'	**2.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	167.75'	**6.0" W x 3.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 1	169.25'	**6.0" W x 4.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#5	Device 1	171.75'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#6	Secondary	172.10'	**20.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32
#7	Discarded	165.00'	**1.020 in/hr Exfiltration over Wetted area** Phase-In= 0.01'

Discarded OutFlow Max=0.1 cfs @ 12.49 hrs HW=168.24' (Free Discharge)
└─**7=Exfiltration** (Exfiltration Controls 0.1 cfs)

Primary OutFlow Max=0.5 cfs @ 12.49 hrs HW=168.24' TW=165.13' (Dynamic Tailwater)
└─**1=Culvert** (Passes 0.5 cfs of 4.2 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 0.1 cfs @ 5.71 fps)
  ├─**3=Orifice/Grate** (Orifice Controls 0.4 cfs @ 2.89 fps)
  ├─**4=Orifice/Grate** (Controls 0.0 cfs)
  └─**5=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Secondary OutFlow Max=0.0 cfs @ 0.00 hrs HW=165.00' TW=148.00' (Dynamic Tailwater)
└─**6=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Summary for Pond 7P: Brioretention

Inflow Area = 101,109 sf, 48.88% Impervious, Inflow Depth = 1.77" for 2-Year event
Inflow = 4.4 cfs @ 12.13 hrs, Volume= 14,953 cf
Outflow = 1.0 cfs @ 12.39 hrs, Volume= 14,720 cf, Atten= 77%, Lag= 15.8 min
Discarded = 0.1 cfs @ 12.39 hrs, Volume= 3,176 cf
Primary = 1.0 cfs @ 12.39 hrs, Volume= 11,544 cf
Routed to Reach 3R :
Secondary = 0.0 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Reach 3R :

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 179.78' @ 12.39 hrs Surf.Area= 2,375 sf Storage= 5,159 cf

Plug-Flow detention time= 158.8 min calculated for 14,720 cf (98% of inflow)
Center-of-Mass det. time= 149.5 min (979.9 - 830.4)

Volume	Invert	Avail.Storage	Storage Description
#1	175.00'	14,145 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
175.00	168	50.4	0	0	168
176.00	361	73.0	258	258	398
176.50	478	82.4	209	467	521
178.00	1,417	148.6	1,359	1,826	1,750
180.00	2,513	199.3	3,878	5,705	3,196
182.00	3,821	237.0	6,288	11,993	4,576
182.50	4,804	261.2	2,152	14,145	5,543

Device	Routing	Invert	Outlet Devices
#1	Primary	176.00'	**18.0" Round Culvert** L= 46.0' Ke= 0.500 Inlet / Outlet Invert= 176.00' / 174.00' S= 0.0435 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf
#2	Device 1	176.75'	**2.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	178.50'	**4.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 1	179.00'	**4.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#5	Device 1	180.00'	**10.0" W x 4.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#6	Device 1	181.00'	**8.0" W x 3.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#7	Device 1	181.75'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#8	Secondary	182.25'	**20.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32
#9	Discarded	175.00'	**1.020 in/hr Exfiltration over Wetted area** Phase-In= 0.01'

Discarded OutFlow Max=0.1 cfs @ 12.39 hrs HW=179.78' (Free Discharge)
└─**9=Exfiltration** (Exfiltration Controls 0.1 cfs)

Primary OutFlow Max=1.0 cfs @ 12.39 hrs HW=179.78' TW=172.10' (Dynamic Tailwater)
└─**1=Culvert** (Passes 1.0 cfs of 14.8 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 0.2 cfs @ 8.26 fps)
  ├─**3=Orifice/Grate** (Orifice Controls 0.4 cfs @ 5.07 fps)
  ├─**4=Orifice/Grate** (Orifice Controls 0.3 cfs @ 3.76 fps)
  ├─**5=Orifice/Grate** (Controls 0.0 cfs)
  ├─**6=Orifice/Grate** (Controls 0.0 cfs)
  └─**7=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Secondary OutFlow Max=0.0 cfs @ 0.00 hrs HW=175.00' TW=172.00' (Dynamic Tailwater)
└─**8=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Summary for Pond 8P: Brioretention

Inflow Area = 58,074 sf, 42.43% Impervious, Inflow Depth = 1.57" for 2-Year event
Inflow = 1.8 cfs @ 12.20 hrs, Volume= 7,589 cf
Outflow = 0.7 cfs @ 12.44 hrs, Volume= 7,589 cf, Atten= 59%, Lag= 14.1 min
Discarded = 0.1 cfs @ 12.44 hrs, Volume= 1,000 cf
Primary = 0.7 cfs @ 12.44 hrs, Volume= 6,589 cf
Routed to Reach 4R :
Secondary = 0.0 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Reach 4R :

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 180.09' @ 12.44 hrs Surf.Area= 1,566 sf Storage= 1,830 cf

Plug-Flow detention time= 47.0 min calculated for 7,587 cf (100% of inflow)
Center-of-Mass det. time= 47.1 min (911.7 - 864.7)

Volume	Invert	Avail.Storage	Storage Description
#1	177.00'	2,582 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
177.00	101	54.5	0	0	101
178.00	357	92.4	216	216	550
179.00	690	103.3	514	730	746
179.50	875	112.7	390	1,121	916
180.00	1,469	193.1	580	1,700	2,874
180.50	2,077	212.0	882	2,582	3,492

Device	Routing	Invert	Outlet Devices
#1	Primary	177.00'	**12.0" Round Culvert** L= 46.0' Ke= 0.500 Inlet / Outlet Invert= 177.00' / 176.00' S= 0.0217 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Device 1	177.50'	**2.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	178.00'	**2.5" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 1	180.00'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#5	Secondary	180.25'	**15.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32
#6	Discarded	177.00'	**1.020 in/hr Exfiltration over Wetted area** Phase-In= 0.01'

Discarded OutFlow Max=0.1 cfs @ 12.44 hrs HW=180.09' (Free Discharge)
└**6=Exfiltration** (Exfiltration Controls 0.1 cfs)

Primary OutFlow Max=0.7 cfs @ 12.44 hrs HW=180.09' TW=176.10' (Dynamic Tailwater)
└**1=Culvert** (Passes 0.7 cfs of 6.1 cfs potential flow)
  ├**2=Orifice/Grate** (Orifice Controls 0.2 cfs @ 7.62 fps)
  ├**3=Orifice/Grate** (Orifice Controls 0.2 cfs @ 6.78 fps)
  └**4=Broad-Crested Rectangular Weir** (Weir Controls 0.3 cfs @ 0.82 fps)

Secondary OutFlow Max=0.0 cfs @ 0.00 hrs HW=177.00' TW=176.00' (Dynamic Tailwater)
└**5=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Summary for Pond 9P: Brioretention

Inflow Area = 37,513 sf, 29.50% Impervious, Inflow Depth = 1.43" for 2-Year event
Inflow = 1.2 cfs @ 12.14 hrs, Volume= 4,467 cf
Outflow = 0.7 cfs @ 12.22 hrs, Volume= 3,907 cf, Atten= 39%, Lag= 4.9 min
Discarded = 0.0 cfs @ 12.22 hrs, Volume= 2,048 cf
Primary = 0.7 cfs @ 12.22 hrs, Volume= 1,860 cf
Routed to Reach 4R :

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Peak Elev= 198.64' @ 12.22 hrs Surf.Area= 924 sf Storage= 1,425 cf

Plug-Flow detention time= 313.8 min calculated for 3,906 cf (87% of inflow)
Center-of-Mass det. time= 247.4 min (1,075.5 - 828.1)

Volume	Invert	Avail.Storage	Storage Description
#1	196.00'	2,071 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
196.00	225	58.8	0	0	225
198.00	720	100.2	898	898	772
199.00	1,049	119.1	879	1,778	1,120
199.25	1,300	131.7	293	2,071	1,373

Device	Routing	Invert	Outlet Devices
#1	Primary	198.55'	**10.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32
#2	Discarded	196.00'	**1.020 in/hr Exfiltration over Wetted area** Phase-In= 0.01'

Discarded OutFlow Max=0.0 cfs @ 12.22 hrs HW=198.64' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=0.7 cfs @ 12.22 hrs HW=198.64' TW=176.06' (Dynamic Tailwater)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 0.7 cfs @ 0.77 fps)

Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 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 PS1: Runoff Area=617,148 sf 0.92% Impervious Runoff Depth=3.02"
Flow Length=1,779' Tc=18.1 min CN=83 Runoff=31.5 cfs 155,352 cf

Subcatchment PS10: Runoff Area=29,494 sf 8.32% Impervious Runoff Depth=1.33"
Flow Length=502' Tc=8.5 min UI Adjusted CN=62 Runoff=0.9 cfs 3,280 cf

Subcatchment PS11: Runoff Area=64,352 sf 16.63% Impervious Runoff Depth=1.61"
Flow Length=649' Tc=6.2 min UI Adjusted CN=66 Runoff=2.6 cfs 8,650 cf

Subcatchment PS12: Runoff Area=20,216 sf 61.06% Impervious Runoff Depth=3.21"
Tc=6.0 min CN=85 Runoff=1.6 cfs 5,410 cf

Subcatchment PS13: Runoff Area=3,949 sf 0.00% Impervious Runoff Depth=1.33"
Tc=6.0 min CN=62 Runoff=0.1 cfs 439 cf

Subcatchment PS14: Runoff Area=42,549 sf 4.11% Impervious Runoff Depth=2.15"
Tc=6.0 min CN=73 Runoff=2.3 cfs 7,616 cf

Subcatchment PS15: Runoff Area=17,922 sf 41.79% Impervious Runoff Depth=3.02"
Tc=6.0 min CN=83 Runoff=1.4 cfs 4,511 cf

Subcatchment PS16: Runoff Area=81,403 sf 36.51% Impervious Runoff Depth=2.93"
Tc=6.0 min CN=82 Runoff=6.1 cfs 19,859 cf

Subcatchment PS17: Runoff Area=58,074 sf 42.43% Impervious Runoff Depth=3.02"
Flow Length=623' Tc=12.2 min CN=83 Runoff=3.5 cfs 14,619 cf

Subcatchment PS18: Runoff Area=27,660 sf 4.39% Impervious Runoff Depth=2.07"
Flow Length=120' Tc=7.4 min UI Adjusted CN=72 Runoff=1.4 cfs 4,766 cf

Subcatchment PS19: Offsite to Culvert Runoff Area=782,989 sf 33.76% Impervious Runoff Depth=2.93"
Tc=30.0 min CN=82 Runoff=30.3 cfs 191,015 cf

Subcatchment PS2: Runoff Area=167,949 sf 16.69% Impervious Runoff Depth=1.99"
Flow Length=550' Tc=7.5 min CN=71 Runoff=8.0 cfs 27,836 cf

Subcatchment PS3: Runoff Area=13,646 sf 44.33% Impervious Runoff Depth=3.12"
Tc=6.0 min CN=84 Runoff=1.1 cfs 3,543 cf

Subcatchment PS4: Runoff Area=99,519 sf 30.07% Impervious Runoff Depth=3.02"
Flow Length=816' Tc=6.2 min CN=83 Runoff=7.6 cfs 25,051 cf

Subcatchment PS5: Runoff Area=63,875 sf 56.24% Impervious Runoff Depth=3.12"
Tc=6.0 min CN=84 Runoff=5.0 cfs 16,582 cf

Subcatchment PS6: Runoff Area=6,550 sf 0.00% Impervious Runoff Depth=1.02"
Flow Length=122' Tc=6.4 min CN=57 Runoff=0.1 cfs 554 cf

Subcatchment PS7: Runoff Area=58,298 sf 7.21% Impervious Runoff Depth=1.33"
Tc=6.0 min UI Adjusted CN=62 Runoff=1.9 cfs 6,484 cf

Subcatchment PS8: Runoff Area=13,992 sf 0.00% Impervious Runoff Depth=1.08"
Tc=6.0 min CN=58 Runoff=0.3 cfs 1,255 cf

Subcatchment PS9: Runoff Area=29,587 sf 50.13% Impervious Runoff Depth=2.66"
Tc=6.0 min CN=79 Runoff=2.0 cfs 6,548 cf

Subcatchment R1: Runoff Area=9,853 sf 100.00% Impervious Runoff Depth=4.59"
Tc=6.0 min CN=98 Runoff=1.0 cfs 3,772 cf

Subcatchment R10: Runoff Area=2,616 sf 100.00% Impervious Runoff Depth=4.59"
Tc=6.0 min CN=98 Runoff=0.3 cfs 1,001 cf

Subcatchment R11: Runoff Area=5,231 sf 100.00% Impervious Runoff Depth=4.59"
Tc=6.0 min CN=98 Runoff=0.5 cfs 2,002 cf

Subcatchment R12: Runoff Area=15,084 sf 100.00% Impervious Runoff Depth=4.59"
Tc=6.0 min CN=98 Runoff=1.5 cfs 5,774 cf

Subcatchment R13: Runoff Area=11,800 sf 100.00% Impervious Runoff Depth=4.59"
Tc=6.0 min CN=98 Runoff=1.2 cfs 4,517 cf

Subcatchment R14: Runoff Area=5,900 sf 100.00% Impervious Runoff Depth=4.59"
Tc=6.0 min CN=98 Runoff=0.6 cfs 2,258 cf

Subcatchment R15: Runoff Area=18,368 sf 100.00% Impervious Runoff Depth=4.59"
Tc=6.0 min CN=98 Runoff=1.8 cfs 7,031 cf

Subcatchment R16: Runoff Area=9,853 sf 100.00% Impervious Runoff Depth=4.59"
Tc=6.0 min CN=98 Runoff=1.0 cfs 3,772 cf

Subcatchment R17: Runoff Area=14,416 sf 100.00% Impervious Runoff Depth=4.59"
Tc=6.0 min CN=98 Runoff=1.4 cfs 5,518 cf

Subcatchment R18: Runoff Area=9,853 sf 100.00% Impervious Runoff Depth=4.59"
Tc=6.0 min CN=98 Runoff=1.0 cfs 3,772 cf

Subcatchment R19: Runoff Area=9,853 sf 100.00% Impervious Runoff Depth=4.59"
Tc=6.0 min CN=98 Runoff=1.0 cfs 3,772 cf

Subcatchment R2: Runoff Area=7,847 sf 100.00% Impervious Runoff Depth=4.59"
Tc=6.0 min CN=98 Runoff=0.8 cfs 3,004 cf

Subcatchment R3: Runoff Area=13,137 sf 100.00% Impervious Runoff Depth=4.59"
Tc=6.0 min CN=98 Runoff=1.3 cfs 5,029 cf

Subcatchment R4: Runoff Area=6,568 sf 100.00% Impervious Runoff Depth=4.59"
Tc=6.0 min CN=98 Runoff=0.7 cfs 2,514 cf

Subcatchment R5: Runoff Area=13,137 sf 100.00% Impervious Runoff Depth=4.59"
Tc=6.0 min CN=98 Runoff=1.3 cfs 5,029 cf

Subcatchment R6: Runoff Area=6,568 sf 100.00% Impervious Runoff Depth=4.59"
Tc=6.0 min CN=98 Runoff=0.7 cfs 2,514 cf

Subcatchment R7: Runoff Area=36,126 sf 100.00% Impervious Runoff Depth=4.59"
Tc=6.0 min CN=98 Runoff=3.6 cfs 13,829 cf

Subcatchment R8: Runoff Area=3,284 sf 100.00% Impervious Runoff Depth=4.59"
Tc=6.0 min CN=98 Runoff=0.3 cfs 1,257 cf

Subcatchment R9: Runoff Area=6,568 sf 100.00% Impervious Runoff Depth=4.59"
Tc=6.0 min CN=98 Runoff=0.7 cfs 2,514 cf

Reach 1R: Avg. Flow Depth=0.19' Max Vel=6.34 fps Inflow=0.9 cfs 19,835 cf
24.0" Round Pipe n=0.012 L=860.0' S=0.0442 '/' Capacity=51.5 cfs Outflow=0.9 cfs 19,835 cf

Reach 2R: Avg. Flow Depth=0.19' Max Vel=6.82 fps Inflow=0.9 cfs 14,128 cf
18.0" Round Pipe n=0.012 L=865.0' S=0.0510 '/' Capacity=25.7 cfs Outflow=0.9 cfs 14,128 cf

Reach 3R: Avg. Flow Depth=0.19' Max Vel=2.73 fps Inflow=2.6 cfs 23,070 cf
n=0.040 L=1,293.0' S=0.0641 '/' Capacity=62.5 cfs Outflow=2.5 cfs 23,070 cf

Reach 4R: Avg. Flow Depth=0.24' Max Vel=3.26 fps Inflow=5.0 cfs 19,038 cf
n=0.040 L=1,263.0' S=0.0688 '/' Capacity=64.7 cfs Outflow=4.1 cfs 19,038 cf

Reach 5R: Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.0 cfs 0 cf
n=0.040 L=1,225.0' S=0.0636 '/' Capacity=62.2 cfs Outflow=0.0 cfs 0 cf

Reach DP1: Inflow=66.6 cfs 528,916 cf
Outflow=66.6 cfs 528,916 cf

Reach DP2: Inflow=0.1 cfs 554 cf
Outflow=0.1 cfs 554 cf

Reach DP3: Inflow=0.3 cfs 1,255 cf
Outflow=0.3 cfs 1,255 cf

Pond 0P: Peak Elev=98.28' Storage=15,036 cf Inflow=77.4 cfs 528,916 cf
Outflow=66.6 cfs 528,916 cf

Pond 1P: Bioretention Peak Elev=99.56' Storage=4,076 cf Inflow=8.0 cfs 27,836 cf
Discarded=0.1 cfs 5,162 cf Primary=3.0 cfs 18,645 cf Secondary=4.9 cfs 3,507 cf Outflow=8.0 cfs 27,314 cf

Pond 2P: Brioretention Peak Elev=115.68' Storage=7,715 cf Inflow=25.9 cfs 121,313 cf
Discarded=0.1 cfs 3,025 cf Primary=9.1 cfs 109,862 cf Secondary=16.5 cfs 8,427 cf Outflow=25.8 cfs 121,313 cf

Pond 3P: Brioretention Peak Elev=156.17' Storage=16,712 cf Inflow=10.4 cfs 36,819 cf
Discarded=0.4 cfs 16,926 cf Primary=0.9 cfs 19,835 cf Secondary=0.0 cfs 0 cf Outflow=1.3 cfs 36,761 cf

Pond 4P: Brioretention Peak Elev=161.45' Storage=3,647 cf Inflow=5.1 cfs 18,606 cf
Discarded=0.4 cfs 11,166 cf Primary=2.7 cfs 7,440 cf Secondary=0.0 cfs 0 cf Outflow=3.0 cfs 18,606 cf

Pond 5P: Brioretention Peak Elev=166.43' Storage=2,424 cf Inflow=1.5 cfs 16,075 cf
Discarded=0.0 cfs 1,904 cf Primary=0.9 cfs 14,128 cf Secondary=0.0 cfs 0 cf Outflow=0.9 cfs 16,032 cf

Pond 6P: Brioretention Peak Elev=169.52' Storage=6,167 cf Inflow=5.2 cfs 17,646 cf
Discarded=0.1 cfs 3,977 cf Primary=1.2 cfs 13,378 cf Secondary=0.0 cfs 0 cf Outflow=1.2 cfs 17,354 cf

Pond 7P: Brioretention Peak Elev=180.99' Storage=8,502 cf Inflow=8.0 cfs 27,402 cf
Discarded=0.1 cfs 4,035 cf Primary=2.6 cfs 23,070 cf Secondary=0.0 cfs 0 cf Outflow=2.7 cfs 27,105 cf

Pond 8P: Brioretention Peak Elev=180.32' Storage=2,237 cf Inflow=3.5 cfs 14,619 cf
Discarded=0.1 cfs 1,393 cf Primary=2.5 cfs 12,887 cf Secondary=0.8 cfs 338 cf Outflow=3.4 cfs 14,619 cf

Pond 9P: Brioretention Peak Elev=198.75' Storage=1,527 cf Inflow=2.3 cfs 8,538 cf
Discarded=0.0 cfs 2,162 cf Primary=2.3 cfs 5,813 cf Outflow=2.3 cfs 7,975 cf

Total Runoff Area = 2,405,234 sf Runoff Volume = 582,249 cf Average Runoff Depth = 2.90"
71.51% Pervious = 1,719,957 sf 28.49% Impervious = 685,277 sf

Summary for Subcatchment PS1:

Runoff = 31.5 cfs @ 12.27 hrs, Volume= 155,352 cf, Depth= 3.02"
Routed to Pond 0P :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 10-Year Rainfall=4.83"

Area (sf)	CN	Description
44,071	74	>75% Grass cover, Good, HSG C
11,725	80	>75% Grass cover, Good, HSG D
10,632	55	Woods, Good, HSG B
105,057	70	Woods, Good, HSG C
159,591	77	Woods, Good, HSG D
3,226	98	Paved parking, HSG C
1,412	98	Unconnected pavement, HSG C
51	98	Paved parking, HSG D
960	98	Unconnected pavement, HSG D
29,959	98	Water Surface, 0% imp, HSG B
100,589	98	Water Surface, 0% imp, HSG C
102,060	98	Water Surface, 0% imp, HSG D
4,551	58	Meadow, non-grazed, HSG B
39,285	71	Meadow, non-grazed, HSG C
3,979	78	Meadow, non-grazed, HSG D
617,148	83	Weighted Average
611,499		99.08% Pervious Area
5,649		0.92% Impervious Area
2,372		41.99% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.7	50	0.0300	0.08		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
1.0	138	0.0220	2.39		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
2.6	579	0.0520	3.67		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
3.8	1,012	0.0750	4.41		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
18.1	1,779	Total			

Summary for Subcatchment PS10:

Runoff = 0.9 cfs @ 12.16 hrs, Volume= 3,280 cf, Depth= 1.33"
Routed to Pond 4P : Brioretention

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 10-Year Rainfall=4.83"

Area (sf)	CN	Adj	Description
18,930	61		>75% Grass cover, Good, HSG B
2,454	98		Unconnected pavement, HSG B
7,219	58		Meadow, non-grazed, HSG B
891	55		Woods, Good, HSG B
29,494	63	62	Weighted Average, UI Adjusted
27,040			91.68% Pervious Area
2,454			8.32% Impervious Area
2,454			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.9	50	0.0300	0.17		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.10"
3.6	452	0.0170	2.10		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
8.5	502	Total			

Summary for Subcatchment PS11:

Runoff = 2.6 cfs @ 12.14 hrs, Volume= 8,650 cf, Depth= 1.61"
Routed to Pond 3P : Brioretention

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 10-Year Rainfall=4.83"

Area (sf)	CN	Adj	Description
30,469	61		>75% Grass cover, Good, HSG B
3,648	74		>75% Grass cover, Good, HSG C
5,143	98		Paved parking, HSG B
5,079	98		Unconnected pavement, HSG B
482	98		Unconnected pavement, HSG C
14,936	58		Meadow, non-grazed, HSG B
2,705	55		Woods, Good, HSG B
1,890	71		Meadow, non-grazed, HSG C
64,352	67	66	Weighted Average, UI Adjusted
53,648			83.37% Pervious Area
10,704			16.63% Impervious Area
5,561			51.95% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.9	34	0.0500	0.19		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.10"
3.0	400	0.0187	2.20		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.0	23	0.0490	10.88	8.54	**Pipe Channel,** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012
0.1	74	0.0520	14.68	25.95	**Pipe Channel,** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.012
0.2	118	0.0230	9.77	17.26	**Pipe Channel,** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.012
6.2	649	Total			

Summary for Subcatchment PS12:

Runoff = 1.6 cfs @ 12.13 hrs, Volume= 5,410 cf, Depth= 3.21"
Routed to Pond 3P : Brioretention

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 10-Year Rainfall=4.83"

Area (sf)	CN	Description
6,186	61	>75% Grass cover, Good, HSG B
1,596	74	>75% Grass cover, Good, HSG C
9,583	98	Paved parking, HSG B
315	98	Unconnected pavement, HSG B
2,390	98	Paved parking, HSG C
55	98	Unconnected pavement, HSG C
91	71	Meadow, non-grazed, HSG C
20,216	85	Weighted Average
7,873		38.94% Pervious Area
12,343		61.06% Impervious Area
370		3.00% Unconnected

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

Summary for Subcatchment PS13:

Runoff = 0.1 cfs @ 12.14 hrs, Volume= 439 cf, Depth= 1.33"
Routed to Pond 5P : Brioretention

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 10-Year Rainfall=4.83"

Area (sf)	CN	Description
944	61	>75% Grass cover, Good, HSG B
194	74	>75% Grass cover, Good, HSG C
2,062	58	Meadow, non-grazed, HSG B
749	71	Meadow, non-grazed, HSG C
3,949	62	Weighted Average
3,949		100.00% Pervious Area

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

Summary for Subcatchment PS14:

Runoff = 2.3 cfs @ 12.13 hrs, Volume= 7,616 cf, Depth= 2.15"
Routed to Pond 6P : Brioretention

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 10-Year Rainfall=4.83"

Area (sf)	CN	Description
17,357	74	>75% Grass cover, Good, HSG C
1,750	98	Unconnected pavement, HSG C
22,520	71	Meadow, non-grazed, HSG C
922	70	Woods, Good, HSG C
42,549	73	Weighted Average
40,799		95.89% Pervious Area
1,750		4.11% Impervious Area
1,750		100.00% Unconnected

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

Summary for Subcatchment PS15:

Runoff = 1.4 cfs @ 12.13 hrs, Volume= 4,511 cf, Depth= 3.02"
Routed to Pond 6P : Brioretention

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 10-Year Rainfall=4.83"

Area (sf)	CN	Description
244	61	>75% Grass cover, Good, HSG B
5,873	74	>75% Grass cover, Good, HSG C
633	98	Paved parking, HSG B
5,985	98	Paved parking, HSG C
872	98	Unconnected pavement, HSG C
283	58	Meadow, non-grazed, HSG B
4,032	71	Meadow, non-grazed, HSG C
17,922	83	Weighted Average
10,432		58.21% Pervious Area
7,490		41.79% Impervious Area
872		11.64% Unconnected

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

Summary for Subcatchment PS16:

Runoff = 6.1 cfs @ 12.13 hrs, Volume= 19,859 cf, Depth= 2.93"
Routed to Pond 7P : Brioretention

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 10-Year Rainfall=4.83"

Area (sf)	CN	Description
35,815	74	>75% Grass cover, Good, HSG C
3,437	70	Woods, Good, HSG C
27,090	98	Paved parking, HSG C
2,627	98	Unconnected pavement, HSG C
588	58	Meadow, non-grazed, HSG B
11,846	71	Meadow, non-grazed, HSG C
81,403	82	Weighted Average
51,686		63.49% Pervious Area
29,717		36.51% Impervious Area
2,627		8.84% Unconnected

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

Summary for Subcatchment PS17:

Runoff = 3.5 cfs @ 12.20 hrs, Volume= 14,619 cf, Depth= 3.02"
Routed to Pond 8P : Brioretention

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 10-Year Rainfall=4.83"

Area (sf)	CN	Description
14,027	74	>75% Grass cover, Good, HSG C
9,589	70	Woods, Good, HSG C
24,540	98	Paved parking, HSG C
99	98	Unconnected pavement, HSG C
9,819	71	Meadow, non-grazed, HSG C
58,074	83	Weighted Average
33,435		57.57% Pervious Area
24,639		42.43% Impervious Area
99		0.40% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	50	0.0400	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
2.6	500	0.0400	3.22		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.1	49	0.0480	10.77	8.46	**Pipe Channel,** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012
0.0	24	0.0180	8.64	15.27	**Pipe Channel,** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.012
12.2	623	Total			

Summary for Subcatchment PS18:

Runoff = 1.4 cfs @ 12.15 hrs, Volume= 4,766 cf, Depth= 2.07"
Routed to Pond 9P : Brioretention

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 10-Year Rainfall=4.83"

Area (sf)	CN	Adj	Description
9,869	74		>75% Grass cover, Good, HSG C
8,341	70		Woods, Good, HSG C
8,235	71		Meadow, non-grazed, HSG C
1,215	98		Unconnected pavement, HSG C
27,660	73	72	Weighted Average, UI Adjusted
26,445			95.61% Pervious Area
1,215			4.39% Impervious Area
1,215			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.2	50	0.0800	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
0.2	70	0.0860	4.72		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
7.4	120	Total			

Summary for Subcatchment PS19: Offsite to Culvert

Runoff = 30.3 cfs @ 12.43 hrs, Volume= 191,015 cf, Depth= 2.93"
Routed to Pond 0P :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 10-Year Rainfall=4.83"

Area (sf)	CN	Description
2,730	98	Paved roads w/curbs & sewers, HSG B
50,258	98	Paved roads w/curbs & sewers, HSG C
515,359	83	1/4 acre lots, 38% imp, HSG C
40,722	87	1/4 acre lots, 38% imp, HSG D
138,058	70	Woods, Good, HSG C
35,862	77	Woods, Good, HSG D
782,989	82	Weighted Average
518,690		66.24% Pervious Area
264,299		33.76% Impervious Area

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

Summary for Subcatchment PS2:

Runoff = 8.0 cfs @ 12.15 hrs, Volume= 27,836 cf, Depth= 1.99"
Routed to Pond 1P : Bioretention

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 10-Year Rainfall=4.83"

Area (sf)	CN	Description
26,645	61	>75% Grass cover, Good, HSG B
24,124	74	>75% Grass cover, Good, HSG C
11,244	80	>75% Grass cover, Good, HSG D
244	98	Unconnected roofs, HSG C
785	98	Paved parking, HSG B
22,871	98	Paved parking, HSG C
290	98	Paved parking, HSG D
709	98	Unconnected pavement, HSG B
1,901	98	Unconnected pavement, HSG C
1,224	98	Unconnected pavement, HSG D
2,546	55	Woods, Good, HSG B
49,100	58	Meadow, non-grazed, HSG B
26,266	71	Meadow, non-grazed, HSG C
167,949	71	Weighted Average
139,925		83.31% Pervious Area
28,024		16.69% Impervious Area
4,078		14.55% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	50	0.0200	0.15		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.10"
1.3	360	0.0800	4.55		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.3	40	0.0150	2.49		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.1	53	0.0110	6.75	11.94	**Pipe Channel,** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.012
0.1	47	0.0150	9.55	30.02	**Pipe Channel,** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.012
7.5	550	Total			

Summary for Subcatchment PS3:

Runoff = 1.1 cfs @ 12.13 hrs, Volume= 3,543 cf, Depth= 3.12"
Routed to Pond 2P : Brioretention

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 10-Year Rainfall=4.83"

Area (sf)	CN	Description
4,331	74	>75% Grass cover, Good, HSG C
2,298	98	Roofs, HSG C
3,751	98	Unconnected pavement, HSG C
3,266	71	Meadow, non-grazed, HSG C
13,646	84	Weighted Average
7,597		55.67% Pervious Area
6,049		44.33% Impervious Area
3,751		62.01% Unconnected

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

Summary for Subcatchment PS4:

Runoff = 7.6 cfs @ 12.13 hrs, Volume= 25,051 cf, Depth= 3.02"
Routed to Pond 2P : Brioretention

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 10-Year Rainfall=4.83"

Area (sf)	CN	Description
5,560	61	>75% Grass cover, Good, HSG B
103	74	>75% Grass cover, Good, HSG C
37,853	80	>75% Grass cover, Good, HSG D
883	98	Unconnected pavement, HSG B
589	98	Paved parking, HSG C
23,858	98	Paved parking, HSG D
4,595	98	Unconnected pavement, HSG D
3,535	58	Meadow, non-grazed, HSG B
22,543	78	Meadow, non-grazed, HSG D
99,519	83	Weighted Average
69,594		69.93% Pervious Area
29,925		30.07% Impervious Area
5,478		18.31% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.9	50	0.0300	0.17		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.10"
0.3	108	0.1388	6.00		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.0	27	0.0570	11.73	9.21	**Pipe Channel,** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012
0.3	155	0.0140	7.62	13.46	**Pipe Channel,** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.012
0.3	221	0.0470	13.96	24.67	**Pipe Channel,** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.012
0.1	77	0.0750	21.36	67.12	**Pipe Channel,** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.012
0.3	178	0.0110	10.72	75.78	**Pipe Channel,** 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.012
6.2	816	Total			

Summary for Subcatchment PS5:

Runoff = 5.0 cfs @ 12.13 hrs, Volume= 16,582 cf, Depth= 3.12"
Routed to Pond 2P : Brioretention

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 10-Year Rainfall=4.83"

Area (sf)	CN	Description
19,311	61	>75% Grass cover, Good, HSG B
8,640	80	>75% Grass cover, Good, HSG D
20,779	98	Paved parking, HSG B
639	98	Unconnected pavement, HSG B
217	98	Paved parking, HSG C
13,887	98	Paved parking, HSG D
402	98	Unconnected pavement, HSG D
63,875	84	Weighted Average
27,951		43.76% Pervious Area
35,924		56.24% Impervious Area
1,041		2.90% Unconnected

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

Summary for Subcatchment PS6:

Runoff = 0.1 cfs @ 12.14 hrs, Volume= 554 cf, Depth= 1.02"
Routed to Reach DP2 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 10-Year Rainfall=4.83"

Area (sf)	CN	Description
486	61	>75% Grass cover, Good, HSG B
2,801	55	Woods, Good, HSG B
3,263	58	Meadow, non-grazed, HSG B
6,550	57	Weighted Average
6,550		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.1	50	0.1200	0.14		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
0.3	72	0.0560	3.81		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
6.4	122	Total			

Summary for Subcatchment PS7:

Runoff = 1.9 cfs @ 12.14 hrs, Volume= 6,484 cf, Depth= 1.33"
Routed to Pond 2P : Brioretention

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 10-Year Rainfall=4.83"

Area (sf)	CN	Adj	Description
41,173	61		>75% Grass cover, Good, HSG B
4,201	98		Unconnected pavement, HSG B
12,368	58		Meadow, non-grazed, HSG B
556	55		Woods, Good, HSG B
58,298	63	62	Weighted Average, UI Adjusted
54,097			92.79% Pervious Area
4,201			7.21% Impervious Area
4,201			100.00% Unconnected

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

Summary for Subcatchment PS8:

Runoff = 0.3 cfs @ 12.14 hrs, Volume= 1,255 cf, Depth= 1.08"
Routed to Reach DP3 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 10-Year Rainfall=4.83"

Area (sf)	CN	Description
1,073	61	>75% Grass cover, Good, HSG B
12,748	58	Meadow, non-grazed, HSG B
171	55	Woods, Good, HSG B
13,992	58	Weighted Average
13,992		100.00% Pervious Area

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

Summary for Subcatchment PS9:

Runoff = 2.0 cfs @ 12.13 hrs, Volume= 6,548 cf, Depth= 2.66"
Routed to Pond 4P : Brioretention

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 10-Year Rainfall=4.83"

Area (sf)	CN	Description
10,254	61	>75% Grass cover, Good, HSG B
14,365	98	Paved parking, HSG B
4,501	58	Meadow, non-grazed, HSG B
467	98	Unconnected pavement, HSG B
29,587	79	Weighted Average
14,755		49.87% Pervious Area
14,832		50.13% Impervious Area
467		3.15% Unconnected

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

Summary for Subcatchment R1:

Runoff = 1.0 cfs @ 12.13 hrs, Volume= 3,772 cf, Depth= 4.59"
Routed to Pond 2P : Brioretention

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 10-Year Rainfall=4.83"

Area (sf)	CN	Description
9,853	98	Roofs, HSG C
9,853		100.00% Impervious Area

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

Summary for Subcatchment R10:

Runoff = 0.3 cfs @ 12.13 hrs, Volume= 1,001 cf, Depth= 4.59"
Routed to Pond 4P : Brioretention

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 10-Year Rainfall=4.83"

Area (sf)	CN	Description
2,616	98	Roofs, HSG B
2,616		100.00% Impervious Area

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

Summary for Subcatchment R11:

Runoff = 0.5 cfs @ 12.13 hrs, Volume= 2,002 cf, Depth= 4.59"
Routed to Pond 4P : Brioretention

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 10-Year Rainfall=4.83"

Area (sf)	CN	Description
5,231	98	Roofs, HSG B
5,231		100.00% Impervious Area

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

Summary for Subcatchment R12:

Runoff = 1.5 cfs @ 12.13 hrs, Volume= 5,774 cf, Depth= 4.59"
Routed to Pond 4P : Brioretention

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 10-Year Rainfall=4.83"

Area (sf)	CN	Description
15,084	98	Roofs, HSG B
15,084		100.00% Impervious Area

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

Summary for Subcatchment R13:

Runoff = 1.2 cfs @ 12.13 hrs, Volume= 4,517 cf, Depth= 4.59"
Routed to Pond 3P : Brioretention

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 10-Year Rainfall=4.83"

Area (sf)	CN	Description
11,800	98	Roofs, HSG B
11,800		100.00% Impervious Area

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

Summary for Subcatchment R14:

Runoff = 0.6 cfs @ 12.13 hrs, Volume= 2,258 cf, Depth= 4.59"
Routed to Pond 5P : Brioretention

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 10-Year Rainfall=4.83"

Area (sf)	CN	Description
3,284	98	Roofs, HSG B
2,616	98	Roofs, HSG C
5,900	98	Weighted Average
5,900		100.00% Impervious Area

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

Summary for Subcatchment R15:

Runoff = 1.8 cfs @ 12.13 hrs, Volume= 7,031 cf, Depth= 4.59"
Routed to Pond 3P : Brioretention

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 10-Year Rainfall=4.83"

Area (sf)	CN	Description
9,193	98	Roofs, HSG B
9,175	98	Roofs, HSG D
18,368	98	Weighted Average
18,368		100.00% Impervious Area

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

Summary for Subcatchment R16:

Runoff = 1.0 cfs @ 12.13 hrs, Volume= 3,772 cf, Depth= 4.59"
Routed to Pond 7P : Brioretention

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 10-Year Rainfall=4.83"

Area (sf)	CN	Description
9,853	98	Roofs, HSG C
9,853		100.00% Impervious Area

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

Summary for Subcatchment R17:

Runoff = 1.4 cfs @ 12.13 hrs, Volume= 5,518 cf, Depth= 4.59"
Routed to Pond 6P : Brioretention

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 10-Year Rainfall=4.83"

Area (sf)	CN	Description
14,416	98	Roofs, HSG C
14,416		100.00% Impervious Area

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

Summary for Subcatchment R18:

Runoff = 1.0 cfs @ 12.13 hrs, Volume= 3,772 cf, Depth= 4.59"
Routed to Pond 7P : Brioretention

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 10-Year Rainfall=4.83"

Area (sf)	CN	Description
9,853	98	Roofs, HSG C
9,853		100.00% Impervious Area

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

Summary for Subcatchment R19:

Runoff = 1.0 cfs @ 12.13 hrs, Volume= 3,772 cf, Depth= 4.59"
Routed to Pond 9P : Brioretention

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 10-Year Rainfall=4.83"

Area (sf)	CN	Description
9,853	98	Roofs, HSG C
9,853		100.00% Impervious Area

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

Summary for Subcatchment R2:

Runoff = 0.8 cfs @ 12.13 hrs, Volume= 3,004 cf, Depth= 4.59"
Routed to Pond 2P : Brioretention

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 10-Year Rainfall=4.83"

Area (sf)	CN	Description
7,847	98	Roofs, HSG D
7,847		100.00% Impervious Area

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

Summary for Subcatchment R3:

Runoff = 1.3 cfs @ 12.13 hrs, Volume= 5,029 cf, Depth= 4.59"
Routed to Pond 2P : Brioretention

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 10-Year Rainfall=4.83"

Area (sf)	CN	Description
13,137	98	Roofs, HSG D
13,137		100.00% Impervious Area

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

Summary for Subcatchment R4:

Runoff = 0.7 cfs @ 12.13 hrs, Volume= 2,514 cf, Depth= 4.59"
Routed to Pond 2P : Brioretention

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 10-Year Rainfall=4.83"

Area (sf)	CN	Description
6,568	98	Roofs, HSG D
6,568		100.00% Impervious Area

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

Summary for Subcatchment R5:

Runoff = 1.3 cfs @ 12.13 hrs, Volume= 5,029 cf, Depth= 4.59"
Routed to Pond 2P : Brioretention

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 10-Year Rainfall=4.83"

Area (sf)	CN	Description
452	98	Roofs, HSG B
573	98	Roofs, HSG C
12,112	98	Roofs, HSG D
13,137	98	Weighted Average
13,137		100.00% Impervious Area

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

Summary for Subcatchment R6:

Runoff = 0.7 cfs @ 12.13 hrs, Volume= 2,514 cf, Depth= 4.59"
Routed to Pond 2P : Brioretention

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 10-Year Rainfall=4.83"

Area (sf)	CN	Description
6,568	98	Roofs, HSG B
6,568		100.00% Impervious Area

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

Summary for Subcatchment R7:

Runoff = 3.6 cfs @ 12.13 hrs, Volume= 13,829 cf, Depth= 4.59"
Routed to Pond 2P : Brioretention

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 10-Year Rainfall=4.83"

Area (sf)	CN	Description
35,162	98	Roofs, HSG B
964	98	Roofs, HSG D
36,126	98	Weighted Average
36,126		100.00% Impervious Area

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

Summary for Subcatchment R8:

Runoff = 0.3 cfs @ 12.13 hrs, Volume= 1,257 cf, Depth= 4.59"
Routed to Pond 3P : Brioretention

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 10-Year Rainfall=4.83"

Area (sf)	CN	Description
3,284	98	Roofs, HSG B
3,284		100.00% Impervious Area

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

Summary for Subcatchment R9:

Runoff = 0.7 cfs @ 12.13 hrs, Volume= 2,514 cf, Depth= 4.59"
Routed to Pond 3P : Brioretention

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 10-Year Rainfall=4.83"

Area (sf)	CN	Description
6,568	98	Roofs, HSG B
6,568		100.00% Impervious Area

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

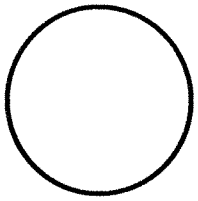
Summary for Reach 1R:

Inflow Area = 206,600 sf, 49.99% Impervious, Inflow Depth = 1.15" for 10-Year event
Inflow = 0.9 cfs @ 13.07 hrs, Volume= 19,835 cf
Outflow = 0.9 cfs @ 13.09 hrs, Volume= 19,835 cf, Atten= 0%, Lag= 1.5 min
Routed to Pond 2P : Brioretention

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Max. Velocity= 6.34 fps, Min. Travel Time= 2.3 min
Avg. Velocity = 4.19 fps, Avg. Travel Time= 3.4 min

Peak Storage= 129 cf @ 13.09 hrs
Average Depth at Peak Storage= 0.19' , Surface Width= 1.17'
Bank-Full Depth= 2.00' Flow Area= 3.1 sf, Capacity= 51.5 cfs

24.0" Round Pipe
n= 0.012
Length= 860.0' Slope= 0.0442 '/'
Inlet Invert= 150.00', Outlet Invert= 112.00'



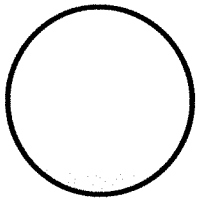
Summary for Reach 2R:

Inflow Area = 84,736 sf, 34.88% Impervious, Inflow Depth = 2.00" for 10-Year event
Inflow = 0.9 cfs @ 13.00 hrs, Volume= 14,128 cf
Outflow = 0.9 cfs @ 13.03 hrs, Volume= 14,128 cf, Atten= 0%, Lag= 1.8 min
Routed to Pond 2P : Brioretention

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Max. Velocity= 6.82 fps, Min. Travel Time= 2.1 min
Avg. Velocity = 3.91 fps, Avg. Travel Time= 3.7 min

Peak Storage= 115 cf @ 13.03 hrs
Average Depth at Peak Storage= 0.19' , Surface Width= 1.00'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 25.7 cfs

18.0" Round Pipe
n= 0.012
Length= 865.0' Slope= 0.0510 '/'
Inlet Invert= 156.10', Outlet Invert= 112.00'



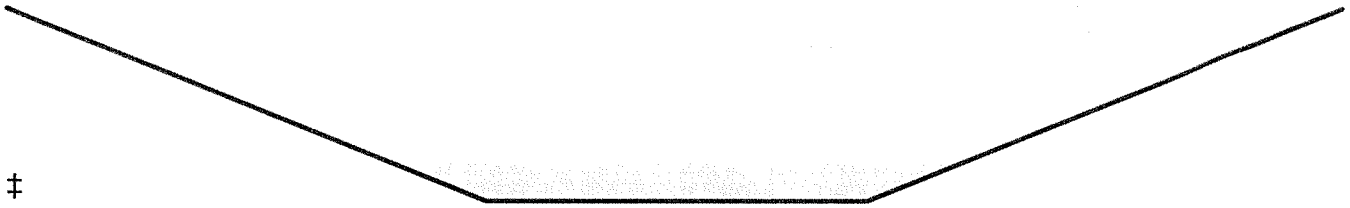
Summary for Reach 3R:

Inflow Area = 101,109 sf, 48.88% Impervious, Inflow Depth = 2.74" for 10-Year event
Inflow = 2.6 cfs @ 12.29 hrs, Volume= 23,070 cf
Outflow = 2.5 cfs @ 12.44 hrs, Volume= 23,070 cf, Atten= 4%, Lag= 9.0 min
Routed to Pond 0P :

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.73 fps, Min. Travel Time= 7.9 min
Avg. Velocity = 0.97 fps, Avg. Travel Time= 22.1 min

Peak Storage= 1,194 cf @ 12.44 hrs
Average Depth at Peak Storage= 0.19' , Surface Width= 5.87'
Bank-Full Depth= 1.00' Flow Area= 9.0 sf, Capacity= 62.5 cfs

4.00' x 1.00' deep channel, n= 0.040 Earth, cobble bottom, clean sides
Side Slope Z-value= 5.0 '/' Top Width= 14.00'
Length= 1,293.0' Slope= 0.0641 '/'
Inlet Invert= 172.00', Outlet Invert= 89.08'



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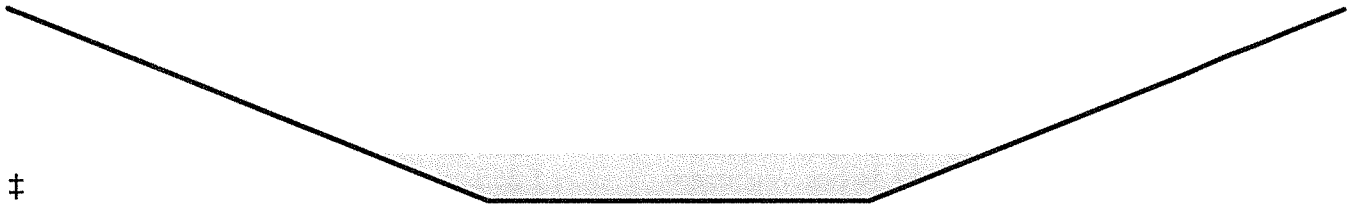
Summary for Reach 4R:

Inflow Area = 95,587 sf, 37.36% Impervious, Inflow Depth = 2.39" for 10-Year event
Inflow = 5.0 cfs @ 12.20 hrs, Volume= 19,038 cf
Outflow = 4.1 cfs @ 12.28 hrs, Volume= 19,038 cf, Atten= 18%, Lag= 4.4 min
Routed to Pond 0P :

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.26 fps, Min. Travel Time= 6.5 min
Avg. Velocity = 0.98 fps, Avg. Travel Time= 21.5 min

Peak Storage= 1,577 cf @ 12.28 hrs
Average Depth at Peak Storage= 0.24' , Surface Width= 6.40'
Bank-Full Depth= 1.00' Flow Area= 9.0 sf, Capacity= 64.7 cfs

4.00' x 1.00' deep channel, n= 0.040 Earth, cobble bottom, clean sides
Side Slope Z-value= 5.0 '/' Top Width= 14.00'
Length= 1,263.0' Slope= 0.0688 '/'
Inlet Invert= 176.00', Outlet Invert= 89.08'



‡

Summary for Reach 5R:

Inflow = 0.0 cfs @ 0.00 hrs, Volume= 0 cf
Outflow = 0.0 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min
Routed to Pond 0P :

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 1.00' Flow Area= 9.0 sf, Capacity= 62.2 cfs

4.00' x 1.00' deep channel, n= 0.040 Earth, cobble bottom, clean sides
Side Slope Z-value= 5.0 '/' Top Width= 14.00'
Length= 1,225.0' Slope= 0.0636 '/'
Inlet Invert= 167.00', Outlet Invert= 89.08'

‡

Summary for Reach DP1:

Inflow Area = 2,384,692 sf, 28.74% Impervious, Inflow Depth = 2.66" for 10-Year event
Inflow = 66.6 cfs @ 12.42 hrs, Volume= 528,916 cf
Outflow = 66.6 cfs @ 12.42 hrs, Volume= 528,916 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Summary for Reach DP2:

Inflow Area = 6,550 sf, 0.00% Impervious, Inflow Depth = 1.02" for 10-Year event
Inflow = 0.1 cfs @ 12.14 hrs, Volume= 554 cf
Outflow = 0.1 cfs @ 12.14 hrs, Volume= 554 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Summary for Reach DP3:

Inflow Area = 13,992 sf, 0.00% Impervious, Inflow Depth = 1.08" for 10-Year event
Inflow = 0.3 cfs @ 12.14 hrs, Volume= 1,255 cf
Outflow = 0.3 cfs @ 12.14 hrs, Volume= 1,255 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Summary for Pond 0P:

Inflow Area = 2,384,692 sf, 28.74% Impervious, Inflow Depth = 2.66" for 10-Year event
Inflow = 77.4 cfs @ 12.27 hrs, Volume= 528,916 cf
Outflow = 66.6 cfs @ 12.42 hrs, Volume= 528,916 cf, Atten= 14%, Lag= 9.5 min
Primary = 66.6 cfs @ 12.42 hrs, Volume= 528,916 cf
Routed to Reach DP1 :

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 98.28' @ 12.42 hrs Surf.Area= 8,647 sf Storage= 15,036 cf

Plug-Flow detention time= 0.8 min calculated for 528,916 cf (100% of inflow)
Center-of-Mass det. time= 0.8 min (860.7 - 859.9)

Volume	Invert	Avail.Storage	Storage Description
#1	89.08'	452,475 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
89.08	10	10.0	0	0	10
93.00	250	50.0	405	405	234
94.00	904	185.2	543	948	2,768
96.00	2,293	261.0	3,091	4,039	5,496
98.00	6,945	557.5	8,819	12,858	24,825
100.00	23,209	885.0	28,567	41,425	62,447
102.00	37,519	1,050.6	60,158	101,583	88,028
104.00	50,433	1,310.8	87,634	189,217	136,980
106.00	65,230	1,557.1	115,346	304,563	193,264
108.00	83,039	1,761.9	147,911	452,475	247,457

Device	Routing	Invert	Outlet Devices
#1	Primary	89.08'	**30.0" Round Culvert** L= 60.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 89.08' / 87.52' S= 0.0260 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 4.91 sf
#2	Primary	98.50'	**100.0' long x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=66.6 cfs @ 12.42 hrs HW=98.28' TW=0.00' (Dynamic Tailwater)
├─**1=Culvert** (Inlet Controls 66.6 cfs @ 13.58 fps)
└─**2=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Summary for Pond 1P: Bioretention

Inflow Area = 167,949 sf, 16.69% Impervious, Inflow Depth = 1.99" for 10-Year event
Inflow = 8.0 cfs @ 12.15 hrs, Volume= 27,836 cf
Outflow = 8.0 cfs @ 12.16 hrs, Volume= 27,314 cf, Atten= 1%, Lag= 0.6 min
Discarded = 0.1 cfs @ 12.16 hrs, Volume= 5,162 cf
Primary = 3.0 cfs @ 12.16 hrs, Volume= 18,645 cf
Routed to Pond 0P :
Secondary = 4.9 cfs @ 12.16 hrs, Volume= 3,507 cf
Routed to Pond 0P :

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Peak Elev= 99.56' @ 12.16 hrs Surf.Area= 2,087 sf Storage= 4,076 cf

Plug-Flow detention time= 101.6 min calculated for 27,306 cf (98% of inflow)
Center-of-Mass det. time= 91.3 min (968.5 - 877.2)

Volume	Invert	Avail.Storage	Storage Description
#1	94.00'	6,462 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
94.00	0	0.0	0	0	0
96.00	345	79.4	230	230	508
98.00	1,115	154.8	1,387	1,617	1,933
100.00	2,416	248.3	3,448	5,065	4,959
100.50	3,189	267.1	1,397	6,462	5,741

Device	Routing	Invert	Outlet Devices
#1	Primary	98.00'	**12.0" Round Culvert** L= 27.0' Ke= 0.500 Inlet / Outlet Invert= 98.00' / 97.90' S= 0.0037 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Device 1	98.10'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	98.75'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 1	99.20'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#5	Secondary	99.40'	**30.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32
#6	Discarded	94.00'	**1.020 in/hr Exfiltration over Wetted area** Phase-In= 0.01'

Discarded OutFlow Max=0.1 cfs @ 12.16 hrs HW=99.56' (Free Discharge)
↑└**6=Exfiltration** (Exfiltration Controls 0.1 cfs)

Primary OutFlow Max=3.0 cfs @ 12.16 hrs HW=99.56' TW=96.28' (Dynamic Tailwater)
↑└**1=Culvert** (Passes 3.0 cfs of 3.4 cfs potential flow)
↑ ├**2=Orifice/Grate** (Orifice Controls 0.3 cfs @ 5.56 fps)
 ├**3=Orifice/Grate** (Orifice Controls 0.2 cfs @ 3.99 fps)
 └**4=Broad-Crested Rectangular Weir** (Weir Controls 2.5 cfs @ 1.74 fps)

Secondary OutFlow Max=4.9 cfs @ 12.16 hrs HW=99.56' TW=96.28' (Dynamic Tailwater)
↑└**5=Broad-Crested Rectangular Weir** (Weir Controls 4.9 cfs @ 1.02 fps)

Summary for Pond 2P: Brioretention

Inflow Area = 619,910 sf, 48.74% Impervious, Inflow Depth = 2.35" for 10-Year event
Inflow = 25.9 cfs @ 12.13 hrs, Volume= 121,313 cf
Outflow = 25.8 cfs @ 12.14 hrs, Volume= 121,313 cf, Atten= 0%, Lag= 0.3 min
Discarded = 0.1 cfs @ 12.14 hrs, Volume= 3,025 cf
Primary = 9.1 cfs @ 12.14 hrs, Volume= 109,862 cf
Routed to Pond 0P :
Secondary = 16.5 cfs @ 12.14 hrs, Volume= 8,427 cf
Routed to Pond 0P :

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 115.68' @ 12.14 hrs Surf.Area= 3,274 sf Storage= 7,715 cf

Plug-Flow detention time= 11.9 min calculated for 121,280 cf (100% of inflow)
Center-of-Mass det. time= 12.0 min (855.7 - 843.7)

Volume	Invert	Avail.Storage	Storage Description
#1	110.00'	8,795 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
110.00	53	45.3	0	0	53
112.00	700	129.0	630	630	1,227
114.00	1,803	205.5	2,418	3,048	3,291
114.50	2,675	230.6	1,112	4,160	4,168
115.00	3,028	240.0	1,425	5,585	4,540
116.00	3,395	249.5	3,210	8,795	4,983

Device	Routing	Invert	Outlet Devices
#1	Primary	110.50'	**24.0" Round Culvert** L= 26.0' Ke= 0.500 Inlet / Outlet Invert= 110.50' / 110.00' S= 0.0192 '/' Cc= 0.900 n= 0.012, Flow Area= 3.14 sf
#2	Device 1	111.00'	**6.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	111.50'	**6.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 1	113.00'	**6.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#5	Device 1	114.00'	**6.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#6	Device 1	115.30'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#7	Secondary	115.50'	**88.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32
#8	Discarded	110.00'	**1.020 in/hr Exfiltration over Wetted area** Phase-In= 0.01'

Discarded OutFlow Max=0.1 cfs @ 12.14 hrs HW=115.68' (Free Discharge)
└**8=Exfiltration** (Exfiltration Controls 0.1 cfs)

Primary OutFlow Max=9.1 cfs @ 12.14 hrs HW=115.68' TW=95.71' (Dynamic Tailwater)
└**1=Culvert** (Passes 9.1 cfs of 30.9 cfs potential flow)
- **2=Orifice/Grate** (Orifice Controls 2.0 cfs @ 10.13 fps)
- **3=Orifice/Grate** (Orifice Controls 1.9 cfs @ 9.54 fps)
- **4=Orifice/Grate** (Orifice Controls 1.5 cfs @ 7.50 fps)
- **5=Orifice/Grate** (Orifice Controls 1.1 cfs @ 5.75 fps)
- **6=Broad-Crested Rectangular Weir** (Weir Controls 2.7 cfs @ 1.78 fps)

Secondary OutFlow Max=16.5 cfs @ 12.14 hrs HW=115.68' TW=95.71' (Dynamic Tailwater)
└**7=Broad-Crested Rectangular Weir** (Weir Controls 16.5 cfs @ 1.06 fps)

Summary for Pond 3P: Brioretention

Inflow Area = 206,600 sf, 49.99% Impervious, Inflow Depth = 2.14" for 10-Year event
Inflow = 10.4 cfs @ 12.14 hrs, Volume= 36,819 cf
Outflow = 1.3 cfs @ 13.07 hrs, Volume= 36,761 cf, Atten= 87%, Lag= 55.7 min
Discarded = 0.4 cfs @ 13.07 hrs, Volume= 16,926 cf
Primary = 0.9 cfs @ 13.07 hrs, Volume= 19,835 cf
Routed to Reach 1R :
Secondary = 0.0 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Reach DP3 :

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 156.17' @ 13.07 hrs Surf.Area= 4,964 sf Storage= 16,712 cf

Plug-Flow detention time= 210.3 min calculated for 36,761 cf (100% of inflow)
Center-of-Mass det. time= 209.3 min (1,007.4 - 798.1)

Volume	Invert	Avail.Storage	Storage Description
#1	148.00'	31,183 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
148.00	0	0.0	0	0	0
150.00	833	121.1	555	555	1,173
152.00	1,785	173.3	2,558	3,114	2,431
154.00	3,143	233.9	4,864	7,978	4,437
156.00	4,805	287.3	7,889	15,867	6,712
158.00	6,810	347.0	11,557	27,424	9,791
158.50	8,248	372.2	3,759	31,183	11,245

Device	Routing	Invert	Outlet Devices
#1	Primary	151.00'	**24.0" Round Culvert** L= 143.0' Ke= 0.500 Inlet / Outlet Invert= 151.00' / 149.35' S= 0.0115 '/' Cc= 0.900 n= 0.012, Flow Area= 3.14 sf
#2	Device 1	151.75'	**2.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	153.00'	**4.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 1	156.60'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#5	Secondary	157.65'	**30.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32
#6	Discarded	148.00'	**2.410 in/hr Exfiltration over Wetted area** Phase-In= 0.01'

Discarded OutFlow Max=0.4 cfs @ 13.07 hrs HW=156.17' (Free Discharge)
└**6=Exfiltration** (Exfiltration Controls 0.4 cfs)

Primary OutFlow Max=0.9 cfs @ 13.07 hrs HW=156.17' TW=150.19' (Dynamic Tailwater)
└**1=Culvert** (Passes 0.9 cfs of 30.9 cfs potential flow)
  ├**2=Orifice/Grate** (Orifice Controls 0.2 cfs @ 10.03 fps)
  ├**3=Orifice/Grate** (Orifice Controls 0.7 cfs @ 8.35 fps)
  └**4=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Secondary OutFlow Max=0.0 cfs @ 0.00 hrs HW=148.00' TW=0.00' (Dynamic Tailwater)
└**5=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Summary for Pond 4P: Brioretention

Inflow Area = 82,012 sf, 49.04% Impervious, Inflow Depth = 2.72" for 10-Year event
Inflow = 5.1 cfs @ 12.13 hrs, Volume= 18,606 cf
Outflow = 3.0 cfs @ 12.22 hrs, Volume= 18,606 cf, Atten= 40%, Lag= 4.9 min
Discarded = 0.4 cfs @ 12.22 hrs, Volume= 11,166 cf
Primary = 2.7 cfs @ 12.22 hrs, Volume= 7,440 cf
Routed to Pond 3P : Brioretention
Secondary = 0.0 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Reach DP3 :

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 161.45' @ 12.22 hrs Surf.Area= 2,422 sf Storage= 3,647 cf

Plug-Flow detention time= 69.5 min calculated for 18,601 cf (100% of inflow)
Center-of-Mass det. time= 69.6 min (883.1 - 813.5)

Volume	Invert	Avail.Storage	Storage Description
#1	158.00'	6,976 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
158.00	142	68.1	0	0	142
159.00	404	96.9	262	262	529
160.00	1,234	201.9	781	1,043	3,030
162.00	2,975	321.8	4,083	5,127	8,054
162.50	4,474	382.9	1,850	6,976	11,485

Device	Routing	Invert	Outlet Devices
#1	Primary	158.00'	**12.0" Round Culvert** L= 61.0' Ke= 0.500 Inlet / Outlet Invert= 158.00' / 154.90' S= 0.0508 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Device 1	160.15'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	160.40'	**12.0" W x 4.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 1	160.90'	**12.0" W x 3.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#5	Device 1	161.40'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#6	Secondary	161.70'	**20.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32
#7	Discarded	158.00'	**2.410 in/hr Exfiltration over Wetted area** Phase-In= 0.01'

Discarded OutFlow Max=0.4 cfs @ 12.22 hrs HW=161.45' (Free Discharge)
└**7=Exfiltration** (Exfiltration Controls 0.4 cfs)

Primary OutFlow Max=2.7 cfs @ 12.22 hrs HW=161.45' TW=155.09' (Dynamic Tailwater)
└**1=Culvert** (Passes 2.7 cfs of 6.5 cfs potential flow)
  ├**2=Orifice/Grate** (Orifice Controls 0.3 cfs @ 5.22 fps)
  ├**3=Orifice/Grate** (Orifice Controls 1.5 cfs @ 4.52 fps)
  ├**4=Orifice/Grate** (Orifice Controls 0.8 cfs @ 3.13 fps)
  └**5=Broad-Crested Rectangular Weir** (Weir Controls 0.1 cfs @ 0.63 fps)

Secondary OutFlow Max=0.0 cfs @ 0.00 hrs HW=158.00' TW=0.00' (Dynamic Tailwater)
└**6=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Summary for Pond 5P: Brioretention

Inflow Area = 84,736 sf, 34.88% Impervious, Inflow Depth = 2.28" for 10-Year event
Inflow = 1.5 cfs @ 12.14 hrs, Volume= 16,075 cf
Outflow = 0.9 cfs @ 13.00 hrs, Volume= 16,032 cf, Atten= 37%, Lag= 51.7 min
Discarded = 0.0 cfs @ 13.00 hrs, Volume= 1,904 cf
Primary = 0.9 cfs @ 13.00 hrs, Volume= 14,128 cf
Routed to Reach 2R :
Secondary = 0.0 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Reach 5R :

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Peak Elev= 166.43' @ 13.00 hrs Surf.Area= 1,369 sf Storage= 2,424 cf

Plug-Flow detention time= 65.3 min calculated for 16,028 cf (100% of inflow)
Center-of-Mass det. time= 63.5 min (962.6 - 899.0)

Volume	Invert	Avail.Storage	Storage Description
#1	163.00'	6,415 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
163.00	192	62.9	0	0	192
164.00	445	91.6	310	310	553
166.00	1,180	141.0	1,566	1,876	1,497
168.00	2,178	184.3	3,307	5,184	2,664
168.50	2,759	203.2	1,231	6,415	3,255

Device	Routing	Invert	Outlet Devices
#1	Primary	162.00'	**12.0" Round Culvert** L= 65.0' Ke= 0.500 Inlet / Outlet Invert= 162.00' / 156.20' S= 0.0892 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Device 1	164.00'	**2.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	164.67'	**4.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 1	165.50'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#5	Device 1	166.50'	**4.0" W x 3.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#6	Device 1	168.10'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#7	Secondary	168.25'	**20.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32
#8	Discarded	163.00'	**1.020 in/hr Exfiltration over Wetted area** Phase-In= 0.01'

Discarded OutFlow Max=0.0 cfs @ 13.00 hrs HW=166.43' (Free Discharge)
└**8=Exfiltration** (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=0.9 cfs @ 13.00 hrs HW=166.43' TW=156.29' (Dynamic Tailwater)
└**1=Culvert** (Passes 0.9 cfs of 7.5 cfs potential flow)
- **2=Orifice/Grate** (Orifice Controls 0.2 cfs @ 7.38 fps)
- **3=Orifice/Grate** (Orifice Controls 0.5 cfs @ 6.08 fps)
- **4=Orifice/Grate** (Orifice Controls 0.2 cfs @ 4.32 fps)
- **5=Orifice/Grate** (Controls 0.0 cfs)
- **6=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Secondary OutFlow Max=0.0 cfs @ 0.00 hrs HW=163.00' TW=167.00' (Dynamic Tailwater)
└**7=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Summary for Pond 6P: Brioretention

Inflow Area = 74,887 sf, 31.59% Impervious, Inflow Depth = 2.83" for 10-Year event
Inflow = 5.2 cfs @ 12.13 hrs, Volume= 17,646 cf
Outflow = 1.2 cfs @ 12.38 hrs, Volume= 17,354 cf, Atten= 76%, Lag= 15.1 min
Discarded = 0.1 cfs @ 12.38 hrs, Volume= 3,977 cf
Primary = 1.2 cfs @ 12.38 hrs, Volume= 13,378 cf
Routed to Pond 5P : Brioretention
Secondary = 0.0 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Pond 3P : Brioretention

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 169.52' @ 12.38 hrs Surf.Area= 2,471 sf Storage= 6,167 cf

Plug-Flow detention time= 164.2 min calculated for 17,354 cf (98% of inflow)
Center-of-Mass det. time= 154.2 min (977.6 - 823.5)

Volume	Invert	Avail.Storage	Storage Description
#1	165.00'	16,396 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
165.00	177	59.1	0	0	177
166.00	643	110.0	386	386	867
168.00	1,920	162.6	2,449	2,835	2,040
170.00	2,659	207.6	4,559	7,394	3,417
172.00	4,083	254.8	6,691	14,085	5,214
172.50	5,180	283.8	2,310	16,396	6,464

Device	Routing	Invert	Outlet Devices
#1	Primary	166.50'	**12.0" Round Culvert** L= 106.0' Ke= 0.500 Inlet / Outlet Invert= 166.50' / 165.00' S= 0.0142 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Device 1	166.75'	**2.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	167.75'	**6.0" W x 3.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 1	169.25'	**6.0" W x 4.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#5	Device 1	171.75'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#6	Secondary	172.10'	**20.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32
#7	Discarded	165.00'	**1.020 in/hr Exfiltration over Wetted area** Phase-In= 0.01'

Discarded OutFlow Max=0.1 cfs @ 12.38 hrs HW=169.52' (Free Discharge)
└─**7=Exfiltration** (Exfiltration Controls 0.1 cfs)

Primary OutFlow Max=1.2 cfs @ 12.38 hrs HW=169.52' TW=166.04' (Dynamic Tailwater)
└─**1=Culvert** (Passes 1.2 cfs of 5.6 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 0.2 cfs @ 7.89 fps)
  ├─**3=Orifice/Grate** (Orifice Controls 0.8 cfs @ 6.18 fps)
  ├─**4=Orifice/Grate** (Orifice Controls 0.2 cfs @ 1.67 fps)
  └─**5=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Secondary OutFlow Max=0.0 cfs @ 0.00 hrs HW=165.00' TW=148.00' (Dynamic Tailwater)
└─**6=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Summary for Pond 7P: Brioretention

Inflow Area = 101,109 sf, 48.88% Impervious, Inflow Depth = 3.25" for 10-Year event
Inflow = 8.0 cfs @ 12.13 hrs, Volume= 27,402 cf
Outflow = 2.7 cfs @ 12.29 hrs, Volume= 27,105 cf, Atten= 66%, Lag= 9.6 min
Discarded = 0.1 cfs @ 12.29 hrs, Volume= 4,035 cf
Primary = 2.6 cfs @ 12.29 hrs, Volume= 23,070 cf
Routed to Reach 3R :
Secondary = 0.0 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Reach 3R :

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 180.99' @ 12.29 hrs Surf.Area= 3,129 sf Storage= 8,502 cf

Plug-Flow detention time= 124.8 min calculated for 27,097 cf (99% of inflow)
Center-of-Mass det. time= 118.2 min (932.6 - 814.3)

Volume	Invert	Avail.Storage	Storage Description
#1	175.00'	14,145 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
175.00	168	50.4	0	0	168
176.00	361	73.0	258	258	398
176.50	478	82.4	209	467	521
178.00	1,417	148.6	1,359	1,826	1,750
180.00	2,513	199.3	3,878	5,705	3,196
182.00	3,821	237.0	6,288	11,993	4,576
182.50	4,804	261.2	2,152	14,145	5,543

Device	Routing	Invert	Outlet Devices
#1	Primary	176.00'	**18.0" Round Culvert** L= 46.0' Ke= 0.500 Inlet / Outlet Invert= 176.00' / 174.00' S= 0.0435 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf
#2	Device 1	176.75'	**2.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	178.50'	**4.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 1	179.00'	**4.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#5	Device 1	180.00'	**10.0" W x 4.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#6	Device 1	181.00'	**8.0" W x 3.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#7	Device 1	181.75'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#8	Secondary	182.25'	**20.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32
#9	Discarded	175.00'	**1.020 in/hr Exfiltration over Wetted area** Phase-In= 0.01'

Discarded OutFlow Max=0.1 cfs @ 12.29 hrs HW=180.99' (Free Discharge)
└**9=Exfiltration** (Exfiltration Controls 0.1 cfs)

Primary OutFlow Max=2.6 cfs @ 12.29 hrs HW=180.99' TW=172.18' (Dynamic Tailwater)
└**1=Culvert** (Passes 2.6 cfs of 17.5 cfs potential flow)
- **2=Orifice/Grate** (Orifice Controls 0.2 cfs @ 9.82 fps)
- **3=Orifice/Grate** (Orifice Controls 0.6 cfs @ 7.35 fps)
- **4=Orifice/Grate** (Orifice Controls 0.6 cfs @ 6.51 fps)
- **5=Orifice/Grate** (Orifice Controls 1.2 cfs @ 4.37 fps)
- **6=Orifice/Grate** (Controls 0.0 cfs)
- **7=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Secondary OutFlow Max=0.0 cfs @ 0.00 hrs HW=175.00' TW=172.00' (Dynamic Tailwater)
└**8=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Summary for Pond 8P: Brioretention

Inflow Area = 58,074 sf, 42.43% Impervious, Inflow Depth = 3.02" for 10-Year event
Inflow = 3.5 cfs @ 12.20 hrs, Volume= 14,619 cf
Outflow = 3.4 cfs @ 12.23 hrs, Volume= 14,619 cf, Atten= 4%, Lag= 1.9 min
Discarded = 0.1 cfs @ 12.23 hrs, Volume= 1,393 cf
Primary = 2.5 cfs @ 12.23 hrs, Volume= 12,887 cf
Routed to Reach 4R :
Secondary = 0.8 cfs @ 12.23 hrs, Volume= 338 cf
Routed to Reach 4R :

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 180.32' @ 12.23 hrs Surf.Area= 1,851 sf Storage= 2,237 cf

Plug-Flow detention time= 38.2 min calculated for 14,619 cf (100% of inflow)
Center-of-Mass det. time= 38.2 min (878.5 - 840.3)

Volume	Invert	Avail.Storage	Storage Description
#1	177.00'	2,582 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
177.00	101	54.5	0	0	101
178.00	357	92.4	216	216	550
179.00	690	103.3	514	730	746
179.50	875	112.7	390	1,121	916
180.00	1,469	193.1	580	1,700	2,874
180.50	2,077	212.0	882	2,582	3,492

Device	Routing	Invert	Outlet Devices
#1	Primary	177.00'	**12.0" Round Culvert** L= 46.0' Ke= 0.500 Inlet / Outlet Invert= 177.00' / 176.00' S= 0.0217 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Device 1	177.50'	**2.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	178.00'	**2.5" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 1	180.00'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#5	Secondary	180.25'	**15.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32
#6	Discarded	177.00'	**1.020 in/hr Exfiltration over Wetted area** Phase-In= 0.01'

Discarded OutFlow Max=0.1 cfs @ 12.23 hrs HW=180.32' (Free Discharge)
└**6=Exfiltration** (Exfiltration Controls 0.1 cfs)

Primary OutFlow Max=2.5 cfs @ 12.23 hrs HW=180.32' TW=176.23' (Dynamic Tailwater)
└**1=Culvert** (Passes 2.5 cfs of 6.4 cfs potential flow)
  ├**2=Orifice/Grate** (Orifice Controls 0.2 cfs @ 7.97 fps)
  ├**3=Orifice/Grate** (Orifice Controls 0.2 cfs @ 7.17 fps)
  └**4=Broad-Crested Rectangular Weir** (Weir Controls 2.1 cfs @ 1.64 fps)

Secondary OutFlow Max=0.8 cfs @ 12.23 hrs HW=180.32' TW=176.23' (Dynamic Tailwater)
└**5=Broad-Crested Rectangular Weir** (Weir Controls 0.8 cfs @ 0.69 fps)

Summary for Pond 9P: Brioretention

Inflow Area = 37,513 sf, 29.50% Impervious, Inflow Depth = 2.73" for 10-Year event
Inflow = 2.3 cfs @ 12.14 hrs, Volume= 8,538 cf
Outflow = 2.3 cfs @ 12.15 hrs, Volume= 7,975 cf, Atten= 2%, Lag= 0.9 min
Discarded = 0.0 cfs @ 12.15 hrs, Volume= 2,162 cf
Primary = 2.3 cfs @ 12.15 hrs, Volume= 5,813 cf
Routed to Reach 4R :

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Peak Elev= 198.75' @ 12.15 hrs Surf.Area= 961 sf Storage= 1,527 cf

Plug-Flow detention time= 173.1 min calculated for 7,975 cf (93% of inflow)
Center-of-Mass det. time= 135.3 min (954.9 - 819.6)

Volume	Invert	Avail.Storage	Storage Description
#1	196.00'	2,071 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
196.00	225	58.8	0	0	225
198.00	720	100.2	898	898	772
199.00	1,049	119.1	879	1,778	1,120
199.25	1,300	131.7	293	2,071	1,373

Device	Routing	Invert	Outlet Devices
#1	Primary	198.55'	**10.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32
#2	Discarded	196.00'	**1.020 in/hr Exfiltration over Wetted area** Phase-In= 0.01'

Discarded OutFlow Max=0.0 cfs @ 12.15 hrs HW=198.75' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=2.3 cfs @ 12.15 hrs HW=198.75' TW=176.17' (Dynamic Tailwater)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 2.3 cfs @ 1.14 fps)

Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 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 PS1: Runoff Area=617,148 sf 0.92% Impervious Runoff Depth=6.88"
Flow Length=1,779' Tc=18.1 min CN=83 Runoff=69.6 cfs 353,766 cf

Subcatchment PS10: Runoff Area=29,494 sf 8.32% Impervious Runoff Depth=4.30"
Flow Length=502' Tc=8.5 min UI Adjusted CN=62 Runoff=2.9 cfs 10,566 cf

Subcatchment PS11: Runoff Area=64,352 sf 16.63% Impervious Runoff Depth=4.79"
Flow Length=649' Tc=6.2 min UI Adjusted CN=66 Runoff=7.8 cfs 25,687 cf

Subcatchment PS12: Runoff Area=20,216 sf 61.06% Impervious Runoff Depth=7.12"
Tc=6.0 min CN=85 Runoff=3.5 cfs 12,000 cf

Subcatchment PS13: Runoff Area=3,949 sf 0.00% Impervious Runoff Depth=4.30"
Tc=6.0 min CN=62 Runoff=0.4 cfs 1,415 cf

Subcatchment PS14: Runoff Area=42,549 sf 4.11% Impervious Runoff Depth=5.65"
Tc=6.0 min CN=73 Runoff=6.1 cfs 20,038 cf

Subcatchment PS15: Runoff Area=17,922 sf 41.79% Impervious Runoff Depth=6.88"
Tc=6.0 min CN=83 Runoff=3.0 cfs 10,273 cf

Subcatchment PS16: Runoff Area=81,403 sf 36.51% Impervious Runoff Depth=6.76"
Tc=6.0 min CN=82 Runoff=13.4 cfs 45,832 cf

Subcatchment PS17: Runoff Area=58,074 sf 42.43% Impervious Runoff Depth=6.88"
Flow Length=623' Tc=12.2 min CN=83 Runoff=7.7 cfs 33,290 cf

Subcatchment PS18: Runoff Area=27,660 sf 4.39% Impervious Runoff Depth=5.53"
Flow Length=120' Tc=7.4 min UI Adjusted CN=72 Runoff=3.7 cfs 12,743 cf

Subcatchment PS19: Offsite to Culvert Runoff Area=782,989 sf 33.76% Impervious Runoff Depth=6.76"
Tc=30.0 min CN=82 Runoff=68.0 cfs 440,846 cf

Subcatchment PS2: Runoff Area=167,949 sf 16.69% Impervious Runoff Depth=5.41"
Flow Length=550' Tc=7.5 min CN=71 Runoff=21.9 cfs 75,650 cf

Subcatchment PS3: Runoff Area=13,646 sf 44.33% Impervious Runoff Depth=7.00"
Tc=6.0 min CN=84 Runoff=2.3 cfs 7,961 cf

Subcatchment PS4: Runoff Area=99,519 sf 30.07% Impervious Runoff Depth=6.88"
Flow Length=816' Tc=6.2 min CN=83 Runoff=16.5 cfs 57,047 cf

Subcatchment PS5: Runoff Area=63,875 sf 56.24% Impervious Runoff Depth=7.00"
Tc=6.0 min CN=84 Runoff=10.8 cfs 37,266 cf

Subcatchment PS6: Runoff Area=6,550 sf 0.00% Impervious Runoff Depth=3.69"
Flow Length=122' Tc=6.4 min CN=57 Runoff=0.6 cfs 2,013 cf

Subcatchment PS7: Runoff Area=58,298 sf 7.21% Impervious Runoff Depth=4.30"
Tc=6.0 min UI Adjusted CN=62 Runoff=6.4 cfs 20,884 cf

Subcatchment PS8: Runoff Area=13,992 sf 0.00% Impervious Runoff Depth=3.81"
Tc=6.0 min CN=58 Runoff=1.4 cfs 4,442 cf

Subcatchment PS9: Runoff Area=29,587 sf 50.13% Impervious Runoff Depth=6.39"
Tc=6.0 min CN=79 Runoff=4.7 cfs 15,752 cf

Subcatchment R1: Runoff Area=9,853 sf 100.00% Impervious Runoff Depth=8.70"
Tc=6.0 min CN=98 Runoff=1.8 cfs 7,143 cf

Subcatchment R10: Runoff Area=2,616 sf 100.00% Impervious Runoff Depth=8.70"
Tc=6.0 min CN=98 Runoff=0.5 cfs 1,897 cf

Subcatchment R11: Runoff Area=5,231 sf 100.00% Impervious Runoff Depth=8.70"
Tc=6.0 min CN=98 Runoff=1.0 cfs 3,792 cf

Subcatchment R12: Runoff Area=15,084 sf 100.00% Impervious Runoff Depth=8.70"
Tc=6.0 min CN=98 Runoff=2.8 cfs 10,935 cf

Subcatchment R13: Runoff Area=11,800 sf 100.00% Impervious Runoff Depth=8.70"
Tc=6.0 min CN=98 Runoff=2.2 cfs 8,555 cf

Subcatchment R14: Runoff Area=5,900 sf 100.00% Impervious Runoff Depth=8.70"
Tc=6.0 min CN=98 Runoff=1.1 cfs 4,277 cf

Subcatchment R15: Runoff Area=18,368 sf 100.00% Impervious Runoff Depth=8.70"
Tc=6.0 min CN=98 Runoff=3.4 cfs 13,316 cf

Subcatchment R16: Runoff Area=9,853 sf 100.00% Impervious Runoff Depth=8.70"
Tc=6.0 min CN=98 Runoff=1.8 cfs 7,143 cf

Subcatchment R17: Runoff Area=14,416 sf 100.00% Impervious Runoff Depth=8.70"
Tc=6.0 min CN=98 Runoff=2.7 cfs 10,451 cf

Subcatchment R18: Runoff Area=9,853 sf 100.00% Impervious Runoff Depth=8.70"
Tc=6.0 min CN=98 Runoff=1.8 cfs 7,143 cf

Subcatchment R19: Runoff Area=9,853 sf 100.00% Impervious Runoff Depth=8.70"
Tc=6.0 min CN=98 Runoff=1.8 cfs 7,143 cf

Subcatchment R2: Runoff Area=7,847 sf 100.00% Impervious Runoff Depth=8.70"
Tc=6.0 min CN=98 Runoff=1.5 cfs 5,689 cf

Subcatchment R3: Runoff Area=13,137 sf 100.00% Impervious Runoff Depth=8.70"
Tc=6.0 min CN=98 Runoff=2.5 cfs 9,524 cf

Subcatchment R4: Runoff Area=6,568 sf 100.00% Impervious Runoff Depth=8.70"
Tc=6.0 min CN=98 Runoff=1.2 cfs 4,762 cf

Subcatchment R5: Runoff Area=13,137 sf 100.00% Impervious Runoff Depth=8.70"
Tc=6.0 min CN=98 Runoff=2.5 cfs 9,524 cf

Subcatchment R6: Runoff Area=6,568 sf 100.00% Impervious Runoff Depth=8.70"
Tc=6.0 min CN=98 Runoff=1.2 cfs 4,762 cf

Subcatchment R7: Runoff Area=36,126 sf 100.00% Impervious Runoff Depth=8.70"
Tc=6.0 min CN=98 Runoff=6.7 cfs 26,190 cf

Subcatchment R8: Runoff Area=3,284 sf 100.00% Impervious Runoff Depth=8.70"
Tc=6.0 min CN=98 Runoff=0.6 cfs 2,381 cf

Subcatchment R9: Runoff Area=6,568 sf 100.00% Impervious Runoff Depth=8.70"
Tc=6.0 min CN=98 Runoff=1.2 cfs 4,762 cf

Reach 1R: Avg. Flow Depth=0.79' Max Vel=14.69 fps Inflow=17.1 cfs 67,165 cf
24.0" Round Pipe n=0.012 L=860.0' S=0.0442 '/' Capacity=51.5 cfs Outflow=16.9 cfs 67,165 cf

Reach 2R: Avg. Flow Depth=0.31' Max Vel=9.20 fps Inflow=2.5 cfs 38,340 cf
18.0" Round Pipe n=0.012 L=865.0' S=0.0510 '/' Capacity=25.7 cfs Outflow=2.5 cfs 38,340 cf

Reach 3R: Avg. Flow Depth=0.40' Max Vel=4.21 fps Inflow=13.3 cfs 54,670 cf
n=0.040 L=1,293.0' S=0.0641 '/' Capacity=62.5 cfs Outflow=10.3 cfs 54,669 cf

Reach 4R: Avg. Flow Depth=0.41' Max Vel=4.42 fps Inflow=12.3 cfs 48,023 cf
n=0.040 L=1,263.0' S=0.0688 '/' Capacity=64.7 cfs Outflow=11.1 cfs 48,023 cf

Reach 5R: Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.0 cfs 0 cf
n=0.040 L=1,225.0' S=0.0636 '/' Capacity=62.2 cfs Outflow=0.0 cfs 0 cf

Reach DP1: Inflow=197.5 cfs 1,257,370 cf
Outflow=197.5 cfs 1,257,370 cf

Reach DP2: Inflow=0.6 cfs 2,013 cf
Outflow=0.6 cfs 2,013 cf

Reach DP3: Inflow=5.8 cfs 6,409 cf
Outflow=5.8 cfs 6,409 cf

Pond 0P: Peak Elev=99.11' Storage=24,602 cf Inflow=197.9 cfs 1,257,370 cf
Outflow=197.5 cfs 1,257,370 cf

Pond 1P: Bioretention Peak Elev=99.78' Storage=4,553 cf Inflow=21.9 cfs 75,650 cf
Discarded=0.1 cfs 6,619 cf Primary=3.7 cfs 46,201 cf Secondary=18.3 cfs 22,247 cf Outflow=21.7 cfs 75,067 cf

Pond 2P: Brioretention Peak Elev=115.88' Storage=8,388 cf Inflow=65.8 cfs 296,257 cf
Discarded=0.1 cfs 4,636 cf Primary=12.1 cfs 218,678 cf Secondary=53.5 cfs 72,940 cf Outflow=65.7 cfs 296,254 cf

Pond 3P: Brioretention Peak Elev=157.73' Storage=25,618 cf Inflow=25.7 cfs 91,656 cf
Discarded=0.5 cfs 23,933 cf Primary=17.1 cfs 67,165 cf Secondary=1.7 cfs 340 cf Outflow=19.3 cfs 91,439 cf

Pond 4P: Brioretention Peak Elev=161.88' Storage=4,781 cf Inflow=11.7 cfs 42,942 cf
Discarded=0.4 cfs 16,360 cf Primary=7.0 cfs 24,955 cf Secondary=3.9 cfs 1,627 cf Outflow=11.3 cfs 42,942 cf

Pond 5P: Brioretention Peak Elev=168.24' Storage=5,743 cf Inflow=3.8 cfs 41,068 cf
Discarded=0.1 cfs 2,661 cf Primary=2.5 cfs 38,340 cf Secondary=0.0 cfs 0 cf Outflow=2.6 cfs 41,000 cf

Pond 6P: Brioretention Peak Elev=171.72' Storage=12,979 cf Inflow=11.8 cfs 40,763 cf
Discarded=0.1 cfs 5,024 cf Primary=2.6 cfs 35,376 cf Secondary=0.0 cfs 0 cf Outflow=2.7 cfs 40,400 cf

Pond 7P: Brioretention Peak Elev=182.38' Storage=13,587 cf Inflow=17.1 cfs 60,119 cf
Discarded=0.1 cfs 5,124 cf Primary=10.9 cfs 54,091 cf Secondary=2.4 cfs 578 cf Outflow=13.5 cfs 59,793 cf

Pond 8P: Brioretention Peak Elev=180.45' Storage=2,489 cf Inflow=7.7 cfs 33,290 cf
Discarded=0.1 cfs 2,216 cf Primary=4.1 cfs 27,711 cf Secondary=3.5 cfs 3,363 cf Outflow=7.7 cfs 33,290 cf

Pond 9P: Brioretention Peak Elev=198.90' Storage=1,675 cf Inflow=5.5 cfs 19,886 cf
Discarded=0.0 cfs 2,372 cf Primary=5.4 cfs 16,949 cf Outflow=5.4 cfs 19,320 cf

Total Runoff Area = 2,405,234 sf Runoff Volume = 1,336,860 cf Average Runoff Depth = 6.67"
71.51% Pervious = 1,719,957 sf 28.49% Impervious = 685,277 sf

Summary for Subcatchment PS1:

Runoff = 69.6 cfs @ 12.26 hrs, Volume= 353,766 cf, Depth= 6.88"
Routed to Pond 0P :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 100-Year Rainfall=8.94"

Area (sf)	CN	Description
44,071	74	>75% Grass cover, Good, HSG C
11,725	80	>75% Grass cover, Good, HSG D
10,632	55	Woods, Good, HSG B
105,057	70	Woods, Good, HSG C
159,591	77	Woods, Good, HSG D
3,226	98	Paved parking, HSG C
1,412	98	Unconnected pavement, HSG C
51	98	Paved parking, HSG D
960	98	Unconnected pavement, HSG D
29,959	98	Water Surface, 0% imp, HSG B
100,589	98	Water Surface, 0% imp, HSG C
102,060	98	Water Surface, 0% imp, HSG D
4,551	58	Meadow, non-grazed, HSG B
39,285	71	Meadow, non-grazed, HSG C
3,979	78	Meadow, non-grazed, HSG D
617,148	83	Weighted Average
611,499		99.08% Pervious Area
5,649		0.92% Impervious Area
2,372		41.99% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.7	50	0.0300	0.08		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
1.0	138	0.0220	2.39		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
2.6	579	0.0520	3.67		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
3.8	1,012	0.0750	4.41		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
18.1	1,779	Total			

Summary for Subcatchment PS10:

Runoff = 2.9 cfs @ 12.16 hrs, Volume= 10,566 cf, Depth= 4.30"
Routed to Pond 4P : Brioretention

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 100-Year Rainfall=8.94"

Area (sf)	CN	Adj	Description
18,930	61		>75% Grass cover, Good, HSG B
2,454	98		Unconnected pavement, HSG B
7,219	58		Meadow, non-grazed, HSG B
891	55		Woods, Good, HSG B
29,494	63	62	Weighted Average, UI Adjusted
27,040			91.68% Pervious Area
2,454			8.32% Impervious Area
2,454			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.9	50	0.0300	0.17		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.10"
3.6	452	0.0170	2.10		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
8.5	502	Total			

Summary for Subcatchment PS11:

Runoff = 7.8 cfs @ 12.13 hrs, Volume= 25,687 cf, Depth= 4.79"
Routed to Pond 3P : Brioretention

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 100-Year Rainfall=8.94"

Area (sf)	CN	Adj	Description
30,469	61		>75% Grass cover, Good, HSG B
3,648	74		>75% Grass cover, Good, HSG C
5,143	98		Paved parking, HSG B
5,079	98		Unconnected pavement, HSG B
482	98		Unconnected pavement, HSG C
14,936	58		Meadow, non-grazed, HSG B
2,705	55		Woods, Good, HSG B
1,890	71		Meadow, non-grazed, HSG C
64,352	67	66	Weighted Average, UI Adjusted
53,648			83.37% Pervious Area
10,704			16.63% Impervious Area
5,561			51.95% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.9	34	0.0500	0.19		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.10"
3.0	400	0.0187	2.20		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.0	23	0.0490	10.88	8.54	**Pipe Channel,** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012
0.1	74	0.0520	14.68	25.95	**Pipe Channel,** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.012
0.2	118	0.0230	9.77	17.26	**Pipe Channel,** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.012
6.2	649	Total			

Summary for Subcatchment PS12:

Runoff = 3.5 cfs @ 12.13 hrs, Volume= 12,000 cf, Depth= 7.12"
Routed to Pond 3P : Brioretention

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 100-Year Rainfall=8.94"

Area (sf)	CN	Description
6,186	61	>75% Grass cover, Good, HSG B
1,596	74	>75% Grass cover, Good, HSG C
9,583	98	Paved parking, HSG B
315	98	Unconnected pavement, HSG B
2,390	98	Paved parking, HSG C
55	98	Unconnected pavement, HSG C
91	71	Meadow, non-grazed, HSG C
20,216	85	Weighted Average
7,873		38.94% Pervious Area
12,343		61.06% Impervious Area
370		3.00% Unconnected

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

Summary for Subcatchment PS13:

Runoff = 0.4 cfs @ 12.13 hrs, Volume= 1,415 cf, Depth= 4.30"
Routed to Pond 5P : Brioretention

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 100-Year Rainfall=8.94"

Area (sf)	CN	Description
944	61	>75% Grass cover, Good, HSG B
194	74	>75% Grass cover, Good, HSG C
2,062	58	Meadow, non-grazed, HSG B
749	71	Meadow, non-grazed, HSG C
3,949	62	Weighted Average
3,949		100.00% Pervious Area

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

Summary for Subcatchment PS14:

Runoff = 6.1 cfs @ 12.13 hrs, Volume= 20,038 cf, Depth= 5.65"
Routed to Pond 6P : Brioretention

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 100-Year Rainfall=8.94"

Area (sf)	CN	Description
17,357	74	>75% Grass cover, Good, HSG C
1,750	98	Unconnected pavement, HSG C
22,520	71	Meadow, non-grazed, HSG C
922	70	Woods, Good, HSG C
42,549	73	Weighted Average
40,799		95.89% Pervious Area
1,750		4.11% Impervious Area
1,750		100.00% Unconnected

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

Summary for Subcatchment PS15:

Runoff = 3.0 cfs @ 12.13 hrs, Volume= 10,273 cf, Depth= 6.88"
Routed to Pond 6P : Brioretention

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 100-Year Rainfall=8.94"

Area (sf)	CN	Description
244	61	>75% Grass cover, Good, HSG B
5,873	74	>75% Grass cover, Good, HSG C
633	98	Paved parking, HSG B
5,985	98	Paved parking, HSG C
872	98	Unconnected pavement, HSG C
283	58	Meadow, non-grazed, HSG B
4,032	71	Meadow, non-grazed, HSG C
17,922	83	Weighted Average
10,432		58.21% Pervious Area
7,490		41.79% Impervious Area
872		11.64% Unconnected

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

Summary for Subcatchment PS16:

Runoff = 13.4 cfs @ 12.13 hrs, Volume= 45,832 cf, Depth= 6.76"
Routed to Pond 7P : Brioretention

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 100-Year Rainfall=8.94"

Area (sf)	CN	Description
35,815	74	>75% Grass cover, Good, HSG C
3,437	70	Woods, Good, HSG C
27,090	98	Paved parking, HSG C
2,627	98	Unconnected pavement, HSG C
588	58	Meadow, non-grazed, HSG B
11,846	71	Meadow, non-grazed, HSG C
81,403	82	Weighted Average
51,686		63.49% Pervious Area
29,717		36.51% Impervious Area
2,627		8.84% Unconnected

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

Summary for Subcatchment PS17:

Runoff = 7.7 cfs @ 12.19 hrs, Volume= 33,290 cf, Depth= 6.88"
Routed to Pond 8P : Brioretention

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 100-Year Rainfall=8.94"

Area (sf)	CN	Description
14,027	74	>75% Grass cover, Good, HSG C
9,589	70	Woods, Good, HSG C
24,540	98	Paved parking, HSG C
99	98	Unconnected pavement, HSG C
9,819	71	Meadow, non-grazed, HSG C
58,074	83	Weighted Average
33,435		57.57% Pervious Area
24,639		42.43% Impervious Area
99		0.40% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	50	0.0400	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
2.6	500	0.0400	3.22		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.1	49	0.0480	10.77	8.46	**Pipe Channel,** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012
0.0	24	0.0180	8.64	15.27	**Pipe Channel,** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.012
12.2	623	Total			

Summary for Subcatchment PS18:

Runoff = 3.7 cfs @ 12.15 hrs, Volume= 12,743 cf, Depth= 5.53"
Routed to Pond 9P : Brioretention

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 100-Year Rainfall=8.94"

Area (sf)	CN	Adj	Description
9,869	74		>75% Grass cover, Good, HSG C
8,341	70		Woods, Good, HSG C
8,235	71		Meadow, non-grazed, HSG C
1,215	98		Unconnected pavement, HSG C
27,660	73	72	Weighted Average, UI Adjusted
26,445			95.61% Pervious Area
1,215			4.39% Impervious Area
1,215			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.2	50	0.0800	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
0.2	70	0.0860	4.72		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
7.4	120	Total			

Summary for Subcatchment PS19: Offsite to Culvert

Runoff = 68.0 cfs @ 12.41 hrs, Volume= 440,846 cf, Depth= 6.76"
Routed to Pond 0P :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 100-Year Rainfall=8.94"

Area (sf)	CN	Description
2,730	98	Paved roads w/curbs & sewers, HSG B
50,258	98	Paved roads w/curbs & sewers, HSG C
515,359	83	1/4 acre lots, 38% imp, HSG C
40,722	87	1/4 acre lots, 38% imp, HSG D
138,058	70	Woods, Good, HSG C
35,862	77	Woods, Good, HSG D
782,989	82	Weighted Average
518,690		66.24% Pervious Area
264,299		33.76% Impervious Area

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

Summary for Subcatchment PS2:

Runoff = 21.9 cfs @ 12.15 hrs, Volume= 75,650 cf, Depth= 5.41"
Routed to Pond 1P : Bioretention

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 100-Year Rainfall=8.94"

Area (sf)	CN	Description
26,645	61	>75% Grass cover, Good, HSG B
24,124	74	>75% Grass cover, Good, HSG C
11,244	80	>75% Grass cover, Good, HSG D
244	98	Unconnected roofs, HSG C
785	98	Paved parking, HSG B
22,871	98	Paved parking, HSG C
290	98	Paved parking, HSG D
709	98	Unconnected pavement, HSG B
1,901	98	Unconnected pavement, HSG C
1,224	98	Unconnected pavement, HSG D
2,546	55	Woods, Good, HSG B
49,100	58	Meadow, non-grazed, HSG B
26,266	71	Meadow, non-grazed, HSG C
167,949	71	Weighted Average
139,925		83.31% Pervious Area
28,024		16.69% Impervious Area
4,078		14.55% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	50	0.0200	0.15		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.10"
1.3	360	0.0800	4.55		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.3	40	0.0150	2.49		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.1	53	0.0110	6.75	11.94	**Pipe Channel,** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.012
0.1	47	0.0150	9.55	30.02	**Pipe Channel,** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.012
7.5	550	Total			

Summary for Subcatchment PS3:

Runoff = 2.3 cfs @ 12.13 hrs, Volume= 7,961 cf, Depth= 7.00"
Routed to Pond 2P : Brioretention

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 100-Year Rainfall=8.94"

Area (sf)	CN	Description
4,331	74	>75% Grass cover, Good, HSG C
2,298	98	Roofs, HSG C
3,751	98	Unconnected pavement, HSG C
3,266	71	Meadow, non-grazed, HSG C
13,646	84	Weighted Average
7,597		55.67% Pervious Area
6,049		44.33% Impervious Area
3,751		62.01% Unconnected

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

Summary for Subcatchment PS4:

Runoff = 16.5 cfs @ 12.13 hrs, Volume= 57,047 cf, Depth= 6.88"
Routed to Pond 2P : Brioretention

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 100-Year Rainfall=8.94"

Area (sf)	CN	Description
5,560	61	>75% Grass cover, Good, HSG B
103	74	>75% Grass cover, Good, HSG C
37,853	80	>75% Grass cover, Good, HSG D
883	98	Unconnected pavement, HSG B
589	98	Paved parking, HSG C
23,858	98	Paved parking, HSG D
4,595	98	Unconnected pavement, HSG D
3,535	58	Meadow, non-grazed, HSG B
22,543	78	Meadow, non-grazed, HSG D
99,519	83	Weighted Average
69,594		69.93% Pervious Area
29,925		30.07% Impervious Area
5,478		18.31% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.9	50	0.0300	0.17		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.10"
0.3	108	0.1388	6.00		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.0	27	0.0570	11.73	9.21	**Pipe Channel,** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012
0.3	155	0.0140	7.62	13.46	**Pipe Channel,** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.012
0.3	221	0.0470	13.96	24.67	**Pipe Channel,** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.012
0.1	77	0.0750	21.36	67.12	**Pipe Channel,** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.012
0.3	178	0.0110	10.72	75.78	**Pipe Channel,** 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.012
6.2	816	Total			

Summary for Subcatchment PS5:

Runoff = 10.8 cfs @ 12.13 hrs, Volume= 37,266 cf, Depth= 7.00"
Routed to Pond 2P : Brioretention

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 100-Year Rainfall=8.94"

Area (sf)	CN	Description
19,311	61	>75% Grass cover, Good, HSG B
8,640	80	>75% Grass cover, Good, HSG D
20,779	98	Paved parking, HSG B
639	98	Unconnected pavement, HSG B
217	98	Paved parking, HSG C
13,887	98	Paved parking, HSG D
402	98	Unconnected pavement, HSG D
63,875	84	Weighted Average
27,951		43.76% Pervious Area
35,924		56.24% Impervious Area
1,041		2.90% Unconnected

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

Summary for Subcatchment PS6:

Runoff = 0.6 cfs @ 12.14 hrs, Volume= 2,013 cf, Depth= 3.69"
Routed to Reach DP2 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 100-Year Rainfall=8.94"

Area (sf)	CN	Description
486	61	>75% Grass cover, Good, HSG B
2,801	55	Woods, Good, HSG B
3,263	58	Meadow, non-grazed, HSG B
6,550	57	Weighted Average
6,550		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.1	50	0.1200	0.14		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
0.3	72	0.0560	3.81		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
6.4	122	Total			

Summary for Subcatchment PS7:

Runoff = 6.4 cfs @ 12.13 hrs, Volume= 20,884 cf, Depth= 4.30"
Routed to Pond 2P : Brioretention

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 100-Year Rainfall=8.94"

Area (sf)	CN	Adj	Description
41,173	61		>75% Grass cover, Good, HSG B
4,201	98		Unconnected pavement, HSG B
12,368	58		Meadow, non-grazed, HSG B
556	55		Woods, Good, HSG B
58,298	63	62	Weighted Average, UI Adjusted
54,097			92.79% Pervious Area
4,201			7.21% Impervious Area
4,201			100.00% Unconnected

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

Summary for Subcatchment PS8:

Runoff = 1.4 cfs @ 12.13 hrs, Volume= 4,442 cf, Depth= 3.81"
Routed to Reach DP3 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 100-Year Rainfall=8.94"

Area (sf)	CN	Description
1,073	61	>75% Grass cover, Good, HSG B
12,748	58	Meadow, non-grazed, HSG B
171	55	Woods, Good, HSG B
13,992	58	Weighted Average
13,992		100.00% Pervious Area

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

Summary for Subcatchment PS9:

Runoff = 4.7 cfs @ 12.13 hrs, Volume= 15,752 cf, Depth= 6.39"
Routed to Pond 4P : Brioretention

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 100-Year Rainfall=8.94"

Area (sf)	CN	Description
10,254	61	>75% Grass cover, Good, HSG B
14,365	98	Paved parking, HSG B
4,501	58	Meadow, non-grazed, HSG B
467	98	Unconnected pavement, HSG B
29,587	79	Weighted Average
14,755		49.87% Pervious Area
14,832		50.13% Impervious Area
467		3.15% Unconnected

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

Summary for Subcatchment R1:

Runoff = 1.8 cfs @ 12.13 hrs, Volume= 7,143 cf, Depth= 8.70"
Routed to Pond 2P : Brioretention

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 100-Year Rainfall=8.94"

Area (sf)	CN	Description
9,853	98	Roofs, HSG C
9,853		100.00% Impervious Area

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

Summary for Subcatchment R10:

Runoff = 0.5 cfs @ 12.13 hrs, Volume= 1,897 cf, Depth= 8.70"
Routed to Pond 4P : Brioretention

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 100-Year Rainfall=8.94"

Area (sf)	CN	Description
2,616	98	Roofs, HSG B
2,616		100.00% Impervious Area

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

Summary for Subcatchment R11:

Runoff = 1.0 cfs @ 12.13 hrs, Volume= 3,792 cf, Depth= 8.70"
Routed to Pond 4P : Brioretention

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 100-Year Rainfall=8.94"

Area (sf)	CN	Description
5,231	98	Roofs, HSG B
5,231		100.00% Impervious Area

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

Summary for Subcatchment R12:

Runoff = 2.8 cfs @ 12.13 hrs, Volume= 10,935 cf, Depth= 8.70"
Routed to Pond 4P : Brioretention

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 100-Year Rainfall=8.94"

Area (sf)	CN	Description
15,084	98	Roofs, HSG B
15,084		100.00% Impervious Area

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

Summary for Subcatchment R13:

Runoff = 2.2 cfs @ 12.13 hrs, Volume= 8,555 cf, Depth= 8.70"
Routed to Pond 3P : Brioretention

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 100-Year Rainfall=8.94"

Area (sf)	CN	Description
11,800	98	Roofs, HSG B
11,800		100.00% Impervious Area

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

Summary for Subcatchment R14:

Runoff = 1.1 cfs @ 12.13 hrs, Volume= 4,277 cf, Depth= 8.70"
Routed to Pond 5P : Brioretention

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 100-Year Rainfall=8.94"

Area (sf)	CN	Description
3,284	98	Roofs, HSG B
2,616	98	Roofs, HSG C
5,900	98	Weighted Average
5,900		100.00% Impervious Area

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

Summary for Subcatchment R15:

Runoff = 3.4 cfs @ 12.13 hrs, Volume= 13,316 cf, Depth= 8.70"
Routed to Pond 3P : Brioretention

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 100-Year Rainfall=8.94"

Area (sf)	CN	Description
9,193	98	Roofs, HSG B
9,175	98	Roofs, HSG D
18,368	98	Weighted Average
18,368		100.00% Impervious Area

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

Summary for Subcatchment R16:

Runoff = 1.8 cfs @ 12.13 hrs, Volume= 7,143 cf, Depth= 8.70"
Routed to Pond 7P : Brioretention

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 100-Year Rainfall=8.94"

Area (sf)	CN	Description
9,853	98	Roofs, HSG C
9,853		100.00% Impervious Area

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

Summary for Subcatchment R17:

Runoff = 2.7 cfs @ 12.13 hrs, Volume= 10,451 cf, Depth= 8.70"
Routed to Pond 6P : Brioretention

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 100-Year Rainfall=8.94"

Area (sf)	CN	Description
14,416	98	Roofs, HSG C
14,416		100.00% Impervious Area

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

Summary for Subcatchment R18:

Runoff = 1.8 cfs @ 12.13 hrs, Volume= 7,143 cf, Depth= 8.70"
Routed to Pond 7P : Brioretention

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 100-Year Rainfall=8.94"

Area (sf)	CN	Description
9,853	98	Roofs, HSG C
9,853		100.00% Impervious Area

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

Summary for Subcatchment R19:

Runoff = 1.8 cfs @ 12.13 hrs, Volume= 7,143 cf, Depth= 8.70"
Routed to Pond 9P : Brioretention

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 100-Year Rainfall=8.94"

Area (sf)	CN	Description
9,853	98	Roofs, HSG C
9,853		100.00% Impervious Area

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

Summary for Subcatchment R2:

Runoff = 1.5 cfs @ 12.13 hrs, Volume= 5,689 cf, Depth= 8.70"
Routed to Pond 2P : Brioretention

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 100-Year Rainfall=8.94"

Area (sf)	CN	Description
7,847	98	Roofs, HSG D
7,847		100.00% Impervious Area

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

Summary for Subcatchment R3:

Runoff = 2.5 cfs @ 12.13 hrs, Volume= 9,524 cf, Depth= 8.70"
Routed to Pond 2P : Brioretention

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 100-Year Rainfall=8.94"

Area (sf)	CN	Description
13,137	98	Roofs, HSG D
13,137		100.00% Impervious Area

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

Summary for Subcatchment R4:

Runoff = 1.2 cfs @ 12.13 hrs, Volume= 4,762 cf, Depth= 8.70"
Routed to Pond 2P : Brioretention

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 100-Year Rainfall=8.94"

Area (sf)	CN	Description
6,568	98	Roofs, HSG D
6,568		100.00% Impervious Area

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

Summary for Subcatchment R5:

Runoff = 2.5 cfs @ 12.13 hrs, Volume= 9,524 cf, Depth= 8.70"
Routed to Pond 2P : Brioretention

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 100-Year Rainfall=8.94"

Area (sf)	CN	Description
452	98	Roofs, HSG B
573	98	Roofs, HSG C
12,112	98	Roofs, HSG D
13,137	98	Weighted Average
13,137		100.00% Impervious Area

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

Summary for Subcatchment R6:

Runoff = 1.2 cfs @ 12.13 hrs, Volume= 4,762 cf, Depth= 8.70"
Routed to Pond 2P : Brioretention

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 100-Year Rainfall=8.94"

Area (sf)	CN	Description
6,568	98	Roofs, HSG B
6,568		100.00% Impervious Area

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

Summary for Subcatchment R7:

Runoff = 6.7 cfs @ 12.13 hrs, Volume= 26,190 cf, Depth= 8.70"
Routed to Pond 2P : Brioretention

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 100-Year Rainfall=8.94"

Area (sf)	CN	Description
35,162	98	Roofs, HSG B
964	98	Roofs, HSG D
36,126	98	Weighted Average
36,126		100.00% Impervious Area

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

Summary for Subcatchment R8:

Runoff = 0.6 cfs @ 12.13 hrs, Volume= 2,381 cf, Depth= 8.70"
Routed to Pond 3P : Brioretention

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 100-Year Rainfall=8.94"

Area (sf)	CN	Description
3,284	98	Roofs, HSG B
3,284		100.00% Impervious Area

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

Summary for Subcatchment R9:

Runoff = 1.2 cfs @ 12.13 hrs, Volume= 4,762 cf, Depth= 8.70"
Routed to Pond 3P : Brioretention

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 100-Year Rainfall=8.94"

Area (sf)	CN	Description
6,568	98	Roofs, HSG B
6,568		100.00% Impervious Area

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

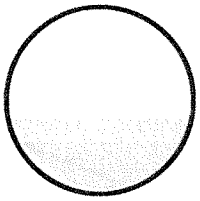
Summary for Reach 1R:

Inflow Area = 206,600 sf, 49.99% Impervious, Inflow Depth = 3.90" for 100-Year event
Inflow = 17.1 cfs @ 12.19 hrs, Volume= 67,165 cf
Outflow = 16.9 cfs @ 12.21 hrs, Volume= 67,165 cf, Atten= 1%, Lag= 0.9 min
Routed to Pond 2P : Brioretention

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Max. Velocity= 14.69 fps, Min. Travel Time= 1.0 min
Avg. Velocity = 5.16 fps, Avg. Travel Time= 2.8 min

Peak Storage= 991 cf @ 12.21 hrs
Average Depth at Peak Storage= 0.79' , Surface Width= 1.96'
Bank-Full Depth= 2.00' Flow Area= 3.1 sf, Capacity= 51.5 cfs

24.0" Round Pipe
n= 0.012
Length= 860.0' Slope= 0.0442 '/'
Inlet Invert= 150.00', Outlet Invert= 112.00'



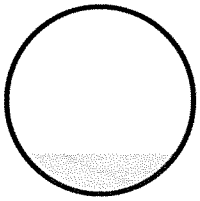
Summary for Reach 2R:

Inflow Area = 84,736 sf, 34.88% Impervious, Inflow Depth = 5.43" for 100-Year event
Inflow = 2.5 cfs @ 12.86 hrs, Volume= 38,340 cf
Outflow = 2.5 cfs @ 12.88 hrs, Volume= 38,340 cf, Atten= 0%, Lag= 1.2 min
Routed to Pond 2P : Brioretention

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Max. Velocity= 9.20 fps, Min. Travel Time= 1.6 min
Avg. Velocity = 4.78 fps, Avg. Travel Time= 3.0 min

Peak Storage= 233 cf @ 12.88 hrs
Average Depth at Peak Storage= 0.31' , Surface Width= 1.22'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 25.7 cfs

18.0" Round Pipe
n= 0.012
Length= 865.0' Slope= 0.0510 '/'
Inlet Invert= 156.10', Outlet Invert= 112.00'



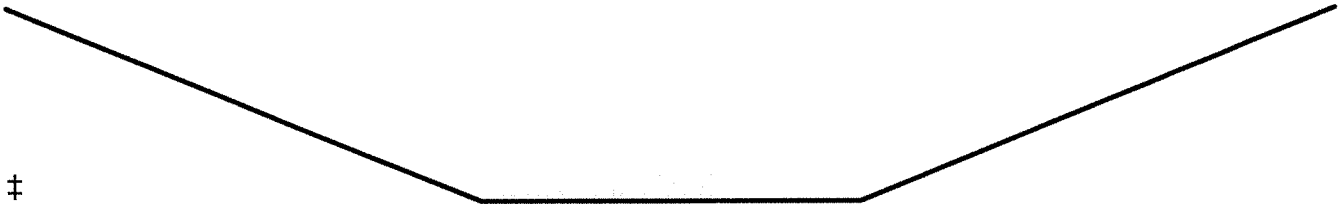
Summary for Reach 3R:

Inflow Area = 101,109 sf, 48.88% Impervious, Inflow Depth = 6.49" for 100-Year event
Inflow = 13.3 cfs @ 12.18 hrs, Volume= 54,670 cf
Outflow = 10.3 cfs @ 12.23 hrs, Volume= 54,669 cf, Atten= 23%, Lag= 3.3 min
Routed to Pond 0P :

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Max. Velocity= 4.21 fps, Min. Travel Time= 5.1 min
Avg. Velocity = 1.20 fps, Avg. Travel Time= 17.9 min

Peak Storage= 3,150 cf @ 12.23 hrs
Average Depth at Peak Storage= 0.40' , Surface Width= 8.04'
Bank-Full Depth= 1.00' Flow Area= 9.0 sf, Capacity= 62.5 cfs

4.00' x 1.00' deep channel, n= 0.040 Earth, cobble bottom, clean sides
Side Slope Z-value= 5.0 '/' Top Width= 14.00'
Length= 1,293.0' Slope= 0.0641 '/'
Inlet Invert= 172.00', Outlet Invert= 89.08'



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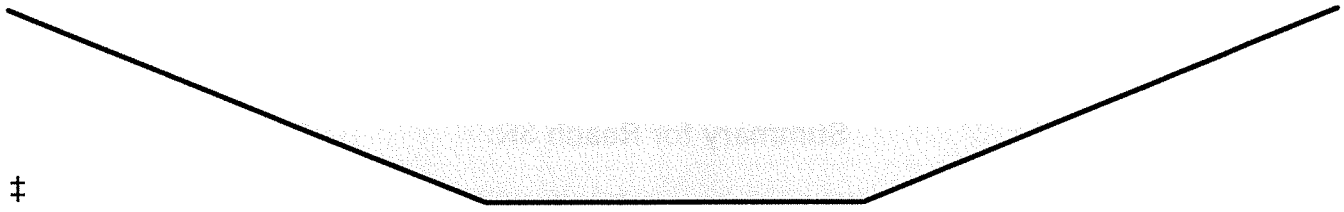
Summary for Reach 4R:

Inflow Area = 95,587 sf, 37.36% Impervious, Inflow Depth = 6.03" for 100-Year event
Inflow = 12.3 cfs @ 12.17 hrs, Volume= 48,023 cf
Outflow = 11.1 cfs @ 12.23 hrs, Volume= 48,023 cf, Atten= 10%, Lag= 3.1 min
Routed to Pond 0P :

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Max. Velocity= 4.42 fps, Min. Travel Time= 4.8 min
Avg. Velocity = 1.25 fps, Avg. Travel Time= 16.8 min

Peak Storage= 3,164 cf @ 12.23 hrs
Average Depth at Peak Storage= 0.41' , Surface Width= 8.13'
Bank-Full Depth= 1.00' Flow Area= 9.0 sf, Capacity= 64.7 cfs

4.00' x 1.00' deep channel, n= 0.040 Earth, cobble bottom, clean sides
Side Slope Z-value= 5.0 '/' Top Width= 14.00'
Length= 1,263.0' Slope= 0.0688 '/'
Inlet Invert= 176.00', Outlet Invert= 89.08'



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Summary for Reach 5R:

Inflow = 0.0 cfs @ 0.00 hrs, Volume= 0 cf
Outflow = 0.0 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min
Routed to Pond 0P :

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 1.00' Flow Area= 9.0 sf, Capacity= 62.2 cfs

4.00' x 1.00' deep channel, n= 0.040 Earth, cobble bottom, clean sides
Side Slope Z-value= 5.0 '/' Top Width= 14.00'
Length= 1,225.0' Slope= 0.0636 '/'
Inlet Invert= 167.00', Outlet Invert= 89.08'

‡

Summary for Reach DP1:

Inflow Area = 2,384,692 sf, 28.74% Impervious, Inflow Depth = 6.33" for 100-Year event
Inflow = 197.5 cfs @ 12.21 hrs, Volume= 1,257,370 cf
Outflow = 197.5 cfs @ 12.21 hrs, Volume= 1,257,370 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Summary for Reach DP2:

Inflow Area = 6,550 sf, 0.00% Impervious, Inflow Depth = 3.69" for 100-Year event
Inflow = 0.6 cfs @ 12.14 hrs, Volume= 2,013 cf
Outflow = 0.6 cfs @ 12.14 hrs, Volume= 2,013 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Summary for Reach DP3:

Inflow Area = 13,992 sf, 0.00% Impervious, Inflow Depth = 5.50" for 100-Year event
Inflow = 5.8 cfs @ 12.18 hrs, Volume= 6,409 cf
Outflow = 5.8 cfs @ 12.18 hrs, Volume= 6,409 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Summary for Pond 0P:

Inflow Area = 2,384,692 sf, 28.74% Impervious, Inflow Depth = 6.33" for 100-Year event
Inflow = 197.9 cfs @ 12.19 hrs, Volume= 1,257,370 cf
Outflow = 197.5 cfs @ 12.21 hrs, Volume= 1,257,370 cf, Atten= 0%, Lag= 1.2 min
Primary = 197.5 cfs @ 12.21 hrs, Volume= 1,257,370 cf
Routed to Reach DP1 :

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 99.11' @ 12.21 hrs Surf.Area= 14,767 sf Storage= 24,602 cf

Plug-Flow detention time= 1.2 min calculated for 1,257,370 cf (100% of inflow)
Center-of-Mass det. time= 1.1 min (832.6 - 831.5)

Volume	Invert	Avail.Storage	Storage Description
#1	89.08'	452,475 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
89.08	10	10.0	0	0	10
93.00	250	50.0	405	405	234
94.00	904	185.2	543	948	2,768
96.00	2,293	261.0	3,091	4,039	5,496
98.00	6,945	557.5	8,819	12,858	24,825
100.00	23,209	885.0	28,567	41,425	62,447
102.00	37,519	1,050.6	60,158	101,583	88,028
104.00	50,433	1,310.8	87,634	189,217	136,980
106.00	65,230	1,557.1	115,346	304,563	193,264
108.00	83,039	1,761.9	147,911	452,475	247,457

Device	Routing	Invert	Outlet Devices
#1	Primary	89.08'	**30.0" Round Culvert** L= 60.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 89.08' / 87.52' S= 0.0260 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 4.91 sf
#2	Primary	98.50'	**100.0' long x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=197.5 cfs @ 12.21 hrs HW=99.11' TW=0.00' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 70.0 cfs @ 14.26 fps)
└—**2=Broad-Crested Rectangular Weir** (Weir Controls 127.5 cfs @ 2.10 fps)

Summary for Pond 1P: Bioretention

Inflow Area = 167,949 sf, 16.69% Impervious, Inflow Depth = 5.41" for 100-Year event
Inflow = 21.9 cfs @ 12.15 hrs, Volume= 75,650 cf
Outflow = 21.7 cfs @ 12.15 hrs, Volume= 75,067 cf, Atten= 1%, Lag= 0.5 min
Discarded = 0.1 cfs @ 12.16 hrs, Volume= 6,619 cf
Primary = 3.7 cfs @ 12.08 hrs, Volume= 46,201 cf
Routed to Pond 0P :
Secondary = 18.3 cfs @ 12.16 hrs, Volume= 22,247 cf
Routed to Pond 0P :

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Peak Elev= 99.78' @ 12.16 hrs Surf.Area= 2,249 sf Storage= 4,553 cf

Plug-Flow detention time= 50.1 min calculated for 75,046 cf (99% of inflow)
Center-of-Mass det. time= 45.7 min (885.6 - 840.0)

Volume	Invert	Avail.Storage	Storage Description
#1	94.00'	6,462 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
94.00	0	0.0	0	0	0
96.00	345	79.4	230	230	508
98.00	1,115	154.8	1,387	1,617	1,933
100.00	2,416	248.3	3,448	5,065	4,959
100.50	3,189	267.1	1,397	6,462	5,741

Device	Routing	Invert	Outlet Devices
#1	Primary	98.00'	**12.0" Round Culvert** L= 27.0' Ke= 0.500 Inlet / Outlet Invert= 98.00' / 97.90' S= 0.0037 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Device 1	98.10'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	98.75'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 1	99.20'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#5	Secondary	99.40'	**30.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32
#6	Discarded	94.00'	**1.020 in/hr Exfiltration over Wetted area** Phase-In= 0.01'

Discarded OutFlow Max=0.1 cfs @ 12.16 hrs HW=99.78' (Free Discharge)
└**6=Exfiltration** (Exfiltration Controls 0.1 cfs)

Primary OutFlow Max=3.7 cfs @ 12.08 hrs HW=99.67' TW=98.74' (Dynamic Tailwater)
└**1=Culvert** (Inlet Controls 3.7 cfs @ 4.65 fps)
  ├**2=Orifice/Grate** (Passes < 0.2 cfs potential flow)
  ├**3=Orifice/Grate** (Passes < 0.2 cfs potential flow)
  └**4=Broad-Crested Rectangular Weir** (Passes < 3.9 cfs potential flow)

Secondary OutFlow Max=18.3 cfs @ 12.16 hrs HW=99.78' TW=99.07' (Dynamic Tailwater)
└**5=Broad-Crested Rectangular Weir** (Weir Controls 18.3 cfs @ 1.60 fps)

Summary for Pond 2P: Brioretention

Inflow Area = 619,910 sf, 48.74% Impervious, Inflow Depth = 5.73" for 100-Year event
Inflow = 65.8 cfs @ 12.14 hrs, Volume= 296,257 cf
Outflow = 65.7 cfs @ 12.15 hrs, Volume= 296,254 cf, Atten= 0%, Lag= 0.2 min
Discarded = 0.1 cfs @ 12.15 hrs, Volume= 4,636 cf
Primary = 12.1 cfs @ 12.15 hrs, Volume= 218,678 cf
Routed to Pond 0P :
Secondary = 53.5 cfs @ 12.15 hrs, Volume= 72,940 cf
Routed to Pond 0P :

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 115.88' @ 12.15 hrs Surf.Area= 3,350 sf Storage= 8,388 cf

Plug-Flow detention time= 9.9 min calculated for 296,172 cf (100% of inflow)
Center-of-Mass det. time= 10.0 min (838.2 - 828.2)

Volume	Invert	Avail.Storage	Storage Description
#1	110.00'	8,795 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
110.00	53	45.3	0	0	53
112.00	700	129.0	630	630	1,227
114.00	1,803	205.5	2,418	3,048	3,291
114.50	2,675	230.6	1,112	4,160	4,168
115.00	3,028	240.0	1,425	5,585	4,540
116.00	3,395	249.5	3,210	8,795	4,983

Device	Routing	Invert	Outlet Devices
#1	Primary	110.50'	**24.0" Round Culvert** L= 26.0' Ke= 0.500 Inlet / Outlet Invert= 110.50' / 110.00' S= 0.0192 '/' Cc= 0.900 n= 0.012, Flow Area= 3.14 sf
#2	Device 1	111.00'	**6.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	111.50'	**6.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 1	113.00'	**6.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#5	Device 1	114.00'	**6.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#6	Device 1	115.30'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#7	Secondary	115.50'	**88.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32
#8	Discarded	110.00'	**1.020 in/hr Exfiltration over Wetted area** Phase-In= 0.01'

Discarded OutFlow Max=0.1 cfs @ 12.15 hrs HW=115.88' (Free Discharge)
└**8=Exfiltration** (Exfiltration Controls 0.1 cfs)

Primary OutFlow Max=12.1 cfs @ 12.15 hrs HW=115.88' TW=99.05' (Dynamic Tailwater)
└**1=Culvert** (Passes 12.1 cfs of 31.7 cfs potential flow)
- **2=Orifice/Grate** (Orifice Controls 2.0 cfs @ 10.36 fps)
- **3=Orifice/Grate** (Orifice Controls 1.9 cfs @ 9.78 fps)
- **4=Orifice/Grate** (Orifice Controls 1.5 cfs @ 7.81 fps)
- **5=Orifice/Grate** (Orifice Controls 1.2 cfs @ 6.14 fps)
- **6=Broad-Crested Rectangular Weir** (Weir Controls 5.4 cfs @ 2.33 fps)

Secondary OutFlow Max=53.3 cfs @ 12.15 hrs HW=115.88' TW=99.05' (Dynamic Tailwater)
└**7=Broad-Crested Rectangular Weir** (Weir Controls 53.3 cfs @ 1.60 fps)

Summary for Pond 3P: Brioretention

Inflow Area = 206,600 sf, 49.99% Impervious, Inflow Depth = 5.32" for 100-Year event
Inflow = 25.7 cfs @ 12.13 hrs, Volume= 91,656 cf
Outflow = 19.3 cfs @ 12.19 hrs, Volume= 91,439 cf, Atten= 25%, Lag= 3.7 min
Discarded = 0.5 cfs @ 12.19 hrs, Volume= 23,933 cf
Primary = 17.1 cfs @ 12.19 hrs, Volume= 67,165 cf
Routed to Reach 1R :
Secondary = 1.7 cfs @ 12.19 hrs, Volume= 340 cf
Routed to Reach DP3 :

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 157.73' @ 12.19 hrs Surf.Area= 6,518 sf Storage= 25,618 cf

Plug-Flow detention time= 142.6 min calculated for 91,439 cf (100% of inflow)
Center-of-Mass det. time= 141.0 min (935.4 - 794.4)

Volume	Invert	Avail.Storage	Storage Description
#1	148.00'	31,183 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
148.00	0	0.0	0	0	0
150.00	833	121.1	555	555	1,173
152.00	1,785	173.3	2,558	3,114	2,431
154.00	3,143	233.9	4,864	7,978	4,437
156.00	4,805	287.3	7,889	15,867	6,712
158.00	6,810	347.0	11,557	27,424	9,791
158.50	8,248	372.2	3,759	31,183	11,245

Device	Routing	Invert	Outlet Devices
#1	Primary	151.00'	**24.0" Round Culvert** L= 143.0' Ke= 0.500 Inlet / Outlet Invert= 151.00' / 149.35' S= 0.0115 '/' Cc= 0.900 n= 0.012, Flow Area= 3.14 sf
#2	Device 1	151.75'	**2.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	153.00'	**4.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 1	156.60'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#5	Secondary	157.65'	**30.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32
#6	Discarded	148.00'	**2.410 in/hr Exfiltration over Wetted area** Phase-In= 0.01'

Discarded OutFlow Max=0.5 cfs @ 12.19 hrs HW=157.73' (Free Discharge)
└**6=Exfiltration** (Exfiltration Controls 0.5 cfs)

Primary OutFlow Max=17.1 cfs @ 12.19 hrs HW=157.73' TW=150.78' (Dynamic Tailwater)
└**1=Culvert** (Passes 17.1 cfs of 36.2 cfs potential flow)
  ├**2=Orifice/Grate** (Orifice Controls 0.3 cfs @ 11.69 fps)
  ├**3=Orifice/Grate** (Orifice Controls 0.9 cfs @ 10.28 fps)
  └**4=Broad-Crested Rectangular Weir** (Weir Controls 15.9 cfs @ 3.53 fps)

Secondary OutFlow Max=1.7 cfs @ 12.19 hrs HW=157.73' TW=0.00' (Dynamic Tailwater)
└**5=Broad-Crested Rectangular Weir** (Weir Controls 1.7 cfs @ 0.71 fps)

Summary for Pond 4P: Brioretention

Inflow Area = 82,012 sf, 49.04% Impervious, Inflow Depth = 6.28" for 100-Year event
Inflow = 11.7 cfs @ 12.13 hrs, Volume= 42,942 cf
Outflow = 11.3 cfs @ 12.15 hrs, Volume= 42,942 cf, Atten= 4%, Lag= 1.1 min
Discarded = 0.4 cfs @ 12.15 hrs, Volume= 16,360 cf
Primary = 7.0 cfs @ 12.15 hrs, Volume= 24,955 cf
Routed to Pond 3P : Brioretention
Secondary = 3.9 cfs @ 12.15 hrs, Volume= 1,627 cf
Routed to Reach DP3 :

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 161.88' @ 12.15 hrs Surf.Area= 2,851 sf Storage= 4,781 cf

Plug-Flow detention time= 47.9 min calculated for 42,930 cf (100% of inflow)
Center-of-Mass det. time= 48.0 min (847.2 - 799.2)

Volume	Invert	Avail.Storage	Storage Description
#1	158.00'	6,976 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
158.00	142	68.1	0	0	142
159.00	404	96.9	262	262	529
160.00	1,234	201.9	781	1,043	3,030
162.00	2,975	321.8	4,083	5,127	8,054
162.50	4,474	382.9	1,850	6,976	11,485

Device	Routing	Invert	Outlet Devices
#1	Primary	158.00'	**12.0" Round Culvert** L= 61.0' Ke= 0.500 Inlet / Outlet Invert= 158.00' / 154.90' S= 0.0508 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Device 1	160.15'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	160.40'	**12.0" W x 4.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 1	160.90'	**12.0" W x 3.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#5	Device 1	161.40'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#6	Secondary	161.70'	**20.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32
#7	Discarded	158.00'	**2.410 in/hr Exfiltration over Wetted area** Phase-In= 0.01'

Discarded OutFlow Max=0.4 cfs @ 12.15 hrs HW=161.88' (Free Discharge)
└**7=Exfiltration** (Exfiltration Controls 0.4 cfs)

Primary OutFlow Max=7.0 cfs @ 12.15 hrs HW=161.88' TW=157.63' (Dynamic Tailwater)
└**1=Culvert** (Inlet Controls 7.0 cfs @ 8.85 fps)
- **2=Orifice/Grate** (Passes < 0.3 cfs potential flow)
- **3=Orifice/Grate** (Passes < 1.8 cfs potential flow)
- **4=Orifice/Grate** (Passes < 1.1 cfs potential flow)
- **5=Broad-Crested Rectangular Weir** (Passes < 4.0 cfs potential flow)

Secondary OutFlow Max=3.9 cfs @ 12.15 hrs HW=161.88' TW=0.00' (Dynamic Tailwater)
└**6=Broad-Crested Rectangular Weir** (Weir Controls 3.9 cfs @ 1.08 fps)

Summary for Pond 5P: Brioretention

Inflow Area = 84,736 sf, 34.88% Impervious, Inflow Depth = 5.82" for 100-Year event
Inflow = 3.8 cfs @ 12.14 hrs, Volume= 41,068 cf
Outflow = 2.6 cfs @ 12.86 hrs, Volume= 41,000 cf, Atten= 33%, Lag= 43.0 min
Discarded = 0.1 cfs @ 12.86 hrs, Volume= 2,661 cf
Primary = 2.5 cfs @ 12.86 hrs, Volume= 38,340 cf
Routed to Reach 2R :
Secondary = 0.0 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Reach 5R :

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Peak Elev= 168.24' @ 12.86 hrs Surf.Area= 2,451 sf Storage= 5,743 cf

Plug-Flow detention time= 49.9 min calculated for 40,989 cf (100% of inflow)
Center-of-Mass det. time= 48.7 min (919.0 - 870.3)

Volume	Invert	Avail.Storage	Storage Description
#1	163.00'	6,415 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
163.00	192	62.9	0	0	192
164.00	445	91.6	310	310	553
166.00	1,180	141.0	1,566	1,876	1,497
168.00	2,178	184.3	3,307	5,184	2,664
168.50	2,759	203.2	1,231	6,415	3,255

Device	Routing	Invert	Outlet Devices
#1	Primary	162.00'	**12.0" Round Culvert** L= 65.0' Ke= 0.500 Inlet / Outlet Invert= 162.00' / 156.20' S= 0.0892 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Device 1	164.00'	**2.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	164.67'	**4.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 1	165.50'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#5	Device 1	166.50'	**4.0" W x 3.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#6	Device 1	168.10'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#7	Secondary	168.25'	**20.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32
#8	Discarded	163.00'	**1.020 in/hr Exfiltration over Wetted area** Phase-In= 0.01'

Discarded OutFlow Max=0.1 cfs @ 12.86 hrs HW=168.24' (Free Discharge)
└**8=Exfiltration** (Exfiltration Controls 0.1 cfs)

Primary OutFlow Max=2.5 cfs @ 12.86 hrs HW=168.24' TW=156.41' (Dynamic Tailwater)
└**1=Culvert** (Passes 2.5 cfs of 9.1 cfs potential flow)
  ├**2=Orifice/Grate** (Orifice Controls 0.2 cfs @ 9.82 fps)
  ├**3=Orifice/Grate** (Orifice Controls 0.8 cfs @ 8.89 fps)
  ├**4=Orifice/Grate** (Orifice Controls 0.4 cfs @ 7.79 fps)
  ├**5=Orifice/Grate** (Orifice Controls 0.5 cfs @ 6.12 fps)
  └**6=Broad-Crested Rectangular Weir** (Weir Controls 0.6 cfs @ 1.05 fps)

Secondary OutFlow Max=0.0 cfs @ 0.00 hrs HW=163.00' TW=167.00' (Dynamic Tailwater)
└**7=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Summary for Pond 6P: Brioretention

Inflow Area = 74,887 sf, 31.59% Impervious, Inflow Depth = 6.53" for 100-Year event
Inflow = 11.8 cfs @ 12.13 hrs, Volume= 40,763 cf
Outflow = 2.7 cfs @ 12.37 hrs, Volume= 40,400 cf, Atten= 77%, Lag= 14.5 min
Discarded = 0.1 cfs @ 12.38 hrs, Volume= 5,024 cf
Primary = 2.6 cfs @ 12.37 hrs, Volume= 35,376 cf
Routed to Pond 5P : Brioretention
Secondary = 0.0 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Pond 3P : Brioretention

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 171.72' @ 12.38 hrs Surf.Area= 3,867 sf Storage= 12,979 cf

Plug-Flow detention time= 113.3 min calculated for 40,389 cf (99% of inflow)
Center-of-Mass det. time= 107.9 min (910.3 - 802.4)

Volume	Invert	Avail.Storage	Storage Description
#1	165.00'	16,396 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
165.00	177	59.1	0	0	177
166.00	643	110.0	386	386	867
168.00	1,920	162.6	2,449	2,835	2,040
170.00	2,659	207.6	4,559	7,394	3,417
172.00	4,083	254.8	6,691	14,085	5,214
172.50	5,180	283.8	2,310	16,396	6,464

Device	Routing	Invert	Outlet Devices
#1	Primary	166.50'	**12.0" Round Culvert** L= 106.0' Ke= 0.500 Inlet / Outlet Invert= 166.50' / 165.00' S= 0.0142 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Device 1	166.75'	**2.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	167.75'	**6.0" W x 3.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 1	169.25'	**6.0" W x 4.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#5	Device 1	171.75'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#6	Secondary	172.10'	**20.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32
#7	Discarded	165.00'	**1.020 in/hr Exfiltration over Wetted area** Phase-In= 0.01'

Discarded OutFlow Max=0.1 cfs @ 12.38 hrs HW=171.72' (Free Discharge)
└─**7=Exfiltration** (Exfiltration Controls 0.1 cfs)

Primary OutFlow Max=2.6 cfs @ 12.37 hrs HW=171.72' TW=167.77' (Dynamic Tailwater)
└─**1=Culvert** (Passes 2.6 cfs of 6.0 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 0.2 cfs @ 9.57 fps)
  ├─**3=Orifice/Grate** (Orifice Controls 1.2 cfs @ 9.44 fps)
  ├─**4=Orifice/Grate** (Orifice Controls 1.2 cfs @ 7.31 fps)
  └─**5=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Secondary OutFlow Max=0.0 cfs @ 0.00 hrs HW=165.00' TW=148.00' (Dynamic Tailwater)
└─**6=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Summary for Pond 7P: Brioretention

Inflow Area = 101,109 sf, 48.88% Impervious, Inflow Depth = 7.14" for 100-Year event
Inflow = 17.1 cfs @ 12.13 hrs, Volume= 60,119 cf
Outflow = 13.5 cfs @ 12.18 hrs, Volume= 59,793 cf, Atten= 21%, Lag= 2.8 min
Discarded = 0.1 cfs @ 12.18 hrs, Volume= 5,124 cf
Primary = 10.9 cfs @ 12.18 hrs, Volume= 54,091 cf
Routed to Reach 3R :
Secondary = 2.4 cfs @ 12.18 hrs, Volume= 578 cf
Routed to Reach 3R :

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 182.38' @ 12.18 hrs Surf.Area= 4,560 sf Storage= 13,587 cf

Plug-Flow detention time= 83.7 min calculated for 59,793 cf (99% of inflow)
Center-of-Mass det. time= 80.2 min (872.1 - 791.9)

Volume	Invert	Avail.Storage	Storage Description
#1	175.00'	14,145 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
175.00	168	50.4	0	0	168
176.00	361	73.0	258	258	398
176.50	478	82.4	209	467	521
178.00	1,417	148.6	1,359	1,826	1,750
180.00	2,513	199.3	3,878	5,705	3,196
182.00	3,821	237.0	6,288	11,993	4,576
182.50	4,804	261.2	2,152	14,145	5,543

Device	Routing	Invert	Outlet Devices
#1	Primary	176.00'	**18.0" Round Culvert** L= 46.0' Ke= 0.500 Inlet / Outlet Invert= 176.00' / 174.00' S= 0.0435 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf
#2	Device 1	176.75'	**2.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	178.50'	**4.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 1	179.00'	**4.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#5	Device 1	180.00'	**10.0" W x 4.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#6	Device 1	181.00'	**8.0" W x 3.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#7	Device 1	181.75'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#8	Secondary	182.25'	**20.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32
#9	Discarded	175.00'	**1.020 in/hr Exfiltration over Wetted area** Phase-In= 0.01'

Discarded OutFlow Max=0.1 cfs @ 12.18 hrs HW=182.38' (Free Discharge)
└**9=Exfiltration** (Exfiltration Controls 0.1 cfs)

Primary OutFlow Max=10.9 cfs @ 12.18 hrs HW=182.38' TW=172.36' (Dynamic Tailwater)
└**1=Culvert** (Passes 10.9 cfs of 20.2 cfs potential flow)
- **2=Orifice/Grate** (Orifice Controls 0.2 cfs @ 11.34 fps)
- **3=Orifice/Grate** (Orifice Controls 0.8 cfs @ 9.28 fps)
- **4=Orifice/Grate** (Orifice Controls 0.8 cfs @ 8.63 fps)
- **5=Orifice/Grate** (Orifice Controls 2.0 cfs @ 7.16 fps)
- **6=Orifice/Grate** (Orifice Controls 0.9 cfs @ 5.39 fps)
- **7=Broad-Crested Rectangular Weir** (Weir Controls 6.2 cfs @ 2.47 fps)

Secondary OutFlow Max=2.4 cfs @ 12.18 hrs HW=182.38' TW=172.36' (Dynamic Tailwater)
└**8=Broad-Crested Rectangular Weir** (Weir Controls 2.4 cfs @ 0.92 fps)

Summary for Pond 8P: Brioretention

Inflow Area = 58,074 sf, 42.43% Impervious, Inflow Depth = 6.88" for 100-Year event
Inflow = 7.7 cfs @ 12.19 hrs, Volume= 33,290 cf
Outflow = 7.7 cfs @ 12.21 hrs, Volume= 33,290 cf, Atten= 1%, Lag= 0.9 min
Discarded = 0.1 cfs @ 12.21 hrs, Volume= 2,216 cf
Primary = 4.1 cfs @ 12.21 hrs, Volume= 27,711 cf
Routed to Reach 4R :
Secondary = 3.5 cfs @ 12.21 hrs, Volume= 3,363 cf
Routed to Reach 4R :

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 180.45' @ 12.21 hrs Surf.Area= 2,017 sf Storage= 2,489 cf

Plug-Flow detention time= 30.7 min calculated for 33,290 cf (100% of inflow)
Center-of-Mass det. time= 30.6 min (841.0 - 810.4)

Volume	Invert	Avail.Storage	Storage Description
#1	177.00'	2,582 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
177.00	101	54.5	0	0	101
178.00	357	92.4	216	216	550
179.00	690	103.3	514	730	746
179.50	875	112.7	390	1,121	916
180.00	1,469	193.1	580	1,700	2,874
180.50	2,077	212.0	882	2,582	3,492

Device	Routing	Invert	Outlet Devices
#1	Primary	177.00'	**12.0" Round Culvert** L= 46.0' Ke= 0.500 Inlet / Outlet Invert= 177.00' / 176.00' S= 0.0217 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Device 1	177.50'	**2.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	178.00'	**2.5" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 1	180.00'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#5	Secondary	180.25'	**15.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32
#6	Discarded	177.00'	**1.020 in/hr Exfiltration over Wetted area** Phase-In= 0.01'

Discarded OutFlow Max=0.1 cfs @ 12.21 hrs HW=180.45' (Free Discharge)
└**6=Exfiltration** (Exfiltration Controls 0.1 cfs)

Primary OutFlow Max=4.1 cfs @ 12.21 hrs HW=180.45' TW=176.41' (Dynamic Tailwater)
└**1=Culvert** (Passes 4.1 cfs of 6.5 cfs potential flow)
  ├**2=Orifice/Grate** (Orifice Controls 0.2 cfs @ 8.16 fps)
  ├**3=Orifice/Grate** (Orifice Controls 0.3 cfs @ 7.38 fps)
  └**4=Broad-Crested Rectangular Weir** (Weir Controls 3.6 cfs @ 2.00 fps)

Secondary OutFlow Max=3.5 cfs @ 12.21 hrs HW=180.45' TW=176.41' (Dynamic Tailwater)
└**5=Broad-Crested Rectangular Weir** (Weir Controls 3.5 cfs @ 1.15 fps)

Summary for Pond 9P: Brioretention

Inflow Area = 37,513 sf, 29.50% Impervious, Inflow Depth = 6.36" for 100-Year event
Inflow = 5.5 cfs @ 12.14 hrs, Volume= 19,886 cf
Outflow = 5.4 cfs @ 12.15 hrs, Volume= 19,320 cf, Atten= 1%, Lag= 0.7 min
Discarded = 0.0 cfs @ 12.15 hrs, Volume= 2,372 cf
Primary = 5.4 cfs @ 12.15 hrs, Volume= 16,949 cf
Routed to Reach 4R :

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Peak Elev= 198.90' @ 12.15 hrs Surf.Area= 1,013 sf Storage= 1,675 cf

Plug-Flow detention time= 86.2 min calculated for 19,315 cf (97% of inflow)
Center-of-Mass det. time= 68.9 min (871.6 - 802.7)

Volume	Invert	Avail.Storage	Storage Description
#1	196.00'	2,071 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
196.00	225	58.8	0	0	225
198.00	720	100.2	898	898	772
199.00	1,049	119.1	879	1,778	1,120
199.25	1,300	131.7	293	2,071	1,373

Device	Routing	Invert	Outlet Devices
#1	Primary	198.55'	**10.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32
#2	Discarded	196.00'	**1.020 in/hr Exfiltration over Wetted area** Phase-In= 0.01'

Discarded OutFlow Max=0.0 cfs @ 12.15 hrs HW=198.90' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=5.4 cfs @ 12.15 hrs HW=198.90' TW=176.37' (Dynamic Tailwater)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 5.4 cfs @ 1.53 fps)

APPENDIX D:

STORMWATER

MANAGEMENT CALCULATIONS

November 30, 2023

Stormwater Management Calculations

Sagamore Spring – Lynnfield, MA Date: 11/30/2023

STANDARD 3: Recharge To Groundwater: Static Method

1. Calculate Impervious Area *(From HydroCAD Model)*
   - New Impervious Area (HSG B Soil) = 162,090 SF
   - New Impervious Area (HSG C Soil) = 157,765 SF
   - New Impervious Area (HSG D Soil) = 95,238 SF

2. Determine Rainfall Depth to be Recharged
   (MassDEP Stormwater Management Handbook: Table 2.3.2)

Hydrologic Soil Group	Recharge Rainfall Depth
B	0.35"
C	0.25"
D	0.10"

3. Calculate Recharge Volume

   'Rv' = [(0.35" x 162,090 SF) / 12 SF-In] + [(0.25" x 157,765 SF) / 12 SF-In] + [(0.10" x 95,238 SF) / 12 SF-In] = 8,808 CF

   ***'Rv'* = 8,808 CF**

   Capture Area Adjustment
   Schedule of Areas Tributary to Recharge Systems

HCAD Node ID	Tributary Impervious Area
1P	28,024 sf
2P	169,335 sf
3P	63,067 sf
4P	40,217 sf
5P	5,900 sf
6P	23,656 sf
7P	49,423 sf
8P	24,639 sf
9P	11,068 sf
Total:	**415,329 sf**

Total New Impervious Area = 414,093 SF
Capture Area Adjustment = 414,093 sf / 415,329 sf = **1.00**

Area adjustment = 1

4. Calculate Provided Recharge

HCAD System ID	Bottom of Infiltration	Lowest System Outlet	Total Recharge Volume Provided (cf)	10-YR Storm Event Peak Elevation
1P	94.00	98.10	**1,731**	**99.56**
2P	110.00	110.00	**153**	**115.68**
3P	148.00	151.75	**2,685**	**156.17**
4P	158.00	160.15	**1,236**	**161.45**
5P	163.00	164.00	**310**	**166.45**
6P	165.00	166.75	**1,012**	**169.52**
7P	175.00	176.75	**602**	**180.99**
8P	177.00	177.50	**76**	**180.32**
9P	196.00	198.55	**1,341**	**198.75**
TOTAL			**9,146**	

Required Recharge Volume Summary

Total Volume Provided Below Outlets = 9,146 CF
Total Volume Required = 8,808 CF

9,146 cf provided > 8,808 cf required

Verify Drawdown, Maximum 72-Hours: Static Method

HCAD System ID	Recharge Volume (CF)	Bottom Surface Area (SF)	Infiltration Rate Inches/Hour	Drawdown Time Rv / (K x A) (Hours)	Description
1P	1,731	345	1.02	59.0	Bioretention Area
2P	153	53	1.02	34.0	Bioretention Area
3P	2,685	833	2.41	16.0	Bioretention Area
4P	1,236	142	2.41	43.3	Bioretention Area
5P	310	192	1.02	19.0	Bioretention Area
6P	1,012	177	1.02	67.3	Bioretention Area
7P	602	168	1.02	42.2	Bioretention Area
8P	76	101	1.02	8.9	Bioretention Area
9P	1,341	225	1.02	70.1	Bioretention Area

Design Complies with Recharge Volume Standard*

STANDARD 4: Water Quality Volume

*Roof area considered to be clean runoff and does not require treatment

- **1P – Bioretention Area**
  - *Proprietary, See Contech Systems Calculation
- **2P – Bioretention Area**
  - *Proprietary, See Contech Systems Calculation
- **3P – Bioretention Area**
  - Tributary Impervious Area = 17,116 SF
    - Calculate required water quality volume (1" depth)
      WQV = [1" x 17,116 SF] / 12 SF-In = **1,426 CF**
  - Lowest outlet elevation = 151.75'
    WQV provided below lowest outlet = **2,685 CF (OK)**
- **4P – Bioretention Area**
  - Tributary Impervious Area = 14,365 SF
    - Calculate required water quality volume (1" depth)
      WQV = [1" x 14,365 SF] / 12 SF-In = **1,197 CF**
  - Lowest outlet elevation = 160.15'
    WQV provided below lowest outlet = **1,236 CF (OK)**
- **6P – Bioretention Area**
  - Tributary Impervious Area = 6,618 SF
    - Calculate required water quality volume (1" depth)
      WQV = [1" x 6,618 SF] / 12 SF-In = **552 CF**
  - Lowest outlet elevation = 166.75'
    WQV provided below lowest outlet = **1,012 CF (OK)**
- **7P – Bioretention Area**
  - *Proprietary, See Contech Systems Calculation
- **8P – Bioretention Area**
  - *Proprietary, See Contech Systems Calculation

Pretreatment Calculations

Pond 1P

- *Proprietary, See Contech Systems Calculation

Pond 2P

- *Proprietary, See Contech Systems Calculation

Pond 3P

- *Proprietary, See Contech Systems Calculation

Pond 4P (SF4)

- Volume = 0.1" × 14,365 SF / 12 = 120 CF required
- 141 CF of storage provided at 159.0'

Pond 6P (SF6)

- Volume = 0.1" × 6,618 SF / 12 = 55 CF required
- 57 CF of storage provided at 163.5'

Pond 7P (SF7)

- Volume = 0.1" × 27,090 SF / 12 = 226 CF required
- 250 CF of storage provided at 176.5'

Pond 8P (SF8)

- Volume = 0.1" × 24,540 SF / 12 = 205 CF required
- 221 CF of storage provided at 179.5'

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Standard 4: Total Suspended Solids Calculation (1P)

Name: The Regency at Lynnfield
Location: 1301 Main Street
Lynnfield, MA
County: Essex
Applicant: Toll Bros., Inc.

Proj. No.: 4171
Date: 10/30/2023
Revised:
Computed by: Daniel Powers, P.E.
Checked by: Scott P. Cameron, P.E.

TSS Removal Calculation

B BMP	C TSS Removal Rate	D Starting TSS Load (*F)	E Amount Removed (C*D)	F Remaining Load (D-E)
Deep Sump and Hooded Catch Basin	0.25	1.00	0.25	0.75
Proprietary Treatment Practice	0.80	0.75	0.60	0.15
	0.00	0.15	0.00	0.15
	0.00	0.15	0.00	0.15
	0.00	0.15	0.00	0.15

Total TSS Removal = 85%

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

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

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Standard 4: Total Suspended Solids Calculation (2P)

Name: The Regency at Lynnfield
Location: 1301 Main Street
Lynnfield, MA
County: Essex
Applicant: Toll Bros., Inc.

Proj. No.: 4171
Date: 10/30/2023
Revised:
Computed by: Daniel Powers, P.E.
Checked by: Scott P. Cameron, P.E.

TSS Removal Calculation

B BMP	C TSS Removal Rate	D Starting TSS Load (*F)	E Amount Removed (C*D)	F Remaining Load (D-E)
Deep Sump and Hooded Catch Basin	0.25	1.00	0.25	0.75
Proprietary Treatment Practice	0.80	0.75	0.60	0.15
	0.00	0.15	0.00	0.15
	0.00	0.15	0.00	0.15
	0.00	0.15	0.00	0.15

Total TSS Removal = 85%

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

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

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Standard 4: Total Suspended Solids Calculation (3P)

Name: The Regency at Lynnfield
Location: 1301 Main Street
Lynnfield, MA
County: Essex
Applicant: Toll Bros., Inc.

Proj. No.: 4171
Date: 10/30/2023
Revised:
Computed by: Daniel Powers, P.E.
Checked by: Scott P. Cameron, P.E.

TSS Removal Calculation

B BMP	C TSS Removal Rate	D Starting TSS Load (*F)	E Amount Removed (C*D)	F Remaining Load (D-E)
Deep Sump and Hooded Catch Basin	0.25	1.00	0.25	0.75
Proprietary Treatment Practice	0.80	0.75	0.60	0.15
Bioretention Area	0.90	0.15	0.14	0.02
	0.00	0.02	0.00	0.02
	0.00	0.02	0.00	0.02

Total TSS Removal = 99%

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

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

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Standard 4: Total Suspended Solids Calculation (4P)

Name: The Regency at Lynnfield
Location: 1301 Main Street
Lynnfield, MA
County: Essex
Applicant: Toll Bros., Inc.

Proj. No.: 4171
Date: 10/30/2023
Revised:
Computed by: Daniel Powers, P.E.
Checked by: Scott P. Cameron, P.E.

TSS Removal Calculation

B BMP	C TSS Removal Rate	D Starting TSS Load (*F)	E Amount Removed (C*D)	F Remaining Load (D-E)
Deep Sump and Hooded Catch Basin	0.25	1.00	0.25	0.75
Sediment Forebay	0.25	0.75	0.19	0.56
Bioretention Area	0.90	0.56	0.51	0.06
	0.00	0.06	0.00	0.06
	0.00	0.06	0.00	0.06

Total TSS Removal = 94%

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

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

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Standard 4: Total Suspended Solids Calculation (6P)

Name: The Regency at Lynnfield
Location: 1301 Main Street
Lynnfield, MA
County: Essex
Applicant: Toll Bros., Inc.

Proj. No.: 4171
Date: 10/30/2023
Revised:
Computed by: Daniel Powers, P.E.
Checked by: Scott P. Cameron, P.E.

TSS Removal Calculation

B BMP	C TSS Removal Rate	D Starting TSS Load (*F)	E Amount Removed (C*D)	F Remaining Load (D-E)
Deep Sump and Hooded Catch Basin	0.25	1.00	0.25	0.75
Sediment Forebay	0.25	0.75	0.19	0.56
Bioretention Area	0.90	0.56	0.51	0.06
	0.00	0.06	0.00	0.06
	0.00	0.06	0.00	0.06

Total TSS Removal = 94%

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

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

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Standard 4: Total Suspended Solids Calculation (7P)

Name: The Regency at Lynnfield
Location: 1301 Main Street
Lynnfield, MA
County: Essex
Applicant: Toll Bros., Inc.

Proj. No.: 4171
Date: 10/30/2023
Revised:
Computed by: Daniel Powers, P.E.
Checked by: Scott P. Cameron, P.E.

TSS Removal Calculation

B BMP	C TSS Removal Rate	D Starting TSS Load (*F)	E Amount Removed (C*D)	F Remaining Load (D-E)
Deep Sump and Hooded Catch Basin	0.25	1.00	0.25	0.75
Proprietary Treatment Practice	0.80	0.75	0.60	0.15
Sediment Forebay	0.25	0.15	0.04	0.11
Bioretention Area	0.90	0.11	0.10	0.01
	0.00	0.01	0.00	0.01

Total TSS Removal = 99%

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

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

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66 Elm Street,
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p | 978.777.8586

Standard 4: Total Suspended Solids Calculation (8P)

Name: The Regency at Lynnfield
Location: 1301 Main Street
Lynnfield, MA
County: Essex
Applicant: Toll Bros., Inc.

Proj. No.: 4171
Date: 10/30/2023
Revised:
Computed by: Daniel Powers, P.E.
Checked by: Scott P. Cameron, P.E.

TSS Removal Calculation

B BMP	C TSS Removal Rate	D Starting TSS Load (*F)	E Amount Removed (C*D)	F Remaining Load (D-E)
Deep Sump and Hooded Catch Basin	**0.25**	**1.00**	**0.25**	**0.75**
Proprietary Treatment Practice	**0.80**	**0.75**	**0.60**	**0.15**
Sediment Forebay	**0.25**	**0.15**	**0.04**	**0.11**
Bioretention Area	**0.90**	**0.11**	**0.10**	**0.01**
	0.00	**0.01**	**0.00**	**0.01**

Total TSS Removal = **99%**

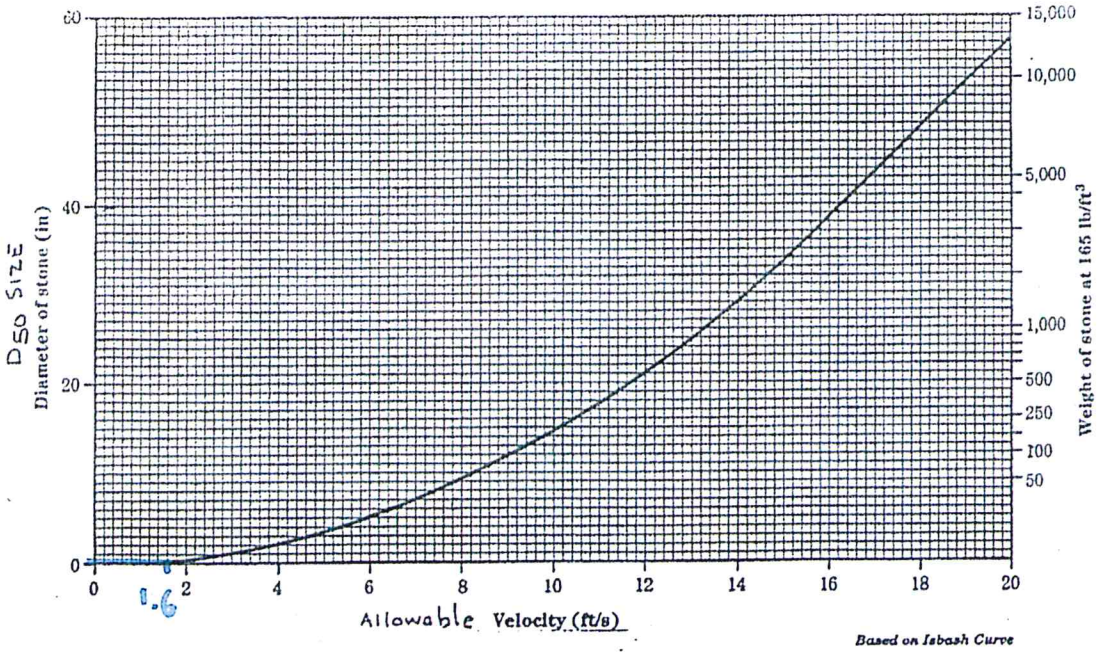
*Equals remaining load from previous BMP (E) which enters the BMP

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

#4171 - TOLC
SAGAMORE SPRINGS

BIO RETENTION AREA #2 (1 of

Sheet 4 of 10



Procedure
1. Determine the design velocity.
2. Use velocity and fig. 16A-1 (Isbash Curve) to determine basic rock size.
3. Basic rock size is the D_{50} size.

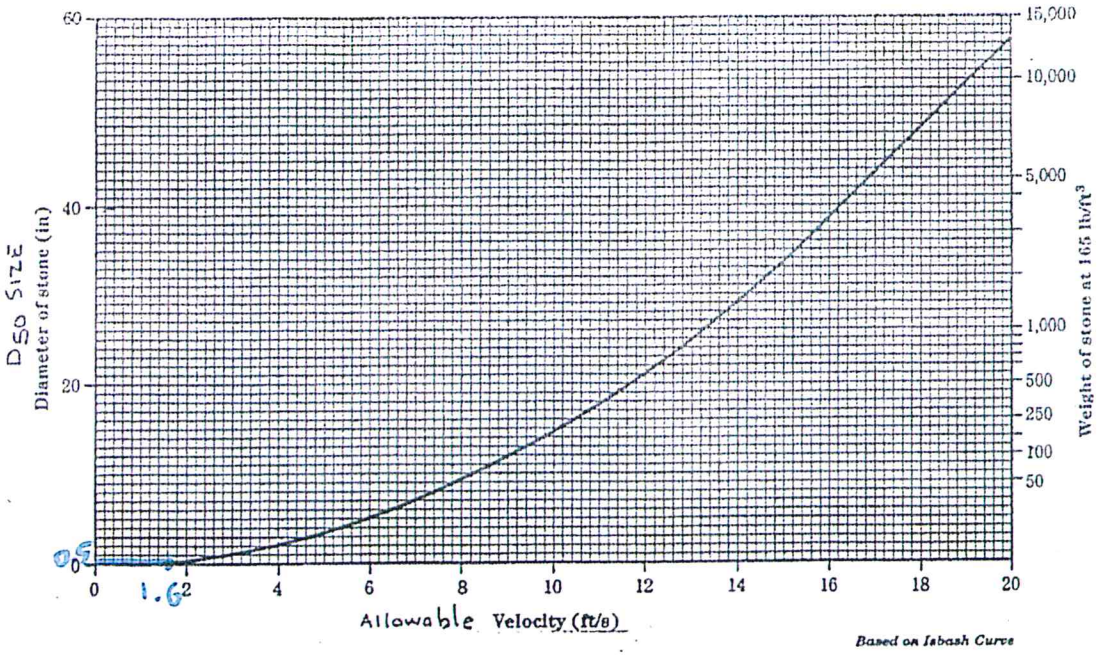
$Q = 18.3$ cfs

$V = 1.6$ ft/s

$D_{50} \approx 0.5"$ → USE 5" (CLASS I)

#4171 - TOLL
SAGAMORE SPRINGS

BIORETENTION AREA #2 (2)



Procedure
1. Determine the design velocity.
2. Use velocity and fig. 16A-1 (Isbash Curve) to determine basic rock size.
3. Basic rock size is the D_{50} size.

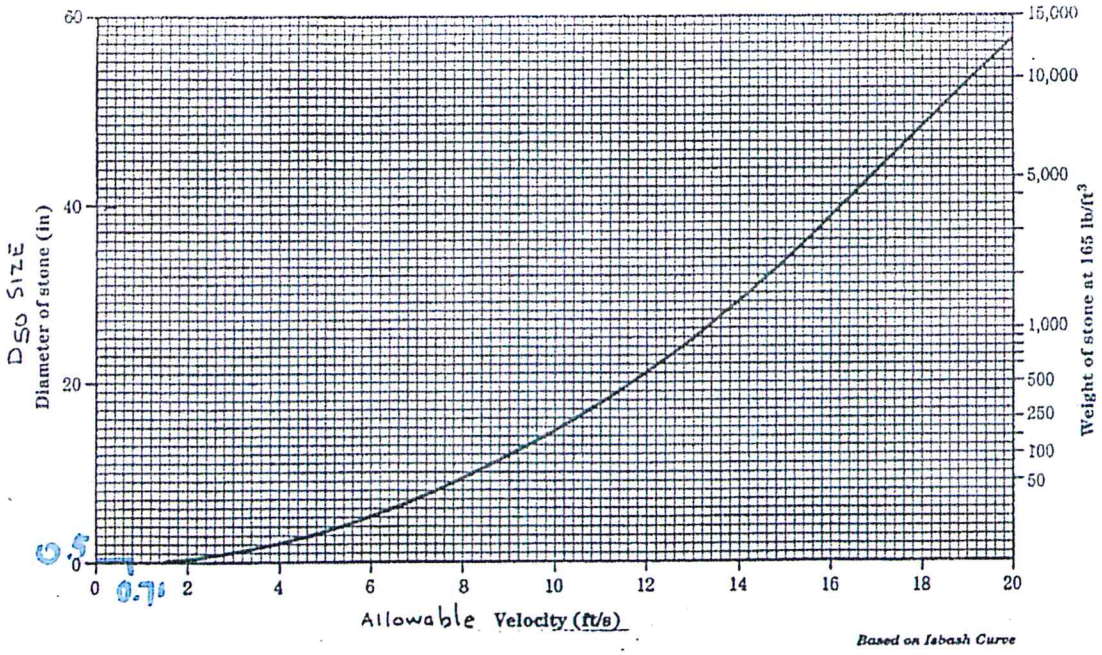
$Q = 53.3$ cfs

$V = 1.6$ cfs

$D_{50} \approx 0.5"$ → USE 5" (CLASS I)

#4171-TULL
SAGAMORE SPRINGS

BIORETENTION AREA #3 (3P)



Procedure
1. Determine the design velocity.
2. Use velocity and fig. 16A-1 (Isbash Curve) to determine basic rock size.
3. Basic rock size is the D_{50} size.

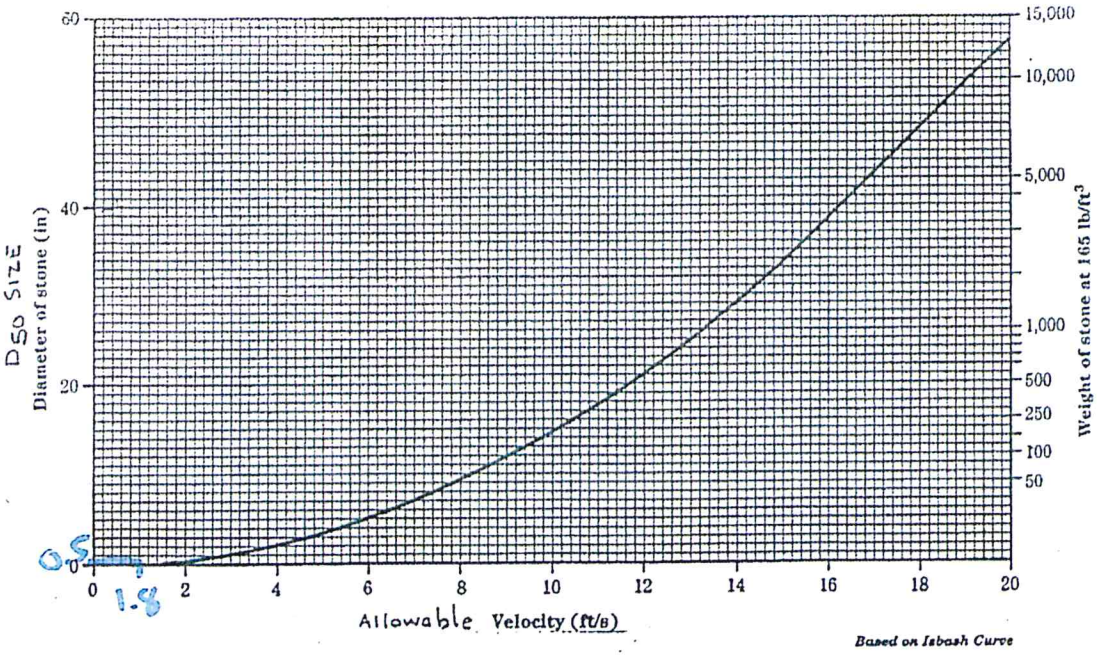
Q = 1.7 CFS

V = 0.71 ft/s

$D_{50} \approx 0.5"$ → USE 5" (CLASS I)

#4171 - TOLL
SYCAMORE SPRINGS

BIORETENTION AREA #4 (4P)



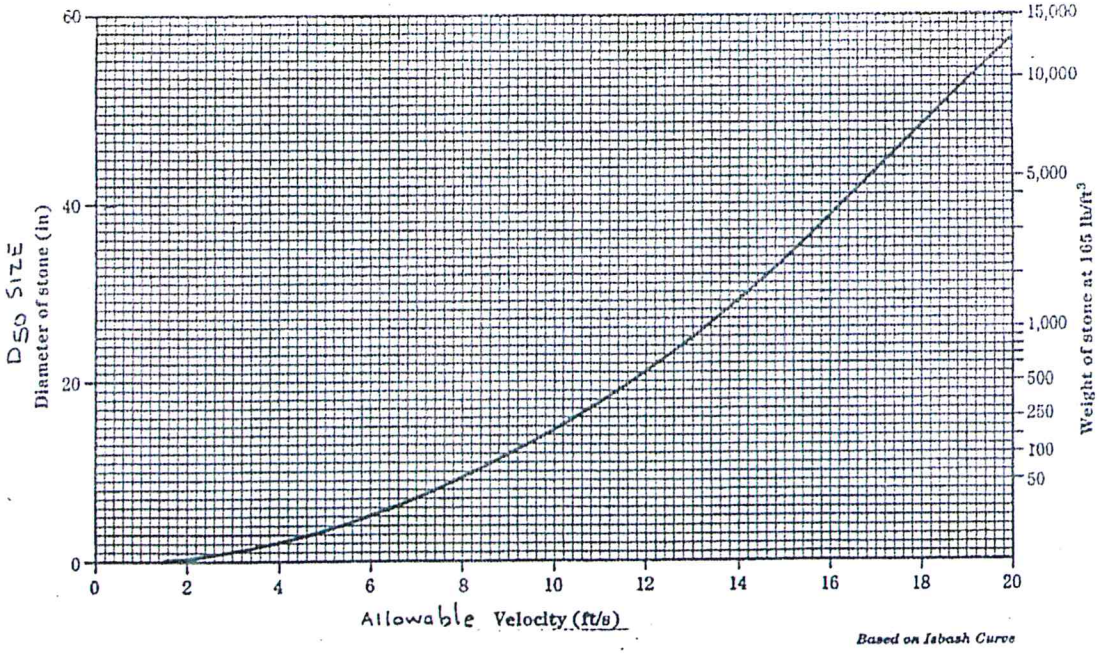
Procedure
1. Determine the design velocity.
2. Use velocity and fig. 16A-1 (Isbash Curve) to determine basic rock size.
3. Basic rock size is the D_{50} size.

$Q = 3.9$ CFS

$V = 1.08$ CFS

$D_{50} \approx 0.5'' \rightarrow$ WSE 5" (CLASS I)

BIORETENTION AREA # 5 (SP)



Procedure

1. Determine the design velocity.
2. Use velocity and fig. 16A-1 (Isbash Curve) to determine basic rock size.
3. Basic rock size is the D_{50} size.

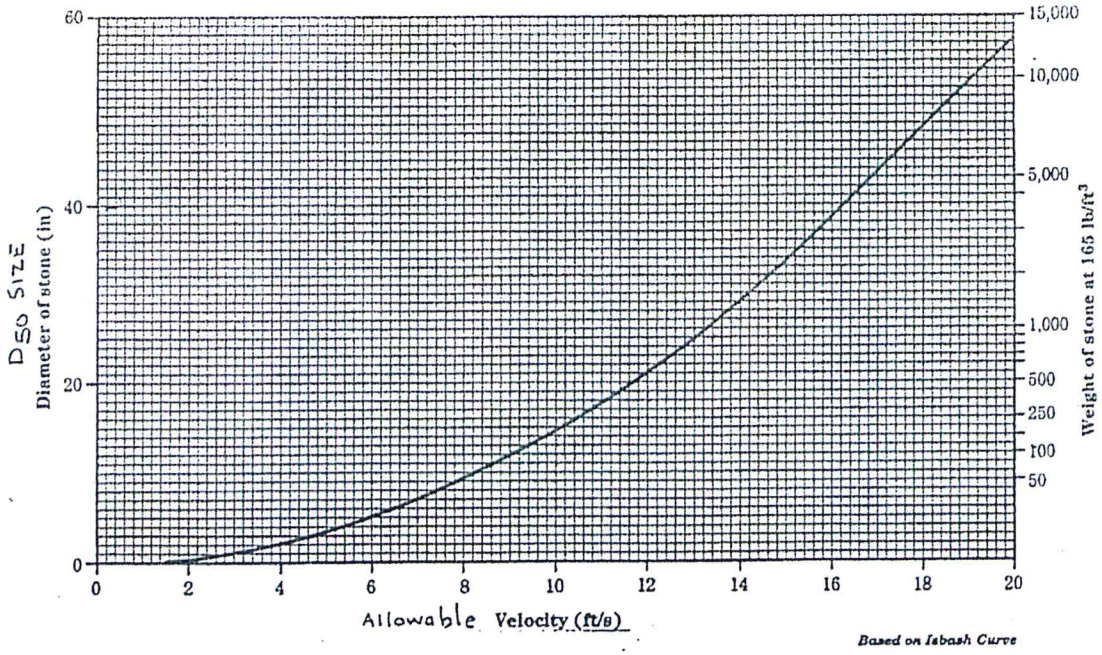
Q= 0 cfs

V= 0 ft/s

$D_{50} \approx$ N/A

#4171 - TOLL
SAGAMORE SPRINGS

BIORETENTION AREA #6 (6P)



Procedure
1. Determine the design velocity.
2. Use velocity and fig. 16A-1 (Isbash Curve) to determine basic rock size.
3. Basic rock size is the D_{50} size.

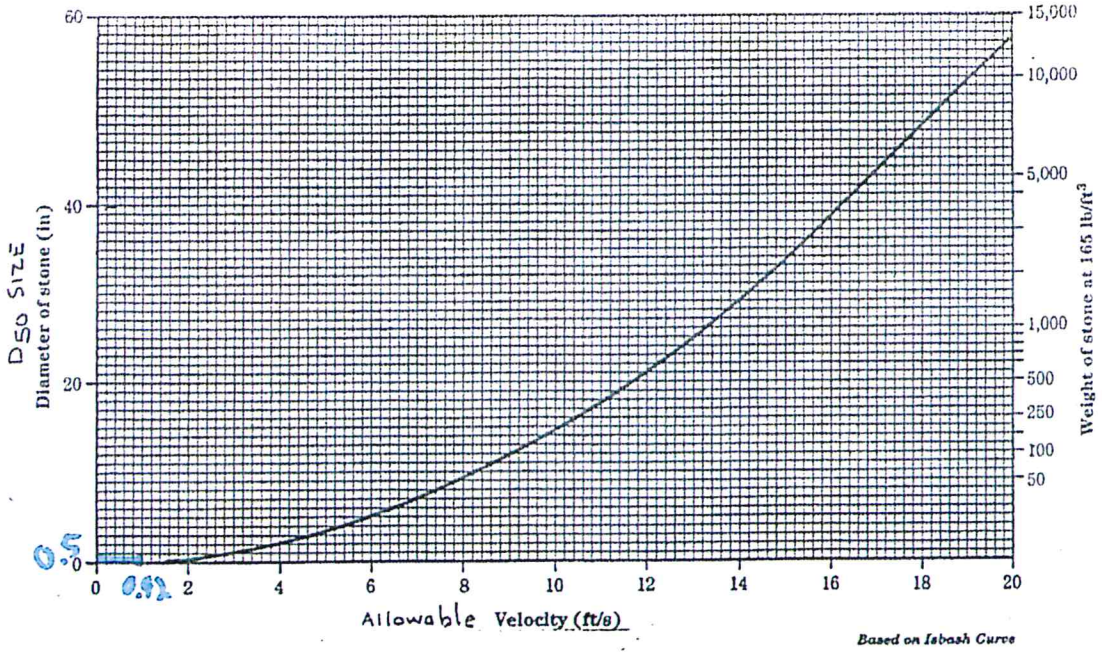
Q = 0 cfs

V = 0 ft/s

$D_{50} \approx$ N/A

#4171 - TOLL
SAGAMORE SPRINGS

BIORETENTION AREA #7 (TP)



Procedure
1. Determine the design velocity.
2. Use velocity and fig. 16A-1 (Isbash Curve) to determine basic rock size.
3. Basic rock size is the D_{50} size.

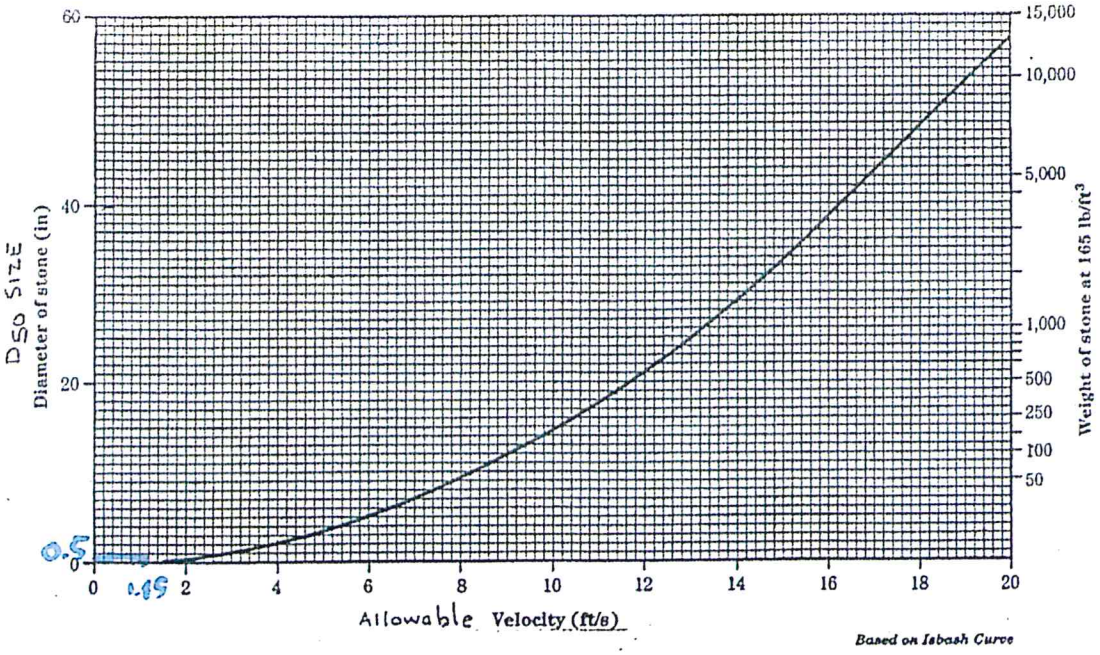
Q = 2.4 CFS

V = 0.92 FT/S

$D_{50} \approx 0.5"$ → USE 5" (CLASS I)

#4171 - TOLL
SYCAMORE SPRINGS

BIORETENTION AREA #8 (SP)



Procedure
1. Determine the design velocity.
2. Use velocity and fig. 16A-1 (Isbash Curve) to determine basic rock size.
3. Basic rock size is the D_{50} size.

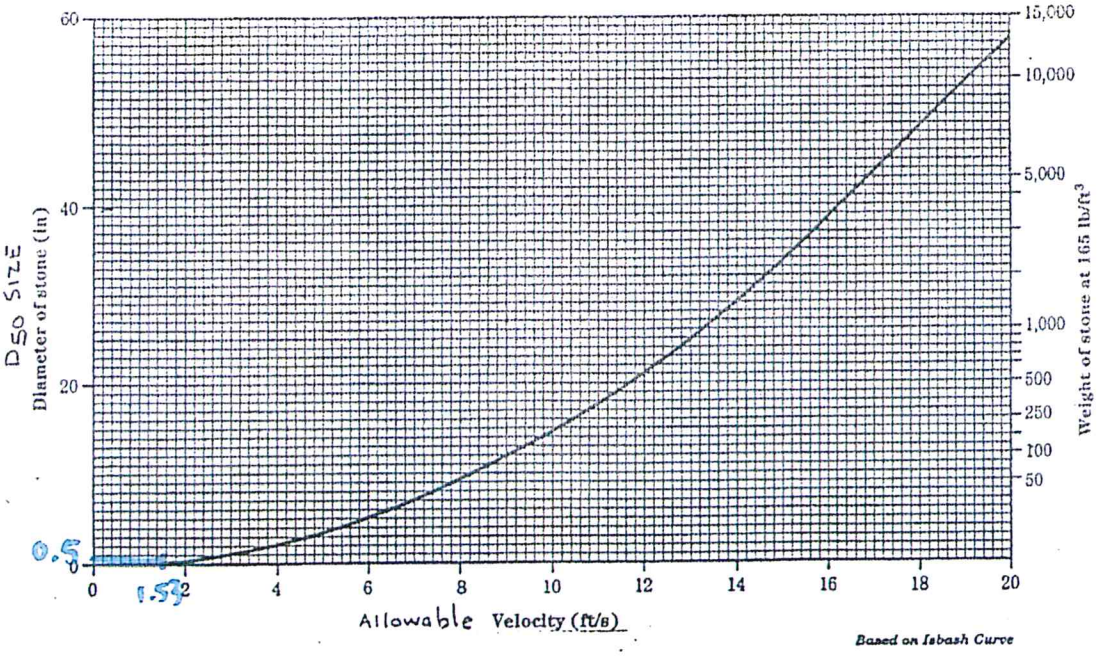
$Q = 3.5$ cfs

$V = 1.15$ ft/s

$D_{50} \approx 0.5"$ ⇒ USE 5" (CLASS I)

#4171- TOLL
SAGAMORE SPRINGS

BIORETENTION AREA #9 (9P)



Procedure
1. Determine the design velocity.
2. Use velocity and fig. 16A-1 (Isbash Curve) to determine basic rock size.
3. Basic rock size is the D_{50} size.

Q = 5.4 cfs

V = 1.53 cfs

$D_{50} \approx 0.5"$ → USE 5" (CLASS I)

Reference: Federal Highway Administration, Hydraulic Engineering Circular No. 14, Third Edition (HEC-14), Hydraulic Design for Culverts and Channels, Publication No. FHWA-NHI-06-086, July 2006

Outlet	Pipe Diameter (D, in)	Pipe Diameter (D, ft)	Design discharge (Q, cfs)	Tailwater depth (TW)(=0.4D)	Aceeleration due to gravity (g, ft/s^2)	Yn	D'	D_{50} (MIN) (ft)	D_{50} (MIN) (in)	D_{50} (SELECTED) (in)	Class	Apron Length (ft)	Apron Depth (ft)	Apron Width (ft)
FES-1	24	2	21.4	0.8	32.2	1.634	1.817	0.66	8	10	3	8.0	2.4	10.7
FES-2	12	1	3.7	0.4	32.2	0.808	0.904	0.32	4	5	1	4.0	1.2	5.4
FES-3	6	0.5	0.4	0.2	32.2	0.316	0.408	0.10	2	5	1	2.0	0.6	2.7
FES-4	36	3	67.7	1.2	32.2	2.626	2.813	1.14	14	14	4	12.0	4.1	16
HW-1	24	2	12.1	0.8	32.2	1.229	1.614	0.36	5	5	1	8.0	1.5	10.7
FES-5	18	1.5	14.3	0.6	32.2	1.435	1.468	0.69	9	10	3	6.0	2.7	8
FES-6	4	0.33	0.6	0.13	32.2	0.428	0.381	0.27	4	5	1	1.3	1.2	1.8
FES-7	6	0.5	1.2	0.2	32.2	0.547	0.524	0.30	4	5	1	2.0	1.2	2.7
FES-8	12	1	6.8	0.4	32.2	1.095	1.048	0.60	8	10	3	4.0	2.4	5.4
FES-9	4	0.33	0.5	0.13	32.2	0.391	0.362	0.23	3	5	1	1.3	0.9	1.8
FES-10	12	1	3.9	0.4	32.2	0.829	0.915	0.34	5	5	1	4.0	1.5	5.4
FES-11	8	0.67	3.8	0.27	32.2	0.906	0.786	0.61	8	10	3	2.7	2.4	3.6
FES-12	6	0.5	1.1	0.2	32.2	0.524	0.512	0.27	4	5	1	2.0	1.2	2.7
FES-13	12	1	2.6	0.4	32.2	0.677	0.839	0.22	3	5	1	4.0	0.9	5.4
FES-14	12	1	3	0.4	32.2	0.727	0.864	0.26	4	5	1	4.0	1.2	5.4
FES-15	8	0.67	2.7	0.27	32.2	0.764	0.715	0.44	6	6	2	2.7	1.8	3.6
FES-16	18	1.5	15.7	0.6	32.2	1.504	1.502	0.75	10	10	3	6.0	3.0	8
FES-17	18	1.5	10.9	0.6	32.2	1.253	1.376	0.52	7	10	3	6.0	2.1	8
FES-18	18	1.5	8.1	0.6	32.2	1.080	1.290	0.38	5	5	1	6.0	1.5	8
FES-19	12	1	4.1	0.4	32.2	0.850	0.925	0.36	5	5	1	4.0	1.5	5.4
FES-20	8	0.67	1.8	0.27	32.2	0.624	0.645	0.29	4	5	1	2.7	1.2	3.6

VERIFY PIPE CAPACITY-100 YEAR STORM

Pipe Sizing Calculation Spreadsheet:

THE MORIN-CAMERON GROUP, INC.
66 Elm Street
Danvers, MA 0193
P: (978) 777-8586

W: www.morincameron.com

Name: The Regency at Lynnfield
Location: 1301 Main Street
Lynnfield, MA
County: Essex
Applicant Toll Bros., Inc.

Proj. No.: 4171
Date: 11/30/2023
Revised:
Computed by: Dan Powers, P.E.
Checked by: Scott P, Cameron, P.E.

Design Parameters:
IDF Curve
100 **Year Storm** Boston, MA
k_e= **0.2**

DESCRIPTION	LOCATION		AREA (AC.)	CURVE NUMBER (CN)	FLOW TIME (MIN)		i*	DESIGN					CAPACITY		PIPE PROFILE				
	FROM	TO			PIPE	CONC. TIME		Q cfs	V fps	n	PIPE SIZE	SLOPE	Q full ft^3/s	V full ft/s	LENGTH ft	FALL ft	RIM	INV UPPER	INV LOWER
1	CB-1	WQU-1	0.21	89	0.22	6.0	7.0	1.6	3.9	0.012	12	0.010	3.9	4.9	51	0.51	99.43	95.43	94.92
2	CB-2	WQU-1	2.44	64	0.13	7.3	6.7	11.8	7.0	0.012	18	0.011	11.9	6.7	53	0.58	99.43	95.50	94.92
3	CB-3	DMH-1	0.27	88	0.06	6.0	7.0	2.0	7.2	0.012	12	0.045	8.2	10.4	28	1.26	112.59	108.49	107.23
4	CB-4	DMH-1	0.64	78	0.06	6.0	7.0	4.4	8.5	0.012	12	0.039	7.7	9.8	32	1.26	112.59	108.49	107.23
5	CB-5	DMH-2	0.12	91	0.07	6.0	7.0	1.0	5.2	0.012	12	0.035	7.3	9.3	22	0.78	116.80	112.70	111.92
6	CB-6	DMH-2	0.08	87	0.14	6.0	7.0	0.6	5.6	0.012	12	0.080	10.9	13.9	47	3.75	119.77	115.67	111.92
7	DMH-2	DMH-1	-	-	0.13	6.1	7.0	1.6	8.3	0.012	12	0.085	11.2	14.3	66	5.59	116.02	110.82	105.23
8	DMH-1	WQU-1	-	-	0.30	6.3	6.9	8.0	11.0	0.012	12	0.046	8.3	10.6	200	9.25	110.33	105.13	95.88
9	WQU-1	FES-1	-	-	0.11	7.3	6.7	21.4	7.3	0.012	24	0.008	22.0	7.0	47	0.38	100.46	94.88	94.50
10	RCH	FES-3	0.05	98	0.41	6.0	7.0	0.4	3.1	0.012	6	0.013	0.7	3.6	76	1.00	-	113.00	112.00
11	CB-7	DMH-3	0.17	91	0.14	6.0	7.0	1.4	7.0	0.012	12	0.060	9.5	12.1	58	3.50	131.45	126.35	122.85
12	CB-8	DMH-3	0.11	94	0.16	6.0	7.0	0.9	6.0	0.012	12	0.061	9.6	12.2	57	3.50	131.45	126.35	122.85
13	R1	DMH-3	0.23	98	0.09	6.0	7.0	1.8	5.6	0.012	8	0.021	1.9	5.4	31	0.65	-	123.50	122.85
14	CB-9	DMH-5	0.18	92	0.02	6.0	7.0	1.4	9.0	0.012	12	0.139	14.4	18.3	11	1.53	142.94	138.84	137.31
15	CB-10	DMH-5	0.17	93	0.03	6.0	7.0	1.4	8.1	0.012	12	0.096	11.9	15.2	16	1.53	142.94	138.84	137.31
16	R2	DMH-5	0.18	98	0.07	6.0	7.0	1.5	8.5	0.012	6	0.071	1.6	8.3	34	2.43	-	141.00	138.57
17	R3/R4	DMH-5	0.33	98	0.06	6.0	7.0	3.7	11.5	0.012	8	0.087	3.9	11.0	38	3.29	-	141.00	137.71
18	DMH-5	DMH-4	-	-	0.02	6.1	7.0	8.0	13.0	0.012	12	0.076	10.6	13.6	18	1.37	142.32	137.21	135.84
19	CB-11	DMH-4	0.07	78	0.13	6.0	7.0	0.5	4.9	0.012	12	0.077	10.7	13.7	38	2.94	142.38	137.28	134.34
20	CB-12	DMH-4	0.14	91	0.13	6.0	7.0	1.1	5.8	0.012	12	0.044	8.1	10.3	44	1.94	142.38	137.78	135.84
21	CB-13	CB-14	0.21	78	0.23	6.0	7.0	1.4	6.3	0.012	12	0.045	8.2	10.4	87	3.90	147.50	143.40	139.50
22	CB-14	DMH-6	0.57	73	0.13	6.2	6.9	4.9	7.8	0.012	12	0.027	6.4	8.1	63	1.73	143.50	139.40	137.67
23	CB-15	DMH-6	0.42	80	0.05	6.0	7.0	3.0	4.8	0.012	12	0.010	3.9	4.9	13	0.13	140.90	137.80	137.67
24	CB-16	DMH-6	0.25	81	0.26	6.0	7.0	1.8	5.4	0.012	12	0.021	5.6	7.1	83	1.73	143.50	139.40	137.67

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Applicant Toll Bros., Inc.

Proj. No.: 4171
Date: 11/30/2023
Revised:
Computed by: Dan Powers, P.E.
Checked by: Scott P, Cameron, P.E.

Design Parameters:
IDF Curve
100 **Year Storm** Boston, MA
k_e= **0.2**

DESCRIPTION	LOCATION		AREA (AC.)	CURVE NUMBER (CN)	FLOW TIME (MIN)		i*	DESIGN					CAPACITY		PIPE PROFILE				
	FROM	TO			PIPE	CONC. TIME		Q cfs	V fps	n	PIPE SIZE	SLOPE	Q full ft^3/s	V full ft/s	LENGTH ft	FALL ft	RIM	INV UPPER	INV LOWER
25	OCS-5	DMH-18	-	-	0.11	6.0	7.0	2.5	10.2	0.012	12	0.103	12.4	15.7	65	6.67	168.60	162.00	155.33
26	DMH-18	DMH-6	-	-	0.38	6.1	7.0	2.5	9.6	0.012	12	0.087	11.4	14.5	220	19.13	160.33	155.23	136.10
27	DMH-6	DMH-4	-	-	0.31	6.5	6.9	12.2	7.9	0.012	18	0.014	13.7	7.8	149	2.16	142.10	136.00	133.84
28	DMH-4	DMH-3	-	-	0.24	6.8	6.8	21.8	15.4	0.012	18	0.060	28.0	15.8	220	13.29	141.79	133.74	120.45
29	DMH-3	WQU-2	-	-	0.08	7.0	6.7	25.9	15.9	0.012	18	0.056	27.0	15.3	77	4.35	126.95	120.35	116.00
30	CB-17	DMH-7	0.53	84	0.06	6.0	7.0	3.9	6.8	0.012	12	0.023	5.9	7.5	25	0.58	137.00	131.90	131.32
31	CB-19	CB-18	0.95	61	0.56	8.8	6.3	4.0	7.1	0.012	12	0.025	6.1	7.8	239	5.95	141.75	137.65	131.70
32	CB-18	DMH-8	0.39	62	0.28	9.4	6.2	5.9	7.9	0.012	12	0.024	5.9	7.6	131	3.10	135.75	131.60	128.50
33	R6	DMH-8	0.15	98	0.07	6.0	7.0	1.2	7.1	0.012	6	0.052	1.4	7.0	29	1.50	-	134.25	132.75
34	R7	DMH-8	0.83	98	0.01	6.0	7.0	6.7	20.7	0.012	8	0.281	6.9	19.9	8	2.25	-	135.00	132.75
35	DMH-8	DMH-7	-	-	0.18	9.6	6.1	13.8	8.3	0.012	18	0.015	14.1	8.0	91	1.40	138.30	128.00	126.60
36	R5	DMH-9	0.30	98	0.07	6.0	7.0	2.5	9.3	0.012	8	0.068	3.4	9.8	39	2.65	-	134.00	131.35
37	CB-20	DMH-10	0.09	92	0.06	6.0	7.0	0.7	3.1	0.012	12	0.010	3.9	4.9	11	0.11	141.83	137.71	137.60
38	CB-21	DMH-10	0.15	79	0.08	6.0	7.0	1.1	3.5	0.012	12	0.010	3.9	4.9	16	0.16	141.83	137.76	137.60
39	CB-22	DMH-11	0.10	93	0.04	6.0	7.0	0.8	3.2	0.012	12	0.010	3.9	4.9	7	0.07	146.71	143.52	143.45
40	CB-23	DMH-11	0.20	84	0.06	6.0	7.0	1.5	3.8	0.012	12	0.010	3.9	4.9	13	0.13	146.71	143.58	143.45
41	CB-24	DMH-12	0.16	89	0.02	6.0	7.0	1.2	6.2	0.012	12	0.050	8.6	11.0	8	0.40	156.90	152.80	152.40
42	CB-25	DMH-12	0.23	79	0.04	6.0	7.0	1.6	5.6	0.012	12	0.027	6.3	8.0	15	0.40	156.90	152.80	152.40
43	OCS-3	DMH-13	-	-	0.31	6.0	7.0	17.0	7.6	0.012	24	0.012	26.3	8.4	143	1.65	157.10	151.00	149.35
44	DMH-13	DMH-12	-	-	0.12	6.3	6.9	17.0	10.1	0.012	18	0.023	17.1	9.7	73	1.65	159.75	149.25	147.60
45	DMH-12	DMH-11	-	-	0.26	6.4	6.9	19.8	11.8	0.012	18	0.031	20.0	11.3	180	5.55	156.50	147.50	141.95
46	DMH-11	DMH-10	-	-	0.20	6.7	6.8	22.1	13.1	0.012	18	0.038	22.2	12.5	158	6.00	146.63	141.85	135.85
47	DMH-10	DMH-9	-	-	0.13	6.9	6.8	21.6	14.3	0.012	18	0.049	25.1	14.2	108	5.25	141.70	135.75	130.50
48	DMH-9	DMH-7	-	-	0.09	7.0	6.7	24.1	14.7	0.012	18	0.048	25.0	14.1	79	3.80	138.72	130.40	126.60
49	DMH-7	WQU-2	-	-	0.04	7.1	6.7	41.8	26.3	0.012	18	0.154	44.7	25.3	68	10.50	137.42	126.50	116.00
50	WQU-2	FES-4	-	-	0.25	7.1	6.7	67.7	11.9	0.012	36	0.014	85.6	12.1	178	2.50	120.60	114.50	112.00

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Proj. No.: 4171
Date: 11/30/2023
Revised:
Computed by: Dan Powers, P.E.
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Design Parameters:
IDF Curve
100 **Year Storm** Boston, MA
k_e= **0.2**

DESCRIPTION	LOCATION		AREA (AC.)	CURVE NUMBER (CN)	FLOW TIME (MIN)		i*	DESIGN					CAPACITY		PIPE PROFILE				
	FROM	TO			PIPE	CONC. TIME		Q cfs	V fps	n	PIPE SIZE	SLOPE	Q full ft^3/s	V full ft/s	LENGTH ft	FALL ft	RIM	INV UPPER	INV LOWER
51	CB-26	DMH-14	0.78	67	0.05	6.0	7.0	4.3	8.0	0.012	12	0.033	7.1	9.0	23	0.77	162.64	158.54	157.77
52	CB-27	DMH-14	0.13	81	0.05	6.0	7.0	0.9	6.6	0.012	12	0.093	11.8	15.0	19	1.77	162.64	158.54	156.77
53	R15	DMH-14	0.42	98	0.10	6.0	7.0	3.4	8.2	0.012	12	0.043	8.0	10.1	50	2.13	-	157.90	155.77
54	CB-30	DMH-17	0.24	86	0.03	6.0	7.0	1.8	5.3	0.012	12	0.020	5.5	6.9	8	0.16	165.61	161.51	161.35
55	CB-31	DMH-17	0.23	84	0.06	6.0	7.0	1.7	4.2	0.012	12	0.011	4.1	5.3	14	0.16	165.61	161.51	161.35
56	R13	DMH-17	0.27	98	0.05	6.0	7.0	2.2	8.7	0.012	8	0.065	3.3	9.5	27	1.75	-	160.00	158.25
57	DMH-17	DMH-14	-	-	0.20	6.1	7.0	5.7	8.1	0.012	12	0.025	6.1	7.8	95	2.38	165.69	158.15	155.77
58	DMH-14	WQU-3	-	-	0.12	6.2	6.9	14.3	9.6	0.012	18	0.023	17.2	9.7	69	1.57	161.77	155.67	154.10
59	WQU-3	FES-5	-	-	0.24	6.4	6.9	14.3	8.5	0.012	18	0.016	14.5	8.2	123	2.00	159.75	154.00	152.00
60	R8	FES-6	0.08	98	0.14	6.0	7.0	0.6	7.8	0.012	4	0.102	0.7	7.5	64	6.50	-	162.50	156.00
61	R9	FES-7	0.15	98	0.11	6.0	7.0	1.2	8.9	0.012	6	0.103	2.0	10.0	58	6.00	-	162.00	156.00
62	CB-28	DMH-16	0.11	83	0.45	6.0	7.0	0.8	3.2	0.012	12	0.010	3.9	4.9	87	0.87	164.22	159.33	158.46
63	CB-29	DMH-16	0.42	85	0.02	6.0	7.0	3.1	4.8	0.012	12	0.010	3.9	4.9	7	0.07	161.67	158.53	158.46
64	DMH-16	FES-10	-	-	0.10	6.5	6.9	3.9	5.7	0.012	12	0.013	4.4	5.5	33	0.42	161.82	158.42	158.00
65	R10	FES-9	0.06	98	0.08	6.0	7.0	0.5	6.2	0.012	4	0.065	0.5	6.0	31	2.00	-	161.00	159.00
66	R11/12	FES-11	0.34	98	0.04	6.0	7.0	3.8	11.7	0.012	8	0.089	3.9	11.2	28	2.50	-	161.00	158.50
67	OCS-4	DMH-15	-	-	0.09	6.0	7.0	6.8	10.7	0.012	12	0.051	8.7	11.1	61	3.10	161.90	158.00	154.90
68	DMH-15	FES-8	-	-	0.14	6.1	7.0	6.8	9.6	0.012	12	0.035	7.3	9.3	79	2.80	159.00	154.80	152.00
69	CB-32	DMH-19	0.09	88	0.07	6.0	7.0	0.7	3.3	0.012	12	0.013	4.4	5.6	13	0.17	170.79	166.69	166.52
70	CB-33	DMH-19	0.32	81	0.05	6.0	7.0	2.3	4.8	0.012	12	0.013	4.4	5.6	13	0.17	170.79	166.69	166.52
71	DMH-19	FES-14	-	-	0.17	6.0	7.0	3.0	4.8	0.012	12	0.010	3.9	4.9	48	0.48	171.73	166.48	166.00
72	R17	FES-15	0.33	98	0.22	6.0	7.0	2.7	12.2	0.012	8	0.143	5.0	14.2	164	23.50	-	196.50	173.00

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Design Parameters:
IDF Curve
100 **Year Storm** Boston, MA
k_e= **0.2**

DESCRIPTION	LOCATION		AREA (AC.)	CURVE NUMBER (CN)	FLOW TIME (MIN)		i*	DESIGN					CAPACITY		PIPE PROFILE				
	FROM	TO			PIPE	CONC. TIME		Q cfs	V fps	n	PIPE SIZE	SLOPE	Q full ft^3/s	V full ft/s	LENGTH ft	FALL ft	RIM	INV UPPER	INV LOWER
73	OCS-6	FES-13	-	-	0.35	6.0	7.0	2.6	5.1	0.012	12	0.014	4.6	5.8	106	1.50	172.25	165.50	164.00
74	R14	FES-12	0.14	98	0.21	6.0	7.0	1.1	5.9	0.012	6	0.034	1.1	5.7	74	2.50	-	166.50	164.00
75	CB-34	WQU-4	0.08	94	0.16	6.0	7.0	0.6	4.4	0.012	12	0.041	7.8	9.9	42	1.72	182.96	178.86	177.14
76	CB-35	WQU-4	0.19	90	0.21	6.0	7.0	1.4	4.3	0.012	12	0.013	4.5	5.7	54	0.72	182.96	178.86	178.14
77	CB-36	DMH-20	0.25	81	0.05	6.0	7.0	1.8	6.8	0.012	12	0.041	7.8	10.0	20	0.82	188.71	184.61	183.79
78	CB-37	DMH-20	0.16	87	0.07	6.0	7.0	1.2	5.6	0.012	12	0.036	7.3	9.3	23	0.82	188.71	184.61	183.79
79	CB-39	CB-38	0.34	74	0.42	6.0	7.0	2.1	4.8	0.012	12	0.014	4.6	5.9	121	1.75	197.75	193.65	191.90
80	R18	TEE	0.23	98	0.02	6.0	7.0	1.8	12.9	0.012	6	0.211	2.8	14.2	18	3.80	-	193.00	189.20
81	CB-38	DMH-22	0.27	74	0.32	6.4	6.9	5.6	7.4	0.012	12	0.021	5.6	7.1	142	3.00	195.00	191.80	188.80
82	R16	DMH-22	0.23	98	0.07	6.0	7.0	1.8	10.2	0.012	6	0.100	1.9	9.8	40	4.00	-	192.50	188.50
83	CB-40	DMH-22	0.23	90	0.09	6.0	7.0	1.8	7.4	0.012	12	0.056	9.1	11.6	40	2.23	198.73	194.63	192.40
84	CB-41	DMH-22	0.20	90	0.09	6.0	7.0	1.5	7.1	0.012	12	0.060	9.5	12.1	37	2.23	198.73	194.63	192.40
85	DMH-22	DMH-21	-	-	0.17	6.7	6.8	10.7	9.0	0.012	18	0.025	18.1	10.2	91	2.29	197.50	187.03	184.74
86	DMH-21	DMH-20	-	-	0.12	6.9	6.8	10.7	10.8	0.012	18	0.041	23.1	13.1	79	3.25	192.24	184.64	181.39
87	DMH-20	WQU-4	-	-	0.06	7.0	6.7	13.7	12.9	0.012	18	0.055	26.7	15.1	48	2.65	187.89	179.29	176.64
88	WQU-4	FES-16	-	-	0.05	7.1	6.7	15.7	9.5	0.012	18	0.020	16.1	9.1	27	0.54	183.90	176.54	176.00
89	CB-42	WQU-5	0.10	98	0.03	6.0	7.0	0.8	4.0	0.012	12	0.020	5.5	6.9	8	0.16	185.25	181.15	180.99
90	CB-43	WQU-5	0.86	78	0.09	10.7	5.9	4.3	6.7	0.012	12	0.020	5.5	6.9	37	0.74	185.36	181.26	180.52
91	CB-44	WQU-5	0.13	96	0.17	6.0	7.0	1.1	5.2	0.012	12	0.031	6.8	8.7	52	1.63	187.17	182.07	180.44
92	CB-45	WQU-5	0.24	92	0.14	6.0	7.0	1.9	6.6	0.012	12	0.037	7.5	9.5	57	2.13	187.17	182.57	180.44
93	WQU-5	FES-18	-	-	0.06	10.8	5.9	8.1	9.8	0.012	18	0.039	22.6	12.8	34	1.34	185.51	180.34	179.00
94	R19	FES-20	0.23	98	0.47	6.0	7.0	1.8	5.4	0.012	8	0.019	1.8	5.2	154	3.00	-	199.00	196.00

APPENDIX E:

CONSTRUCTION PHASE

BEST MANAGEMENT PRACTICES

Construction Phase Best Management Practices (BMP's) Plan

Erosion and Sedimentation will be controlled at the site by utilizing Structural Practices, Stabilization Practices, and Dust Control. These practices correspond with plans entitled "Site Development Plans for the Regency at Lynnfield Senior Housing Development" in Lynnfield, Massachusetts prepared by The Morin-Cameron Group, Inc. dated November 30, 2023 as revised and approved by the Town of Lynnfield, hereinafter referred to as the Site Plans.

Responsible Party Contact Information:

Stormwater Management System Owner:	Toll Brothers, Inc. 134 Flanders Road Westborough, MA 01581 P: (508) 366-1440
Lynnfield Department of Public Works:	55 Summer Street Lynnfield, MA 01940 P: (781) 334-9500 ext. 0
Lynnfield Planning Board:	55 Summer Street Lynnfield, MA 01940 P: (781) 334-9495
Lynnfield Conservation Commission:	55 Summer Street Lynnfield, MA 01940 P: (781) 334-9495
Site Design Engineer Information:	The Morin-Cameron Group, Inc. 66 Elm Street Danvers, MA 01923 Phone: (978) 777-8586

Structural Practices:

1) **Silt Sock** – A siltation sock barrier shall be installed in accordance with the approved plans where high rates of stormwater runoff are anticipated.
   a) Installation Schedule: Prior to Start of land disturbance

   b) Maintenance and Inspection: The site supervisor shall inspect the barrier at least once per week or after a major storm (3.15 inches of rainfall within a twenty-four-hour period) event and shall repair any damaged or affected areas of the barrier at the time they are noted. Remove sediment deposits promptly after storm events to provide adequate storage volume for the next rain and to reduce pressure on the barrier. Sediment will be removed from in front of the barrier when it becomes about 4" deep at the barrier. Take care to avoid undermining the barrier during cleanout.

2) **Silt Fence & Silt Sock** – A siltation fence and sock barrier shall be installed in accordance with the approved plans where high rates of stormwater runoff are anticipated.
   a) Installation Schedule: Prior to Start of land disturbance

   b) Maintenance and Inspection: The site supervisor shall inspect the barrier at least once per week or after a major storm (3.15 inches of rainfall within a twenty-four-hour period) event and shall repair any damaged or affected areas of the barrier at the time they are noted. Remove sediment deposits promptly after storm events to provide adequate storage volume for the next rain and to reduce pressure on the barrier. Sediment will be removed from in front of the barrier when it becomes about 4" deep at the barrier. Take care to avoid undermining the barrier during cleanout.

3) **Inlet Protection** – Inlet Protection will be utilized around the catch basin grates in the street layout in the closest down gradient structure. The inlet protection will allow the storm drain inlets to be used before final stabilization. This structural practice will allow early use of the drainage system. Siltsack or equivalent will be utilized for the inlet protection. Siltsack is manufactured by ACF Environmental. The telephone number is 800-448-3636. Regular flow siltsack will be utilized, and if it does not allow enough storm water flow, hi-flow siltsack will be utilized.

Silt Sack (or equivalent) Inlet Protection Inspection/Maintenance Requirements *

a) The silt sack trapping devices and the catch basins should be inspected after every rain storm and repairs made as necessary.

b) Sediment should be removed from the silt sack after the sediment has reached a maximum depth of one-half the depth of the trap.

c) Sediment should be disposed of in a suitable area and protected from erosion by either structural or vegetative means. Sediment material removed shall be disposed of in accordance with all applicable local, state, and federal regulations.

d) The silt sack must be replaced if it is ripped or torn in any way.

e) Temporary traps should be removed and the area repaired as soon as the contributing drainage area to the inlet has been completely stabilized.

4) **Sediment Track-Out:** The site supervisor will inspect and ensure that sediment is not tracked into the roadway. If tracking onto the roadway is noted, it shall be removed immediately via by hand or a mechanical street sweeper. A stabilized construction exit (crushed stone anti-tracking pad) shall be installed at the entrance to the site. This will prevent trucks from tracking material onto the road from the construction site. If, at any point during the project, the tracking pad becomes ineffective due to accumulation of soil, the crushed stone shall be replaced. Details for construction of the stabilized entrance can be found in the details sheet that is part of the permit plan set associated with the project. The site supervisor will inspect the tracking pads weekly to ensure that they are properly limiting the tracking of soil onto the road. If tracking onto the roadway is noted, it shall be removed immediately via by hand or a mechanical street sweeper.)

Stabilization Practices:

Stabilization measures shall be implemented as soon as practicable in portions of the site where construction activities have temporarily or permanently ceased, but in no case more than 14 days after the construction activity in that portion of the site has temporarily or permanently ceased, with the following exceptions.

- Where the initiation of stabilization measures by the 14th day after construction activity temporary or permanently cease is precluded by snow cover, stabilization measures shall be initiated as soon as practicable.

- Where construction activity will resume on a portion of the site within 21 days from when activities ceased, (e.g. the total time period that construction activity is temporarily ceased is less than 21 days) then stabilization measures do not have to be initiated on that portion of the site by the 14th day after construction activity temporarily ceased.

1) **Temporary Seeding** – Temporary seeding will allow a short-term vegetative cover on disturbed site areas that may be in danger of erosion. Temporary seeding will be done at stock piles and disturbed portions of the site where construction activity will temporarily cease for at least 21 days. The temporary seeding will stabilize cleared and unvegetated areas that will not be brought into final grade for several weeks or months.

Temporary Seeding Planting Procedures *

a) Planting should preferably be done between April 1st and June 30th, and September 1st through September 31st. If planting is done in the months of July

and August, irrigation may be required. If planting is done between October 1st and March 31st, mulching should be applied immediately after planting.

b) Before seeding, install structural practice controls. Utilize Amoco supergro or equivalent.

c) Select the appropriate seed species for temporary cover from the following table.

Species	Seeding Rate (lbs./1,000 sq.)	Seeding Rate (lbs./acre)	Recommended Seeding Dates	Seed Cover required
Annual Ryegrass	1	40	April 1st to June 1st August 15th to Sept. 15th	¼ inch
Foxtail Millet	0.7	30	May 1st to June 30th	½ to ¾ inch
Oats	2	80	April 1st to July 1st August 15th to Sept. 15th	1 to 1-½ inch
Winter Rye	3	120	August 15th to Oct. 15th	1 to 1-½ inch

Apply the seed uniformly by hydroseeding, broadcasting, or by hand.

d) Use effective mulch, such as clean grain straw; tacked and/or tied with netting to protect seedbed and encourage plant growth.

Temporary Seeding Inspection/Maintenance *

a) Inspect within 6 weeks of planting to see if stands are adequate. Check for damage within 24 hours of the end to a heavy rainfall, defined as a 2-year storm event (i.e., 3.15 inches of rainfall within a twenty-four-hour period). Stands should be uniform and dense. Reseed and mulch damaged and sparse areas immediately. Tack or tie down mulch as necessary.

b) Seeds should be supplied with adequate moisture. Furnish water as needed, especially in abnormally hot or dry weather. Water application rates should be controlled to prevent runoff.

2) **Geotextiles** - Geotextiles such as jute netting will be used in combination with other practices such as mulching to stabilize slopes. The following geotextile materials or equivalent are to be utilized for structural and nonstructural controls as shown in the following table.

Practice	Manufacturer	Product	Remarks
Sediment Fence	Amoco	Woven polypropylene 1198 or equivalent	0.425 mm opening
Construction Entrance	Amoco	Woven polypropylene 2002 or equivalent	0.300 mm opening
Outlet Protection	Amoco	Nonwoven polypropylene 4551 or equivalent	0.150 mm opening
Erosion Control (slope stability)	Amoco	Supergro or equivalent	Erosion control revegetation mix, open

			polypropylene fiber on degradable polypropylene net scrim

Amoco may be reached at (800) 445-7732

Geotextile Installation

a) Netting and matting require firm, continuous contact between the materials and the soil. If there is no contact, the material will not hold the soil and erosion will occur underneath the material.

Geotextile Inspection/Maintenance *

a) In the field, regular inspections should be made to check for cracks, tears, or breaches in the fabric. The appropriate repairs should be made.

3) **Mulching and Netting** – Mulching will provide immediate protection to exposed soils during the period of short construction delays, or over winter months through the application of plant residues, or other suitable materials, to exposed soil areas. In areas, which have been seeded either for temporary or permanent cover, mulching should immediately follow seeding. On steep slopes, mulch must be supplemented with netting. The preferred mulching material is straw.

Mulch (Hay or Straw) Materials and Installation

a) Straw has been found to be one of the most effective organic mulch materials. The specifications for straw are described below, but other material may be appropriate. The straw should be air-dried; free of undesirable seeds & coarse materials. The application rate per 1,000 sq. is 90-100 lbs. (2-3 bales) and the application rate per acre is 2 tons (100-120 bales). The application should cover about 90% of the surface. The use of straw mulch is appropriate where mulch is maintained for more than three months. Straw mulch is subject to wind blowing unless anchored, is the most commonly used mulching material, and has the best microenvironment for germinating seeds.

Mulch Maintenance *

a) Inspect after rainstorms to check for movement of mulch or erosion. If washout, breakage, or erosion occurs, repair surface, reseed, remulch, and install new netting.

b) Straw or grass mulches that blow or wash away should be repaired promptly.

c) If plastic netting is used to anchor mulch, care should be taken during initial mowing to keep the mower height high. Otherwise, the netting can wrap up on the mower blade shafts. After a period of time, the netting degrades and becomes less of a problem.

d) Continue inspections until vegetation is well established.

4) **Land Grading** – Grading on fill slopes, cut slopes, and stockpile areas will be done with full siltation controls in place.

Land Grading Design/Installation Requirements

a) Areas to be graded should be cleared and grubbed of all timber, logs, brush, rubbish, and vegetated matter that will interfere with the grading operation. Topsoil should be stripped and stockpiled for use on critical disturbed areas for establishment of vegetation. Cut slopes to be topsoiled should be thoroughly scarified to a minimum depth of 3-inches prior to placement of topsoil.

b) Fill materials should be generally free of brush, rubbish, rocks, and stumps. Frozen materials or soft and easily compressible materials should not be used in fills intended to support buildings, parking lots, roads, conduits, or other structures.

c) Earth fill intended to support structural measures should be compacted to a minimum of 90 percent of Standard Proctor Test density with proper moisture control, or as otherwise specified by the engineer responsible for the design. Compaction of other fills should be to the density required to control sloughing, erosion or excessive moisture content. Maximum thickness of fill layers prior to compaction should not exceed 9 inches.

d) The uppermost one foot of fill slopes should be compacted to at least 85 percent of the maximum unit weight (based on the modified AASHTO compaction test). This is usually accomplished by running heavy equipment over the fill.

e) Fill should consist of material from borrow areas and excess cut will be stockpiled on site. All disturbed areas should be free draining, left with a neat and finished appearance, and should be protected from erosion.

Land Grading Stabilization Inspection/Maintenance *

a) All slopes should be checked periodically to see that vegetation is in good condition. Any rills or damage from erosion and animal burrowing should be repaired immediately to avoid further damage.

b) If seeps develop on the slopes, the area should be evaluated to determine if the seep will cause an unstable condition. Subsurface drains or a gravel mulch may be required to solve seep problems.

c) Areas requiring revegetation should be repaired immediately. Control undesirable vegetation such as weeds and woody growth to avoid bank stability problems in the future.

5) **Topsoiling *** – Topsoiling will help establish vegetation on all disturbed areas throughout the site during the seeding process. The soil texture of the topsoil to be used will be a sandy loam to a silt loam texture with 15% to 20% organic content.

Topsoiling Placement

a) Topsoil should not be placed while in a frozen or muddy condition, when the subgrade is excessively wet, or when conditions exist that may otherwise be detrimental to proper grading or proposed seeding.

b) Do not place topsoil on slopes steeper than 2.5:1, as it will tend to erode.

c) If topsoil and subsoil are not properly bonded, water will not infiltrate the soil profile evenly and it will be difficult to establish vegetation. The best method is to actually work the topsoil into the layer below for a depth of at least 6 inches.

6) **Permanent Seeding** – Permanent Seeding should be done immediately after the final design grades are achieved. Native species of plants should be used to establish perennial vegetative cover on disturbed areas. The revegetation should be done early enough in the fall so that a good cover is established before cold weather comes and growth stops until the spring. A good cover is defined as vegetation covering 75 percent or more of the ground surface.

Permanent Seeding Seedbed Preparation

a) In infertile or coarse-textured subsoil, it is best to stockpile topsoil and re-spread it over the finished slope at a minimum 2 to 6-inch depth and roll it to provide a firm seedbed. The topsoil must have a sandy loam to silt loam texture with 15% to 20% organic content. If construction fill operations have left soil exposed with a loose, rough, or irregular surface, smooth with blade and roll.

b) Loosen the soil to a depth of 3-5 inches with suitable agricultural or construction equipment.

c) Areas not to receive topsoil shall be treated to firm the seedbed after incorporation of the lime and fertilizer so that it is depressed no more than ½ - 1 inch when stepped on with a shoe. Areas to receive topsoil shall not be firmed until after topsoiling and lime and fertilizer is applied and incorporated, at which time it shall be treated to firm the seedbed as described above.

Permanent Seeding Grass Selection/Application

a) Select an appropriate cool or warm season grass based on site conditions and seeding date. Apply the seed uniformly by hydro-seeding, broadcasting, or by hand. Uniform seed distribution is essential. On steep slopes, hydroseeding may be the most effective seeding method. Surface roughening is particularly important when preparing slopes for hydroseeding.

b) Lime and fertilize. Organic fertilizer shall be utilized in areas within the 100-foot buffer zone to a wetland resource area.

c) Mulch the seedings with straw applied at the rate of ½ tons per acre. Anchor the mulch with erosion control netting or fabric on sloping areas. Amoco supergro or equivalent should be utilized.

Permanent Seeding Inspection/Maintenance *

a) Frequently inspect seeded areas for failure and make necessary repairs and reseed immediately. Conduct or follow-up survey after one year and replace failed plants where necessary.

b) If vegetative cover is inadequate to prevent rill erosion, overseed and fertilize in accordance with soil test results.

c) If a stand has less than 40% cover, reevaluate choice of plant materials and quantities of lime and fertilizer. Re-establish the stand following seedbed preparation and seeding recommendations, omitting lime and fertilizer in the absence of soil test results. If the season prevents resowing, mulch or jute netting is an effective temporary cover.

d) Seeded areas should be fertilized during the second growing season. Lime and fertilize thereafter at periodic intervals, as needed. Organic fertilizer shall be utilized in areas within the 100-foot buffer zone to a wetland resource area.

Dust Control:

Dust control will be utilized throughout the entire construction process of the site. For example, keeping disturbed surfaces moist during windy periods will be an effective control measure, especially for construction access roads. The use of dust control will prevent the movement of soil to offsite areas. However, care must be taken to not create runoff from excessive use of water to control dust. The following are methods of Dust Control that may be used on-site:

- Vegetative Cover – The most practical method for disturbed areas not subject to traffic.
- Calcium Chloride – Calcium chloride may be applied by mechanical spreader as loose, dry granules or flakes at a rate that keeps the surface moist but not so high as to cause water pollution or plant damage.
- Sprinkling – The site may be sprinkled until the surface is wet. Sprinkling will be effective for dust control on haul roads and other traffic routes.
- Stone – Stone will be used to stabilize construction roads and will provide dust control.

The general contractor shall employ an on-site water vehicle for the control of dust as necessary.

De-Watering Practices:

- De-watering is anticipated at this job site. If necessary, dewatering practices shall conform to the following guidelines:
    - Any water that is pumped and discharged from a trench and/or excavation shall be filtered by an approved method prior to its discharge into a receiving water or drainage system.
    - Under no circumstances shall the Contractor discharge water to wetland resource areas. When constructing near a wetland resource area, the Contractor shall discharge uncontaminated water from dewatering operations directly to the nearest drainage system, stream, or waterway after filtering by an approved method.
    - The pumped water shall be filtered through either: bailed hay, a vegetative filter strip, a vegetative channel, dewatering bag or a mechanical tank system to trap sediment occurring as a result of the construction operations. Vegetated channels, if utilized shall be constructed such that the discharge flow rate shall not exceed a velocity of more than 1 foot per second. Accumulated sediment shall be cleared from the channel periodically.

Sediment material removed shall be disposed of in accordance with all applicable local, state, and federal regulations.

The developer and site general contractor will comply with the E.P.A.'s Final General Permit for Construction De-watering Discharges, (N.P.D.E.S., Section 2.4 and 40 C.F.R. 122.26(b) (14) (x).

Inspection/Maintenance:

Operator personnel must inspect the construction site at least once every 7 calendar days or every 14 calendar days and within 24 hours of a storm event of ¼-inch or greater. The applicant shall be responsible to secure the services of a qualified person (inspector meeting EPA 2022 CPG requirements) on an on-going basis throughout all phases of the project. Refer to the Inspection/Maintenance Requirements presented earlier in the "Structural and Stabilization Practices." The inspector should review the erosion and sediment controls with respect to the following:

- Whether or not the measure was installed/performed correctly.
- Whether or not there has been damage to the measure since it was installed or performed.
- What should be done to correct any problems with the measure.

The inspector should document the findings and should request the required maintenance or repair for the pollution prevention measures when the inspector finds that it is necessary for the measure to be effective. The inspector should notify the appropriate person to make the required changes.

It is essential that the inspector document the inspection of the pollution prevention measures. These records will be used to request maintenance and repair and to prove that the inspection and maintenance were performed. The forms list each of the measures to be inspected on the site, the inspector's name, the date of the inspection, the condition of the measure/area inspected, maintenance or repair performed and any

changes which should be made to the Operation and Maintenance Plan to control or eliminate unforeseen pollution of storm water.

APPENDIX F:

LONG TERM BEST MANAGEMENT PRACTICES O&M PLAN

Long Term Stormwater Best Management Practices
Operation and Maintenance Plan
for
1301 Main Street
Lynnfield, Massachusetts
November 30, 2023

The following operation and maintenance plan has been provided to satisfy the requirements of Standard 9 of the Mass DEP Stormwater Management Handbook associated with development of the site and associated infrastructure. The success of the Stormwater Management Plan depends on the proper implementation, operation and maintenance of several management components. The following procedures shall be implemented to ensure success of the Stormwater Management Plan:

1. The contractor shall comply with the details of construction of the site as shown on the approved plans.
2. The stormwater management system shall be inspected and maintained as indicated below.
3. Effective erosion control measurers during and after construction shall be maintained until a stable turf is established on all altered areas.
4. A Stormwater Management Maintenance Log is included at the end of this Appendix.

Basic Information

Stormwater Management System Owner:	Toll Brothers, Inc. 134 Flanders Road Westborough, MA 01581 P: (508) 366-1440
Lynnfield Department of Public Works:	55 Summer Street Lynnfield, MA 01940 P: (781) 334-9500 ext. 0
Lynnfield Planning Board:	55 Summer Street Lynnfield, MA 01940 P: (781) 334-9490
Lynnfield Conservation Commission:	55 Summer Street Lynnfield, MA 01940 P: (781) 334-9495

Erosion and Sedimentation Controls during Construction:

The site and drainage construction contractor shall be responsible for managing stormwater during construction. Routine monitoring of disturbed soils shall be performed to ensure adequate runoff and pollution control during construction.

A sediment and erosion control barrier will be placed as shown on the Erosion Control Plans prior to the commencement of any clearing, grubbing, and earth removal or construction activity. The integrity of the erosion control barrier will be maintained by periodic inspection and replacement as necessary. The erosion control barrier will remain in place until the first course of pavement has been placed and all side slopes have been loamed and seeded and vegetation has been established.

Operations and maintenance plans for the long-term operation of the system have been attached to this report.

General Conditions

1. The site contractor shall be responsible for scheduling regular inspections and maintenance of the stormwater BMP's until the project has been completed. The BMP maintenance shall be conducted as detailed in the following long-term pollution prevention plan and on the approved design plans:
   "Site Development Plans for the Regency at Lynnfield Senior Housing Development Located at 1301 Main Street, Lynnfield, Massachusetts" by The Morin Cameron Group, Inc. dated November 30, 2023 and as revised.
2. All Stormwater BMP's shall be operated and maintained in accordance with the design plans and the following Long-Term Pollution Prevention Plan.
3. The owner shall:
   a. Maintain an Operation and Maintenance Log for the last three years. The Log shall include all BMP inspections, repairs, replacement activities and disposal activities (disposal material and disposal location shall be included in the Log);
   b. Make the log available to the Lynnfield Planning Board and Conservation Commission upon request;
   c. Allow members and agents of the Lynnfield Department of Public Works, Planning Board and Conservation Commission to enter the premises and ensure that the Owner has complied with the Operation and Maintenance Plan requirements for each BMP.
4. A recommended inspection and maintenance schedule is outlined below based on statewide averages. This inspection and maintenance schedule shall be adhered to at a minimum for the first year of service of all BMP's referenced in this document. At the commencement of the first year of service, a more accurate inspection/maintenance schedule shall be determined based on the level of service for this site.

Long-Term Pollution Prevention Plan (LTPPP)

Vegetated Areas:

Immediately after construction, monitoring of the erosion control systems shall occur until establishment of natural vegetation. Afterwards, vegetated areas shall be maintained as such. Vegetation shall be replaced as necessary to ensure proper stabilization of the site.

Cost: Included with annual landscaping budget. Consult with local landscape contractors.

Paved Areas:

Sweepers shall sweep paved areas periodically during dry weather to remove excess sediments and to reduce the amount of sediments that the drainage system shall have to remove from the runoff. The sweeping shall be conducted primarily between March 15th and November 15th. Special attention should be made to sweeping paved surfaces in March and April before spring rains wash residual sand into the drainage system.

Cost: Consult with local landscaping companies for associated costs if necessary.

Salt used for de-icing on the roadway during winter months shall be limited as much as possible as this will reduce the need for removal and treatment. Sand containing the minimum amount of calcium chloride (or approved equivalent) needed for handling may be applied as part of the routine winter maintenance activities.

Deep Sump Hooded Catch Basins:

The catch basin grates shall be checked quarterly and following heavy rainfalls to verify that the inlet openings are not clogged by debris. Debris shall be removed from the grates and disposed of properly. Deep sump catch basins shall be inspected twice per year and cleaned as needed when accumulated sediments exceeds 2' from the bottom of the sump (approximately 1/2 of the sump capacity). Catch basins shall be inspected four times per year. Catch basins with hoods shall be inspected annually to check oil build-up and outlet obstructions. Material shall be removed from catch basins and disposed of in accordance with all applicable regulations

Cost: Estimated $50 - $100 per cleaning per catch basin as needed. The Owner shall consult local vacuum cleaning contractors for detailed cost estimates.

Public Safety Concerns: Catch basins shall not be left open and unattended at any time during inspection, cleaning or otherwise. Broken or missing grates or frames shall be replaced immediately. At no time shall any person enter the basin structure unless measures have been taken to ensure safe access in accordance with OSHA enclosed space regulations.

CDS Water Quality Units:

The CDS water quality units shall be inspected twice per year in April and October. The unit shall be cleaned per manufacturer instructions included herein.

Bioretention Areas:

The bioretention areas shall be inspected after every major storm event for the first 3 months after construction; a major storm event is 3.9 inches of rainfall in a 24 hour period (2 year storm). Thereafter, the basin shall be inspected twice per year, typically in the spring and fall. If erosion or loss of vegetation is observed in the basin, it shall be repaired immediately and new vegetation shall be established. Trash, leaves, branches, etc. shall be removed from facility. The bioretention area shall be mowed twice per year.

The outlet structures and overflow spillways shall be inspected annually for obstructions and structural integrity. The inspections shall be conducted by qualified personnel.

Cost: Consult with local landscaping companies for associated costs if necessary.

Sediment Forebays:
The forebays shall be inspected after every major storm event for the first 3 months after construction; a major storm event is 3.9 inches of rainfall in a 24 hour period (2 year storm). Thereafter, the sediment forebay shall be inspected at a minimum of twice per year (at the same time as the inspection of the basin). All forebays shall be inspected on an annual basis, typically in the spring months, and sediment shall be removed when depth exceeds 6 inches.

Cost: Consult with local landscaping or pumping companies for associated costs if necessary.

Rip-Rap Outfalls:
The rip-rap outfalls shall be checked for debris accumulation twice per year. Additional inspections should be scheduled during the first few months to make sure that the outfall is functioning as intended. Trash, leaves, branches, etc. shall be removed from outfall. Silt, sand and sediment, if significant accumulation occurs, shall be removed as required by means of mechanical excavation. Material removed shall be disposed of in accordance with all applicable local, state, and federal regulations. The outfall shall be kept free of woody vegetation and removal of woody vegetation shall be conducted between October 15th and April 15th. Any slope erosion within the outfall shall be stabilized and repaired immediately and additional rip-rap added as required.

Cost: $500-$1000 per cleaning if excavator is necessary to remove sediment. The owner should consult local landscape contractors for a detailed cost estimate.

Roof Leaders, Gutters and Downspouts:
The gutters and downspouts shall be inspected and cleaned at least once per year to remove any debris accumulation (i.e. leafs, sticks). The roof leaders shall be inspected and cleaned at least twice per year (April and October) to confirm that the roof leaders are not obstructed by debris.

Cost: $200-300 per cleaning for the gutters as needed. The owner should consult local contractors for a detailed cost estimate.

Debris & Litter:
All debris and litter shall be removed from the roadway and parking lots as necessary to prevent migration into the drainage system.

Pesticides, Herbicides, and Fertilizers:
Pesticides and herbicides shall be used sparingly. Fertilizers shall be restricted to the use of organic fertilizers only. All fertilizers, herbicides, pesticides, sand and salt for deicing and the like shall be stored in dry area that is protected from weather.

Cost: Included in the routine landscaping maintenance schedule. The Owner shall consult local landscaping contractors for details.

Public Safety Concerns: Chemicals shall be stored in a secure area to prevent children from obtaining access to them. Any major spills shall be reported to municipal officials.

Prevention of Illicit Discharges:

Illicit discharges to the stormwater management system are not allowed. Illicit discharges are discharges that are not comprised entirely of stormwater. Pursuant to Mass DEP Stormwater Standards the following activities or facilities are not considered illicit discharges: firefighting, water line flushing, landscape irrigation, uncontaminated groundwater, potable water sources, foundation drains, air conditioning condensation, footing drains, individual resident car washing, flows from riparian habitats and wetlands, dechlorinated water from swimming pools, water used for street washing and water used to clean residential building without detergents.

To prevent illicit discharges to the stormwater management system the following policies should be implemented:

1. Provisions For Storing Materials And Waste Products Inside Or Under Cover
2. Vehicle Maintenance And Washing Controls
3. Requirements for Routine Inspections of the Stormwater Management System (i.e.: subsurface infiltration system and outlet control structure.)
4. Spill Prevention and Response Plans.

Snow Storage:

Property owner shall inform their snow removal contractor of the designated areas for snow storage.

Stormwater Management Maintenance Log

The Regency at Lynnfield - 1301 Main Street, Lynnfield, MA

The Following structures shall be inspected and maintained by the owner until the homeowner's association is established.

BMP STRUCTURE	INSPECTION DATE	WORK PERFORMED	DATE WORK PERFORMED	COMMENTS
Stormwater Management Infrastructure				
Catch Basin CB-1				
Catch Basin CB-2				
Catch Basin CB-3				
Catch Basin CB-4				
Catch Basin CB-5				
Catch Basin CB-6				
Catch Basin CB-7				
Catch Basin CB-8				
Catch Basin CB-9				
Catch Basin CB-10				
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Catch Basin CB-37				
Catch Basin CB-38				
Catch Basin CB-39				
Catch Basin CB-40				
Catch Basin CB-41				
Catch Basin CB-41				
Catch Basin CB-43				
Catch Basin CB-44				
Catch Basin CB-45				
Drain Manhole DMH-1				
Drain Manhole DMH-2				
Drain Manhole DMH-3				

Drain Manhole DMH-4				
Drain Manhole DMH-5				
Drain Manhole DMH-6				
Drain Manhole DMH-7				
Drain Manhole DMH-8				
Drain Manhole DMH-9				
Drain Manhole DMH-10				
Drain Manhole DMH-11				
Drain Manhole DMH-12				
Drain Manhole DMH-13				
Drain Manhole DMH-14				
Drain Manhole DMH-15				
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Drain Manhole DMH-17				
Drain Manhole DMH-18				
Drain Manhole DMH-19				
Drain Manhole DMH-20				
Drain Manhole DMH-21				
Drain Manhole DMH-22				
Flared End Section FES-1				
Flared End Section FES-2				
Flared End Section FES-3				
Flared End Section FES-4				
Flared End Section FES-5				

Flared End Section FES-6				
Flared End Section FES-7				
Flared End Section FES-8				
Flared End Section FES-9				
Flared End Section FES-10				
Flared End Section FES-11				
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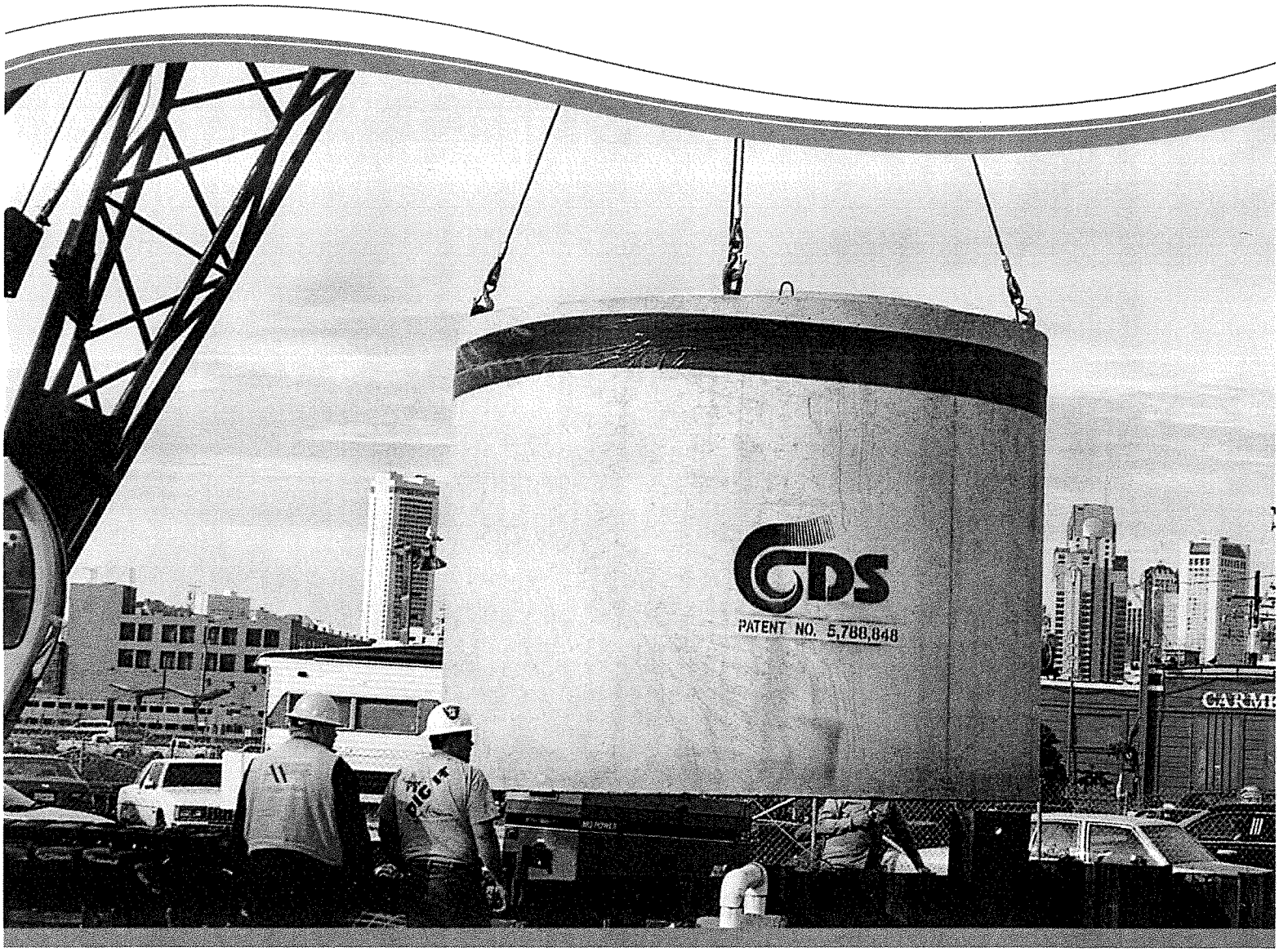
Flared End Section FES-14				
Flared End Section FES-15				
Flared End Section FES-16				
Flared End Section FES-17				
Flared End Section FES-18				
Flared End Section FES-19				
Flared End Section FES-20				
Bioretention Area BA-1				
Bioretention Area BA-2				
Bioretention Area BA-3				
Bioretention Area BA-4				
Bioretention Area BA-5				
Bioretention Area BA-6				
Bioretention Area BA-7				
Bioretention Area BA-8				
Bioretention Area BA-9				
Sediment Forebay SF-4				

Sediment Forebay SF-6				
Sediment Forebay SF-7				
Sediment Forebay SF-8				
WQU-1				
WQU-2				
WQU-3				
WQU-4				
WQU-5				
Additional Comments: Submit Maintenance Log sheets to the Town of Boxford as requested.				

CONTECH®
ENGINEERED SOLUTIONS

CDS Guide
Operation, Design, Performance and Maintenance



CDS®

Using patented continuous deflective separation technology, the CDS system screens, separates and traps debris, sediment, and oil and grease from stormwater runoff. The indirect screening capability of the system allows for 100% removal of floatables and neutrally buoyant material without blinding. Flow and screening controls physically separate captured solids, and minimize the re-suspension and release of previously trapped pollutants. Inline units can treat up to 6 cfs, and internally bypass flows in excess of 50 cfs (1416 L/s). Available precast or cast-in-place, offline units can treat flows from 1 to 300 cfs (28.3 to 8495 L/s). The pollutant removal capacity of the CDS system has been proven in lab and field testing.

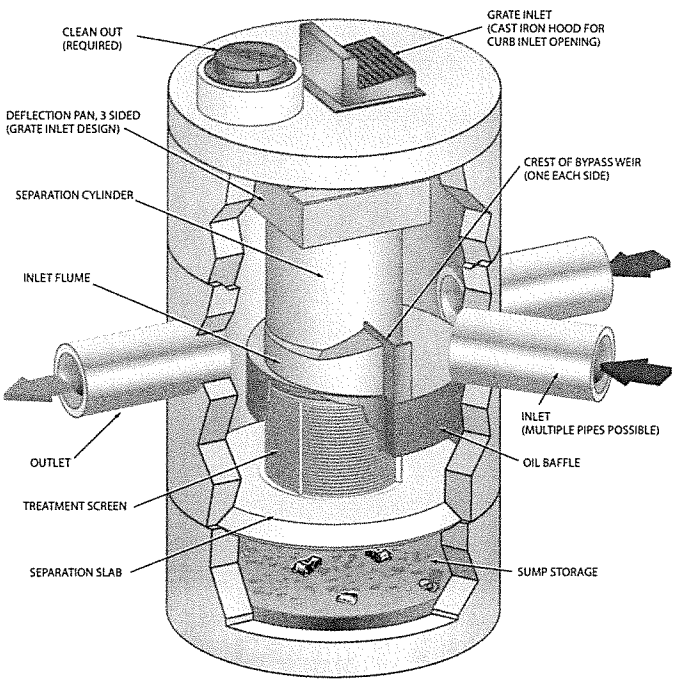
Operation Overview

Stormwater enters the diversion chamber where the diversion weir guides the flow into the unit's separation chamber and pollutants are removed from the flow. All flows up to the system's treatment design capacity enter the separation chamber and are treated.

Swirl concentration and screen deflection force floatables and solids to the center of the separation chamber where 100% of floatables and neutrally buoyant debris larger than the screen apertures are trapped.

Stormwater then moves through the separation screen, under the oil baffle and exits the system. The separation screen remains clog free due to continuous deflection.

During the flow events exceeding the treatment design capacity, the diversion weir bypasses excessive flows around the separation chamber, so captured pollutants are retained in the separation cylinder.



Design Basics

There are three primary methods of sizing a CDS system. The Water Quality Flow Rate Method determines which model size provides the desired removal efficiency at a given flow rate for a defined particle size. The Rational Rainfall Method™ or the and Probabilistic Method is used when a specific removal efficiency of the net annual sediment load is required.

Typically in the Unites States, CDS systems are designed to achieve an 80% annual solids load reduction based on lab generated performance curves for a gradation with an average particle size (d50) of 125 microns (μm). For some regulatory environments, CDS systems can also be designed to achieve an 80% annual solids load reduction based on an average particle size (d50) of 75 microns (μm) or 50 microns (μm).

Water Quality Flow Rate Method

In some cases, regulations require that a specific treatment rate, often referred to as the water quality design flow (WQQ), be treated. This WQQ represents the peak flow rate from either an event with a specific recurrence interval, e.g. the six-month storm, or a water quality depth, e.g. 1/2-inch (13 mm) of rainfall.

The CDS is designed to treat all flows up to the WQQ. At influent rates higher than the WQQ, the diversion weir will direct most flow exceeding the WQQ around the separation chamber. This allows removal efficiency to remain relatively constant in the separation chamber and eliminates the risk of washout during bypass flows regardless of influent flow rates.

Treatment flow rates are defined as the rate at which the CDS will remove a specific gradation of sediment at a specific removal efficiency. Therefore the treatment flow rate is variable, based on the gradation and removal efficiency specified by the design engineer.

Rational Rainfall Method™

Differences in local climate, topography and scale make every site hydraulically unique. It is important to take these factors into consideration when estimating the long-term performance of any stormwater treatment system. The Rational Rainfall Method combines site-specific information with laboratory generated performance data, and local historical precipitation records to estimate removal efficiencies as accurately as possible.

Short duration rain gauge records from across the United States and Canada were analyzed to determine the percent of the total annual rainfall that fell at a range of intensities. US stations' depths were totaled every 15 minutes, or hourly, and recorded in 0.01-inch increments. Depths were recorded hourly with 1-mm resolution at Canadian stations. One trend was consistent at all sites; the vast majority of precipitation fell at low intensities and high intensity storms contributed relatively little to the total annual depth.

These intensities, along with the total drainage area and runoff coefficient for each specific site, are translated into flow rates using the Rational Rainfall Method. Since most sites are relatively small and highly impervious, the Rational Rainfall Method is appropriate. Based on the runoff flow rates calculated for each intensity, operating rates within a proposed CDS system are

determined. Performance efficiency curve determined from full scale laboratory tests on defined sediment PSDs is applied to calculate solids removal efficiency. The relative removal efficiency at each operating rate is added to produce a net annual pollutant removal efficiency estimate.

Probabilistic Rational Method

The Probabilistic Rational Method is a sizing program Contech developed to estimate a net annual sediment load reduction for a particular CDS model based on site size, site runoff coefficient, regional rainfall intensity distribution, and anticipated pollutant characteristics.

The Probabilistic Method is an extension of the Rational Method used to estimate peak discharge rates generated by storm events of varying statistical return frequencies (e.g. 2-year storm event). Under the Rational Method, an adjustment factor is used to adjust the runoff coefficient estimated for the 10-year event, correlating a known hydrologic parameter with the target storm event. The rainfall intensities vary depending on the return frequency of the storm event under consideration. In general, these two frequency dependent parameters (rainfall intensity and runoff coefficient) increase as the return frequency increases while the drainage area remains constant.

These intensities, along with the total drainage area and runoff coefficient for each specific site, are translated into flow rates using the Rational Method. Since most sites are relatively small and highly impervious, the Rational Method is appropriate. Based on the runoff flow rates calculated for each intensity, operating rates within a proposed CDS are determined. Performance efficiency curve on defined sediment PSDs is applied to calculate solids removal efficiency. The relative removal efficiency at each operating rate is added to produce a net annual pollutant removal efficiency estimate.

Treatment Flow Rate

The inlet throat area is sized to ensure that the WQQ passes through the separation chamber at a water surface elevation equal to the crest of the diversion weir. The diversion weir bypasses excessive flows around the separation chamber, thus preventing re-suspension or re-entrainment of previously captured particles.

Hydraulic Capacity

The hydraulic capacity of a CDS system is determined by the length and height of the diversion weir and by the maximum allowable head in the system. Typical configurations allow hydraulic capacities of up to ten times the treatment flow rate. The crest of the diversion weir may be lowered and the inlet throat may be widened to increase the capacity of the system at a given water surface elevation. The unit is designed to meet project specific hydraulic requirements.

Performance

Full-Scale Laboratory Test Results

A full-scale CDS system (Model CDS2020-5B) was tested at the facility of University of Florida, Gainesville, FL. This CDS unit was evaluated under controlled laboratory conditions of influent flow rate and addition of sediment.

Two different gradations of silica sand material (UF Sediment & OK-110) were used in the CDS performance evaluation. The particle size distributions (PSDs) of the test materials were analyzed using standard method "Gradation ASTM D-422 "Standard Test Method for Particle-Size Analysis of Soils" by a certified laboratory.

UF Sediment is a mixture of three different products produced by the U.S. Silica Company: "Sil-Co-Sil 106", "#1 DRY" and "20/40 Oil Frac". Particle size distribution analysis shows that the UF Sediment has a very fine gradation (d50 = 20 to 30 μm) covering a wide size range (Coefficient of Uniformity, C averaged at 10.6). In comparison with the hypothetical TSS gradation specified in the NJDEP (New Jersey Department of Environmental Protection) and NJCAT (New Jersey Corporation for Advanced Technology) protocol for lab testing, the UF Sediment covers a similar range of particle size but with a finer d50 (d50 for NJDEP is approximately 50 μm) (NJDEP, 2003).

The OK-110 silica sand is a commercial product of U.S. Silica Sand. The particle size distribution analysis of this material, also included in Figure 1, shows that 99.9% of the OK-110 sand is finer than 250 microns, with a mean particle size (d50) of 106 microns. The PSDs for the test material are shown in Figure 1.

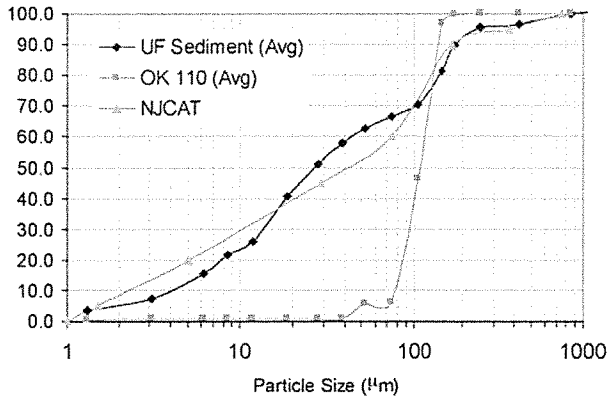


Figure 1. Particle size distributions

Tests were conducted to quantify the performance of a specific CDS unit (1.1 cfs (31.3-L/s) design capacity) at various flow rates, ranging from 1% up to 125% of the treatment design capacity of the unit, using the 2400 micron screen. All tests were conducted with controlled influent concentrations of approximately 200 mg/L. Effluent samples were taken at equal time intervals across the entire duration of each test run. These samples were then processed with a Dekaport Cone sample splitter to obtain representative sub-samples for Suspended Sediment Concentration (SSC) testing using ASTM D3977-97 "Standard Test Methods for Determining Sediment Concentration in Water Samples", and particle size distribution analysis.

Results and Modeling

Based on the data from the University of Florida, a performance model was developed for the CDS system. A regression analysis was used to develop a fitting curve representative of the scattered data points at various design flow rates. This model, which demonstrated good agreement with the laboratory data, can then be used to predict CDS system performance with respect

to SSC removal for any particle size gradation, assuming the particles are inorganic sandy-silt. Figure 2 shows CDS predictive performance for two typical particle size gradations (NJCAT gradation and OK-110 sand) as a function of operating rate.

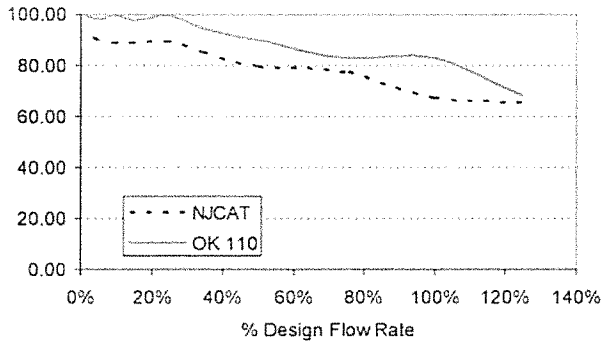


Figure 2. CDS stormwater treatment predictive performance for various particle gradations as a function of operating rate.

Many regulatory jurisdictions set a performance standard for hydrodynamic devices by stating that the devices shall be capable of achieving an 80% removal efficiency for particles having a mean particle size (d50) of 125 microns (e.g. Washington State Department of Ecology — WASDOE - 2008). The model can be used to calculate the expected performance of such a PSD (shown in Figure 3). The model indicates (Figure 4) that the CDS system with 2400 micron screen achieves approximately 80% removal at the design (100%) flow rate, for this particle size distribution (d50 = 125 μm).

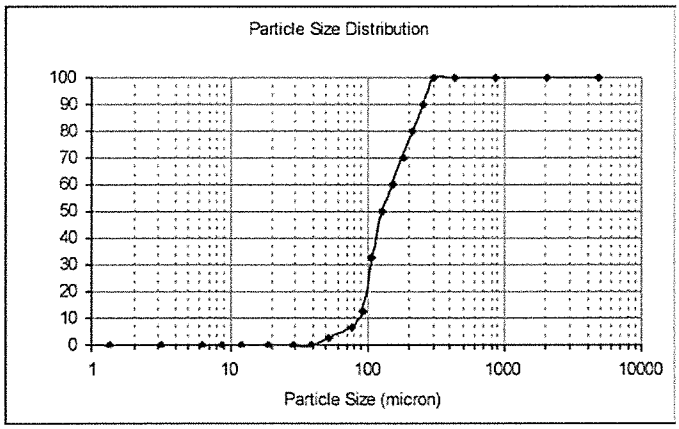


Figure 3. WASDOE PSD

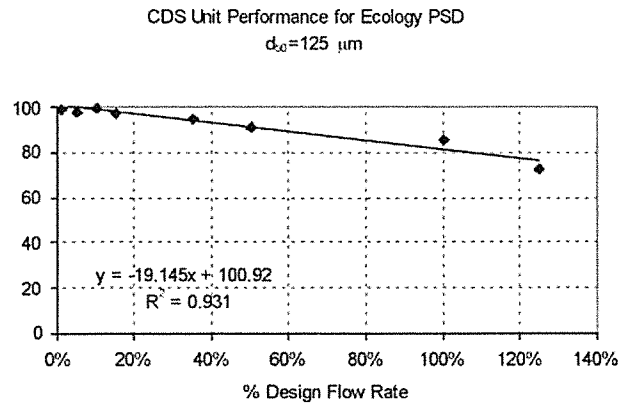


Figure 4. Modeled performance for WASDOE PSD.

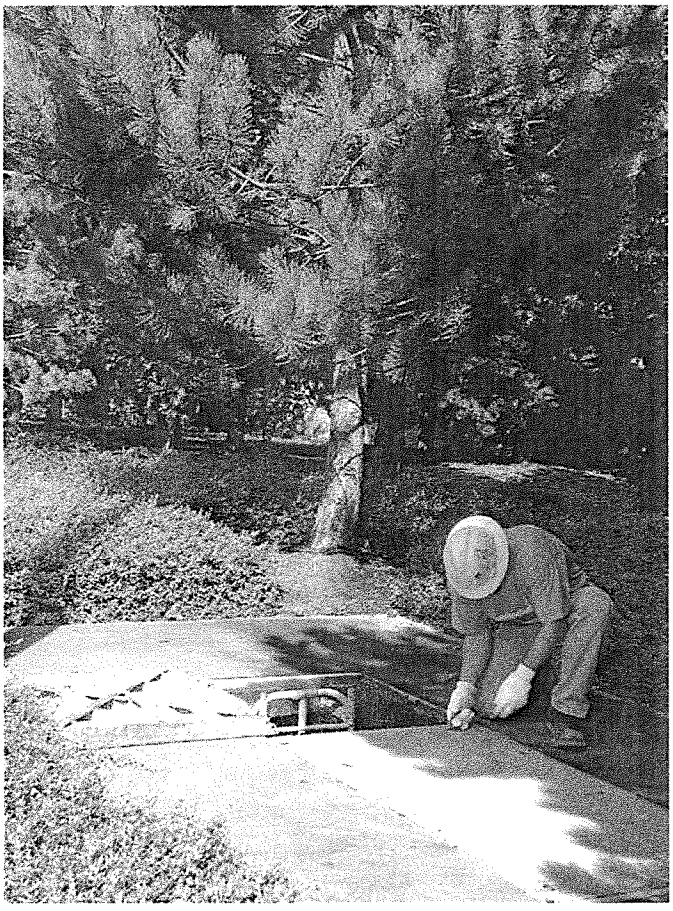
Maintenance

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

Inspection

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

The visual inspection should ascertain that the system components are in working order and that there are no blockages or obstructions in the inlet and separation screen. The inspection should also quantify the accumulation of hydrocarbons, trash, and sediment in the system. Measuring pollutant accumulation can be done with a calibrated dipstick, tape measure or other measuring instrument. If absorbent material is used for enhanced removal of hydrocarbons, the level of discoloration of the sorbent material should also be identified



during inspection. It is useful and often required as part of an operating permit to keep a record of each inspection. A simple form for doing so is provided.

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

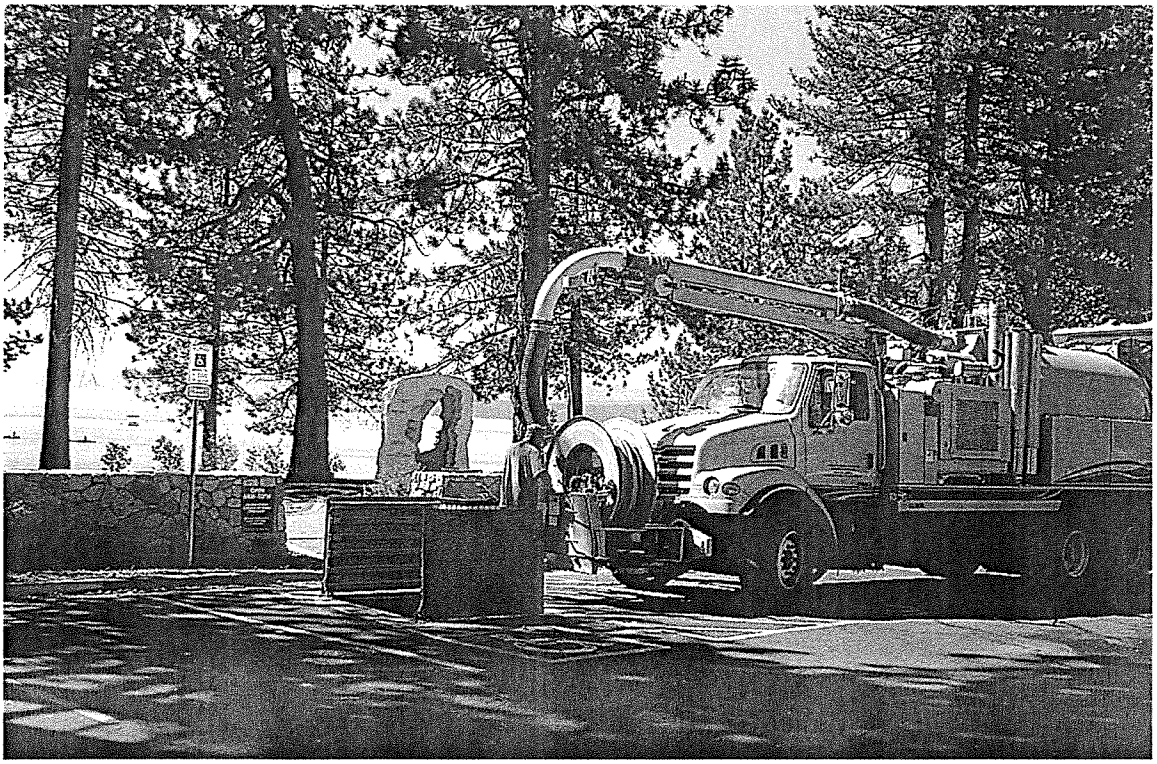
The CDS system should be cleaned when the level of sediment has reached 75% of capacity in the isolated sump or when an appreciable level of hydrocarbons and trash has accumulated. If absorbent material is used, it should be replaced when significant discoloration has occurred. Performance will not be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

Cleaning

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

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

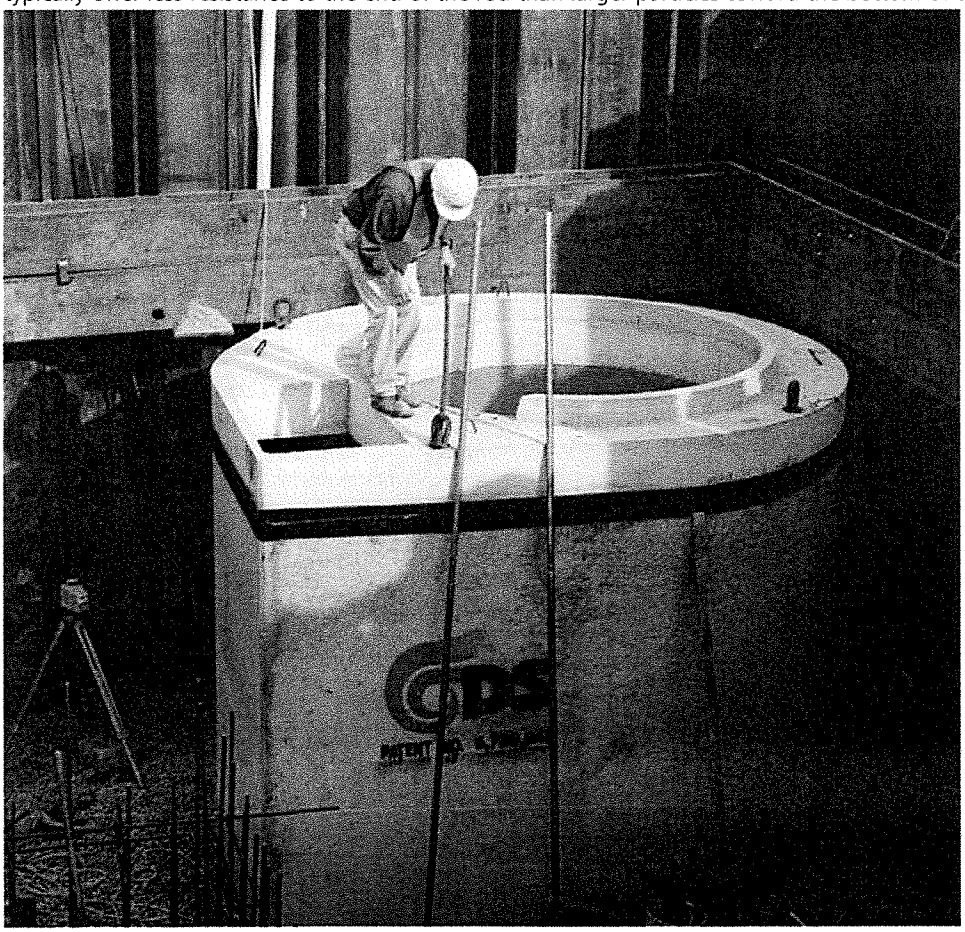
Manhole covers should be securely seated following cleaning activities to prevent leakage of runoff into the system from above and also to ensure that proper safety precautions have been followed. Confined space entry procedures need to be followed if physical access is required. Disposal of all material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



CDS Model	Diameter		Distance from Water Surface to Top of Sediment Pile		Sediment Storage Capacity	
	ft	m	ft	m	yd³	m³
CDS1515	3	0.9	3.0	0.9	0.5	0.4
CDS2015	4	1.2	3.0	0.9	0.9	0.7
CDS2015	5	1.5	3.0	0.9	1.3	1.0
CDS2020	5	1.5	3.5	1.1	1.3	1.0
CDS2025	5	1.5	4.0	1.2	1.3	1.0
CDS3020	6	1.8	4.0	1.2	2.1	1.6
CDS3025	6	1.8	4.0	1.2	2.1	1.6
CDS3030	6	1.8	4.6	1.4	2.1	1.6
CDS3035	6	1.8	5.0	1.5	2.1	1.6
CDS4030	8	2.4	4.6	1.4	5.6	4.3
CDS4040	8	2.4	5.7	1.7	5.6	4.3
CDS4045	8	2.4	6.2	1.9	5.6	4.3
CDS5640	10	3.0	6.3	1.9	8.7	6.7
CDS5653	10	3.0	7.7	2.3	8.7	6.7
CDS5668	10	3.0	9.3	2.8	8.7	6.7
CDS5678	10	3.0	10.3	3.1	8.7	6.7

Table 1: CDS Maintenance Indicators and Sediment Storage Capacities

Note: To avoid underestimating the volume of sediment in the chamber, carefully lower the measuring device to the top of the sediment pile. Finer silty particles at the top of the pile may be more difficult to feel with a measuring stick. These finer particles typically offer less resistance to the end of the rod than larger particles toward the bottom of the pile.



CDS Inspection & Maintenance Log

CDS Model: _____ Location: _____

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

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

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

SUPPORT

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

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The product(s) described may be protected by one or more of the following US patents: 5,322,629; 5,624,576; 5,707,527; 5,759,415; 5,788,848; 5,985,157; 6,027,639; 6,350,374; 6,406,218; 6,641,720; 6,511,595; 6,649,048; 6,991,114; 6,998,038; 7,186,058; 7,296,692; 7,297,266; related foreign patents or other patents pending.

APPENDIX G:

ILLICIT DISCHARGE STATEMENT

Illicit Discharge Compliance Statement

I, Scott P. Cameron, P.E., hereby notify the Lynnfield Planning Board and Conservation Commission that I have not witnessed, nor am aware of any existing illicit discharges at the site known as 1301 Main Street in Lynnfield, Massachusetts. I also hereby certify that the development of said property as illustrated on the final plans entitled "Site Development Plans for the Regency at Lynnfield Senior Housing Development Located at 1301 Main Street, Lynnfield, Massachusetts," prepared by The Morin-Cameron Group, Inc. dated November 30, 2023 and as revised and approved by the Lynnfield Planning Board and Conservation Commission and maintenance thereof in accordance with the "Construction Phase Best Management Practices Plan" and "Long Term Best Management Practices Operation and Maintenance Plan" prepared by The Morin-Cameron Group, Inc. dated November 30, 2023 and as revised and approved by the Lynnfield Planning Board and Conservation Commission will not create any new illicit discharges. There is no warranty implied regarding future illicit discharges that may occur as a result of improper construction or maintenance of the stormwater management system or unforeseen accidents.

Name: Scott P. Cameron, P.E.

Company: The Morin-Cameron Group, Inc.

Title: Owner's Representative

Signature:

Date: 11/30/23