STORMWATER REPORT

THORNDIKE PLACE DOROTHY ROAD ARLINGTON, MA

NOVEMBER 2020 Revised: August 2021

Owner/Applicant:

ARLINGTON LAND REALTY LLC 84 Sherman Street, 2nd Floor Cambridge, MA 02140

BSC Job Number: 23407.00

Prepared by:



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SECTION 1.0

PROJECT INFORMATION



1.01 PROJECT DESCRIPTION

Arlington Realty, LLC (The Applicant) is seeking to construct a new age restricted multi-family housing and assisted living development in Arlington, Massachusetts, hereinafter referred to as "the Project." The total property area is approximately 17.66 acres and is located off Dorothy Road near the intersection with Littlejohn Street. The project is bounded on the north by Dorothy Road, on the east by residential properties and Thorndike Field, and bounded on the south and west by Concord Turnpike (Route 2).

The Project consists of clearing and grubbing of the northwest section of the property and construction of one 4-story assisted living residential building with a lower level parking garage, six duplex townhouses with covered carports, as well as surface parking, walkways, utility services, and a stormwater management system. The buildings have a combined footprint of approximately 43,100 square feet.

The Project is designed to comply with the Massachusetts General Laws (M.G.L.) Chapter 40B, which allows developers to override certain aspects of municipal zoning bylaws by providing a certain percentage of affordable housing, as well as the Department of Environmental Protection's Stormwater Management Standards. There are wetland resource areas in the south, west and east portions of the property. The Project is concentrated in the northwest area of the property and minimizes impacts to the 100-foot wetland buffer zones, which are regulated by the Arlington Wetlands Bylaw as Adjacent Upland Resource Areas (AURA's). Part of the site is located within the 1% Chance Annual Flood as defined by FEMA which is regulated under the Wetlands Protection Act and the Arlington Wetlands Bylaw as Bordering Land Subject to Flooding (BLSF). Compensatory flood storage is proved at a 2:1 ratio as described in section 2.12 below.

1.02 PRE-DEVELOPMENT CONDITIONS

The existing site topography generally slopes southeast across the property towards the wetlands located on the property with slopes ranging from 0-15%. The current site is comprised of forest and the primary soil classification identified by the NRCS Web Soil Survey is udorthents (655), which accounts for the majority of the property and all of the project area. On November 25, 2020, BSC Group conducted three test pits on the site, the locations of which are noted on the Grading and Drainage plan, and the test pit logs are attached in Appendix D. The test pits consisted primarily of fill material to a depth of 9-11 feet generally conforming with the soils mapping. Even though the material was fill, all samples textured as sandy loam in test pits TP-1 and TP-2, closest to the proposed stormwater management systems. At the bottom of test pit TP-3, a layer of clay material was found. Based on the fill materials found, runoff calculations have been performed using curve numbers corresponding to Hydrologic Soil Group (HSG) C.

The existing site being largely undeveloped has no existing drainage facilities and the majority of the stormwater runoff is directed to the wetlands on the property. A small portion of the site discharges to the north to Dorothy Road.

1.03 POST-DEVELOPMENT CONDITIONS

The proposed stormwater management system has been designed in a manner that will meet or exceed the provisions of the Department of Environmental Protection (DEP) Stormwater Management Standards for a new construction project.

Stormwater runoff from a portion of the 4-story building (approximately 15,900 square feet) will be temporarily detained on the roof of the building. This collected runoff will be released at controlled rates through roof drains to an underground infiltration system in the adjacent driveway and drop-off area. The majority of the 4-story building roof will discharge at grade directly to the surface and flow overland towards the wetlands to the south.

Stormwater runoff from the site driveway and small parking/drop-off area at the main entrance to the building will be collected via a deep sump catch basin, conveyed through a water quality unit before being directed to the underground infiltration system. Stormwater runoff from the driveway into the garage below the building will be collected via a trench drain and conveyed through a water quality unit before being directed to the underground system. Due to its



elevation difference, this leg of the system has been provided with a backflow preventer device. In addition, runoff from the townhouse and carport roofs, as well as the landscaped areas between the townhouses and 4-story building will be collected and routed to the underground infiltration area. This underground infiltration system provides for recharge to groundwater and provides peak flow rate attenuation. In larger storm events, this system will overflow through an outlet control structure to a flared end section with a rip-rap apron to the south.

Stormwater runoff from the townhouse driveways along Dorothy Rd will be collected via individual trench drains and routed to small underground infiltration chamber systems beneath each driveway. Each system is designed to completely hold and infiltrate the 100-year, 24-hour storm event.

Although all soils sampled in test pits TP-1 and TP-2 were identified as sandy loam (see above), the infiltration rate for loam (0.52-inches per hour) has been used in the infiltration system design to account for the materials found being primarily fill. Based upon the test pit data performed in November 2020 (see above), the estimated seasonal high groundwater elevation ranges between elevations 0 and 2. As such the infiltration systems have been set with a bottom elevation of 6.0 and higher to provide the minimum 2-feet of clearance above groundwater and account for any groundwater fluctuations that may occur.

To provide emergency access to the sides and rear of the building, a reinforced grass access lane will be installed. A portion of this access lane will include a 6-foot wide, porous asphalt walkway to allow residents to have ADA/AAB accessible access the rear of the site. Both the reinforced grass and porous asphalt will allow stormwater runoff to freely infiltrate back to the ground and will result in negligible runoff.

Specifics of the project's compliance with the Stormwater Standards are discussed in detail in the following sections.



SECTION 2.0

DRAINAGE SUMMARY



2.01 Stormwater Standard 1 – New Stormwater Conveyances

Per Massachusetts Stormwater Management Standard #1, no new outfalls may discharge untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth. No new untreated stormwater discharges are proposed. Rip-rap outlet protection sizing calculations are included in Section 6.0 of this Report.

2.02 Stormwater Standard 2 – Stormwater Runoff Rates

Watershed modeling was performed using HydroCAD Stormwater Modeling Software version 10.00, a computer aided design program that combines SCS runoff methodology with standard hydraulic calculations. A model of the site's hydrology was developed for both pre- and post-development conditions to assess the effects of the proposed development on the project site and surrounding areas.

In accordance with previous peer review comments received from BETA Group, Inc., and to account for impacts from climate change, stormwater runoff was modeled using data from the NOAA 14+ rainfall data. In accordance with BETA Group's letter, the following rainfall values have been used:

Storm Frequency	NOAA 14+ Rainfall (Inches)
2-year	3.64
10-year	5.79
25-year	7.49
50-year	8.72
100-year	10.35

As detailed in BETA Group's review letter, these values are greater than, in some cases significantly so, than the rainfall required by either the DEP's Stormwater Handbook or the Arlington Wetlands Bylaw.

The stormwater management system for the project has been designed such that the post-development conditions result in no increase to peak runoff rates off the property for the 2, 10, 25, 50, and 100-year, 24-hour storm events, as detailed in the table below.

Peak Flow Discharge Rates

Node 1L - Flow to Wetlands

Storm Event	Pre-Development Peak Discharge Rate (cfs)	Post-Development Peak Discharge Rate (cfs)	Change in Peak Discharge Rate (cfs)
2-Year	2.9	2.9	0.0
10-Year	7.6	5.7	-1.9
25-Year	11.7	8.5	-3.2
50-Year	14.8	11.8	-3.0
100-Year	19.0	16.1	-2.9



Storm Event	Pre-Development Peak Discharge Rate (cfs)	Post-Development Peak Discharge Rate (cfs)	Change in Peak Discharge Rate (cfs)
2-Year	0.2	0.2	0.0
10-Year	0.6	0.5	-0.1
25-Year	0.8	0.8	0.0
50-Year	1.0	0.9	-0.1
100-Year	1.3	1.2	-0.1

Node 2L - Flow Towards Street

Node 100L - Total Flows

Storm Event	Pre-Development Peak Discharge Rate (cfs)	Post-Development Peak Discharge Rate (cfs)	Change in Peak Discharge Rate (cfs)
2-Year	3.1	3.1	0.0
10-Year	7.9	6.2	-1.7
25-Year	12.1	9.1	-3.0
50-Year	15.3	12.5	-2.8
100-Year	19.7	17.0	-2.7

2.03 Stormwater Standard 3 – Groundwater Recharge

Groundwater recharge is provided on site via an underground structural infiltration system beneath the surface parking area to the north of the building, and smaller systems beneath each individual driveway of the duplex townhouses. Overall, the project will result in no loss of annual recharge to groundwater as required by Standard 3. Refer to Section 6.0 of this Report for groundwater recharge information.

As the infiltration system has more than 2-feet but less than 4-feet separation to estimated seasonal high groundwater, a mounding analysis has been performed in accordance with the Hantoush Method to ensure that a groundwater mound does not extend into the bottom of the infiltration system preventing infiltration of the required recharge volume. This analysis is included in Section 6.0 of this Report.

2.04 Stormwater Standard 4 – TSS Removal

As a new development, the Project stormwater management system will achieve a TSS removal greater than 80%. The proposed stormwater management system has been designed to provide treatment of runoff in order to reduce suspended solids prior to discharge off-site through the implementation of the following best management practices:

- Deep Sump Hooded Catch Basins
- Proprietary Hydrodynamic Separators
- Underground Stormwater Infiltration Systems



The water quality volume is defined as the runoff volume requiring TSS Removal for the site, and is equal to 0.5-inches of runoff over the total impervious area of the post-development site. The required water quality volume for the project is provided in Section 6.0 of this Report

The underground infiltration system has been sized to treat the required water quality volume and calculations are included in Section 6.0 of this Report.

A long-term pollution prevention plan complying with the requirements of Standard 4 is included in Section 4.0 of this Report.

2.05 Stormwater Standard 5 – Land Uses with Higher Potential Pollutant Loads

This standard is not applicable as the project site is not a land use with higher potential pollutant loads (LUHPPL).

2.06 Stormwater Standard 6 – Stormwater Discharges to a Critical Area

This standard is not applicable as runoff from the project site does not discharge to a critical area.

2.07 Stormwater Standard 7 – Redevelopment Projects

This project is a new development and therefore has been designed to fully comply with the Stormwater Management Standards.

2.08 Stormwater Standard 8 – Sedimentation and Erosion Control Plan

Erosion and sedimentation controls are shown on the Project Plans. Additionally, a Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan is included in Section 3.0 of this Report.

2.09 Stormwater Standard 9 – Long Term Operation and Maintenance Plan

A Long-Term Operation and Maintenance Plan is included in Section 4.0 of this Report.

2.10 Stormwater Standard 10 – Illicit Discharges

There are no known illicit discharges on the project site and none are proposed. An illicit discharge compliance statement is included in Section 6.0 and will be signed by the Applicant prior to issuance of any permits.

2.11 Conclusion

The project has been designed in accordance with DEP Stormwater Management Standards and the Town of Arlington Wetlands Protection Bylaw and Regulations. Through the construction of the aforementioned stormwater systems, the project will provide peak rate attenuation, TSS removal and groundwater recharge.

2.12 Compensatory Flood Storage

A portion of the project site is located within the 1% Chance Annual Flood as defined by FEMA, which is regulated under the Wetlands Protection Act and Arlington Wetlands Bylaw as Bordering Land Subject to Flooding (BLSF). In order to protect the values provided by BLSF and prevent downstream flooding impacts, the project is required to provide compensatory flood storage on a 1-foot incremental basis to match whatever is lost due to the project's development. Further, Arlington requires compensatory flood storage to be provided at a 2 to 1 ratio for any flood storage lost. In order to provide this compensatory flood storage, the project will minimize the area of BLSF impacted and regrade a portion of the project property southeast of the proposed building as shown on the Plans. A breakdown of the flood storage impacts and compensatory storage provided is shown below:



Elevations	<u>Existing</u> <u>Incremental</u> <u>Available Flood</u> <u>Storage (CU.FT.)</u>	<u>Incremental</u> <u>Available Flood</u> <u>Storage with No</u> <u>Compensatory</u> <u>Storage (CU.FT.)</u>	Incremental Flood Storage Change <u>w/No</u> <u>Compensatory</u> Storage (CU.FT.)	<u>Proposed</u> <u>Incremental</u> <u>Compensatory</u> <u>Storage (CU.FT.)</u>	<u>Ratio of</u> <u>Compensatory</u> <u>Storage to Storage</u> <u>Lost</u>
5.0 - 6.0	136.0	67.5	-68.5	146.0	2.1
6.0 - 6.8	9,327.6	5,003.2	-4,324.4	9,014.8	2.1

As shown above, the project will exceed the 2 to 1 ratio of compensatory flood storage for all flood storage lost due to the project development. In addition, as shown on the Plans, the proposed compensatory storage is hydrologically connected to the flood plain impacted by the project. Therefore, the project as proposed meets the applicable requirements for BLSF in both the Wetlands Protection Act and the Arlington Wetlands Bylaw and Regulations.



SECTION 3.0

CONSTRUCTION PERIOD POLLUTION PREVENTION AND EROSION AND SEDIMENTATION CONTROL PLAN

3.0 Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan

This Section specifies requirements and suggestions for implementation of a Stormwater Pollution Prevention Plan (SWPPP) for **Thorndike Place**, in Arlington, Massachusetts. The SWPPP shall be provided and maintained on-site by the Contractor(s) during all construction activities. The SWPPP shall be updated as required to reflect changes to construction activity.

The stormwater pollution prevention measures contained in the SWPPP shall be at least the minimum required by Local Regulations. The Contractor shall provide additional measures to prevent pollution from stormwater discharges in compliance with the National Pollution Discharge Elimination System (NPDES) Phase II permit requirements and all other local, state and federal requirements.

The SWPPP shall include provisions for, but not be limited to, the following:

- 1. Construction Trailers
- 2. Lay-down Areas
- 3. Equipment Storage Areas
- 4. Stockpile Areas
- 5. Disturbed Areas

The Contractor shall NOT begin construction without submitting evidence that a NPDES Notice of Intent (NOI) governing the discharge of stormwater from the construction site for the entire construction period has been filed **at least fourteen (14) days prior to construction**. It is the Contractor's responsibility to complete and file the NOI, unless otherwise determined by the project team.

The cost of any fines, construction delays and remedial actions resulting from the Contractor's failure to comply with all provisions of local regulations and Federal NPDES permit requirements shall be paid for by the Contractor at no additional cost to the Owner.

As a requirement of the EPA's NPDES permitting program, each Contractor and Subcontractor responsible for implementing and maintaining stormwater Best Management Practices shall execute a Contractor's Certification form.

Erosion and Sedimentation Control

The Contractor shall be solely responsible for erosion and sedimentation control at the site. The Contractor shall utilize a system of operations and all necessary erosion and sedimentation control measures, even if not specified herein or elsewhere, to minimize erosion damage at the site to prevent the migration of sediment into environmentally sensitive areas. Environmentally sensitive areas include all wetland resource areas within, and downstream of, the site, and those areas of the site that are not being altered.

Erosion and sedimentation control shall be in accordance with this Section, the design drawings, and the following:

- "National Pollutant Discharge Elimination System General Permit for Discharges from Construction Activities (EPA Construction General Permit February 16, 2017).
- □ Massachusetts Stormwater Management Policy Handbook issued by the Massachusetts Department of Environmental Protection, January 2008.
- Massachusetts Erosion and Sediment Control Guidelines for Urban and Suburban Areas, A Guide for Planners, Designers and Municipal Officials, March 1997.

The BMP's presented herein should be used as a guide for erosion and sedimentation control and are <u>not</u> intended to be considered specifications for construction. The most important BMP is maintaining a rapid



construction process, resulting in prompt stabilization of surfaces, thereby reducing erosion potential. Given the primacy of rapid construction, these guidelines have been designed to allow construction to progress with essentially no hindrance by the erosion control methods prescribed. These guidelines have also been designed with sufficient flexibility to allow the Contractor to modify the suggested methods as required to suit seasonal, atmospheric, and site-specific physical constraints.

Another important BMP is the prevention of concentrated water flow. Sheet flow does not have the erosive potential of a concentrated rivulet. These guidelines recommend construction methods that allow localized erosion control and a system of construction, which inhibits the development of shallow concentrated flow. These BMP's shall be maintained throughout the construction process.

CONTACT INFORMATION AND RESPONSIBLE PARTIES

The following is a list of all project-associated parties:

Owner

Arlington Land Realty, LLC 84 Sherman Street, 2nd Floor Cambridge, MA 02140

Contractor To be determined

Environmental Consultant

BSC Group, Inc. 803 Summer Street Boston, MA 02127

Contact: Dominic Rinaldi, P.E. Phone: (617) 896–4300 Email: drinaldi@bscgroup.com

Qualified SWPPP Inspectors To Be Determined

3.1 Procedural Conditions of the Construction General Permit (CGP)

The following list outlines the Stormwater Responsibilities for all construction operators working on the Project. The operators below agree through a cooperative agreement to abide by the following conditions throughout the duration of the construction project, effective the date of signature of the required SWPPP. These conditions apply to all operators on the project site.

The project is subject to EPA's NPDES General Permit through the CGP. The goal of this permit is to prevent the discharge of pollutants associated with construction activity from entering the existing and proposed storm drain system or surface waters.

All contractors/operators involved in clearing, grading and excavation construction activities must sign the appropriate certification statement required, which will remain with the SWPPP. The owner must also sign a certification, which is to remain with the SWPPP in accordance with the signatory requirements of the SWPPP.



Once the SWPPP is finalized, a signed copy, plus supporting documents, must be held at the project site during construction. A copy must remain available to EPA, State and Local agencies, and other interested parties during normal business hours.

The following items associated with this SWPPP must be posted in a prominent place at the construction site until final stabilization has been achieved:

- The completed/submitted NOI form
- Location where the public can view the SWPPP during normal business hours
- A copy of the signed/submitted NOI, permit number issued by the EPA and a copy of the current CGP.

Project specific SWPPP documents are not submitted to the US EPA unless the agency specifically requests a copy for review. SWPPP documents requested by a permitting authority, the permittee(s) will submit it in a timely manner.

EPA inspectors will be allowed free and unrestricted access to the project site and all related documentation and records kept under the conditions of the permit.

The permitee is expected to keep all BMP's and Stormwater controls operating correctly and maintained regularly.

Any additions to the project which will significantly change the anticipated discharges of pollutants, must be reported to the EPA. The EPA should also be notified in advance of any anticipated events of noncompliance. The permitee must also orally inform the EPA of any discharge, which may endanger health or the environment within 24 hours, with a written report following within 5 days.

In maintaining the SWPPP, all records and supporting documents will be compiled together in an orderly fashion. Inspection reports and amendments to the SWPPP must remain with the document. Federal regulations require permitee(s) to keep their Project Specific SWPPP and all reports and documents for at least three (3) years after the project is complete.

3.2 Existing Site and Soil Conditions

The total project area is approximately 17.66 acres and is located off Dorothy Road. The project is bounded on the north by Dorothy Road, bounded on the east by residential properties, and bounded on the south and west by Concord Turnpike (Route 2).

The current site is comprised of forest and the primary soil classification identified by the NRCS Web Soil Survey is udorthents (655), which accounts for the majority of the property and all of the project area. On November 25, 2020, BSC Group conducted three test pits on the site, the locations of which are noted on the Grading and Drainage plan, and the test pit logs are attached in Appendix D. The test pits consisted of primarily fill material to a depth of 9-11 feet generally conforming with the soils mapping. Even though the material was fill, it all samples textured as sandy loam in test pits TP-1 and TP-2, closest to the proposed stormwater management systems. At the bottom of test pit TP-3, a layer of clay material was found. Based on the fill materials found, runoff calculations have been performed using curve numbers corresponding to Hydrologic Soil Group (HSG) C.

3.3 Project Description and Intended Construction Sequence

The site is currently comprised of woods. The proposed activities will include the following major components:

- The construction of one (1) multi-family housing building and six (6) duplex townhouses with associated parking, driveways, walkways, and retaining walls,
- The construction of stormwater management systems,



- Site grading and compensatory flood storage creation, and
- Utility connections and installation.

The proposed project will disturb a total of approximately $175,000\pm$ S.F. ($4.02\pm$ acres).

Soil disturbing activities will include site demolition, installing stabilized construction exits, installation of erosion and sedimentation controls, grading, storm drain inlets, stormwater management systems, utilities, building foundation, construction of site driveways and preparation for final landscaping. Please refer to Table 1 for the projects anticipated construction timetable. A description of BMP's associated with project timetable and construction-phasing elements is provided in this Erosion and Sediment Control Plan.

Table 1 – Anticipated Construction Timetable	
Construction Phasing Activity	Anticipated Timetable
Grubbing and Stripping of Limits of	To be determined
Construction Phase	
Rough Site Grading and Site Utilities	To be determined
Utility Plan Construction	To be determined
Landscaping	To be determined

3.4 Potential Sources of Pollution

Any project site activities that have the potential to add pollutants to runoff are subject to the requirements of the SWPPP. Listed below are a description of potential sources of pollution from both sedimentation to Stormwater runoff, and pollutants from sources other than sedimentation.

Table 2 – Potential Sources of Sediment to Stormwater Runoff			
Potential Source	Activities/Comments		
Construction Site Entrance and	Vehicles leaving the site can track soils onto public		
Site Vehicles	roadways. Site Vehicles can readily transport exposed soils		
	throughout the site and off-site areas.		
Grading Operations	Exposed soils have the potential for erosion and discharge of sediment to off-site areas.		
Material Excavation, Relocation,	Stockpiling of materials during excavation and relocation of		
and Stockpiling	soils can contribute to erosion and sedimentation. In		
	addition, fugitive dust from stockpiled material, vehicle		
	transport and site grading can be deposited in wetlands and		
	waterway.		
Landscaping Operations	Landscaping operations specifically associated with exposed		
	soils can contribute to erosion and sedimentation.		
	Hydroseeding, if not properly applied, can runoff to adjacent		
	wetlands and waterways.		

Table 3 – Potential Pollutants and Sources, other than Sediment to Stormwater Runoff			
Potential Source	Activities/Comments		
Staging Areas and Construction	Vehicle refueling, minor equipment maintenance, sanitary		
Vehicles	facilities and hazardous waste storage		
Materials Storage Area	General building materials, solvents, adhesives, paving		
	materials, paints, aggregates, trash, etc.		
Construction Activities	Construction, paving, curb/gutter installation, concrete		
	pouring/mortar/stucco		



3.5 Erosion and Sedimentation Control Best Management Practices

All construction activities will implement Best Management Practices (BMP's) in order to minimize overall site disturbance and impacts to the sites natural features. Please refer to the following sections for a detailed description of site specific BMP's. In addition, an Erosion and Sedimentation Control Plan is provided in the Site Plans.

3.6 Timetable and Construction Phasing

This section provides the Owner and Contractor with a suggested order of construction that shall minimize erosion and the transport of sediments. The individual objectives of the construction techniques described herein shall be considered an integral component of the project design intent of each project phase. The construction sequence is not intended to prescribe definitive construction methods and should not be interpreted as a construction specification document. However, the Contractor shall follow the general construction phase principles provided below:

- Protect and maintain existing vegetation wherever possible.
- Minimize the area of disturbance.
- To the extent possible, route unpolluted flows around disturbed areas.
- Install mitigation devices as early as possible.
- Minimize the time disturbed areas are left unstabilized.
- Maintain siltation control devices in proper condition.
- The contractor should use the suggested sequence and techniques as a general guide and modify the suggested methods and procedures as required to best suit seasonal, atmospheric, and site specific physical constraints for the purpose of minimizing the environmental impact of construction.

Demolition, Grubbing and Stripping of Limits of Construction Phase

- Install Temporary Erosion Control (TEC) devices as required to prevent sediment transport into resource areas.
- Place a ring of silt socks and/or haybales around stockpiles.
- Stabilize all exposed surfaces that will not be under immediate construction.
- Store and/or dispose all pavement and building demolition debris as indicated in accordance with all applicable local, state, and federal regulations.

Driveway Area Sub-Base Construction

- Install temporary culverts and diversion ditches and additional TEC devices as required by individual construction area constraints to direct potential runoff toward detention areas designated for the current construction phase.
- Compact gravel as work progresses to control erosion potential.
- Apply water to control air suspension of dust.
- Avoid creating an erosive condition due to over-watering.
- Install piped utility systems as required as work progresses, keeping all inlets sealed until all downstream drainage system components are functional.

Binder Construction

- Fine grade gravel base and install processed gravel to the design grades.
- Compact pavement base as work progresses.
- Install pavement binder coat starting from the downhill end of the site and work toward the top.



Finish Paving

- Repair and stabilize damaged side slopes.
- Clean inverts of drainage structures.
- Install final top coat of pavement.

Final Clean-up

- Clean inverts of culverts and catch basins.
- Remove sediment and debris from rip-rap outlet areas.
- Remove TEC devices only after permanent vegetation and erosion control has been fully established.

3.7 Site Stabilization

Grubbing Stripping and Grading

- Erosion control devices shall be in place as shown on the design plans before grading commences.
- Stripping shall be done in a manner, which will not concentrate runoff. If precipitation is expected, earthen berms shall be constructed around the area being stripped, with a silt sock, silt fence or haybale dike situated in an arc at the low point of the berm.
- If intense precipitation is anticipated, silt socks, haybales, dikes and /or silt fences shall be used as required to prevent erosion and sediment transport. The materials required shall be stored on site at all time.
- If water is required for soil compaction, it shall be added in a uniform manner that does not allow excess water to flow off the area being compacted.
- Dust shall be held at a minimum by sprinkling exposed soil with an appropriate amount of water.

Maintenance of Disturbed Surfaces

- Runoff shall be diverted from disturbed side slopes in both cut and fill.
- Mulching may be used for temporary stabilization.
- Silt sock, haybale or silt fences shall be set where required to trap products of erosion and shall be maintained on a continuing basis during the construction process.

Loaming and Seeding

- Loam shall not be placed unless it is to be seeded directly thereafter.
- All disturbed areas shall have a minimum of 4" of loam placed before seeded and mulched.
- Consideration shall be given to hydro-mulching, especially on slopes in excess of 3 to 1.
- Loamed and seeded slopes shall be protected from washout by mulching or other acceptable slope protection until vegetation begins to grow.

Stormwater Collection System Installation

- The Stormwater drainage system shall be installed from the downstream end up and in a manner which will not allow runoff from disturbed areas to enter pipes.
- Excavation for the drainage system shall not be left open when rainfall is expected overnight. If left open under other circumstances, pipe ends shall be closed by a staked board or by an equivalent method.
- All catch basin openings shall be covered by a silt bag between the grate and the frame or protected from sediment by silt fence surrounding the catch basin grate.



Completion of Paved Areas

- During the placement of sub-base and pavement, the entrance to the Stormwater drainage systems shall be sealed when rain is expected. When these entrances are closed, consideration must be given to the direction of run-off and measures shall be undertaken to minimize erosion and to provide for the collection of sediment.
- In some situations, it may be necessary to keep catch basins open.
- Appropriate arrangements shall be made downstream to remove all sediment deposition.

Stabilization of Surfaces

- Stabilization of surfaces includes the placement of pavement, rip-rap, wood bark mulch and the establishment of vegetated surfaces.
- Upon completion of construction, all surfaces shall be stabilized even though it is apparent that future construction efforts will cause their disturbance.
- Vegetated cover shall be established during the proper growing season and shall be enhanced by soil adjustment for proper pH, nutrients and moisture content.
- Surfaces that are disturbed by erosion processes or vandalism shall be stabilized as soon as possible.
- Areas where construction activities have permanently or temporarily ceased shall be stabilized within 14 days from the last construction activity, except when construction activity will resume within 21 days (e.g., the total time period that construction activity is temporarily ceased is less than 21 days).
- Hydro-mulching of grass surfaces is recommended, especially if seeding of the surfaces is required outside the normal growing season.
- Hay mulch is an effective method of temporarily stabilizing surfaces, but only if it is properly secured by branches, weighted snow fences or weighted chicken wire.

3.8 Temporary Structural Erosion Control Measures

Temporary erosion control measures serve to minimize construction-associated impacts to wetland resource and undisturbed areas. Please refer to the following sections for a description of temporary erosion control measures implemented as part of the project and this sample SWPPP.

3.8.1 Silt Socks, Haybales, and Silt Fencing

The siltation barriers will demarcate the limit of work, form a work envelope and provide additional assurance that construction equipment will not enter the adjacent wetlands or undisturbed portions of the site. All barriers will remain in place until disturbed areas are stabilized.

3.8.2 Temporary Stormwater Diversion Swale

A temporary diversion swale is an effective practice for temporarily diverting stormwater flows and to reduce stormwater runoff velocities during storm events. The swale channel can be installed before infrastructure construction begins at the site, or as needed throughout the construction process. The diversion swale should be routinely compacted or seeded to minimize the amount of exposed soil.

3.8.3 Dewatering Basins

Dewatering may be required during stormwater system, foundation construction and utility installation. Should the need for dewatering arise, groundwater will be pumped directly into a temporary settling basin, which will act as a sediment trap during construction. All temporary settling basins will be located within close proximity of daily work activities. Prior to discharge, all groundwater will be treated by means of the settling basin or acceptable substitute. Discharges from sediment basins will be free of visible floating, suspended and settleable solids that would impair the functions of a wetland or degrade the chemical



composition of the wetland resource area receiving ground or surface water flows and will be to the combined system.

3.8.4 Material Stockpiling Locations

Piping and trench excavate associated with the subsurface utility work will be contained with a single row of silt socks and/or haybales.

3.9 Permanent Structural Erosion Control Measures

Permanent erosion control measures serve to minimize post-construction impacts to wetland resource areas and undisturbed areas. Please refer to the Site Plans and Long-Term Operations and Maintenance Plan for a description of permanent erosion control measures implemented as part of the project and this SWPPP.

3.10 Good Housekeeping Best Management Practices

3.10.1 Street Sweeping

Dorothy Road in front of the project property shall be swept clean on a daily basis of any soils tracked onto it from the project site. All sweepings shall be disposed of off-site in accordance with all applicable laws and regulations.

3.10.2 Material Handling and Waste Management

Solid waste generation during the construction period will be primarily construction debris. The debris will include scrap lumber (used forming and shoring pallets and other shipping containers), waste packaging materials (plastic sheeting and cardboard), scrap cable and wire, roll-off containers (or dumpsters) and will be removed by a contract hauler to a properly licensed landfill. The roll-off containers will be covered with a properly secured tarp before the hauler exits the site. In addition to construction debris, the construction work force will generate some amount of household-type wastes (food packing, soft drink containers, and other paper). Trash containers for these wastes will be located around the site and will be emptied regularly so as to prevent wind-blown litter. This waste will also be removed by a contract hauler.

All hazardous waste material such as oil filters, petroleum products, paint and equipment maintenance fluids will be stored in structurally sound and sealed shipping containers in the hazardous-materials storage area and segregated from other non-waste materials. Secondary containment will be provided for all materials in the hazardous materials storage area and will consist of commercially available spill pallets. Additionally, all hazardous materials will be disposed of in accordance with federal, state and municipal regulations.

Two temporary sanitary facilities (portable toilets) will be provided at the site in the combined staging area. The toilets will be away from a concentrated flow path and traffic flow and will have collection pans underneath as secondary treatment. All sanitary waste will be collected from an approved party at a minimum of three times per week.

3.10.3 Building Material Staging Areas

Construction equipment and maintenance materials will be stored at the combined staging area and materials storage areas. Silt fence will be installed around the perimeter to designate the staging and materials storage area. A watertight shipping container will be used to store hand tools, small parts and other construction materials.

Non-hazardous building materials such as packaging material (wood, plastic and glass) and construction scrap material (brick, wood, steel, metal scraps, and pine cuttings) will be stored in a separate covered storage facility adjacent to other stored materials. All hazardous-waste materials such as oil filters,



petroleum products, paint and equipment maintenance fluids will be stored in structurally sound and sealed containers under cover within the hazardous materials storage area.

Large items such as framing materials and stockpiled lumber will be stored in the open storage area. Such materials will be elevated on wood blocks to minimize contact with runoff.

The combined storage areas are expected to remain clean, well-organized and equipped with ample cleaning supplies as appropriate for the materials being stored. Perimeter controls such as containment structures, covers and liners will be repaired or replaced as necessary to maintain proper function.

3.10.4 Designated Washout Areas

Designated temporary, below-ground concrete washout areas will be constructed, as required, to minimize the pollution potential associated with concrete, paint, stucco, mixers etc. Signs will, if required, be posted marking the location of the washout area to ensure that concrete equipment operators use the proper facility. Concrete pours will not be conducted during or before an anticipated precipitation event. All excess concrete and concrete washout slurries from the concrete mixer trucks and chutes will be discharged to the washout area or hauled off-site for disposal.

3.10.5 Equipment/Vehicle Maintenance and Fueling Areas

Several types of vehicles and equipment will be used on-site throughout the project including graders, scrapers, excavators, loaders, paving equipment, rollers, trucks and trailers, backhoes and forklifts. All major equipment/vehicle fueling and maintenance will be performed off-site. A small, 20-gallon pickup bed fuel tank will be kept on-site in the combined staging area. When vehicle fueling must occur on-site, the fueling activity will occur in the staging area. Only minor equipment maintenance will occur on-site. Vehicular refueling or maintenance shall not be allowed within the Adjacent Upland Resource Area (AURA) or in any protected wetland resource areas as defined by the Town of Arlington Regulations for Wetland Protection. All equipment fluids generated from maintenance activities will be disposed of into designated drums stored on spill pallets. Absorbent, spill-cleanup materials and spill kits will be available at the combined staging and materials storage area. Drip pans will be placed under all equipment receiving maintenance and vehicles and equipment parked overnight.

3.10.6 Equipment/Vehicle Wash down Area

All equipment and vehicle washing will be performed off-site.

3.10.7 Spill Prevention Plan

A spill containment kit will be kept on-site in the Contractor's trailer and/or the designated staging area throughout the duration of construction. Should there be an accidental release of petroleum product into a resource area, the appropriate agencies will be immediately notified.

3.10.8 Inspections

Maintenance of existing and proposed BMP's to address stormwater management facilities during construction is an on-going process. The purpose of the inspections is to observe all sources of stormwater or non-stormwater discharge as identified in the SWPPP as well as the status of the receiving waters and fulfill the requirements of the Order of Conditions. The following sections describe the appropriate inspection measures to adequately implement the project's SWPPP. A blank inspection form is provided at the end of this section. Completed inspection forms are to be maintained on site.

Inspection Personnel

The owner's appointed representative will be responsible for performing regular inspections of erosion controls and ordering repairs as necessary.



Inspection Frequency

Inspections will be performed by qualified personnel once every 7 days, in accordance with the CGP. The inspections must be documented on the inspection form provided at the end of this section, and completed forms will be provided to the on-site supervisor and maintained at the Owner's office throughout the entire duration of construction.

Inspection Reporting

Each inspection report will summarize the scope of the inspection, name(s) and qualifications of personnel making the inspection, and major observations relating to the implementation of the SWPPP, including compliance and non-compliance items. Completed inspection reports will remain with the completed SWPPP on site.

3.10.9 Amendment Requirements

The final SWPPP is intended to be a working document that is utilized regularly on the construction site, and provides guidance to the Contractor. It must reflect changes made to the originally proposed plan and will be updated to include project specific activities and ensure that they are in compliance with the NPDES General Permit and state and local laws and regulations. It should be amended whenever there is a change in design, construction, operation or maintenance that affects discharge of pollutants. The following items should be addressed should an amendment to the SWPPP occur:

- Dates of certain construction activities such as major grading activities, clearing and initiation of and completion of stabilization measures should be recorded.
- Future amendments to the SWPPP will be recorded as required. As this SWPPP is amended, all amendments will be kept on site and made part of the SWPPP.
- Upon completion of site stabilization (completed as designed and/or 70% background vegetative cover), it can be documented and marked on the plans. Inspections are no longer required at this time.
- Inspections often identify areas not included in the original SWPPP, which will require the SWPPP to be amended. These updates should be made within seven days of being recognized by the inspector.

3.11 SWPPP Inspection and Maintenance Report

The following form is an example to be used for SWPPP Inspection Reporting.



Stormwater Construction Site Inspection and Maintenance Report

TO BE COMPLETED AT LEAST EVERY 7 DAYS. AFTER SITE STABILIZATION, TO BE COMPLETED AT LEAST ONCE PER MONTH FOR THREE YEARS OR UNTIL A NOTICE OF TERMINATION IS FILED (IF APPLICABLE).

General Information			
Project Name	Thorndike Place		
NPDES Tracking No.		Location	Dorothy Road
(if applicable)			Arlington, MA
Date of Inspection		Start/End Time	
Inspector's Name(s)			
Inspector's Title(s)			
Inspector's Contact Information			
Inspector's Qualifications			
Describe present phase of construction			
Type of Inspection:RegularPre-storm event	During storm event	Post-storm e	vent
Weather Information			
Has there been a storm event since the last inspection? UYes No			
If yes, provide:			
Storm Start Date & Time: S	torm Duration (hrs):	Approximate	Amount of Precipitation (in):
Weather at time of this inspection:	?		
□ Clear □Cloudy □ Rain □ Sleet □ Fog □ Snowing □ High Winds □ Other: Temperature:			
Have any discharges occurred since the last inspection? Yes No If yes, describe:			
Are there any discharges at the time of inspection? □Yes □No If yes, describe:			

Site-specific BMPs

- Number the structural and non-structural BMPs identified in your SWPPP on your site map and list them below (add as many BMPs as necessary). Carry a copy of the numbered site map with you during your inspections. This list will ensure that you are inspecting all required BMPs at your site.
- Describe corrective actions initiated, date completed, and note the person that completed the work in the Corrective *Action Log.*

	BMP	BMP	BMP	Corrective Action Needed and Notes
		Installed?	Maintenance	Action required by whom and when
			Required ?	
1	Catch Basin Protection	□Yes □No	□Yes □No	

	BMP	BMP Installed?	BMP Maintenance Required?	Corrective Action Needed and Notes Action required by whom and when
2	Haybale & Silt Fencing	□Yes □No	□Yes □No	
3	Straw Wattles	□Yes □No	□Yes □No	
4	Construction Entrance	□Yes □No	□Yes □No	
5	Sediment Basins	□Yes □No	□Yes □No	
6	Dewatering Pit	□Yes □No	□Yes □No	
7		□Yes □No	□Yes □No	

Overall Site Issues

Below are some general site issues that should be assessed during inspections. Customize this list as needed for conditions at your site.

	BMP/activity	Implemented?	Maintenance Required?	Corrective Action Needed and Notes Action required by whom and when
1	Are all slopes and disturbed areas not actively being worked properly stabilized?	□Yes □No	□Yes □No	
2	Are natural resource areas (e.g., streams, wetlands, mature trees, etc.) protected with barriers or similar BMPs?	□Yes □No	□Yes □No	
3	Are perimeter controls and sediment barriers adequately installed	□Yes □No	□Yes □No	

	BMP/activity	Implemented?	Maintenance Required?	Corrective Action Needed and Notes Action required by whom and when
	(keyed into substrate) and maintained?			
4	Are discharge points and receiving waters free of any sediment deposits?	□Yes □No	□Yes □No	
5	Are storm drain inlets properly protected?	□Yes □No	□Yes □No	
6	Is the construction exit preventing sediment from being tracked into the street?	□Yes □No	□Yes □No	
7	Is trash/litter from work areas collected and placed in covered dumpsters?	□Yes □No	□Yes □No	
8	Are washout facilities (e.g., paint, stucco, concrete) available, clearly marked, and maintained?	□Yes □No	□Yes □No	
9	Are vehicle and equipment fueling, cleaning, and maintenance areas free of spills, leaks, or any other deleterious material?	□Yes □No	□Yes □No	Vehicle Maintenance not allowed on site
10	Are materials that are potential stormwater contaminants stored inside or under cover?	□Yes □No	□Yes □No	
11	Are non-stormwater discharges (e.g., wash water, dewatering) properly controlled?	□Yes □No	Tyes No	
12	(Other)	Yes No	□Yes □No	

Non-Compliance

Describe any incidents of non-compliance not described above:

CERTIFICATION STATEMENT

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

Print name and title:				
Signature:	Date:			
Print name and title:				
Signature:	Date:			

SECTION 4.0

LONG-TERM POLLUTION PREVENTION & OPERATION AND MAINTENANCE PLAN

4.0 LONG-TERM POLLUTION PREVENTION & OPERATION AND MAINTENANCE PLAN

As required by Standard #4 of the Stormwater Management Policy, this Long-Term Pollution Prevention Plan has been developed for source control and pollution prevention at the site after construction.

MAINTENANCE RESPONSIBILITY

Ensuring that the provisions of the Long-Term Pollution Prevention Plan are followed will be the responsibility of The Applicant, Arlington Land Realty, LLC.

GOOD HOUSEKEEPING PRACTICES

The site to be kept clean of trash and debris at all times. Trash, junk, etc. is not to be left outside.

VEHICLE WASHING CONTROLS

The following BMP's, or equivalent measures, methods or practices are required if you are engaged in vehicle washing and/or steam cleaning:

It is allowable to rinse down the body or a vehicle, including the bed of a truck, with just water without doing any wash water control BMP's.

If you wash (with mild detergents) on an area that infiltrates water, such as gravel, grass, or loose soil, it is acceptable to let the wash water infiltrate as long as you only wash the body of vehicles.

However, if you wash on a paved area and use detergents or other cleansers, or if you wash/rinse the engine compartment or the underside of vehicles, you must take the vehicles to a commercial vehicle wash.

REQUIREMENTS FOR ROUTINE INSPECTIONS AND MAINTENANCE OF STORMWATER BMPs

All stormwater BMPs are to be inspected and maintain as follows;

Haybales, Silt Fence, and other temporary measures

The temporary erosion control measures will be installed up gradient of any wetland resource area where any disturbance or alteration might otherwise allow for erosion or sedimentation. They will be regularly inspected to ensure that they are functioning adequately. Additional supplies of these temporary measures will be stockpiled on site for any immediate needs or routine replacement.

Deep Sump Hooded Catch Basins

Regular maintenance is essential. Catch basins remain effective at removing pollutants only if they are cleaned out frequently. Inspect or clean basins at least four times per year and at the end of the foliage and snow removal seasons. Sediments must also be removed four times per year or whenever the depth of the deposits in the catch basin sump is greater than or equal to one half the depth from the bottom of the invert of the lowest pipe in the basin.

Water Quality Treatment Units

The water quality treatment structures require periodic inspection and cleaning to maintain operation and function. Owners should have these units inspected on a semi-annual basis and after periods of intense precipitation. Inspections can be done by using a clear Plexiglas tube ("sludge judge") to extract a water column sample. When sediment accumulation reaches 15% of storage capacity, cleaning of the unit is required.

These water quality structures must and will be checked and cleaned immediately after petroleum spills; contact appropriate regulatory agencies.

Maintenance of these units should be done by a vacuum truck that will remove the water, sediment, debris, floating hydrocarbons and other materials in unit. Proper cleaning and disposal of the removed materials and liquid must be followed.

Underground Infiltration System

Maintenance is required for the proper operation of the underground infiltration system. Infiltration systems are prone to failure due to clogging if the upstream water quality units are not maintained. The use of pretreatment BMPs will minimize failure and maintenance requirements.

After construction, the infiltration system shall be inspected after every major storm for the first few months to ensure proper stabilization and function. Water levels in the access ports shall be recorded over several days to check the drainage of the systems. It is recommended that a log book be maintained showing the depth of water in the detention/infiltration systems at each observation in order to determine the rate at which the system dewaters after runoff producing storm events. Once the performance characteristics of the detention/infiltration have been verified, the monitoring schedule can be reduced to an annual basis, unless the performance data suggests that a more frequent schedule is required.

Preventive maintenance on the infiltration system shall be performed at least twice a year, and sediment shall be removed from any and all pretreatment and collection structures. Sediment shall be removed when deposits approach within six inches of the invert heights of connecting pipes between unit rows, or in sumped inlet structures. Ponded water inside the systems (as visible from the access ports) that remains after several days most likely indicates that the bottom of the system is clogged and will require cleaning or replacement.

The system is designed with a defined top portal area at the "down-flow" end of the chamber that can be cut out to accept up to a 10-inch diameter riser pipe. The 10-inch riser can be used as an observation well and as access for a vacuum truck tube for use in removing sediment. The "down flow" ends of the units have end walls that are closed on the bottom. The closed bottom functions like a coffer dam, with most of the sediment depositing prior to flowing into the next chamber, facilitating its removal through the riser pipe, which is positioned directly above this area.

Pipe Outlet Protection

The outlet protection should be checked at least annually and after every major storm. If the rip-rap has been displaced, undermined or damaged, it should be repaired immediately. The channel immediately below the outlet should be checked to see that erosion is not occurring. The downstream channel should be kept clear of obstructions such as fallen trees, debris, and sediment that could change flow patterns and/or tailwater depths on the pipes. Repairs must be carried out immediately to avoid additional damage to the outlet protection apron.

PROVISIONS FOR MAINTENANCE OF LAWNS, GARDENS AND OTHER LANDSCAPE AREAS

Suggested Maintenance Operations

A. Trees and Shrubs

Disease and Pest Management - Prevention of disease or infestation is the first step of Pest Management. A plant that is in overall good health is far less susceptible to disease. Good general landscape maintenance can reduce problems from disease.

Inspections of plant materials for signs of disease or infestation are to be performed monthly by the Landscape Maintenance Contractor's Certified Arborist. This is a critical step for early diagnosis. Trees and Shrubs that have been diagnosed to have a plant disease or an infestation of insect pests are to be treated promptly with an appropriate material by a licensed applicator.

Fertilization - Trees and shrubs live outside their natural environment and should be given proper care to maintain health and vigor. Fertilizing trees and shrubs provides the plants with nutrients needed to resist insect attack, to resist drought and to grow thicker foliage. Fertilizing of new and old trees may be done in one of three ways, in either the early spring or the late fall.

• Systemic Injection of new and existing trees on trees 2 inches or greater in diameter. You must be licensed to apply this method.

- Soil Injection a liquid fertilizer with a product such as Arbor Green or Rapid Grow injected into the soil under the drip zone of a tree or shrub. Material must be used according to manufacturers' specifications to be effective. Outside contracting is recommended.
- Punch Bar Method a dry fertilizer such as 10-10-10, may be used by punched holes in the drip zone of the tree 12-18" deep, two feet apart around the circumference, to the edge of the drip line. Three pounds of fertilizer should be used per diameter inch for trees with trunks six inches or more in diameter.
- Fertilizer of shrubs use a fertilizer such as 10-10-10, broadcast over the planting area according to the manufacturers' rate and water in.
- All fertilization must be noted on daily maintenance log.

Watering - Trees and Shrubs will need supplemental watering to remain in vigorous health. All new plants need to be watered once a week in cool weather, twice a week during warm weather, and up to three times in a week during periods of extreme heat and drought. Trees and shrubs should be watered in such a manner as to totally saturate the soil in the root zone area. Over-watering or constant saturation of the soil must be avoided as this could lead to root rot and other disease problems. The use of a soil moisture meter can help you monitor the soil's water intake.

Plant Replacement - Unhealthy plants that may cause widespread infestation of other nearby plants shall be immediately removed from the site. Any vegetation removed from the site must be recorded and submitted with the daily maintenance log. The area shall be treated to prevent further infestation. The plant shall then be replaced with a healthy specimen of the same species and size. This work shall have a pre-established budget allowance for the year.

A spring inspection of all plant materials shall be performed to identify those plant materials that are not in vigorously healthy condition. Unhealthy plant materials shall be evaluated. If the problem is determined to be minor the plant material shall be given appropriate restorative care in accordance with this maintenance guideline until it is restored to a vigorously healthy condition. Unhealthy plant materials that do not respond to restorative care or are determined to be beyond saving shall be replaced with a healthy specimen of the same species and size. In the case of the necessity of replacing extremely large plant materials the Landscape Architect shall determine the size of the replacement plant.

Pruning - Proper pruning is the selective removal of branches without changing the plant's natural appearance, or habit of growth. All tree pruning is to be performed by a licensed Arborist. All branches that are dead, broken, scared or crossing should be removed. All cuts should be made at the collar and not cut flush with the base.

Pruning on the site shall be done for the following purposes;

- To maintain or reduce the size of a tree or shrub
- To remove dead, diseased or damaged branches
- To rejuvenate old shrubs and encourage new growth
- To stimulate future flower and fruit development
- To maximize the visibility of twig color
- To prevent damage and reduce hazards to people and properties

All shrubs are recommended to be pruned on an annual basis to prevent the shrub from becoming overgrown and eliminate the need for drastic pruning. There are several types of pruning for deciduous shrubs. Hand snips should be used to maintain a more natural look or hand shears can be used for a more formal appearance.

Winter Protection - All trees and shrubs are to be watered, fertilized, and mulched before the first frost. All stakes should be checked and ties adjusted. Damaged branches should be pruned.

Broadleaf and Coniferous Evergreen plant materials are to be sprayed with an anti-desiccant product to prevent winter burn. The application shall be repeated during a suitable mid-winter thaw.

Shrubs located in areas likely to be piled with snow during snow removal (but not designated as Snow Storage Areas) shall be marked by six-foot high poles with bright green banner flags. Stockpiles of snow are not to be located in these areas due to potential damage to the plant materials from both the weight of the snow and the snow melting chemicals.

At the fall landscape maintenance conference parameters will be discussed between the Landscape Maintenance Contractor and the snow removal contractor to assure minimal damage and loss of landscape amenities during the winter season.

Seasonal Clean Up - A thorough spring cleanup is to be performed. This includes the removal and replacement of dead or unhealthy plant materials and the cleanup of plant debris and any general debris that has accumulated over the winter season. Mulch is to be lightly raked to clean debris from the surface without removing any mulch. Twigs and debris are to be removed from the planting beds throughout the growing season.

Mulching - Planting beds shall be mulched with a treated shredded hardwood mulch free from dirt, debris, and insects. A sample of this mulch shall be given to the Owner for approval prior to installation.

Maintain a 2-3" maximum depth and keep free of weeds either by hand weeding or by the use of a pre-emergent weed control such as Treflan or Serfian. Seasonal re-mulching shall occur as necessary in the spring and the fall to maintain this minimum depth. When new mulch is added to the planting bed it shall be spread to create a total depth of no more than three inches. Edges should be maintained in a cleanly edged fashion.

Mulch shall not be placed directly against the trunk of any tree or shrub.

B. Groundcover and Perennials

Disease and Pest Management – Pesticides and herbicides should be applied only as problems occur, with the proper chemical applied only by a trained professional or in the case of pesticide, a Certified Pesticide Applicator. Plants should be monitored weekly and treated accordingly.

Fertilizer – The health of the plants can be maintained or improved, and their growth encouraged by an application of complete fertilizer. Apply a fertilizer such as 4-12-4 as growth becomes apparent and before mulching. Apply to all groundcover and perennial planting areas by hand and avoid letting the fertilizer come in contact with the foliage, or use a liquid fertilizer and apply by soaking the soil. Apply according to the manufacturers' specifications.

Fertilization shall stop at the end of July.

Water – Groundcovers and Perennials will need supplemental watering in order to become established, healthy plants. All new plants need to be watered once a week in cool weather, twice a week during warm weather, and up to three times in a week during periods of extreme heat and drought. Until established, groundcovers and perennials should be watered in such a manner as to totally saturate the soil in the root zone area, to a depth of 6 inches. Once established, perennials shall continue to be watered as necessary to maintain them in a vigorous healthy condition. Over-watering or constant saturation of the soil must be avoided as this could lead to root rot and other disease problems. The use of a soil moisture meter can help you monitor the soil's water intake.

On-site water shall be furnished by the Owner. Hose and other watering equipment shall be furnished by the Landscape Maintenance Contractor.

Replacement – Any unhealthy plant/s that may cause widespread infestation of other nearby plants shall be immediately removed from the site. Any vegetation removed from the site must be recorded and submitted with the landscape maintenance log. The area shall be treated to prevent further infestation. The plant/s shall then be replaced with healthy specimen/s of the same species and size. Old Forge shall have a pre-established budget allowance for this type of replacement, each year.

Plant material that is damaged as a result of other landscape maintenance activities, such as mowing, shall be replaced with healthy specimens of the same species and size, at no additional cost to the owner.

Deadheading – Perennials shall be checked on a weekly basis and dead-headed once flowers have faded or as necessary based on plant type and duration of flower. Spent flowers can be pinched off with the thumb and forefinger. Continue to remove all faded flowers until Fall. All associated debris shall be removed from site daily.

Staking – Upright-growing perennials need support especially when in flower. Use of bamboo stakes, galvanized wire hoops or mesh may be necessary for their support. Supports should be put in place before they have become too difficult to handle. The supports should not be taller than the mature height of the perennial plant.

Division of Perennials – Two or three-year-old perennials are easily divided in the spring if more plants are needed. To divide, cut out the entire section of plant to be divided, including roots. The larger divisions (those with three or more shoots), can be set out immediately in their permanent location, where they can be expected to bloom the same season. Smaller divisions are best planted in an out-of-the-way planting bed until the following autumn or spring, when they can be moved to their permanent location.

Weeding – All planting beds should be kept weed-free. Weed either by hand or with a pre-emergent herbicide such as Treflen used according to manufacturers' specifications. Manual weeding is to be used in combination with the use of spot applications of herbicides. Both live and dead weeds are to be pulled and removed from the site.

All herbicide applications shall be documented in the Landscape Maintenance Log. The actual product label or the manufacturer's product specification sheet for the specific product shall also be included in the Log.

Only personnel with appropriate applicator licenses shall supervise and/or perform the application of pesticide products requiring a license.

Winterizing – Perennial gardens should be cleaned-up when growth ceases in the fall. Remove foliage of plants that normally die down to the ground. Divide and replant over-grown clumps.

C. Lawn Areas - Turf Systems

Mowing – Proper mowing is an integral part of any good turf maintenance program. Without it, the finest in fertilization, watering and other vital maintenance practices would be completely ineffective. Proper mowing will help control dicot weeds; help the turf survive during periods of extreme heat, and gain strength and vigor to resist disease and other infestations.

Mowing height – The proper mowing height will vary somewhat according to the type of grass. The most common type of seed & sod lawns contain a mixture of bluegrass, fine fescue and perennial rye, which should be mowed at 2-3 inches.

Mowing frequency – The basic rule of thumb for mowing frequency is to never remove more than 1/3 of the grass blade in one mowing. Example: if you want to mow your turf at 2 inches, you should cut it when it reaches 3 inches. Removing more than $\frac{1}{2}$ of the grass plant at a time can put the plant into shock, thus making it more susceptible to stress disease and weed infestation.

Mowing frequency will vary with the growing season and should be set by the plant height and not a set date. It will often be necessary to mow twice a week during periods of surge growth to help maintain plant health and color. Mowing should be cut back during periods of stress.

Grass clippings should be removed whenever they are thick enough to layer the turf. The return of clippings to the soil actually adds nutrients and helps retain moisture. Heavily clumped grass clippings are a sign of infrequent mowing, calling for an adjustment in the mowing schedule.

When mowing any area, try to alternate mowing patterns. This tends to keep grass blades more erect and assures an even cut. A dull mower will cause color loss due to tearing of the turf plant, and since mowing will ultimately determine the appearance of any turf area there is an absolute necessity for a clean sharp cut.

Weed & Pest Control and Fertilizing- In order to maintain turf grass health, vigor color, and nutrients, fertilizer must be added to the soil. Recommendations for fertilization of lawn areas are as follows; fertilize at the rate of one (1) pound of nitrogen per thousand square feet, per year is optimum. Fertilizer should be a balanced slow release, sulfur coated type fertilizer.

Weed Control - All turf areas will require some weed control, for both weed grasses and dicot weeds. Weeds should be treated at the appropriate time and with a material labeled for the target weed. Please refer to the fertilizer weed and pest schedule for timing.

Pest Control - All turf areas will require some pest control. Pests should be treated at the appropriate time with a material labeled for the target pest. Please refer to the fertilizer, weed and pest schedule for timing.

Lime - A common cause for an unhealthy lawn is acidic soil. When the pH is below the neutral range (between 6-7) vital plant nutrients become fixed in the soil and cannot be absorbed by the grass plant. Lime corrects an acid soil condition, supplies calcium for plant growth and improves air and water circulation. Limestone applied at the rate of 50 lbs. per thousand square feet will adjust the soil pH one point over a period of 6-9 months.

D. Fertilizer, Weed & Pest Control Schedule – Turf Systems

<u>Spring -</u> (April)	Fertilize one (1) pound of nitrogen per 1,000 square feet Pre-emergent weed grass control Broadleaf weed control
Late Spring - (June)	Fertilize one (1) pound of nitrogen per 1,000 square feet Pre-emergent weed grass control Broadleaf weed control Insect Control (if needed)
<u>*Summer</u> - (August)	Fertilize one (1) pound of nitrogen per 1,000 square feet Broadleaf weed control (if needed) Insect Control (if needed)
<u>Fall</u> - (September)	Fertilize one (1) pound of nitrogen per 1,000 square feet

*Omit if area is not to be irrigated

Lawn Maintenance Task Schedule

MARCH (Weather permitting)

- Clean up winter debris, sand, leaves, trash etc.
- Re-edge mulch beds, maintain at 2-3" maximum.
- Fertilize plants
- Aerate and thatch turf (conditions permitting)

APRIL

- Reseed or sod all areas needing attention.
- Fertilize and weed control
- Lime
- Start mowing when grass reaches 2-1/2", mow to 2"

MAY

- Mow turf to 2-2-1/2"
- Weed as necessary.
- Check for disease and pest problems in both turf and plants.

JUNE

- Mow turf to 2-1/2" 3"
- Fertilize and weed control.
- Weed
- Check for disease and pest problems in both turf and plants, treat as necessary.

PROVISIONS FOR SOLID WASTE MANAGEMENT (SITE TRASH)

Trash will be placed in on-site dumpsters and the Owner will make provisions for its regular and timely removal.

SNOW DISPOSAL AND PLOWING PLANS

The purpose of the snow and snowmelt management plan is to provide guidelines regarding snow disposal site selection, site preparation and maintenance that are acceptable to the Department of Environmental Protection. For the areas that require snow removal, snow storage onsite will largely be accomplished by using pervious areas along the shoulder of the roadway and development as windrowed by plows.

- Avoid dumping of snow into any water body, including rivers, ponds, or wetlands. In addition to water quality impacts and flooding, snow disposed of in open water can cause navigational hazards when it freezes into ice blocks.
- Avoid disposing of snow on top of storm drain catch basins or in stormwater basins. Snow combined with sand and debris may block a storm drainage system, causing localized flooding. A high volume of sand, sediment, and litter released from melting snow also may be quickly transported through the system into surface water.
- In significant storm events, the melting or off-site trucking of snow may be implemented. These activities shall be conducted in accordance with all local, state and federal regulations.
- Snow shall be removed from the areas around on-site fire-hydrants to maintain emergency access to hydrants at all times. Removable flags or markers should be placed on hydrants to allow snow removal crews to more easily locate hydrants and not damage them with plows or other snow removal equipment.

WINTER ROAD SALT AND/OR SAND USE AND STORAGE RESTRICTIONS

The applicant will be responsible for sanding and salting the site. No storage on site.

STREET SWEEPING SCHEDULES

There are three types of sweepers: Mechanical, Regenerative Air, and Vacuum Filter.

- 1) Mechanical: Mechanical sweepers use brooms or rotary brushes to scour the pavement.
- 2) Regenerative Air: These sweepers blow air onto the road or parking lot surface, causing fines to rise where they are vacuumed.
- 3) Vacuum filter: These sweepers remove fines along roads. Two general types of vacuum filter sweepers are available wet and dry. The dry type uses a broom in combination with the vacuum. The wet type uses water for dust suppression

Regardless of the type chosen, the efficiency of street sweeping is increased when sweepers are operated in tandem.

This project has not included street sweeping as part of the TSS removal calculations. However, it is recommended that street sweeping of the parking areas occur four times a year, including once after the spring snow melt.

Reuse and Disposal of Street Sweepings

Once removed from paved surfaces, the sweepings must be handled and disposed of properly. Mass DEP's Bureau of Waste Prevention has issued a written policy regarding the reuse and disposal of street sweepings. These sweepings are regulated as a solid waste, and can be used in three ways:

- In one of the ways already approved by Mass DEP (e.g., daily cover in a landfill, additive to compost, fill in a public way)
- If approved under a Beneficial Use Determination
- Disposed in a landfill

TRAINING OF STAFF OR PERSONNEL INVOLVED WITH IMPLEMENTING LONG-TERM POLLUTION PREVENTION PLAN

The Long-Term Pollution Prevention Plan is to be implemented by property owner of the site. Trained and, if required, licensed Professionals are to be hired by the owner as applicable to implement the Long-Term Pollution Prevention Plan.

LIST OF EMERGENCY CONTACTS FOR IMPLEMENTING LONG-TERM POLLUTION PREVENTION PLAN

The applicant will be required to implement the Long-Term Pollution Prevention Plan and will create and maintain a list of emergency contacts.

POST CONSTRUCTION PHASE INSPECTION SCHEDULE AND EVALUATION CHECKLIST

Inspection Date	Inspector	BMP Inspected	Inspection Frequency Requirement s	Comments	Recommendation	Follow-up Inspection Required (yes/no)
		Catch Basin	Four times a year			
		Water Quality Units	Four times a year			
		Infiltration System	Twice a year			
		Pipe Outlet Protection	Once a year			

- 1. Refer to the Massachusetts Stormwater Handbook Volume Two: Stormwater Technical Handbook (February 2008) for recommendations regarding frequency for inspections and maintenance of specific BMP's
- 2. Inspections to be conducted by a qualified professional such as an environmental scientist or civil engineer.
- 3. Limited or no use of sodium chloride salts, fertilizers or pesticides recommended.
- 4. <u>Other Notes</u>: (Include deviations from Conservation Commission Approvals, Planning Board Approvals and Approved Plans)

SECTION 5.0

HYDROLOGY CALCULATIONS
5.01 EXISTING WATERSHED PLAN



5.02 EXISTING HYDROLOGY CALCULATIONS (HYDROCADTM PRINTOUTS)



2340700-FX	dike Place - Ple-Development
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Area Listing (all nodes)	

Area (sq-ft)	CN	Description (subcatchment-numbers)
925	98	Paved parking, HSG C (2S)
157,761	70	Woods, Good, HSG C (1S, 2S)
158,686	70	TOTAL AREA

Thorndike Place - Pre-Development

Thorndike Place - Pre-Development

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Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
0	HSG A	
0	HSG B	
158,686	HSG C	1S, 2S
0	HSG D	
0	Other	
158.686		TOTAL AREA

				Thorr	ndike Place ·	Pre-Developm	ient
40700-EX epared by BS(droCAD® 10.00-2	C Group 22 s/n 00904 (© 2018 HydroCA	D Software Solu	itions LLC		Printed 8/24/20 Pag	021 <u>le 4</u>
		Ground	Covers (all r	nodes)			
HSG-A	HSG-B	HSG-C	HSG-D	Other	Total	Ground	Subcatchment
(sq-ft)	(sq-ft)	(sq-ft)	(sq-ft)	(sq-ft)	(sq-ft)	Cover	Numbers
0	0	925	0	0	925	Paved parking	2 S
0	0	157,761	0	0	157,761	Woods, Good	1
							S,
							2
							S
0	0	158.686	0	0	158.686	TOTAL AREA	

2340700-EX Prepared by BSC Group	Thorndike Place Type III 24-hr 2-Y	- Pre-Development <i>'ear Rainfall=3.64"</i> Printed 8/24/2021
HydroCAD® 10.00-22 s/n 00904 © 2018 H	ydroCAD Software Solutions LLC	Page 5
Time span=0. Runoff by SCS Reach routing by Stor-Ind-	00-24.00 hrs, dt=0.01 hrs, 2401 points TR-20 method, UH=SCS, Weighted-CN +Trans method - Pond routing by Stor-Ind me	ethod
Subcatchment 1S: Flow to Wetlands	Runoff Area=151,732 sf 0.00% Impervious Flow Length=310' Tc=17.5 min CN=70 Rur	Runoff Depth>1.09" noff=2.9 cfs 13,786 cf
Subcatchment 2S: Flow to Street	Runoff Area=6,954 sf 13.30% Impervious Flow Length=95' Tc=6.0 min CN=74 F	Runoff Depth>1.34" Runoff=0.2 cfs 774 cf
Link 1L: Towards Wetlands	Infl Prim	low=2.9 cfs 13,786 cf ary=2.9 cfs 13,786 cf
Link 2L: Towards Street	Ρ	Inflow=0.2 cfs 774 cf rimary=0.2 cfs 774 cf
Link 100L: Total Flows	Infl Prim	low=3.1 cfs 14,560 cf ary=3.1 cfs 14,560 cf

 Total Runoff Area = 158,686 sf
 Runoff Volume = 14,560 cf
 Average Runoff Depth = 1.10"

 99.42%
 Pervious = 157,761 sf
 0.58% Impervious = 925 sf

2340700-EX Prepared by BSC Group <u>HydroCAD® 10.00-22 s/n 00904 © 2018 HydroCAD</u>	Thorndike Place - Pre-Development <i>Type III 24-hr 2-Year Rainfall=3.64"</i> Printed 8/24/2021 Software Solutions LLC Page 6
Summary for Subcate	chment 1S: Flow to Wetlands
Runoff = 2.9 cfs @ 12.27 hrs, Volu	me= 13,786 cf, Depth> 1.09"
Runoff by SCS TR-20 method, UH=SCS, Weight Type III 24-hr 2-Year Rainfall=3.64"	ed-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Area (sf) CN Description	
151,732 70 Woods, Good, HSG C	
151,732 100.00% Pervious Area	1
Tc Length Slope Velocity Capacity (min) (feet) (ft/ft) (ft/sec) (cfs)	Description
11.4 50 0.0240 0.07	Sheet Flow, A to B
6.1 260 0.0200 0.71	Shallow Concentrated Flow, B to C Woodland Kv= 5.0 fps
17.5 310 Total	
Subcatchment Hydrog	1S: Flow to Wetlands
Type III 24-hr 2-Year Rainfall=3.64" Runoff Area=151,732 sf Runoff Volume=13,786 cf Runoff Depth>1.09" Flow Length=310' Tc=17.5 min CN=70	9 cfs
0 1 2 3 4 5 6 7 8 9 10 11 Time	12 13 14 15 16 17 18 19 20 21 22 23 24 (hours)

	Thorndike Place - Pre-Development
2340700-EX	Type III 24-hr 2-Year Rainfall=3.64"
Prepared by BSC Group	Printed 8/24/2021
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Summary for Subcatchment 2S: Flow to Street

= 0.2 cfs @ 12.09 hrs, Volume= 774 cf, Depth> 1.34"

Runoff

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs Type III 24-hr 2-Year Rainfall=3.64"

_	A	rea (sf)	CN	Description		
		6,029	70	Woods, Go	od, HSG C	
_		925	98	Paved park	ing, HSG C	
		6,954	74	Weighted A	verage	
		6,029		86.70% Per	rvious Area	
		925		13.30% Imp	pervious Are	ea
	Tc	Length	Slope	e Velocity	Capacity	Description
_	(min)	(feet)	(ft/ft	t) (ft/sec)	(cfs)	
	3.5	20	0.0750	0.10		Sheet Flow, A to B
						Woods: Light underbrush n= 0.400 P2= 3.23"
	1.8	75	0.020	0 0.71		Shallow Concentrated Flow, B to C
_						Woodland Kv= 5.0 fps
	53	95	Total	Increased t	o minimum	$T_{c} = 6.0 \text{ min}$

Subcatchment 2S: Flow to Street



	Thorndike Place - Pre-Development
2340700-EX	Type III 24-hr 2-Year Rainfall=3.64"
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Summary for Link 1L: Towards Wetlands

Inflow Area	a =	151,732 sf,	0.00% Impervious,	Inflow Depth > 1	.09"	for 2-Year event
Inflow	=	2.9 cfs @	12.27 hrs, Volume=	13,786 cf		
Primary	=	2.9 cfs @	12.27 hrs, Volume=	13,786 cf,	, Atter	n= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link 1L: Towards Wetlands



	Thorndike Place - Pre-Development
2340700-EX	Type III 24-hr 2-Year Rainfall=3.64"
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Summary for Link 2L: Towards Street

Inflow Are	a =	6,954 sf,	13.30% Impervious,	Inflow Depth > 1.34"	for 2-Year event
Inflow	=	0.2 cfs @	12.09 hrs, Volume=	774 cf	
Primary	=	0.2 cfs @	12.09 hrs, Volume=	774 cf, Atte	en= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs



	Thorndike Place - Pre-Development
2340700-EX	Type III 24-hr 2-Year Rainfall=3.64"
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Summary for Link 100L: Total Flows

Inflow Area	a =	158,686 sf,	0.58% Impervious,	Inflow Depth > 1	.10"	for 2-1	'ear event
Inflow	=	3.1 cfs @	12.26 hrs, Volume=	14,560 cf			
Primary	=	3.1 cfs @	12.26 hrs, Volume=	14,560 cf	, Atte	n= 0%,	Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs





2340700-EX Prepared by BSC Group HydroCAD® 10.00-22 s/n 00904 © 2018 Hydro	Thorndike Place - Pre-Development Type III 24-hr 10-Year Rainfall=5.79" Printed 8/24/2021 IroCAD Software Solutions LLC Page 11
Time span=0.0 Runoff by SCS T Reach routing by Stor-Ind+	0-24.00 hrs, dt=0.01 hrs, 2401 points R-20 method, UH=SCS, Weighted-CN Irans method - Pond routing by Stor-Ind method
Subcatchment 1S: Flow to Wetlands	Runoff Area=151,732 sf 0.00% Impervious Runoff Depth>2.63" Flow Length=310' Tc=17.5 min CN=70 Runoff=7.6 cfs 33,243 cf
Subcatchment 2S: Flow to Street	Runoff Area=6,954 sf 13.30% Impervious Runoff Depth>3.01" Flow Length=95' Tc=6.0 min CN=74 Runoff=0.6 cfs 1,742 cf
Link 1L: Towards Wetlands	Inflow=7.6 cfs 33,243 cf Primary=7.6 cfs 33,243 cf
Link 2L: Towards Street	Inflow=0.6 cfs 1,742 cf Primary=0.6 cfs 1,742 cf
Link 100L: Total Flows	Inflow=7.9 cfs 34,985 cf Primary=7.9 cfs 34,985 cf

Total Runoff Area = 158,686 sf Runoff Volume = 34,985 cf Average Runoff Depth = 2.65" 99.42% Pervious = 157,761 sf 0.58% Impervious = 925 sf

	Thorndike Place - Pre-Development
2340700-EX	Type III 24-hr 10-Year Rainfall=5.79"
Prepared by BSC Group	Printed 8/24/2021
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Summary for Subcatchment 1S: Flow to Wetlands

Runoff = 7.6 cfs @ 12.25 hrs, Volume= 33,243 cf, Depth> 2.63"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs Type III 24-hr 10-Year Rainfall=5.79"

A	rea (sf)	CN I	Description		
1	51,732	70	Woods, Go	od, HSG C	
1	51,732		100.00% Pe	ervious Are	a
Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.4	50	0.0240	0.07		Sheet Flow, A to B
6.1	260	0.0200	0.71		Woods: Light underbrush n= 0.400 P2= 3.23" Shallow Concentrated Flow, B to C Woodland Kv= 5.0 fps
17.5	310	Total			

Subcatchment 1S: Flow to Wetlands



	Thorndike Place - Pre-Development
2340700-EX	Type III 24-hr 10-Year Rainfall=5.79"
Prepared by BSC Group	Printed 8/24/2021
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Summary for Subcatchment 2S: Flow to Street

Runoff = 0.6 cfs @ 12.09 hrs, Volume=

e= 1,742 cf, Depth> 3.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs Type III 24-hr 10-Year Rainfall=5.79"

_	A	rea (sf)	CN	Description		
		6,029	70	Woods, Go	od, HSG C	
_		925	98	Paved park	ing, HSG C	
		6,954	74	Weighted A	verage	
		6,029		86.70% Pe	rvious Area	
		925		13.30% Imp	pervious Are	ea
	Tc	Length	Slope	e Velocity	Capacity	Description
_	(min)	(feet)	(ft/ft)) (ft/sec)	(cfs)	
	3.5	20	0.0750	0.10		Sheet Flow, A to B
						Woods: Light underbrush n= 0.400 P2= 3.23"
	1.8	75	0.0200	0.71		Shallow Concentrated Flow, B to C
_						Woodland Kv= 5.0 fps
	5.3	95	Total	Increased t	o minimum	Tc = 6.0 min

Subcatchment 2S: Flow to Street



	Thorndike Place - Pre-Development
2340700-EX	Type III 24-hr 10-Year Rainfall=5.79"
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Summary for Link 1L: Towards Wetlands

Inflow Area	a =	151,732 sf,	0.00% Impervious,	Inflow Depth > 2.63	for 10-Year event
Inflow	=	7.6 cfs @	12.25 hrs, Volume=	33,243 cf	
Primary	=	7.6 cfs @	12.25 hrs, Volume=	33,243 cf, At	ten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link 1L: Towards Wetlands



	Thorndike Place - Pre-Development
2340700-EX	Type III 24-hr 10-Year Rainfall=5.79
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Summary for Link 2L: Towards Street

Inflow Area	a =	6,954 sf,	13.30% Impervious,	Inflow Depth > 3.01"	for 10-Year event
Inflow	=	0.6 cfs @	12.09 hrs, Volume=	1,742 cf	
Primary	=	0.6 cfs @	12.09 hrs, Volume=	1,742 cf, Att	en= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs



	Thornaike	Place - Pre-Development
2340700-EX	Type III 24-hr	10-Year Rainfall=5.79"
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Summary for Link 100L: Total Flows

Inflow Area	a =	158,686 sf,	0.58% Impervious,	Inflow Depth > 2.65"	for 10-Year event
Inflow	=	7.9 cfs @	12.24 hrs, Volume=	34,985 cf	
Primary	=	7.9 cfs @	12.24 hrs, Volume=	34,985 cf, Atte	en= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs





2340700-EX Prepared by BSC Group HydroCAD® 10.00-22 s/n 00904 © 2018 Hy	Thorndike Place - Pre-Development Type III 24-hr 25-Year Rainfall=7.49" Printed 8/24/2021 vdroCAD Software Solutions LLC Page 17
Time span=0. Runoff by SCS Reach routing by Stor-Ind-	00-24.00 hrs, dt=0.01 hrs, 2401 points TR-20 method, UH=SCS, Weighted-CN •Trans method - Pond routing by Stor-Ind method
Subcatchment 1S: Flow to Wetlands	Runoff Area=151,732 sf 0.00% Impervious Runoff Depth>4.01" Flow Length=310' Tc=17.5 min CN=70 Runoff=11.7 cfs 50,764 cf
Subcatchment 2S: Flow to Street	Runoff Area=6,954 sf 13.30% Impervious Runoff Depth>4.47" Flow Length=95' Tc=6.0 min CN=74 Runoff=0.8 cfs 2,589 cf
Link 1L: Towards Wetlands	Inflow=11.7 cfs 50,764 cf Primary=11.7 cfs 50,764 cf
Link 2L: Towards Street	Inflow=0.8 cfs 2,589 cf Primary=0.8 cfs 2,589 cf
Link 100L: Total Flows	Inflow=12.1 cfs 53,353 cf Primary=12.1 cfs 53,353 cf

Total Runoff Area = 158,686 sf Runoff Volume = 53,353 cf Average Runoff Depth = 4.03" 99.42% Pervious = 157,761 sf 0.58% Impervious = 925 sf

	Thorndike Place - Pre-Development
2340700-EX	Type III 24-hr 25-Year Rainfall=7.49"
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Summary for Subcatchment 1S: Flow to Wetlands

Runoff = 11.7 cfs @ 12.24 hrs, Volume= 50,764 cf, Depth> 4.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs Type III 24-hr 25-Year Rainfall=7.49"

A	rea (sf)	CN	Description		
1	51,732	70	Woods, Go	od, HSG C	
1	51,732		100.00% Pe	ervious Are	a
Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.4	50	0.0240	0.07		Sheet Flow, A to B
6.1	260	0.0200	0.71		Woods: Light underbrush n= 0.400 P2= 3.23" Shallow Concentrated Flow, B to C Woodland Kv= 5.0 fps
17 5	210	Total			

17.5 310 Total

Subcatchment 1S: Flow to Wetlands



	Thorndike Place - Pre-Development
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Summary for Subcatchment 2S: Flow to Street

Runoff =

0.8 cfs @ 12.09 hrs, Volume= 2,589 cf, Depth> 4.47"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs Type III 24-hr 25-Year Rainfall=7.49"

_	A	rea (sf)	CN I	Description		
		6,029	70	Woods, Go	od, HSG C	
_		925	98	Paved park	ing, HSG C	;
		6,954	74	Weighted A	verage	
		6,029	1	86.70% Per	rvious Area	
		925		13.30% Imp	pervious Are	ea
	_					
	Тс	Length	Slope	Velocity	Capacity	Description
_	(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	
	3.5	20	0.0750	0.10		Sheet Flow, A to B
						Woods: Light underbrush n= 0.400 P2= 3.23"
	1.8	75	0.0200	0.71		Shallow Concentrated Flow, B to C
_						Woodland Kv= 5.0 fps
	53	95	Total	Increased t	o minimum	$T_{c} = 6.0 \text{ min}$

Subcatchment 2S: Flow to Street



	I horndike Place - Pre-Development
2340700-EX	Type III 24-hr 25-Year Rainfall=7.49"
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Summary for Link 1L: Towards Wetlands

Inflow Area	a =	151,732 sf,	0.00% Impervious,	Inflow Depth > 4.01	for 25-Year event
Inflow	=	11.7 cfs @	12.24 hrs, Volume=	50,764 cf	
Primary	=	11.7 cfs @	12.24 hrs, Volume=	50,764 cf, A	tten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link 1L: Towards Wetlands



	Thorndike Place - Pre-Development
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Summary for Link 2L: Towards Street

Inflow Area	a =	6,954 sf,	13.30% Impervious,	Inflow Depth > 4.47	for 25-Year event
Inflow	=	0.8 cfs @	12.09 hrs, Volume=	2,589 cf	
Primary	=	0.8 cfs @	12.09 hrs, Volume=	2,589 cf, At	ten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs



	I horndike Place - Pre-Development	í –
2340700-EX	Type III 24-hr 25-Year Rainfall=7.49'	4
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Summary for Link 100L: Total Flows

Inflow Are	a =	158,686 sf,	0.58% Impervious,	Inflow Depth >	4.03"	for 25-Year event
Inflow	=	12.1 cfs @	12.23 hrs, Volume=	53,353 cf	f	
Primary	=	12.1 cfs @	12.23 hrs, Volume=	53,353 cf	f, Atte	n= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs





2240700 EV	Thorndike Place - Pre-Development
2340700-EA Bronarod by RSC Croup	Printed 8/24/2021
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Time span=0.	00-24.00 hrs, dt=0.01 hrs, 2401 points
Runoff by SCS	TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind-	-Trans method - Pond routing by Stor-Ind method
Subcatchment 1S: Flow to Wetlands	Runoff Area=151,732 sf 0.00% Impervious Runoff Depth>5.07" Flow Length=310' Tc=17.5 min CN=70 Runoff=14.8 cfs 64,125 cf
Subcatchment 2S: Flow to Street	Runoff Area=6,954 sf 13.30% Impervious Runoff Depth>5.57" Flow Length=95' Tc=6.0 min CN=74 Runoff=1.0 cfs 3,227 cf
Link 1I · Towards Wetlands	Inflow=14.8 cfs 64 125 cf
	Primary=14.8 cfs 64,125 cf
Link 2L: Towards Street	Inflow=1.0 cfs 3,227 cf
	Primary=1.0 cfs 3,227 cf
Link 1001 : Total Flows	Inflow=15.3 cfs. 67.352 cf
LINK TOOL. TOTALLIOWS	Primary=15.3 cfs 67.352 cf

Total Runoff Area = 158,686 sf Runoff Volume = 67,352 cf Average Runoff Depth = 5.09" 99.42% Pervious = 157,761 sf 0.58% Impervious = 925 sf

	Thorndike	Place - Pre-De	velopment
2340700-EX	Type III 24-hr	50-Year Rair	fall=8.72"
Prepared by BSC Group		Printed	8/24/2021
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Summary for Subcatchment 1S: Flow to Wetlands

Runoff = 14.8 cfs @ 12.23 hrs, Volume= 64,125 cf, Depth> 5.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs Type III 24-hr 50-Year Rainfall=8.72"

A	rea (sf)	CN I	Description		
1	51,732	70 \	Noods, Go	od, HSG C	
1	51,732		100.00% P	ervious Are	а
Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.4	50	0.0240	0.07		Sheet Flow, A to B
6.1	260	0.0200	0.71		Woods: Light underbrush n= 0.400 P2= 3.23" Shallow Concentrated Flow, B to C Woodland Kv= 5.0 fps
 475	040	Tatal			

17.5 310 Total

Subcatchment 1S: Flow to Wetlands



	Thorndike Place - Pre-Development
2340700-EX	Type III 24-hr 50-Year Rainfall=8.72"
Prepared by BSC Group	Printed 8/24/2021
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Summary for Subcatchment 2S: Flow to Street

Runoff =

1.0 cfs @ 12.09 hrs, Volume= 3,227 cf, Depth> 5.57"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs Type III 24-hr 50-Year Rainfall=8.72"

_	A	rea (sf)	CN	Description		
		6,029	70	Woods, Go	od, HSG C	
		925	98	Paved park	ing, HSG C	
_		6,954	74	Weighted A	verage	
		6,029		86.70% Pei	rvious Area	
		925		13.30% Imp	pervious Are	ea
	Tc	Length	Slope	 Velocity 	Capacity	Description
_	(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	
	3.5	20	0.0750	0.10		Sheet Flow, A to B
						Woods: Light underbrush n= 0.400 P2= 3.23"
	1.8	75	0.0200	0.71		Shallow Concentrated Flow, B to C
_						Woodland Kv= 5.0 fps
_	5.3	95	Total,	Increased t	o minimum	Tc = 6.0 min

Subcatchment 2S: Flow to Street



	I horndike Place - Pre-Development
2340700-EX	Type III 24-hr 50-Year Rainfall=8.72"
Prepared by BSC Group	Printed 8/24/2021
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Summary for Link 1L: Towards Wetlands

Inflow Area =	151,732 sf,	0.00% Impervious,	Inflow Depth > 5.	.07" for 50-Year event
Inflow =	14.8 cfs @	12.23 hrs, Volume=	64,125 cf	
Primary =	14.8 cfs @	12.23 hrs, Volume=	64,125 cf,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link 1L: Towards Wetlands



	Thorndike Place - Pre-Development
2340700-EX	Type III 24-hr 50-Year Rainfall=8.72"
Prepared by BSC Group	Printed 8/24/2021
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Summary for Link 2L: Towards Street

Inflow Area	a =	6,954 sf,	13.30% Impervious,	Inflow Depth > 5.	.57" for 50-Year event
Inflow	=	1.0 cfs @	12.09 hrs, Volume=	3,227 cf	
Primary	=	1.0 cfs @	12.09 hrs, Volume=	3,227 cf,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs



	Thorndike Place - Pre-Development
2340700-EX	Type III 24-hr 50-Year Rainfall=8.72"
Prepared by BSC Group	Printed 8/24/2021
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Summary for Link 100L: Total Flows

Inflow Area	a =	158,686 sf,	0.58% Impervious,	Inflow Depth > 5.0	09" for 50-Year event
Inflow	=	15.3 cfs @	12.23 hrs, Volume=	67,352 cf	
Primary	=	15.3 cfs @	12.23 hrs, Volume=	67,352 cf,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link 100L: Total Flows



2340700 EX	Thorndike Type III 24-br 1	Place - Pre-Development
2340700-EA Bronarad by BSC Crown		Drinted 8/21/2021
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		1 age 23
Time span=0.0	00-24.00 hrs. dt=0.01 hrs. 2401 points	
Runoff by SCS	TR-20 method, UH=SCS, Weighted-CN	N
Reach routing by Stor-Ind+	Trans method - Pond routing by Stor	Ind method
Subcatchment 1S: Flow to Wetlands	Runoff Area=151,732 sf 0.00% Imp Flow Length=310' Tc=17.5 min CN=70	ervious Runoff Depth>6.52" Runoff=19.0 cfs 82,424 cf
Subcatchment 2S: Flow to Street	Runoff Area=6,954 sf 13.30% Imp Flow Length=95' Tc=6.0 min CN=	ervious Runoff Depth>7.06" 74 Runoff=1.3 cfs 4,094 cf
Link 11 : Towards Wetlands		Inflow=19.0 cfs 82.424 cf
Link IL. Towards Wettands		Primary=19.0 cfs 82,424 cf
		· · · · · · · · · · · · · · · · · · ·
Link 2L: Towards Street		Inflow=1.3 cfs 4,094 cf
		Primary=1.3 cfs 4,094 cf
Link 100L: Total Flows		Inflow=19.7 cfs 86,518 cf
		Primary=19.7 cfs 86,518 cf

 Total Runoff Area = 158,686 sf
 Runoff Volume = 86,518 cf
 Average Runoff Depth = 6.54"

 99.42%
 Pervious = 157,761 sf
 0.58% Impervious = 925 sf

	I horndike Place - Pre-Developmen
2340700-EX	Type III 24-hr 100-Year Rainfall=10.35
Prepared by BSC Group	Printed 8/24/2021
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Summary for Subcatchment 1S: Flow to Wetlands

Runoff = 19.0 cfs @ 12.23 hrs, Volume= 82,424 cf, Depth> 6.52"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs Type III 24-hr 100-Year Rainfall=10.35"

A	rea (sf)	CN I	Description		
1	51,732	70	Woods, Go	od, HSG C	
1	51,732		100.00% P	ervious Are	a
Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.4	50	0.0240	0.07		Sheet Flow, A to B
6.1	260	0.0200	0.71		Woods: Light underbrush n= 0.400 P2= 3.23" Shallow Concentrated Flow, B to C Woodland Kv= 5.0 fps
17 5	210	Total			

17.5 310 Total

Subcatchment 1S: Flow to Wetlands



	Thorndike Place - Pre-Development
2340700-EX	Type III 24-hr 100-Year Rainfall=10.35"
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Summary for Subcatchment 2S: Flow to Street

Runoff =

1.3 cfs @ 12.09 hrs, Volume= 4,094 cf, Depth> 7.06"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs Type III 24-hr 100-Year Rainfall=10.35"

_	A	rea (sf)	CN I	Description		
		6,029	70 Woods, Good, HSG C			
_		925	925 98 Paved parking, HSG C			
6,954 74 Weighted Average						
		6,029	;	36.70% Pei	rvious Area	
		925		13.30% Imp	pervious Are	ea
	Tc	Length	Slope	Velocity	Capacity	Description
_	(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	
	3.5	20	0.0750	0.10		Sheet Flow, A to B
						Woods: Light underbrush n= 0.400 P2= 3.23"
	1.8	75	0.0200	0.71		Shallow Concentrated Flow, B to C
_						Woodland Kv= 5.0 fps
	5.3	95	Total,	Increased t	to minimum	Tc = 6.0 min

Subcatchment 2S: Flow to Street



	I horndike Place - Pre-Development	1
2340700-EX	Type III 24-hr 100-Year Rainfall=10.35	
Prepared by BSC Group	Printed 8/24/2021	
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Summary for Link 1L: Towards Wetlands

Inflow Area =	151,732 sf,	0.00% Impervious,	Inflow Depth > 6.52"	for 100-Year event
Inflow =	19.0 cfs @	12.23 hrs, Volume=	82,424 cf	
Primary =	19.0 cfs @	12.23 hrs, Volume=	82,424 cf, Atte	en= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link 1L: Towards Wetlands



	Thorndike Place - Pre-Development
2340700-EX	Type III 24-hr 100-Year Rainfall=10.35"
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Summary for Link 2L: Towards Street

Inflow Area =		6,954 sf,	13.30% Impervious,	Inflow Depth > 7.06	" for 100-Year event
Inflow	=	1.3 cfs @	12.09 hrs, Volume=	4,094 cf	
Primary	=	1.3 cfs @	12.09 hrs, Volume=	4,094 cf, A	tten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs



	I horndi	ke Place - Pre-Development
2340700-EX	Type III 24-hr	100-Year Rainfall=10.35"
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Summary for Link 100L: Total Flows

Inflow Area	a =	158,686 sf,	0.58% Impervious,	Inflow Depth > 6.	54" for 100-Year event
Inflow	=	19.7 cfs @	12.23 hrs, Volume=	86,518 cf	
Primary	=	19.7 cfs @	12.23 hrs, Volume=	86,518 cf,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link 100L: Total Flows



5.03 PROPOSED WATERSHED PLAN



5.04 PROPOSED HYDROLOGY CALCULATIONS (HYDROCADTM PRINTOUTS)



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Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
74,444	74	>75% Grass cover, Good, HSG C (1S, 3.1S, 4.2S, 4.3S, 4.4S, 4.5S, 4.6S, 5S,
		6.1S, 6S, 7S)
220	89	Gravel roads, HSG C (6.1S)
411	89	Gravel sidewalk, HSG C (3.1S)
25,811	98	Paved parking, HSG C (1S, 4.2S, 4.3S, 4.4S, 4.5S, 4.6S, 5S, 7S)
6,444	98	Paved roads w/curbs & sewers, HSG C (6.1S)
46,099	98	Roofs, HSG C (2.1S, 2S, 3S, 6S)
272	98	Unconnected pavement, HSG C (3.1S)
4,985	70	Woods, Good, HSG C (6S)
158.686	86	TOTAL AREA

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Thorndike Place - Post-Development

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Soil Listing (all nodes)

Area	Soil	Subcatchment
(sq-ft)	Group	Numbers
0	HSG A	
0	HSG B	
158,686	HSG C	1S, 2.1S, 2S, 3.1S, 3S, 4.2S, 4.3S, 4.4S, 4.5S, 4.6S, 5S, 6.1S, 6S, 7S
0	HSG D	
0	Other	
158,686		TOTAL AREA

HSG-A	HSG-B	HSG-C	HSG-D	Other	Total	Ground
(sq-ft)	(sq-ft)	(sq-ft)	(sq-ft)	(sq-ft)	(sq-ft)	Cover
0	0	74,444	0	0	74,444	>75% Grass
						cover, Good
0	0	220	0	0	220	Gravel roads
0	0	411	0	0	411	Gravel sidewalk
0	0	25,811	0	0	25,811	Paved parking
0	0	6,444	0	0	6,444	Paved roads
						w/curbs & sewers
0	0	46,099	0	0	46,099	Roofs
0	0	272	0	0	272	Unconnected
						pavement
0	0	4,985	0	0	4,985	Woods, Good
0	0	158,686	0	0	158,686	TOTAL AREA

Ground Covers (all nodes)

2340700-PR-2021-08-18 Prepared by BSC Group <u>HydroCAD® 10.00-22 s/n 00904 © 2018 Hyd</u>	Thorndike Place - Post-Development <i>Type III 24-hr 2-Year Rainfall=3.64"</i> Printed 8/24/2021 droCAD Software Solutions LLC Page 5	2340700-PR-2021-08-18 Prepared by BSC Group <u>HydroCAD® 10.00-22 s/n 00904</u>	Thorndike Place - Post-Development <i>Type III 24-hr 2-Year Rainfall=3.64"</i> Printed 8/24/2021 © 2018 HydroCAD Software Solutions LLC Page 6
Time span=0.0 Runoff by SCS T Reach routing by Stor-Ind+	10-72.00 hrs, dt=0.01 hrs, 7201 points IR-20 method, UH=SCS, Weighted-CN Trans method Pond routing by Stor-Ind method	Pond 3P: Rain garden	Peak Elev=6.36' Storage=194 cf Inflow=0.8 cfs 2,362 cf Discarded=0.0 cfs 405 cf Primary=0.8 cfs 1,957 cf Outflow=0.8 cfs 2,362 cf
Subcatchment 1S: CB-1	Runoff Area=22,742 sf 72.16% Impervious Runoff Depth=2.67" Tc=6.0 min CN=91 Runoff=1.6 cfs 5.068 cf	Pond TD2:	Peak Elev=6.54' Storage=163 cf Inflow=0.1 cfs 305 cf Discarded=0.0 cfs 305 cf Primary=0.0 cfs 0 cf Outflow=0.0 cfs 305 cf
Subcatchment 2.1S: Building	Runoff Area=14,140 sf 100.00% Impervious Runoff Depth=3.41" Tc=6.0 min CN=98 Runoff=1.2 cfs 4.013 cf	Pond TD3:	Peak Elev=6.53' Storage=162 cf Inflow=0.1 cfs 303 cf Discarded=0.0 cfs 303 cf Primary=0.0 cfs 0 cf Outflow=0.0 cfs 303 cf
Subcatchment 2S: Building Roof	Runoff Area=18,785 sf 100.00% Impervious Runoff Depth=3.41" Tc=6.0 min CN=98 Runoff=1.5 cfs 5.332 cf	Pond TD4:	Peak Elev=6.53' Storage=161 cf Inflow=0.1 cfs 303 cf Discarded=0.0 cfs 303 cf Primary=0.0 cfs 0 cf Outflow=0.0 cfs 303 cf
Subcatchment 3.1S: Backyard ADs	Runoff Area=8,985 sf 3.03% Impervious Runoff Depth=1.40" Flow Length=147' To=10.3 min CN=75 Runoff=0.3 cfs 1.050 cf	Pond TD5:	Peak Elev=6.03' Storage=161 cf Inflow=0.1 cfs 307 cf Discarded=0.0 cfs 307 cf Primary=0.0 cfs 0 cf Outflow=0.0 cfs 307 cf
Subcatchment 3S: Townhouse Roofs	Runoff Area=13,067 sf 100.00% Impervious Runoff Depth=3.41"	Pond TD6:	Peak Elev=6.00' Storage=155 cf Inflow=0.1 cfs 300 cf Discarded=0.0 cfs 300 cf Primary=0.0 cfs 0 cf Outflow=0.0 cfs 300 cf
Subcatchment 4.2S: Townhouse TDs	Runoff Area=1,112 sf 95.68% Impervious Runoff Depth=3.29"	Link 1L: Towards Wetlands	Inflow=2.9 cfs 12,442 cf Primary=2.9 cfs 12,442 cf
Subcatchment 4.3S: Townhouse TDs	Runoff Area=1,105 sf 97.29% Impervious Runoff Depth=3.29"	Link 2L: Towards Street	Inflow=0.2 cfs 781 cf Primary=0.2 cfs 781 cf
Subcatchment 4.4S: Townhouse TDs	Runoff Area=1,104 sf 97.46% Impervious Runoff Depth=3.29"	Link 100L: Total Flows	Inflow=3.1 cfs 13,223 cf Primary=3.1 cfs 13,223 cf
Subcatchment 4.5S: Townhouse TDs	Runoff Area=1,082 sf 98.06% Impervious Runoff Depth=3.41" Tc=6.0 min CN=98 Runoff=0.1 cfs 307 cf	Total Runoff Area	= 158,686 sf Runoff Volume = 30,661 cf Average Runoff Depth = 2.32" 50.45% Pervious = 80,060 sf 49.55% Impervious = 78,626 sf
Subcatchment 4.6S: Townhouse TDs	Runoff Area=1,056 sf 99.24% Impervious Runoff Depth=3.41" Tc=6.0 min CN=98 Runoff=0.1 cfs 300 cf		
Subcatchment 5S: TD-1	Runoff Area=5,851 sf 51.63% Impervious Runoff Depth=2.22" Tc=6.0 min CN=86 Runoff=0.3 cfs 1,084 cf		
Subcatchment 6.1S: East driveway	Runoff Area=12,275 sf 52.50% Impervious Runoff Depth=2.31" Tc=6.0 min CN=87 Runoff=0.8 cfs 2,362 cf		
Subcatchment 6S: Bypass Towards	Runoff Area=51,539 sf 0.21% Impervious Runoff Depth=1.34" Flow Length=125' Tc=14.0 min CN=74 Runoff=1.4 cfs 5,744 cf		
Subcatchment 7S: To Street	Runoff Area=5,843 sf 18.07% Impervious Runoff Depth=1.60" Tc=6.0 min CN=78 Runoff=0.2 cfs 781 cf		
Pond 1P: Underground Infiltration Syste Discarded=(em Peak Elev=7.61' Storage=10,475 cf Inflow=3.4 cfs 16,242 cf 0.1 cfs 15,514 cf Primary=0.1 cfs 727 cf Outflow=0.1 cfs 16,242 cf		
Pond 2P: Rooftop Detention	Peak Elev=57.31' Storage=2,295 cf Inflow=1.5 cfs 5,332 cf Outflow=0.2 cfs 5,332 cf		



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Summary for Subcatchment 2.	1S: Building Roof-Southeast
Runoff = 1.2 cfs @ 12.08 hrs, Volume=	4,013 cf, Depth= 3.41"
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN Type III 24-hr 2-Year Rainfall=3.64"	, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Area (sf) CN Description	
14,140 98 Roofs, HSG C	
14,140 100.00% Impervious Area	
Tc Length Slope Velocity Capacity Descr (min) (feet) (ft/ft) (ft/sec) (cfs)	iption
6.0 Direct	t Entry, Min. Tc
Subcatchment 2.15: Bui Hydrograph	Iding Roof-Southeast Type III 24-hr 2-Year Rainfall=3.64" Runoff Area=14,140 sf Runoff Volume=4,013 cf Runoff Depth=3.41" Tc=6.0 min CN=98
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 Time (hours)	42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72



2340700-PR-2021-08-18 Thorndike Place - Post-Development Prepared by BSC Group Type III 24-hr 2-Year Rainfall=3.64" HydroCAD® 10.00-22 s/n 00904 © 2018 HydroCAD Software Solutions LLC Page 10								
		Su	mmary f	or Subca	tchment 3.1S: Backyard ADs			
Runoff	=	0.3 ct	is @ 12.1	5 hrs, Volu	ume= 1,050 cf, Depth= 1.40"			
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs Type III 24-hr 2-Year Rainfall=3.64"								
A	rea (sf)	CN D	escription					
	272	98 U	nconnecte	d pavemer	nt, HSG C			
*	8,302 411	89 G	ravel side	walk, HSG	C			
	8,985	75 V	/eighted A	verage				
	8,713	9	6.97% Per .03% Impe	vious Area	a			
	272	1	00.00% Ui	nconnected				
Тс	Length	Slope	Velocity	Capacity	Description			
(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)				
9.4	50	0.0142	0.09		Sheet Flow, Grass: Dense n= 0.240 P2= 3.23"			
0.9	97	0.0154	1.86		Shallow Concentrated Flow,			
10.3	147	Total			Glassed Waterway RV- 15.0 lps			
			Cub		4245 Beekverd ADe			
			Sube	atchmer	IL 3.15: Dackyard ADS			
					graphi 			
0.3		0.3 cfs						
0.28					Type III 24-hr			
0.26	[,}				2-Year Rainfall=3.64"			
0.24	/		+ - +		Runoff Area=8,985 sf			
0.2					Runoff Volume=1,050 cf			
ຊິ 0.18	´_ -		+ - + - + -!!-		Runoff Depth=1.40"			
0.16 0 0.14	[, <u>}</u> -⊱-;		+ - + - + - + - +-		Flow Length=147'			
0.12	<pre>/ +</pre>		+ - + - +		Tc=10.3 min			
0.1			 + - +		CN=75			
0.08	()			$\begin{matrix} 1 & 1 & 1 & 1 \\ -1 & -1 & -1 & -1 \\ 1 & -1 & -$				
0.06	[, <u></u> +	i- i- 🚺	+ - + - + - + - + - + - + - + - + - + -	$\frac{1}{2} - \frac{1}{2} - \frac{1}{2} - \frac{1}{2} - \frac{1}{2} - \frac{1}{2} - \frac{1}{2}$				
0.02								

0 - 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 64 88 50 52 54 56 58 60 62 64 66 68 70 72 Time (hours)



2240700 DD 2024 08 48	Thorndike Place - Post-Development
2340700-PR-2021-08-18 Prepared by BSC Group	Type III 24-III 2- Fear Rairian-3.04 Printed 8/24/2021
HydroCAD® 10.00-22 s/n 00904 © 2018 HydroCAD Software Solutio	ons LLC Page 12
Summary for Subcatchment 4.2S:	: Townhouse TDs
Runoff = 0.1 cfs @ 12.08 hrs, Volume=	305 cf, Depth= 3.29"
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Sp Type III 24-hr 2-Year Rainfall=3.64"	pan= 0.00-72.00 hrs, dt= 0.01 hrs
Area (sf) CN Description	
1,064 98 Paved parking, HSG C	
48 74 >75% Grass cover, Good, HSG C	
1,112 97 Weighted Average	
1.064 95.68% Impervious Area	
·,···	
Tc Length Slope Velocity Capacity Description	
6.0 Direct Entry	Min To
0.0 Direct Entry, 1	
Subcatchment 4.2S: Townh	
Hydrograph	
Hydrograph	
0.1 0.095	
Hydrograph	
Hydrograph 0.095 0.085 0.085	Type III 24-hr
Hydrograph 0.095 0.099 0.085 0.085 0.085 0.085 0.085 0.085 0.085 0.085 0.085 0.085 0.085 0.095 0.085 0.095 0.00	Type III 24-hr ar Rainfall=3.64"
Hydrograph	Type III 24-hr ar Rainfall=3.64" off Area=1,112 sf
Hydrograph	Type III 24-hr ar Rainfall=3.64" off Area=1,112 sf ff Volume=305 cf
Hydrograph	Type III 24-hr ar Rainfall=3.64" off Area=1,112 sf ff Volume=305 cf
Hydrograph	Type III 24-hr ar Rainfall=3.64" off Area=1,112 sf ff Volume=305 cf noff Depth=3.29"
Hydrograph	Type III 24-hr ar Rainfall=3.64" off Area=1,112 sf ff Volume=305 cf noff Depth=3.29" Tc=6.0 min
Hydrograph	Type III 24-hr ar Rainfall=3.64" off Area=1,112 sf ff Volume=305 cf noff Depth=3.29" Tc=6.0 min CN=97
Hydrograph	Type III 24-hr ar Rainfall=3.64" off Area=1,112 sf ff Volume=305 cf noff Depth=3.29" Tc=6.0 min CN=97
Hydrograph	Type III 24-hr ar Rainfall=3.64" off Area=1,112 sf ff Volume=305 cf noff Depth=3.29" Tc=6.0 min CN=97
Hydrograph	Type III 24-hr ar Rainfall=3.64" off Area=1,112 sf ff Volume=305 cf noff Depth=3.29" Tc=6.0 min CN=97
Hydrograph	Type III 24-hr ar Rainfall=3.64" off Area=1,112 sf ff Volume=305 cf noff Depth=3.29" Tc=6.0 min CN=97
Hydrograph	Type III 24-hr ar Rainfall=3.64" off Area=1,112 sf ff Volume=305 cf noff Depth=3.29" Tc=6.0 min CN=97

2340700-PR-2021-08-18 Prepared by BSC Group	Thorndike Place - Post-Development Type III 24-hr 2-Year Rainfall=3.64" Printed 8/24/2021				
HydroCAD® 10.00-22 s/n 00904 © 2018 HydroCAD So	ftware Solutions LLC Page 13				
Summary for Subcatch	ment 4.3S: Townhouse TDs				
Runoff = 0.1 cfs @ 12.08 hrs, Volume	≥= 303 cf, Depth= 3.29"				
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs Type III 24-hr 2-Year Rainfall=3.64"					
Area (of) CNL Description					

-		iea (31)		Jescription						
		1,075	98	Paved parking, HSG C						
		30	74	>75% Grass cover, Good, HSG C						
		1,105	97	Weighted Average						
		30	:	2.71% Pervious Area						
		1,075	1	97.29% Impervious Area						
	Tc	Length	Slope	Velocity	Capacity	Description				
	(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)					
	6.0					Direct Entry, Min. Tc				
						-				
				<u> </u>						

Subcatchment 4.3S: Townhouse TDs



2 340700 Prenared	-PR-2021-	08-18			Thorndike I Type III 24-h	Place - Post-Devel r 2-Year Rainfal Printed 8/	opmen /=3.64 24/2021
-lydroCAD	® 10.00-22 s	/n 00904 © 20	18 HydroCAE	O Software Solution	ons LLC	Finder 6/1	Page 14
	:	Summary f	or Subcat	chment 4.4S	Townhouse	TDs	
Runoff	= 0).1 cfs @ 12	.08 hrs, Vol	ume=	303 cf, Depth=	= 3.29"	
Runoff by Type III 24	SCS TR-20 1-hr 2-Year I	method, UH= Rainfall=3.64'	SCS, Weigh "	nted-CN, Time S	pan= 0.00-72.00	hrs, dt= 0.01 hrs	
Are	ea (sf) CN	Descriptio	n				
	1,076 98	Paved par	king, HSG C				
	<u> </u>	Weighted	Average				
	28	2.54% Pe	rvious Area				
	1,076	97.46% In	npervious Ar	ea			
Tc I	Length Sl	ope Velocity	Capacity	Description			
(min) 6.0	(feet) (f	τ/π) (π/sec) (CIS)	Direct Entry	Min Tc		
				,,,,,			
		Sub	catchmen	t 4.4S: Townl	nouse TDs		
			Hydro	graph			
0.095		1 cfs	·	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~			Runoff
0.09					Type I	ll 24-hr	
0.08			·	2-Ye	ear Rainfal	l=3.64"	
0.075 0.07			·	Run	off Area=1	104 sf	
0.065			· + - + - + - + - + - + - + - + - + - +	Pubo	ff Volumo	-202 of	
<u>ද</u> ි 0.055			· + - + - + - + - · + - + - + - + -	Runc			
0.05 0.045			· + - + - + - + - + - + - + - + - + - +	Ru		1=3.29	
ت ــــــــــــــــــــــــــــــــــــ			· + - + - + - + - + - + - + - + - + - +		TC=	6.0 min	
0.035			· +- + - + - + -			CN=97	
0.025	()++++		$\cdot \frac{1}{4} - \frac{1}{7} - \frac{1}{7} - \frac{1}{7} - \frac{1}{17} - $				
0.02			· + - + - +			ii - + - + - + - + - ii -	
0.01			· + - +				

234070 Prepare _{HydroCA}	00-PR-20 ed by BSC .D® 10.00-2	Thorndike Place - Post-Development D21-08-18 Type III 24-hr 2-Year Rainfall=3.64' C Group Printed 8/24/2021 22 s/n 00904 © 2018 HydroCAD Software Solutions LLC Page 15
		Summary for Subcatchment 4.5S: Townhouse TDs
Runoff	=	0.1 cfs @ 12.08 hrs, Volume= 307 cf, Depth= 3.41"
Runoff b Type III :	oy SCS TR 24-hr 2-Y	R-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs ⁄ear Rainfall=3.64"
А	vrea (sf)	CN Description
	1,061 21	98 Paved parking, HSG C 74 >75% Grass cover, Good, HSG C
	1,082	98 Weighted Average
	21 1,061	1.94% Pervious Area 98.06% Impervious Area
Tc (min)	Length (feet)	Slope Velocity Capacity Description (ft/ft) (ft/sec) (cfs)
6.0	(1001)	Direct Entry, Min. Tc
0.099 0.00 0.08 0.00 0.07 0.06 0.06 0.06 0.06 0.06 0.06		0.1 cfs Type III 24-hr 2-Year Rainfall=3.64" Runoff Area=1,082 sf Runoff Volume=307 cf Runoff Depth=3.41" Tc=6.0 min CN=98
0.0 0.00	1	

2340700-PR-2021-08-18	Thorndike Place - Post-Development Type III 24-hr 2-Year Rainfall=3.64"
Prepared by BSC Group	Printed 8/24/2021
HydroCAD® 10.00-22 s/n 00904 © 2018 HydroCAD Software Solution	ns LLC Page 16
Summary for Subcatchment 4.6S:	Townhouse TDs
Runoff = 0.1 cfs @ 12.08 hrs, Volume=	300 cf, Depth= 3.41"
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Sp Type III 24-hr 2-Year Rainfall=3.64"	an= 0.00-72.00 hrs, dt= 0.01 hrs
Area (sf) CN Description	
1,048 98 Paved parking, HSG C 8 74 >75% Grass cover, Good, HSG C	
1,056 98 Weighted Average	
8 0.76% Pervious Area 1,048 99.24% Impervious Area	
Tc Length Slope Velocity Capacity Description	
6.0 Direct Entry, N	lin. Tc
Subcatchment 4.6S: Townh	ouse TDs
Hydrograph	
0.095	
0.09	
0.075	ar Rainfall≑3.64"
0.07	off Area=1.056 sf
	ff Volume=300 cf
	noff Donth=2.44"
	CN≑98
0.025	·
	·
0.005	
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 Time (hours)	50 52 54 56 58 60 62 64 66 68 70 72

Thorndike Place - Post- 7 ppe III 24-hr 2-Year R. Printe Printe Printe	Development ainfall=3.64" ed 8/24/2021 Page 17
Summary for Subcatchment 5S: TD-1	<u> </u>
unoff = 0.3 cfs @ 12.09 hrs, Volume= 1,084 cf, Depth= 2.22"	
inoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.0 pe III 24-hr 2-Year Rainfall=3.64"	l hrs
Area (sf) CN Description	
3,021 98 Paved parking, HSG C	
2,830 74 >75% Grass cover, Good, HSG C	
5,851 86 Weighted Average	
3.021 51.63% Impervious Area	
Tc Length Slope Velocity Capacity Description	
(MIN) (Teet) (TUT) (TUSEC) (CTS)	
0.0 Direct Entry, with. TC	
Subcatchment 5S: TD-1	
Hydrograph	
	Dunoff
$\begin{array}{c} 0.38 \\ 0.36 \end{array}$	Ranon
0.34 Type III 24-hr	-
^{0.32} 2-Year Rainfall=3.64"	-
0.3	
	_
	-
ق 0.22 Runoff Depth=2.22"	-
ۇ 0.18 🖓 🚺	-
- 0.16 / CN=86	-
	-
	-
0.02	ļ

234070 Prepare HydroCA	0-PR-20 d by BSC D® 10.00-2	21-08-1 C Group 22 s/n 009	18 904 © 201	8 HydroCAE) Software So	Tho <i>Type</i> lutions LLC	rndike Place - Pos III 24-hr 2-Year Prir	t-Development Rainfall=3.64' nted 8/24/2021 Page 18
		Su	mmary f	or Subca	atchment 6	.1S: East	driveway	
Runoff	=	0.8 cf	fs @ 12.0	9 hrs, Vol	ume=	2,362 cf,	Depth= 2.31"	
Runoff b Type III 2	y SCS TR 24-hr 2-Y	R-20 meth ear Rainf	nod, UH=S fall=3.64"	CS, Weigh	ited-CN, Time	e Span= 0.00	0-72.00 hrs, dt= 0.	01 hrs
A	rea (sf)	CN D	escription					
	5,611 6,444 220	74 > 98 P 89 G	75% Grass aved road Gravel road	s cover, Go s w/curbs & s, HSG C	ood, HSG C & sewers, HS	GC		
	12,275 5,831 6,444	87 W 4 52	Veighted A 7.50% Per 2.50% Imp	verage vious Area ervious Ar	ea			
Tc (min)	Length	Slope	Velocity	Capacity	Description			
6.0	(ieet)	(1011)	(10360)	(013)	Direct Entr	v .		
0.85 0.8 0.7 0.65 0.6 0.5 0.5 0.5 0.5 0.4 0.4 0.4 0.3 0.3 0.3 0.3 0.25 0.1 0.2 0.1 0.2 0.1 0.5		0.8 cfs	Sub	Example 1	nt 6.1S: Ea	st drivewa -Year R unoff Volu Runoff	^a y ^c ype III 24-hr ainfalI=3.64" ea=12,275 sf me=2,362 cf Depth=2.31" Tc=6.0 min CN=87	
0-	02468	3 10 12 14 1	16 18 20 22 24	26 28 30 32 3 Tim	4 36 38 40 42 44 e (hours)	46 48 50 52 54 56	6 58 60 62 64 66 68 70 7	2

	Thorndike Place - Post-Development
2340700-PR-2021-08-18	Type III 24-hr 2-Year Rainfall=3.64"
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Summary for Subcatchment 6S: Bypass Towards Wetlands

Runoff =

1.4 cfs @ 12.21 hrs, Volume= 5,744 cf, Depth= 1.34"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs Type III 24-hr 2-Year Rainfall=3.64"

A	rea (sf)	CN [Description					
	4,985	70 V	Voods, Go	od, HSG C				
	46,447	74 >	75% Gras	s cover, Go	ood, HSG C			
	107	98 F	Roofs, HSG C					
	51,539	74 V	74 Weighted Average					
	51,432 99.79% Pervious Area							
	107	0).21% Impe	ervious Area	а			
Tc	Length	Slope	Velocity	Capacity	Description			
(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)				
11.8	50	0.0220	0.07		Sheet Flow,			
					Woods: Light underbrush n= 0.400 P2= 3.23"			
2.2	75	0.0133	0.58		Shallow Concentrated Flow,			
					Woodland Kv= 5.0 fps			
14.0	125	Total						

Subcatchment 6S: Bypass Towards Wetlands



HydroCAD® 10.00			
	<u>)-22 s/n 00904 © 2018 Hydro</u>	oCAD Software Solutions LLC	Page 20
	Summary for	r Subcatchment 7S: To Street	
Runoff =	0.2 cfs @ 12.09 hrs,	Volume= 781 cf, Depth= 1.60"	
Runoff by SCS T Type III 24-hr 2-	R-20 method, UH=SCS, W Year Rainfall=3.64"	Veighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.0)1 hrs
Area (sf)	CN Description		
1,056 4 787	98 Paved parking, HS 74 >75% Grass cove	SG C er Good HSG C	
5,843	78 Weighted Average	e	
4,787	81.93% Pervious	Area	
Tc Length (min) (feet)	Slope Velocity Capa (ft/ft) (ft/sec) (acity Description (cfs)	
6.0	(111) (12000) (Direct Entry, Min. Tc	
	Subca	atchmont 75: To Streat	
	Subca	atchinent 75. 10 Street	
	• • • • • • • • • • • • • • • • • • • •		
0.26	0.2 cfs		_ Runoff
0.24		Type III 24-hr	
0.22		2-Year Rainfall=3.64"	_
0.2	·┤-┤-┣ <mark>-</mark> ┼-┼-┝-┼-┤-┤-┤	Runoff Area=5,843 sf	-
0.18		Runoff Volume=781 cf	-
3 0.14		Runoff Depth=1 60"	· -
B 0.12		$T_{0}=60$ min	-
0.1	· · · · · · · · · · · · · · · · · · ·		
0.08		CN= 78	
0.06			
0.04			
0.02			-

 2340700-PR-2021-08-18
 Thorndike Place - Post-Development

 7/pe III 24-hr
 2-Year Rainfall=3.64"

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Summary for Pond 1P: Underground Infiltration System

Inflow Area =	69,430 sf, 74.25% Impervious,	Inflow Depth = 2.81" for 2-Year event
Inflow =	3.4 cfs @ 12.09 hrs, Volume=	16,242 cf
Outflow =	0.1 cfs @ 17.55 hrs, Volume=	16,242 cf, Atten= 96%, Lag= 327.6 min
Discarded =	0.1 cfs @ 9.37 hrs, Volume=	15,514 cf
Primary =	0.1 cfs @ 17.55 hrs, Volume=	727 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs Peak Elev= 7.61' @ 17.55 hrs Surf.Area= 7,556 sf Storage= 10,475 cf

Plug-Flow detention time= 993.8 min calculated for 16,239 cf (100% of inflow) Center-of-Mass det. time= 993.7 min (1,822.2 - 828.5)

Volume	Invert	Avail.Storage	Storage Description
#1	6.00'	19,495 cf	6.89'W x 14.06'L x 3.00'H StormTrap ST-1 Units (Irregular Shape)x 78

Device	Routing	Invert	Outlet Devices
#1	Discarded	6.00'	0.520 in/hr Exfiltration over Surface area
#2	Primary	7.50'	15.0" Round Culvert L= 190.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 7.50' / 6.00' S= 0.0079 '/' Cc= 0.900 = 0.013 Elow Area= 1.23 sf.

Discarded OutFlow Max=0.1 cfs @ 9.37 hrs HW=6.03' (Free Discharge) **1=Exfiltration** (Exfiltration Controls 0.1 cfs)

Primary OutFlow Max=0.1 cfs @ 17.55 hrs HW=7.61' (Free Discharge) -2=Culvert (Barrel Controls 0.1 cfs @ 1.44 fps)





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iyuroo,	10.00	<u>Su</u>	mmary f	or Pond 2	P: Poofton Detenti	on
		50	iiiiiai y it		P. Roonop Detenti	
Inflow A	rea =	18,785 s	f,100.00%	Impervious,	, Inflow Depth = 3.41"	for 2-Year event
Inflow	=	1.5 cfs @) 12.08 hrs	s, Volume=	= 5,332 cf	
Outflow	=	0.2 cfs @) 12.56 hrs	s, Volume=	= 5,332 cf, Att	en= 85%, Lag= 28.9 min
rimary	=	0.2 cts @) 12.56 hrs	s, Volume=	= 5,332 cf	
Pouting	by Stor	Ind mothod Ti	mo Span-	0 00 72 00	$brc_{dt} = 0.01 brc_{dt}$	
Doak El	Dy 3101-	1' @ 12 56 br	Surf Area	0.00-72.00	Storage= 2 205 cf	
	ev- 57.5	1 @ 12.00113		a- 1.000 SI		
				,		
Diug_Ele	w deten	tion time= 152	7 min calcu	ulated for 5	331 cf (100% of inflow)	
Plug-Flo	ow deten	tion time= 152	.7 min calcu	ulated for 5,	,331 cf (100% of inflow)	
Plug-Flo Center-	ow deten of-Mass o	tion time= 152 det. time= 153	.7 min calcı .0 min (906	ulated for 5, 5.8 - 753.8)	,331 cf (100% of inflow))	
Plug-Flo Center- Volume	ow deten of-Mass o In	tion time= 152 det. time= 153 vert Avail.	.7 min calcu .0 min (906 Storage S	ulated for 5, 5.8 - 753.8) Storage Des	,331 cf (100% of inflow)) scription	
Plug-Flo Center- <u>Volume</u> #1	ow deten of-Mass o In 57	tion time= 152 det. time= 153 <u>vert Avail.</u> .00'	.7 min calcu .0 min (906 <u>Storage S</u> 7,500 cf F	ulated for 5, 5.8 - 753.8) Storage Des Rooftop De	,331 cf (100% of inflow)) scription stention (Prismatic)List	ed below (Recalc)
Plug-Flo Center- <u>Volume</u> #1	ow deten of-Mass o In 57	tion time= 152 det. time= 153 vert Avail. .00'	.7 min calcu .0 min (906 <u>Storage S</u> 7,500 cf F	ulated for 5, 5.8 - 753.8) Storage Des Rooftop De	,331 cf (100% of inflow)) scription stention (Prismatic)List	ed below (Recalc)
Plug-Flo Center- <u>Volume</u> #1 Elevati	ow deten of-Mass o <u>In</u> 57 on	tion time= 152 det. time= 153 <u>vert Avail.</u> .00' Surf.Area	.7 min calcu .0 min (906 <u>Storage S</u> 7,500 cf F Inc.S	ulated for 5, 5.8 - 753.8) Storage Des Rooftop De	,331 cf (100% of inflow)) scription stention (Prismatic)List Cum.Store	ed below (Recalc)
Plug-Flo Center- <u>Volume</u> #1 Elevatio (feo	ow detent of-Mass of In 57 on et)	tion time= 152 det. time= 153 <u>vert Avail.</u> .00' Surf.Area (sq-ft)	.7 min calcu .0 min (906 <u>Storage S</u> 7,500 cf F Inc.S (cubic-1	ulated for 5, 5.8 - 753.8) Storage Des Rooftop De Store feet)	,331 cf (100% of inflow)) scription etention (Prismatic)List Cum.Store (cubic-feet)	ed below (Recalc)
Plug-Flo Center- <u>Volume</u> #1 Elevatio (feo 57.0	ow detent of-Mass of In 57 on et) 00	tion time= 152 det. time= 153 vert Avail. .00' Surf.Area (sq-ft) 7,500	.7 min calcu .0 min (900 <u>Storage S</u> 7,500 cf F Inc.S (cubic-1	ulated for 5, 5.8 - 753.8) Storage Des Rooftop De Store feet) (0	,331 cf (100% of inflow)) scription etention (Prismatic)List Cum.Store (cubic-feet) 0	ed below (Recalc)
Plug-Flo Center- Volume #1 Elevatio (fec 57.1 58.1	ow deten of-Mass of In 57 on et) 00 00	tion time= 152 det. time= 153 .00' Surf.Area (sq-ft) 7,500 7,500	.7 min calco .0 min (906 <u>Storage S</u> 7,500 cf F Inc.S (cubic-1 7	ulated for 5, 5.8 - 753.8) Storage Des Rooftop De Store (eet) (0,500	,331 cf (100% of inflow)) scription etention (Prismatic)List Cum.Store (cubic-feet) 0 7,500	ed below (Recalc)
Plug-Flo Center- #1 Elevati (fer 57. 58.	ow deten of-Mass of In 57 on et) 00 00	tion time= 152 det. time= 153 .00' Surf.Area (sq-ft) 7,500 7,500	.7 min calco .0 min (906 <u>Storage S</u> 7,500 cf F Inc.S (cubic-f	ulated for 5, 5.8 - 753.8) Storage Des Rooftop De Store feet) (0 ,500	,331 cf (100% of inflow)) scription tention (Prismatic)List Cum.Store (<u>cubic-feet)</u> 0 7,500	ed below (Recalc)
Plug-Flo Center- #1 Elevatio (feo 57. 58. Device	ow detent of-Mass of In 57 on et) 00 00 Routing	tion time= 152 det. time= 153 .00' Surf.Area (sq-ft) 7,500 7,500 g Inv.	.7 min calct .0 min (906 <u>Storage §</u> 7,500 cf F Inc.S (cubic-1 7 ert Outlet	ulated for 5, 5.8 - 753.8) Storage Des Rooftop De Store feet) (0 ,500 Devices	,331 cf (100% of inflow)) scription stention (Prismatic)List Cum.Store (cubic-feet) 0 7,500	ed below (Recalc)
Plug-Flo Center- #1 Elevati (feo 57. 58. Device #1	ow deten of-Mass of In 57 on et) 00 00 00 Routing Primary	tion time= 152 det. time= 153 .00' Surf.Area (sq-ft) 7,500 7,500 7,500 9 10v 8.0 8.0	.7 min calct .0 min (906 <u>Storage S</u> 7,500 cf F Inc.S (cubic-1 7 ert Outlet 02' 12.0'	ulated for 5, 5.8 - 753.8) Storage Des Rooftop De Store feet) (0 ,500 Devices Round Ro	,331 cf (100% of inflow) scription tention (Prismatic)List Cum.Store (cubic-feet) 0 7,500 tof Drain	ed below (Recalc)
Plug-Flo Center #1 Elevati (fer 57.1 58.1 Device #1	ow deten of-Mass of In 57 on et) 00 00 00 Primary	tion time= 152 det. time= 153 vert Avail. .00' Surf.Area (sq-ft) 7,500 7,500 9 Inv. 4 8.0	.7 min calct .0 min (906 <u>Storage S</u> 7,500 cf F Inc.S (cubic-1 7 ert Outlet 02' 12.0" L= 16.	ulated for 5, 5.8 - 753.8) Storage Des Rooftop De Store (0 0,500 Devices Round Ro 0' CPP, m	,331 cf (100% of inflow) scription stention (Prismatic)List Cum.Store (cubic-feet) 0 7,500 rof Drain nitered to conform to fill,	ed below (Recalc) Ke= 0.700
Plug-Flo Center #1 Elevatii (fer 57.1 58.1 Device #1	ow deten of-Mass of In 57 on et) 00 00 00 Routing Priman	tion time= 152 det. time= 153 .00' Surf.Area (sq-ft) 7,500 7,500 0 10v (8.0	.7 min calco .0 min (906 <u>Storage S</u> 7,500 cf F Inc.S (cubic-1 7 ert Outlet D2' 12.0" L= 16. Inlet /	ulated for 5, 5.8 - 753.8) Storage Des Rooftop De Store feet) (0 ,500 Devices Round Ro 0' CPP, m Outlet Inver	,331 cf (100% of inflow) scription stention (Prismatic)List Cum.Store (cubic-feet) 0 7,500 cof Drain nitered to conform to fill, rt= 8.02' / 7.70' S= 0.02	red below (Recalc) Ke= 0.700 200 '/' Cc= 0.900
Plug-Flo Center- #1 Elevati (fec 57. 58. Device #1	ow deten of-Mass of In 57 on et) 00 00 00 Routing Primary	tion time= 152 det. time= 153 .00' Surf.Area (sq-ft) 7,500 7,500 9, Inv. 4 8.0	.7 min calct .0 min (900 <u>Storage S</u> 7,500 cf F Inc.S (cubic-1 7 ert <u>Outlet</u> 2' 12.0" L = 16. Inlet / n = 0.0	ulated for 5, 5.8 - 753.8) Storage Des Rooftop De Store feet) (0 .500 Devices Round Ro 0' CPP, m CPP, m 13, Flow A	,331 cf (100% of inflow) scription stention (Prismatic)List Cum.Store (cubic-feet) 0 7,500 pof Drain itered to conform to fill, rt= 8.02' / 7.70' S= 0.0; rea= 0.79 sf	ke= 0.700 200 '/' Cc= 0.900
Plug-Flo Center- #1 Elevatii (fer 58.) Device #1 #2	ow deteni of-Mass of In 57 on et) 00 00 00 Priman Device	tion time= 152 det. time= 153 .00' Surf.Area (sq-ft) 7,500 7,500 7,500 1 57.0	.7 min calct .0 min (906 <u>Storage S</u> 7,500 cf F Inc.S (cubic-1 7 ert Outlet D2' 12.0" L= 16. Inlet / n= 0.0 00' 4.0" H	ulated for 5, 5.8 - 753.8) Storage Des Rooftop De Store feet) (0 ,500 Devices Round Ro 0' CPP, m Outlet Inver 13, Flow A oriz. Orific	,331 cf (100% of inflow) scription scription (Prismatic)List Cum.Store (cubic-feet) 0 7,500 cof Drain nitered to conform to fill, rt= 8.02' / 7.70' S= 0.02 rea= 0.79 sf se/Grate C= 0.600	red below (Recalc) Ke= 0.700 200 '/' Cc= 0.900

2=Orifice/Grate (Orifice Controls 0.2 cfs @ 2.66 fps)

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 Pond 2P: Rooftop Detention



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Summary for Pond 3P: Rain garden

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Inflow Area	ı =	12,275 sf,	52.50% Impervious,	Inflow Depth = 2.31" for 2-Year event
Inflow	=	0.8 cfs @	12.09 hrs, Volume=	2,362 cf
Outflow	=	0.8 cfs @	12.09 hrs, Volume=	2,362 cf, Atten= 0%, Lag= 0.3 min
Discarded	=	0.0 cfs @	12.09 hrs, Volume=	405 cf
Primary	=	0.8 cfs @	12.09 hrs, Volume=	1,957 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs Peak Elev= 6.36' @ 12.09 hrs Surf.Area= 381 sf Storage= 194 cf

Plug-Flow detention time= 91.1 min calculated for 2,361 cf (100% of inflow) Center-of-Mass det. time= 91.2 min (904.7 - 813.5)

Volume	Invert	Avail	.Storage	Storage Descriptior	1	
#1	5.60'		253 cf	Custom Stage Dat	a (Irregular)Listed	below (Recalc)
Elevation (feet)	Surf (Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
5.60		125	46.0	0	0	125
6.00		276	66.0	78	78	305
6.30		350	73.0	94	172	385
6.50		460	87.0	81	253	564

Device	Routing	Invert	Outlet Devices		
#1	Discarded	5.60'	0.520 in/hr Exfiltration over Surface area		
#2	Primary	6.30'	22.0' 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		

Discarded OutFlow Max=0.0 cfs @ 12.09 hrs HW=6.36' (Free Discharge) **1=Exfiltration** (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=0.8 cfs @ 12.09 hrs HW=6.36' (Free Discharge) -2=Broad-Crested Rectangular Weir (Weir Controls 0.8 cfs @ 0.57 fps)

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Summary for Pond TD2:

Inflow Area	i =	1,112 sf,	95.68% Impervious,	Inflow Depth = 3.29" for 2-Year event
Inflow	=	0.1 cfs @	12.08 hrs, Volume=	305 cf
Outflow	=	0.0 cfs @	9.85 hrs, Volume=	305 cf, Atten= 96%, Lag= 0.0 min
Discarded	=	0.0 cfs @	9.85 hrs, Volume=	305 cf
Primary	=	0.0 cfs @	0.00 hrs, Volume=	0 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs Peak Elev= 6.54' @ 15.22 hrs Surf.Area= 278 sf Storage= 163 cf

Plug-Flow detention time= 431.8 min calculated for 305 cf (100% of inflow) Center-of-Mass det. time= 431.8 min (1,194.7 - 762.9)

Volume	Invert	Avail.Storage	Storage Description
#1	5.50'	206 cf	17.06'W x 16.29'L x 3.83'H Stone
			1,064 cf Overall - 548 cf Embedded = 516 cf x 40.0% Voids
#2	6.00'	472 cf	6.89'W x 14.06'L x 2.83'H StormTrap ST-1 Units x 2 Inside #1
			548 cf Overall x 86.0% Voids
		678 cf	Total Available Storage
Device	Routing	Invert Out	et Devices
#1	Discarded	5.50' 0.52	20 in/hr Exfiltration over Surface area
#2	Primary	10.00' 6.0''	x 240.0" Horiz. Orifice/Grate C= 0.600
	•	Limi	ited to weir flow at low heads

Discarded OutFlow Max=0.0 cfs @ 9.85 hrs HW=5.55' (Free Discharge) **1=Exfiltration** (Exfiltration Controls 0.0 cfs)



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Summary for Pond TD3:

Inflow Area	=	1,105 sf,	97.29% Impervious,	Inflow Depth = 3.29" for 2-Year event
Inflow	=	0.1 cfs @	12.08 hrs, Volume=	303 cf
Outflow	=	0.0 cfs @	9.90 hrs, Volume=	303 cf, Atten= 96%, Lag= 0.0 min
Discarded	=	0.0 cfs @	9.90 hrs, Volume=	303 cf
Primary	=	0.0 cfs @	0.00 hrs, Volume=	0 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs Peak Elev= 6.53' @ 15.20 hrs Surf.Area= 278 sf Storage= 162 cf

Plug-Flow detention time= 429.4 min calculated for 303 cf (100% of inflow) Center-of-Mass det. time= 429.4 min (1,192.3 - 762.9)

Volume	Invert	Avail.Storage	Storage Description
#1	5.50'	206 cf	17.06'W x 16.29'L x 3.83'H Stone
			1,064 cf Overall - 548 cf Embedded = 516 cf x 40.0% Voids
#2	6.00'	472 cf	6.89'W x 14.06'L x 2.83'H StormTrap ST-1 Units x 2 Inside #1
			548 cf Overall x 86.0% Voids
		678 cf	Total Available Storage
Device	Routing	Invert Out	let Devices
#1	Discarded	5.50' 0.52	20 in/hr Exfiltration over Surface area
#2	Primary	10.30' 6.0 "	x 240.0" Horiz. Orifice/Grate C= 0.600
		Limi	ited to weir flow at low heads

Discarded OutFlow Max=0.0 cfs @ 9.90 hrs HW=5.55' (Free Discharge) **1=Exfiltration** (Exfiltration Controls 0.0 cfs)



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Summary for Pond TD4:

Inflow Area	i =	1,104 sf,	97.46% Impervious,	Inflow Depth = 3.29" for 2-Year event
Inflow	=	0.1 cfs @	12.08 hrs, Volume=	303 cf
Outflow	=	0.0 cfs @	9.89 hrs, Volume=	303 cf, Atten= 96%, Lag= 0.0 min
Discarded	=	0.0 cfs @	9.89 hrs, Volume=	303 cf
Primary	=	0.0 cfs @	0.00 hrs, Volume=	0 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs Peak Elev= 6.53' @ 15.20 hrs Surf.Area= 278 sf Storage= 161 cf

Plug-Flow detention time= 428.3 min calculated for 303 cf (100% of inflow) Center-of-Mass det. time= 428.4 min (1,191.2 - 762.9)

Volume	Invert	Avail.Storage	Storage Description
#1	5.50'	206 cf	17.06'W x 16.29'L x 3.83'H Stone
			1,064 cf Overall - 548 cf Embedded = 516 cf x 40.0% Voids
#2	6.00'	472 cf	6.89'W x 14.06'L x 2.83'H StormTrap ST-1 Units x 2 Inside #1
			548 cf Overall x 86.0% Voids
		678 cf	Total Available Storage
Device	Routing	Invert Out	et Devices
#1	Discarded	5.50' 0.52	20 in/hr Exfiltration over Surface area
#2	Primary	10.20' 6.0"	x 240.0" Horiz. Orifice/Grate C= 0.600
	•	Limi	ited to weir flow at low heads

Discarded OutFlow Max=0.0 cfs @ 9.89 hrs HW=5.55' (Free Discharge) **1=Exfiltration** (Exfiltration Controls 0.0 cfs)



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Summary for Pond TD5:

Inflow Area	a =	1,082 sf,	98.06% Impervious,	Inflow Depth = 3.41" for 2-Year event
Inflow	=	0.1 cfs @	12.08 hrs, Volume=	307 cf
Outflow	=	0.0 cfs @	9.74 hrs, Volume=	307 cf, Atten= 96%, Lag= 0.0 min
Discarded	=	0.0 cfs @	9.74 hrs, Volume=	307 cf
Primary	=	0.0 cfs @	0.00 hrs, Volume=	0 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs Peak Elev= 6.03' @ 15.15 hrs Surf.Area= 278 sf Storage= 161 cf

Plug-Flow detention time= 420.2 min calculated for 307 cf (100% of inflow) Center-of-Mass det. time= 420.2 min (1,174.0 - 753.8)

Volume	Invert	Avail.Storage	Storage Description
#1	5.00'	206 cf	17.06'W x 16.29'L x 3.83'H Stone
			1,064 cf Overall - 548 cf Embedded = 516 cf x 40.0% Voids
#2	5.50'	472 cf	6.89'W x 14.06'L x 2.83'H StormTrap ST-1 Units x 2 Inside #1
			548 cf Overall x 86.0% Voids
		678 cf	Total Available Storage
Device	Routing	Invert Out	let Devices
#1	Discarded	5.00' 0.5 2	20 in/hr Exfiltration over Surface area
#2	Primary	9.80' 6.0'	" x 240.0" Horiz. Orifice/Grate C= 0.600
		Lim	ited to weir flow at low heads

Discarded OutFlow Max=0.0 cfs @ 9.74 hrs HW=5.05' (Free Discharge) **1=Exfiltration** (Exfiltration Controls 0.0 cfs)



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Summary for Pond TD6:

Inflow Area	a =	1,056 sf,	99.24% Impervious,	Inflow Depth = 3.41" for 2-Year event
Inflow	=	0.1 cfs @	12.08 hrs, Volume=	300 cf
Outflow	=	0.0 cfs @	9.79 hrs, Volume=	300 cf, Atten= 96%, Lag= 0.0 min
Discarded	=	0.0 cfs @	9.79 hrs, Volume=	300 cf
Primary	=	0.0 cfs @	0.00 hrs, Volume=	0 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs Peak Elev= 6.00' @ 15.07 hrs Surf.Area= 278 sf Storage= 155 cf

Plug-Flow detention time= 404.2 min calculated for 300 cf (100% of inflow) Center-of-Mass det. time= 404.2 min (1,158.0 - 753.8)

Volume	Invert	Avail.Storage	Storage Description
#1	5.00'	206 cf	17.06'W x 16.29'L x 3.83'H Stone
			1,064 cf Overall - 548 cf Embedded = 516 cf x 40.0% Voids
#2	5.50'	472 cf	6.89'W x 14.06'L x 2.83'H StormTrap ST-1 Units x 2 Inside #1
			548 cf Overall x 86.0% Voids
		678 cf	Total Available Storage
Device	Routing	Invert Out	let Devices
#1	Discarded	5.00' 0.52	20 in/hr Exfiltration over Surface area
#2	Primary	9.50' 6.0"	x 240.0" Horiz. Orifice/Grate C= 0.600
		Limi	ited to weir flow at low heads

Discarded OutFlow Max=0.0 cfs @ 9.79 hrs HW=5.05' (Free Discharge) **1=Exfiltration** (Exfiltration Controls 0.0 cfs)



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Summary for Link 1L: Towards Wetlands

Inflow Area	a =	147,384 sf,	49.02% Impervious,	Inflow Depth = 1.01	for 2-Year event
Inflow	=	2.9 cfs @	12.11 hrs, Volume=	12,442 cf	
Primary	=	2.9 cfs @	12.11 hrs, Volume=	12,442 cf, At	ten= 0%, Lag= 0.0 min

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



	i nomalke Pl	ace - Post-Development
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Summary for Link 2L: Towards Street

Inflow Area	a =	11,302 sf,	56.45% Impervious,	Inflow Depth = 0.83"	for 2-Year event
Inflow	=	0.2 cfs @	12.09 hrs, Volume=	781 cf	
Primary	=	0.2 cfs @	12.09 hrs, Volume=	781 cf, Atte	n= 0%, Lag= 0.0 min

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

Link 2L: Towards Street



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Summary for Link 100L: Total Flows

Inflow Area	a =	158,686 sf,	49.55% Impervious,	Inflow Depth = 1.00	0" for 2-Year event
Inflow	=	3.1 cfs @	12.11 hrs, Volume=	13,223 cf	
Primary	=	3.1 cfs @	12.11 hrs, Volume=	13,223 cf, A	tten= 0%, Lag= 0.0 min

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

Link 100L: Total Flows



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Time span=0.00 Runoff by SCS TF Reach routing by Stor-Ind+Tr	-72.00 hrs, dt=0.01 hrs, 7201 points R-20 method, UH=SCS, Weighted-CN rans method - Pond routing by Stor-Ind method
Subcatchment 1S: CB-1	Runoff Area=22,742 sf 72.16% Impervious Runoff Depth=4.75" Tc=6.0 min CN=91 Runoff=2.8 cfs 9,005 cf
Subcatchment 2.1S: Building	Runoff Area=14,140 sf 100.00% Impervious Runoff Depth=5.55" Tc=6.0 min CN=98 Runoff=1.8 cfs 6,542 cf
Subcatchment 2S: Building Roof	Runoff Area=18,785 sf 100.00% Impervious Runoff Depth=5.55" Tc=6.0 min CN=98 Runoff=2.4 cfs 8,691 cf
Subcatchment 3.1S: Backyard ADs	Runoff Area=8,985 sf 3.03% Impervious Runoff Depth=3.10" Flow Length=147' Tc=10.3 min CN=75 Runoff=0.6 cfs 2,324 cf
Subcatchment 3S: Townhouse Roofs	Runoff Area=13,067 sf 100.00% Impervious Runoff Depth=5.55" Tc=6.0 min CN=98 Runoff=1.7 cfs 6,046 cf
Subcatchment4.2S: Townhouse TDs	Runoff Area=1,112 sf 95.68% Impervious Runoff Depth=5.43" Tc=6.0 min CN=97 Runoff=0.1 cfs 504 cf
Subcatchment 4.3S: Townhouse TDs	Runoff Area=1,105 sf 97.29% Impervious Runoff Depth=5.43" Tc=6.0 min CN=97 Runoff=0.1 cfs 500 cf
Subcatchment 4.4S: Townhouse TDs	Runoff Area=1,104 sf 97.46% Impervious Runoff Depth=5.43" Tc=6.0 min CN=97 Runoff=0.1 cfs 500 cf
Subcatchment 4.5S: Townhouse TDs	Runoff Area=1,082 sf 98.06% Impervious Runoff Depth=5.55" Tc=6.0 min CN=98 Runoff=0.1 cfs 501 cf
Subcatchment 4.6S: Townhouse TDs	Runoff Area=1,056 sf 99.24% Impervious Runoff Depth=5.55" Tc=6.0 min CN=98 Runoff=0.1 cfs 489 cf
Subcatchment 5S: TD-1	Runoff Area=5,851 sf 51.63% Impervious Runoff Depth=4.21" Tc=6.0 min CN=86 Runoff=0.6 cfs 2,053 cf
Subcatchment 6.1S: East driveway	Runoff Area=12,275 sf 52.50% Impervious Runoff Depth=4.32" Tc=6.0 min CN=87 Runoff=1.4 cfs 4,415 cf
Subcatchment 6S: Bypass Towards	Runoff Area=51,539 sf 0.21% Impervious Runoff Depth=3.01" Flow Length=125' Tc=14.0 min CN=74 Runoff=3.2 cfs 12,924 cf
Subcatchment 7S: To Street	Runoff Area=5,843 sf 18.07% Impervious Runoff Depth=3.39" Tc=6.0 min CN=78 Runoff=0.5 cfs 1,653 cf
Pond 1P: Underground Infiltration System Discarded=0.1 cl	n Peak Elev=7.90' Storage=12,342 cf Inflow=5.9 cfs 28,119 cf fs 16,675 cf Primary=0.7 cfs 11,444 cf Outflow=0.8 cfs 28,119 cf
Pond 2P: Rooftop Detention	Peak Elev=57.50' Storage=3,785 cf Inflow=2.4 cfs 8,691 cf Outflow=0.3 cfs 8,691 cf

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Pond 3P: Rain garden	Peak Elev=6.39' Storage=205 cf Inflow=1.4 cfs 4,415 cf Discarded=0.0 cfs 435 cf Primary=1.4 cfs 3,980 cf Outflow=1.4 cfs 4,415 cf
Pond TD2:	Peak Elev=7.30' Storage=315 cf Inflow=0.1 cfs 504 cf Discarded=0.0 cfs 504 cf Primary=0.0 cfs 0 cf Outflow=0.0 cfs 504 cf
Pond TD3:	Peak Elev=7.28' Storage=313 cf Inflow=0.1 cfs 500 cf Discarded=0.0 cfs 500 cf Primary=0.0 cfs 0 cf Outflow=0.0 cfs 500 cf
Pond TD4:	Peak Elev=7.28' Storage=312 cf Inflow=0.1 cfs 500 cf Discarded=0.0 cfs 500 cf Primary=0.0 cfs 0 cf Outflow=0.0 cfs 500 cf
Pond TD5:	Peak Elev=6.76' Storage=308 cf Inflow=0.1 cfs 501 cf Discarded=0.0 cfs 501 cf Primary=0.0 cfs 0 cf Outflow=0.0 cfs 501 cf
Pond TD6:	Peak Elev=6.71' Storage=298 cf Inflow=0.1 cfs 489 cf Discarded=0.0 cfs 489 cf Primary=0.0 cfs 0 cf Outflow=0.0 cfs 489 cf
Link 1L: Towards Wetlands	Inflow=5.7 cfs 34,891 cf Primary=5.7 cfs 34,891 cf
Link 2L: Towards Street	Inflow=0.5 cfs 1,653 cf Primary=0.5 cfs 1,653 cf
Link 100L: Total Flows	Inflow=6.2 cfs 36,543 cf Primary=6.2 cfs 36,543 cf

 Total Runoff Area = 158,686 sf
 Runoff Volume = 56,147 cf
 Average Runoff Depth = 4.25"

 50.45%
 Pervious = 80,060 sf
 49.55%
 Impervious = 78,626 sf

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Summary for Subcatch	ment 1S: CB-1
Runoff = 2.8 cfs @ 12.08 hrs, Volume=	9,005 cf, Depth= 4.75"
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Tir Type III 24-hr 10-Year Rainfall=5.79"	ne Span= 0.00-72.00 hrs, dt= 0.01 hrs
Area (sf) CN Description	
16,410 98 Paved parking, HSG C 6,332 74 >75% Grass cover, Good, HSG C	
22,742 91 Weighted Average	
6,332 27.84% Pervious Area	
10,410 72.10% impervious Area	
Tc Length Slope Velocity Capacity Descriptio	n
6.0 Direct En	try, Min. Tc
Subcatchment 1	6: CB-1
st st st st st st st st st st	Type III 24-hr 0-Year Rainfall=5.79" Sunoff Area=22,742 sf noff Volume=9,005 cf Runoff Depth=4.75" Tc=6.0 min CN=91
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 Time (hours)	46 48 50 52 54 56 58 60 62 64 66 68 70 72



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Summary for Subcatchment 2	S: Building Roof
Runoff = 2.4 cfs @ 12.08 hrs, Volume=	8,691 cf, Depth= 5.55"
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Type III 24-hr 10-Year Rainfall=5.79"	Span= 0.00-72.00 hrs, dt= 0.01 hrs
Area (sf) CN Description	
18,785 98 Roofs, HSG C	
18,785 100.00% Impervious Area	
Tc Length Slope Velocity Capacity Description (min) (feet) (ft/ft) (ft/sec) (cfs)	
6.0 Direct Entry	ν, Min. Tc
Subatahmant 28, Buil	ding Boof
Subcatchment 25: Build	
Hydrograph	
	Runoff
	Type III 24-hr
10-	Year Rainfall=5 79"
	noff Aroa-19'795 of
Ru	
	off Volume=8,691 cf
C C C C C C C C C C C C C C C C C C C	Runoff Depth=5.55"
Щ	Tc=6.0 min
	CN=98
Time (hours)	40 30 32 34 30 30 00 02 04 00 00 70 72

Thorndike Place - Post-Development 2340700-PR-2021-08-18 Type III 24-hr 10-Year Rainfall=5.79" Prepared by BSC Group Printed 8/24/2021 HydroCAD® 10.00-22 s/n 00904 © 2018 HydroCAD Software Solutions LLC Page 45	Thorndike Place - Post-Dev 2340700-PR-2021-08-18 Type III 24-hr 10-Year Rainf Prepared by BSC Group Printed & HydroCAD® 10.00-22 s/n 00904 © 2018 HydroCAD Software Solutions LLC
Summary for Subcatchment 3.1S: Backyard ADs	Summary for Subcatchment 3S: Townhouse Roofs
Runoff = 0.6 cfs @ 12.14 hrs, Volume= 2,324 cf, Depth= 3.10"	Runoff = 1.7 cfs @ 12.08 hrs, Volume= 6,046 cf, Depth= 5.55"
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs Type III 24-hr 10-Year Rainfall=5.79"	Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs Type III 24-hr 10-Year Rainfall=5.79"
Area (sf) CN Description	Area (sf) CN Description
272 98 Unconnected pavement, HSG C 8.302 74 ≥75% Grass cover Good HSG C	13,067 98 Roofs, HSG C 13,067 100,00% Impensious Area
* 411 89 Gravel sidewalk, HSG C 8 985 75 Weighted Average	Tc. Length Slope Velocity Capacity Description
8,713 96.97% Pervious Area	(min) (feet) (ft/ft) (ft/sec) (cfs)
272 3.03% Impervious Area272 100.00% Unconnected	6.0 Direct Entry, Min. Tc
To Length Slope Velocity Capacity Description	Subcatchment 3S: Townhouse Roofs
(min) (feet) (ft/ft) (ft/sec) (cfs)	Hydrograph
<u>0.9 97 0.0154</u> 1.86 <u>Brase Dense n e 0.240 P2 = 3.23°</u> <u>Shallow Concentrated Flow, Grassed Waterway Kv= 15.0 fps</u> <u>10.3 147 Total</u> Subcatchment 3.1S: Backyard ADS <u>Hydrograph</u> 10.4 Genetation 10.4 Constant 1	(t) (t) (t) (t) (t) (t) (t) (t) (t) (t)

Thorndike Place - Post-Development Type III 24-hr 10-Year Rainfall=5.79" Printed 8/24/2021

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Runoff

	Thorndike Place - Post-Development
2340700-PR-2021-08-18	Type III 24-hr 10-Year Rainfall=5.79"
Prepared by BSC Group	Printed 8/24/2021
HydroCAD® 10.00-22 s/n 00904 © 2018 HydroCAD Softw	vare Solutions LLC Page 47

Summary for Subcatchment 4.2S: Townhouse TDs

Runoff =

0.1 cfs @ 12.08 hrs, Volume= 504 cf, Depth= 5.43"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs Type III 24-hr 10-Year Rainfall=5.79"

Area	(sf)	CN	Description		
1,0	064	98	Paved park	ing, HSG C	
	48	74	>75% Gras	s cover, Go	bod, HSG C
1,1	112	97	Weighted A	verage	
	48		4.32% Perv	vious Area	
1,0	064		95.68% Imp	pervious Are	ea
Tc Le	ngth	Slope	e Velocity	Capacity	Description
<u>(min)</u> (1	feet)	(ft/ft) (ft/sec)	(cfs)	
6.0					Direct Entry, Min. Tc

Subcatchment 4.2S: Townhouse TDs



Summary for Subcatchment 4.3S: Townhouse TDS Runoff = 0.1 cfs @ 12.08 hrs, Volume 500 cf, Depth= 5.43" Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs Type III 24-hr 10-Year Rainfall=5.79" <u>Area (sf) CN Description</u> <u>1.075 98 Paved parking, HSG C</u> <u>0.74 - 75% Grass cover, Good, HSG C</u> <u>1.105 97 Weighted Average</u> <u>3.07 2.71% Pervious Area</u> <u>1.075 97.29% Impervious Area</u> <u>1.075 0.000000000000000000000000000000000</u>	2340700-PR-2 Prepared by BS _{HydroCAD®} 10.00	Thorndike Place - Post-Developm 1021-08-18 Type III 24-hr 10-Year Rainfall=5. SC Group Printed 8/24/2 P-22 s/n 00904 © 2018 HydroCAD Software Solutions LLC Page
Runoff = 0.1 cfs @ 12.08 hrs, Volume= 500 cf, Depth= 5.43" Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs Sypell 24-hr 10.75 98 Paved parking, HSG C 1,075 98 Paved parking, HSG C 10.75 97.29% Grass cover, Good, HSG C 1,075 97.29% Impervious Area 10.75 97.29% Impervious Area 1,075 97.29% Impervious Area 10.75 0.72.9% Impervious Area 1,075 97.29% Impervious Area 0.01 cfs 0.01 cfs 6.0 Direct Entry, Min. Tc Subcatchment 4.3S: Townhouse TDs Mydrograph 0.1 cfs 0.1 cfs Type III.24-hr 0.1 cfs 0.1 cfs Type III.24-hr 0.1 cfs 0.1 cfs Runoff Area=1,105 sf. 0.1 cfs Runoff Volume=5000 cf. Runoff Volume=5000 cf. 0.0 colspan="2">Runoff Volume=50.0 cf. 0.0 colspan="2">CN = 97.0 colspan= 2.200 cf. 0.0 colspan=2.200 cf. CN = 97		Summary for Subcatchment 4.3S: Townhouse TDs
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs Type III 24-hr 10-Year Rainfall=5.79" Area (sf) CN Description 1,075 98 Paved parking, HSG C 30 74 >75% Grass cover, Good, HSG C 1,105 97 Weighted Average 30 2.71% Pervious Area 1,075 97.29% Impervious Area 1,	Runoff =	0.1 cfs @ 12.08 hrs, Volume= 500 cf, Depth= 5.43"
Area (sf) CN Description 1,075 98 Paved parking, HSG C 30 74 >75% Grass cover, Good, HSG C 1,105 97 Weighted Average 30 2.71% Pervious Area 1,075 97.29% Impervious Area 1,075 97.29% Impervious Area Tc Length Slope Velocity Capacity Description (ft/ft) (ft/sec) (cfs) 6.0 Direct Entry, Min. Tc Subcatchment 4.3S: Townhouse TDS Hydrograph 0.16 0.1 cfs 10-1 cfs 10	Runoff by SCS T Type III 24-hr 10	R-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs I-Year Rainfall=5.79"
1,075 98 Paved parking, HSG C 30 74 >75% Grass cover, Good, HSG C 1,105 97 Weighted Average 30 2.71% Pervious Area 1,075 97.29% Impervious Area 1,075 97.29% Impervious Area Tc Length Slope Velocity Capacity Description (feet) (ft/ft) (ft/sec) (cfs) 6.0 Direct Entry, Min. Tc Subcatchment 4.3S: Townhouse TDS Hydrograph 0.1 cfs 10-Year Rainfall=5.79" Runoff Area=1,105 sf 10-Year Rainfall=5.79" Runoff Volume=500 cff 0.0 CN=97 0.0 CN=9	Area (sf)	CN Description
1,05 97 Weighted Average 30 2.71% Pervious Area 1,075 97.29% Impervious Area 1,075 97.29% Impervious Area Tc Length Slope Velocity Capacity Description (min) (feet) (ft/ft) (ft/sec) (cfs) 6.0 Direct Entry, Min. Tc Subcatchment 4.3S: Townhouse TDS Hydrograph 0,16 0,1 cfs 10-Year Rainfall=5.79" Runoff Area=1,105 sf Runoff Area=1,105 sf Runoff Colume=500 cf 0,00	1,075	98 Paved parking, HSG C
30 2.71% Pervious Area 1,075 97.29% Impervious Area Tc Length Slope Velocity Capacity Description (min) (feet) (ft/ft) (ft/sec) (cfs) 6.0 Direct Entry, Min. Tc Subcatchment 4.3S: Townhouse TDs Hydrograph 0 0.1 cfs 10-Year Rainfall=5.79" 0.1 0.1 cfs 10-Year Rainfall=5.79" 0.1 0.0 Runoff Area=1,105 sf 0.0 Runoff Depth=5.43" 0.0 CN=97 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	1.105	97 Weighted Average
1,075 97.29% Impervious Area Tc Length Slope Velocity Capacity Description 6.0 Direct Entry, Min. Tc Subcatchment 4.3S: Townhouse TDS Hydrograph 0.1 of 0.1 cfs Type III 24-hr 10-Year Rainfall=5.79" Runoff Area=1,105 sf Runoff Depth=5.43" C C Sign colspan="2">Tc=6.0 min 0.2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 23 24 30 38 40 42 44 46 48 50 52 54 56 58 60 62 64 68 68 70 72	30	2.71% Pervious Area
Tc Length Slope Velocity Capacity Description 6.0 Direct Entry, Min. Tc Subcatchment 4.3S: Townhouse TDS Hydrograph 0.0 0.1 cfs Hydrograph 0.1 0.1 cfs Type III 24-hr 0.1 0.1 cfs 10-Year Rainfall=5.79" 0.1 Runoff Area=1,105 sf Runoff Depth=5.43" 0.0 Runoff Depth=5.43" Tc=6.0 min 0.0 CN=97 CN=97 0.1 0.2 4.6 8.10 12 14 16 18 20 22 24 26 28 30 23 34 30 34 04 24 44 64 85 05 25 65 860 62 64 86 86 87 07	1,075	97.29% Impervious Area
(min) (feet) (ft/ft) (ft/sec) (cfs) 6.0 Direct Entry, Min. Tc Subcatchment 4.3S: Townhouse TDs Hydrograph 0.1 cfs 0.1 cfs 0.1 cfs 10-Year Rainfall=5.79" Runoff Area=1,105 sf Runoff Volume=500 cf Runoff Volume=500 cf Runoff Depth=5.43" CN=97 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4	Tc Length	Slope Velocity Capacity Description
6.0 Direct Entry, Min. Tc Subcatchment 4.3S: Townhouse TDs Hydrograph 0.1 cfs 0.1 cfs 0.	(min) (feet)	(ft/ft) (ft/sec) (cfs)
Subcatchment 4.3S: Townhouse TDs Hytrograph 10- 10- 10- 10- 10- 10- 10- 10-	6.0	Direct Entry, Min. Tc
Pydrograph		Subcatchment 4.3S: Townhouse TDs
CN=97 0.4 0.4 0.1 cfs 0.1 cfs 10-Year Rainfall=5.79" Runoff Area=1,105 sf Runoff Volume=500 cf Runoff Depth=5.43" Tc=6.0 min CN=97 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.		Hydrograph
0.02 0.01 0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72 Time (hours)	0.16 0.15 0.14 0.13 0.12 0.11 0.11 0.11 0.11 0.09 0.08 0.09 0.08 0.06 0.06 0.06	0.1 cfs Type III 24-hr. 10-Year Rainfall=5.79" Runoff Area=1,105 sf. Runoff Volume=500 cf Runoff Depth=5.43" Tc=6.0 min CN=97
0.01 0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72 Time (hours)	0.02	
0 1 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72 Time (hours)	0.01	
Time (hours)	0 2 4 6	8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72
		Time (hours)

2340700-PR-2021-08-18 Prepared by BSC Group	Type III 24-hr	10-Year Rainfall=5.79" Printed 8/24/2021
HydroCAD® 10.00-22 s/n 00904 © 2018 HydroCAD Software Solution	ons LLC	Page 49
Summary for Subcatchment 4.4S	: Townhouse	TDs

Runoff =

0.1 cfs @ 12.08 hrs, Volume= 500 cf, Depth= 5.43"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs Type III 24-hr 10-Year Rainfall=5.79"

A	rea (sf)	CN	Description					
	1,076	98	Paved park	Paved parking, HSG C				
	28	74	>75% Gras	s cover, Go	bod, HSG C			
	1,104	97	Weighted A	verage				
	28		2.54% Perv	vious Area				
	1,076		97.46% Imp	pervious Ar	ea			
т.	1	01	- M-1	0	Description			
	Length	Slop	e Velocity	Capacity	Description			
(min)	(feet)	(ft/f	(ft/sec)	(CIS)				
6.0					Direct Entry, Min. Tc			
			Cuba	otohmon	t / /S: Townhouse TDe			

Subcatchment 4.4S: Townhouse TDs



2340700-PR-2021-08-18	Thorndike Place - Post-Development Type III 24-hr 10-Year Rainfall=5.7
Prepared by BSC Group	Printed 8/24/202
HydroCAD® 10.00-22 s/n 00904 © 2018 HydroCAD Software So	Iutions LLC Page 5
Summary for Subcatchment 4.	5S: Townhouse TDs
Runoff = 0.1 cfs @ 12.08 hrs, Volume=	501 cf, Depth= 5.55"
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time	e Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=5.79"	
Area (sf) CN Description	
1,061 98 Paved parking, HSG C	
21 74 >75% Grass cover, Good, HSG C	
21 1.94% Pervious Area	
1,061 98.06% Impervious Area	
To Length Slope Velocity Capacity Description	
(min) (feet) (ft/ft) (ft/sec) (cfs)	'
6.0 Direct Entr	ry, Min. Tc
Subatchmont 4 55: Tou	
Subcatchment 4.55. Tov	Villouse i Ds
0.15	
0.14	Type III 24-hr
0.13	Voar Painfall=5 70"
0.11 0.1	Inoff Area=1,082 st
© 0.09 } } + + + + + + + + + + + + + + + + +	off Volume=501 cf
5 0.08 1 1 1 1 1 1 1 1 1 1	Runoff Depth=5.55"
0.06	
	CN=98
0.01	
Time (hours)	-0 -0 00 02 0+ 00 00 02 04 00 00 10 12

2340700-PR-2021-08-18 Prepared by BSC Group					T	Thorndike ype III 24-hi	Place - Po r <i>10-Yea</i> Pr	ost-Dev r <i>Rainf</i> inted 8	elopment <i>all=5.79"</i> 3/24/2021		
HydroCA	D® 10.00-	22 s/n	0904 ©	2018 Hydro	DAD	Software Sol	lutions	LLC			Page 51
		Su	ımmary	for Sub	ocato	chment 4.6	6S: T	ownhouse	TDs		
Runoff	=	0.1	cfs @ 1	12.08 hrs,	Volu	ime=	4	89 cf, Depth	= 5.55"		
Runoff b Fype III :	y SCS TF 24-hr 10-	R-20 me -Year R	ethod, UF ainfall=5.	H=SCS, W .79"	/eight	ed-CN, Time	e Spar	0.00-72.00 =ר) hrs, dt= (0.01 hr:	5
A	rea (sf)	CN	Descript	ion							
	1,048	98	Paved p	arking, H	SGC						
	1 056	/4	>/5% G	rass cove	r, Goo	od, HSG C					
	1,056	98	0 76% P	u Average Pervious A	; rea						
	1,048		99.24%	Imperviou	is Are	a					
	,										
Tc	Length	Slop	e Veloc	ity Capa	icity	Description	ı				
(min)	(teet)	(π/f	.) (II/se	ec) (cfs)	Direct Entr					
0.0						Direct Entr	ry, Min	1. 10			
			Su	bcatchn	nent	4.6S: Tov	wnhoi	use TDs			
			54		lydrog	ranh					
				• 	-+-+						
0.15	11	0.1 cf	s				4-4-4			_L_ [Runoff
0.14	11				-+-+			Type I	ll 94-h	r	
0.13	Ĩ,∤-⊱-⊱-	i- i- /		 	- + - +			Deinf-			
0.12	1/+++	/	-+-+		-+-+	10-1	rear	Raintai	1=5.79		
0.11	Į ,∤-⊱-⊱	i- i- ∕				Ru	inof	f Area=1	,056 s	f	
0.1-	┋╱┟╌┝╌	/	-+-+-		-+-+	Run	off	Volume	=189 c	f	
ີ ເ ຍີ່	[/+⊹+-	/						volume			
0.08- 8 0.07]/+++-	/	-+-+-		-+-+	R	Runo	off Depth	า=5.55		
± 0.07]/††††				$-\frac{1}{1}-\frac{1}{1}$		$\frac{1}{1} = \frac{1}{1} = \frac{1}{1}$	Tc=0	6.0 mii	ī 🗌	
0.05			-+-+-	+	-+-+-		+-+-+			 D	
0.00	1 4-5-5-				- + - + -				UN=98	D C	

0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72 Time (hours)

0.04 0.03 0.02

	I horndike Place - Post-Development
2340700-PR-2021-08-18	Type III 24-hr 10-Year Rainfall=5.79"
Prepared by BSC Group	Printed 8/24/2021
HydroCAD® 10.00-22 s/n 00904 © 2018 HydroCA	D Software Solutions LLC Page 52

Summary for Subcatchment 5S: TD-1

Runoff = 0.6 cfs @ 12.09 hrs, Volume=

2,053 cf, Depth= 4.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs Type III 24-hr $\,$ 10-Year Rainfall=5.79"

Area (sf) CN Description	
3,021 98 Paved parking, HSG C	
2,830 74 >75% Grass cover, Good, HSG C	
5,851 86 Weighted Average	
2,830 48.37% Pervious Area	
5,021 51.05% Impervious Area	
Tc Length Slope Velocity Capacity Description	
(min) (feet) (ft/ft) (ft/sec) (cfs)	
6.0 Direct Entry, Min. Tc	
Subcatchment 5S: TD-1	
Hydrograph	
0.7 0.6 cfs	Jnoff
0.6	
0.5	
0.45 Runoff Volume=2,053 cf	
€ 0.4 Runoff Depth=4.21"	
§ 0.35	
0.25 CN-00	
0 2 4 0 0 10 12 14 10 10 20 22 24 20 20 30 32 34 30 30 40 42 44 40 40 50 52 54 50 58 80 62 64 66 68 70 72 Time (hours)	

2340700-PR-20 Prepared by BS0 HydroCAD® 10.00-	D21-08-18 Thorndike Place - Post-Development D21-08-18 Type III 24-hr 10-Year Rainfall=5.79" C Group Printed 8/24/2021 22 s/n 00904 © 2018 HydroCAD Software Solutions LLC Page 53
	Summary for Subcatchment 6.1S: East driveway
Runoff =	1.4 cfs @ 12.09 hrs, Volume= 4,415 cf, Depth= 4.32"
Runoff by SCS TF Type III 24-hr 10-	R-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs Year Rainfall=5.79"
Area (sf)	CN Description
5,611 6,444 220	 74 >75% Grass cover, Good, HSG C 98 Paved roads w/curbs & sewers, HSG C 89 Gravel roads, HSG C
12,275	87 Weighted Average
6,444	52.50% Impervious Area
Tc Length (min) (feet)	Slope Velocity Capacity Description (ft/ft) (ft/sec) (cfs)
6.0	Direct Entry,
	Subcatchment 6.1S: East driveway
Flow (dfs)	Hydrograph 1.4 cfs Type III 24-hr 10-Year Rainfall=5.79" Runoff Area=12,275 sf Runoff Volume=4,415 cf Runoff Depth=4.32" Tc=6.0 min CN=87
0 2 4 6 8	10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72

HydroCA	HydroCAD® 10.00-22 s/n 00904 © 2018 HydroCAD Software Solutions LLC Page 54						
Summary for Subcatchment 6S: Bypass Towards Wetlands							
Runoff	=	3.2 c	fs @ 12.1	9 hrs, Vol	ume=	12,924 cf, Depth= 3.01"	
Runoff b Type III :	Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs Type III 24-hr 10-Year Rainfall=5.79"						
	4 005						
	4,985	70 V	vooas, Go				
	46,447	74 >	75% Gras	s cover, Go	ood, HSG C		
	107	98 F	Roofs, HSG	G C			
	51 539	74 V	Veighted A	verage			
	51 / 32		0 70% Po	vious Area			
	107	0	210/ Imp		•		
	107	U	.21% impe	ervious Area	a		
Тс	Length	Slope	Velocity	Capacity	Description		
(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)			
11.8	50	0 0220	0.07		Sheet Flow		
		0.0220	0.07		Woods: Light	underbruch n= 0.400 P2	- 3 23"
2.2	75	0 0122	0 5 9		Shallow Cor		- 0.20
2.2	15	0.0133	0.58		Shanow Cor	fue 5 0 free	
					vvoodland P	V= 5.0 Ips	

2340700-PR-2021-08-18 Prepared by BSC Group

14.0

125 Total

Thorndike Place - Post-Development Type III 24-hr 10-Year Rainfall=5.79"

Printed 8/24/2021

Subcatchment 6S: Bypass Towards Wetlands



234070 Prepare HydroCAl	0-PR-20 d by BS0 D® 10.00-	Thorndike Place - Post-E D21-08-18 Type III 24-hr 10-Year Ra C Group Printer 22 s/n 00904 © 2018 HydroCAD Software Solutions LLC	evelopment <i>infall=5.79"</i> d 8/24/2021 <u>Page 55</u>					
	Summary for Subcatchment 7S: To Street							
Runoff	=	0.5 cfs @ 12.09 hrs, Volume= 1,653 cf, Depth= 3.39"						
Runoff by Type III 2	y SCS TF 24-hr 10-	R-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 Year Rainfall=5.79"	hrs					
A	rea (sf)	CN Description						
	1,056 4 787	98 Paved parking, HSG C 74 ⇒75% Grass cover Good, HSG C						
	5,843	78 Weighted Average						
	4,787 1,056	81.93% Pervious Area 18.07% Impervious Area						
Tc	Length	Slope Velocity Capacity Description						
(min) 6.0	(feet)	(ft/ft) (ft/sec) (cfs) Direct Entry Min Tc						
0.0		Direct Entry, mill re						
		Subcatchment 7S: To Street						
		Hydrograph						
0.55	 	0.5 cfs	Runoff					
0.5	,	Type III-24-hr						
0.45	/	<mark>/</mark> Rainfall=5.79"						
0.4	/	Runoff Area=5,843 sf						
0.35	/	Runoff Volume=1,653 cf						
(cts) 0.3		Runoff Depth=3.39"						
⁸ ≝ 0.25	/	Tc=6.0 min						
0.2	,							
0.15	,							
0.1-	,							
0.05								
0-								
	0246	3 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72 Time (hours)						

Prenare)0-PR-2021-0 ed by BSC Gro)8-18			Type II	l 24-hr	10-Year Rainfall=5.79" Printed 8/24/2021
HydroCA	D® 10.00-22 s/r	<u>n 00904 © 2</u>	2018 Hy	ydroCAD Softwa	re Solutions LLC		Page 56
	Sur	nmary fo	r Pon	nd 1P: Under	ground Infiltra	ation Sy	ystem
Inflow A Inflow Outflow Discarde Primary Routing	rea = 6 = 5. = 0. ≥d = 0. = 0.	9,430 sf, 7 9 cfs @ 1 .8 cfs @ 1 .1 cfs @ .7 cfs @ 1 thod Time	4.25% 2.09 h 3.06 h 7.57 h 3.06 h	b Impervious, Ir irs, Volume= irs, Volume= irs, Volume= irs, Volume= = 0 00-72 00 brs	nflow Depth = 4. 28,119 cf 28,119 cf, 16,675 cf 11,444 cf	86" for Atten= 8	10-Year event 37%, Lag= 58.2 min
Peak Ele	ev= 7.90' @ 13	.06 hrs Su	Irf.Area	a= 7,556 sf St	orage= 12,342 cf		
Plug-Flo Center-o	w detention tim of-Mass det. tim	ıe= 659.9 n ıe= 659.9 n	nin calo nin (1,	culated for 28,1 ,479.8 - 819.8)	19 cf (100% of in	flow)	
Volume	Invert	Avail.Sto	rage	Storage Descri	iption		
#1	6.00'	19,49	95 cf	6.89'W x 14.06 22,668 cf Over	S'L x 3.00'H Stor all x 86.0% Void	nTrap S s	T-1 Units (Irregular Shap
Device	Routing	Invert	Outle	et Devices			
#1 #2	Discarded Primary	6.00' 7.50'	0.520 15.0" L= 19 Inlet / n= 0.0	0 in/hr Exfiltrat ' Round Culve 90.0' CPP, squ / Outlet Invert= 013, Flow Area	ion over Surface ert Jare edge headwa 7.50' / 6.00' S= a= 1.23 sf	area all, Ke= 0.0079 '/	0.500 " Cc= 0.900
	ed OutFlow M	ax=0.1 cfs	@ 7.57 trols 0.	7 hrs HW=6.03 .1 cfs)	8' (Free Dischar	je)	
Discard	filtration (Exfil			,			
Discard 1=Ex Primary 2=Cu	filtration (Exfil OutFlow Max Ivert (Barrel C	=0.7 cfs @ ontrols 0.7	13.06 cfs @	hrs HW=7.90' 3.06 fps)	(Free Discharge	9)	
Discard 1=Ex Primary 2=Cu	filtration (Exfil OutFlow Max Ilvert (Barrel C	=0.7 cfs @ ontrols 0.7	13.06 cfs @	hrs HW=7.90' 3.06 fps)	(Free Discharge	e)	
Discard 1=Ex Primary 2=Cu	filtration (Exfil [,] OutFlow Max Ilvert (Barrel C	=0.7 cfs @ ontrols 0.7	13.06 cfs @	hrs HW=7.90' 3.06 fps)	(Free Discharge	e)	
Discard 1=Ex Primary 2=Cu	filtration (Exfil OutFlow Max Ivert (Barrel C	=0.7 cfs @ ontrols 0.7	13.06 cfs @	hrs HW=7.90' 3.06 fps)	(Free Discharge)	
Discard 1=Ex Primary 1−2=Cu	filtration (Exfil OutFlow Max Ivert (Barrel C	=0.7 cfs @ ontrols 0.7	13.06 cfs @	hrs HW=7.90' 3.06 fps)	(Free Discharge	2)	
Discard 1=Ex Primary 1−2=Cu	filtration (Exfil v OutFlow Max Ilvert (Barrel C	=0.7 cfs @ controls 0.7	13.06 cfs @	hrs HW=7.90' 3.06 fps)	(Free Discharge	?)	
Discard	filtration (Exfil OutFlow Max Ivert (Barrel C	=0.7 cfs @ ontrols 0.7	13.06 cfs @	hrs HW=7.90' 3.06 fps)	(Free Discharge	»)	
Discard 1=Ex Primary 1−2=Cu	filtration (Exfil OutFlow Max Ivert (Barrel C	=0.7 cfs @ ontrols 0.7	13.06 cfs @	hrs HW=7.90' 3.06 fps)	(Free Discharge	2)	

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Pond 1P: Underground Infiltration System



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Summary for Pond 2P: Rooftop Detention

Inflow Are	ea =	18,785 sf,	100.00% Impervious,	Inflow Depth =	5.55" for 10)-Year event
Inflow	=	2.4 cfs @	12.08 hrs, Volume=	8,691 c	of	
Outflow	=	0.3 cfs @	12.64 hrs, Volume=	8,691 c	of, Atten= 88%	, Lag= 33.4 min
Primary	=	0.3 cfs @	12.64 hrs, Volume=	8,691 c	of	-

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3 Peak Elev= 57.50' @ 12.64 hrs Surf.Area= 7,500 sf Storage= 3,785 cf

Plug-Flow detention time= 166.1 min calculated for 8,690 cf (100% of inflow) Center-of-Mass det. time= 166.4 min (912.1 - 745.7)

Volume	Invert	Avail.Stor	rage Storage	e Description	
#1	57.00	7,50	00 cf Roofto	p Detention (Prisma	tic)Listed below (Recalc)
Elevatio (fee 57.0 58.0	on S et) 00 00	urf.Area (sq-ft) 7,500 7,500	Inc.Store (cubic-feet) 0 7,500	Cum.Store (cubic-feet) 0 7,500	
Device	Routing	Invert	Outlet Device	es	
#1	Primary	8.02'	12.0" Round L= 16.0' CP Inlet / Outlet	d Roof Drain P, mitered to conforn Invert= 8.02' / 7.70'	n to fill, Ke= 0.700 S= 0.0200 '/' Cc= 0.900
#2	Device 1	57.00'	4.0" Horiz. O Limited to we	orifice/Grate C= 0.6 Fir flow at low heads	00

Primary OutFlow Max=0.3 cfs @ 12.64 hrs HW=57.50' (Free Discharge) =Roof Drain (Passes 0.3 cfs of 23.4 cfs potential flow) =2=Orifice/Grate (Orifice Controls 0.3 cfs @ 3.42 fps)

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Summary for Pond 3P: Rain garden

Inflow Area	1 =	12,275 sf,	52.50% Impervious,	Inflow Depth = 4.32" for 10-Year event
Inflow	=	1.4 cfs @	12.09 hrs, Volume=	4,415 cf
Outflow	=	1.4 cfs @	12.09 hrs, Volume=	4,415 cf, Atten= 0%, Lag= 0.3 min
Discarded	=	0.0 cfs @	12.09 hrs, Volume=	435 cf
Primary	=	1.4 cfs @	12.09 hrs, Volume=	3,980 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs Peak Elev= 6.39' @ 12.09 hrs Surf.Area= 397 sf Storage= 205 cf

Plug-Flow detention time= 53.3 min calculated for 4,415 cf (100% of inflow) Center-of-Mass det. time= 53.3 min (849.2 - 795.9)

Volume	Invert	Avail.Sto	orage	Storage Description		
#1	5.60'	2	53 cf	Custom Stage Data	a (Irregular)Listed	below (Recalc)
Elevatio (fee	on Si et)	urf.Area F (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
5.6 6.0 6.3	50 00 30	125 276 350	46.0 66.0 73.0	0 78 94	0 78 172	125 305 385
6.5	50	460	87.0	81	253	564
Device	Routing	Invert	Outle	et Devices		
#1 #2	Device Roung Interf #1 Discarded 5.60' 0 #2 Primary 6.30' 2 2 C 2 C 2 2 C 2		0.52 22.0 Head 2.50 Coel 2.65	0 in/hr Exfiltration or 'long x 5.0' breadth d (feet) 0.20 0.40 0. 3.00 3.50 4.00 4.5 f. (English) 2.34 2.50 2.67 2.66 2.68 2.7	ver Surface area Broad-Crested I 60 0.80 1.00 1.2 0 5.00 5.50 0 2.70 2.68 2.68 0 2.74 2.79 2.88	Rectangular Weir 20 1.40 1.60 1.80 2.00 2.66 2.65 2.65 2.65

Discarded OutFlow Max=0.0 cfs @ 12.09 hrs HW=6.39' (Free Discharge) **1=Exfiltration** (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=1.4 cfs @ 12.09 hrs HW=6.39' (Free Discharge) 2=Broad-Crested Rectangular Weir (Weir Controls 1.4 cfs @ 0.70 fps)





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Summary for Pond TD2:

Inflow Area	a =	1,112 sf,	95.68% Impervious,	Inflow Depth = 5.43" for 10-Year event
Inflow	=	0.1 cfs @	12.08 hrs, Volume=	504 cf
Outflow	=	0.0 cfs @	8.34 hrs, Volume=	504 cf, Atten= 98%, Lag= 0.0 min
Discarded	=	0.0 cfs @	8.34 hrs, Volume=	504 cf
Primary	=	0.0 cfs @	0.00 hrs, Volume=	0 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs Peak Elev= 7.30' @ 16.79 hrs Surf.Area= 278 sf Storage= 315 cf

Plug-Flow detention time= $825.7~{\rm min}$ calculated for 504 cf (100% of inflow) Center-of-Mass det. time= $825.8~{\rm min}$ (1,578.6 - 752.8)

Volume	Invert	Avail.Storage	Storage Description			
#1	5.50'	206 cf	cf 17.06'W x 16.29'L x 3.83'H Stone			
#2	6.00'	472 cf	1,064 cf Overall - 548 cf Embedded = 516 cf x 40.0% Voids 6.89'W x 14.06'L x 2.83'H StormTrap ST-1 Units x 2 Inside #1 548 cf Overall x 86.0% Voids			
		678 cf	f Total Available Storage			
Device	Routing	Invert Ou	tlet Devices			
#1 #2	Discarded Primary	5.50' 0.5 10.00' 6.0 Lin	520 in/hr Exfiltration over Surface area " x 240.0" Horiz. Orifice/Grate C= 0.600 nited to weir flow at low heads			

Discarded OutFlow Max=0.0 cfs @ 8.34 hrs HW=5.55' (Free Discharge) **1=Exfiltration** (Exfiltration Controls 0.0 cfs)





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Summary for Pond TD3:

Inflow Area =	1,105 sf,	97.29% Impervious,	Inflow Depth = 5.43" for 10-Year event
Inflow =	0.1 cfs @	12.08 hrs, Volume=	500 cf
Outflow =	0.0 cfs @	8.38 hrs, Volume=	500 cf, Atten= 98%, Lag= 0.0 min
Discarded =	0.0 cfs @	8.38 hrs, Volume=	500 cf
Primary =	0.0 cfs @	0.00 hrs, Volume=	0 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs Peak Elev= 7.28' @ 16.76 hrs Surf.Area= 278 sf Storage= 313 cf

Plug-Flow detention time= 820.3 min calculated for 500 cf (100% of inflow) Center-of-Mass det. time= 820.4 min (1,573.3 - 752.8)

Volume	Invert	Avail.Storag	e Storage Description
#1	5.50'	206 0	cf 17.06'W x 16.29'L x 3.83'H Stone
			1,064 cf Overall - 548 cf Embedded = 516 cf x 40.0% Voids
#2	6.00'	472 0	cf 6.89'W x 14.06'L x 2.83'H StormTrap ST-1 Units x 2 Inside #1
			548 cf Overall x 86.0% Voids
		678 0	cf Total Available Storage
. .	.		
Device	Routing	Invert O	outlet Devices
#1	Discarded	5.50' 0.	.520 in/hr Exfiltration over Surface area
#2	Primary	10.30' 6.	.0" x 240.0" Horiz. Orifice/Grate C= 0.600
		Li	imited to weir flow at low heads

Discarded OutFlow Max=0.0 cfs @ 8.38 hrs HW=5.55' (Free Discharge) **1=Exfiltration** (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=5.50' (Free Discharge) 2=Orifice/Grate (Controls 0.0 cfs)





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Summary for Pond TD4:

Inflow Area =	1,104 sf,	97.46% Impervious,	Inflow Depth = 5.43" for 10-Year event
Inflow =	0.1 cfs @	12.08 hrs, Volume=	500 cf
Outflow =	0.0 cfs @	8.38 hrs, Volume=	500 cf, Atten= 98%, Lag= 0.0 min
Discarded =	0.0 cfs @	8.38 hrs, Volume=	500 cf
Primary =	0.0 cfs @	0.00 hrs, Volume=	0 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs Peak Elev= 7.28' @ 16.76 hrs Surf.Area= 278 sf Storage= 312 cf

Plug-Flow detention time= 818.9 min calculated for 500 cf (100% of inflow) Center-of-Mass det. time= 819.0 min (1,571.8 - 752.8)

Volume	Invert	Avail.Storage	Storage Description
#1	5.50'	206 cf	17.06'W x 16.29'L x 3.83'H Stone
#2	6.00'	472 cf	1,064 cf Overall - 548 cf Embedded = 516 cf x 40.0% Voids 6.89'W x 14.06'L x 2.83'H StormTrap ST-1 Units x 2 Inside #1 548 cf Overall x 86.0% Voids
		678 cf	Total Available Storage
Device	Routing	Invert Out	tlet Devices
#1 #2	Discarded Primary	5.50' 0.5 2 10.20' 6.0' Lim	20 in/hr Exfiltration over Surface area " x 240.0" Horiz. Orifice/Grate C= 0.600 ited to weir flow at low heads

Discarded OutFlow Max=0.0 cfs @ 8.38 hrs HW=5.55' (Free Discharge) **1=Exfiltration** (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=5.50' (Free Discharge) 2=Orifice/Grate (Controls 0.0 cfs)





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Summary for Pond TD5:

Inflow Area	a =	1,082 sf,	98.06% Impervious,	Inflow Depth = 5.55" for 10-Year event
Inflow	=	0.1 cfs @	12.08 hrs, Volume=	501 cf
Outflow	=	0.0 cfs @	8.25 hrs, Volume=	501 cf, Atten= 98%, Lag= 0.0 min
Discarded	=	0.0 cfs @	8.25 hrs, Volume=	501 cf
Primary	=	0.0 cfs @	0.00 hrs, Volume=	0 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs Peak Elev= 6.76' @ 16.67 hrs Surf.Area= 278 sf Storage= 308 cf

Plug-Flow detention time= 799.7 min calculated for 501 cf (100% of inflow) Center-of-Mass det. time= 799.8 min (1,545.5 - 745.7)

Volume	Invert	Avail.Storage	e Storage Description
#1	5.00'	206 c	f 17.06'W x 16.29'L x 3.83'H Stone
			1,064 cf Overall - 548 cf Embedded = 516 cf x 40.0% Voids
#2	5.50'	472 c	f 6.89'W x 14.06'L x 2.83'H StormTrap ST-1 Units x 2 Inside #1
			548 cf Overall x 86.0% Voids
		678 c	f Total Available Storage
. .	.		
Device	Routing	Invert OL	itiet Devices
#1	Discarded	5.00' 0.5	520 in/hr Exfiltration over Surface area
#2	Primary	9.80' 6.0)" x 240.0" Horiz. Orifice/Grate C= 0.600
		Lir	nited to weir flow at low heads

Discarded OutFlow Max=0.0 cfs @ 8.25 hrs HW=5.05' (Free Discharge) **1=Exfiltration** (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=5.00' (Free Discharge) 2=Orifice/Grate (Controls 0.0 cfs)



0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72 Time (hours)

0.03

0.02

0.0 cfs

0.0.cfs

0.0 cfs

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Summary for Pond TD6:

Inflow Area	a =	1,056 sf,	99.24% Impervious,	Inflow Depth = 5.55"	for 10-Year event
Inflow	=	0.1 cfs @	12.08 hrs, Volume=	489 cf	
Outflow	=	0.0 cfs @	8.31 hrs, Volume=	489 cf, Atter	n= 98%, Lag= 0.0 min
Discarded	=	0.0 cfs @	8.31 hrs, Volume=	489 cf	-
Primary	=	0.0 cfs @	0.00 hrs, Volume=	0 cf	

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs Peak Elev= 6.71' @ 16.56 hrs Surf.Area= 278 sf Storage= 298 cf

Plug-Flow detention time= 772.7 min calculated for 489 cf (100% of inflow) Center-of-Mass det. time= 772.8 min (1,518.5 - 745.7)

Volume	Invert	Avail.Storage	e Storage Description
#1	5.00'	206 c	of 17.06'W x 16.29'L x 3.83'H Stone
			1,064 cf Overall - 548 cf Embedded = 516 cf x 40.0% Voids
#2	5.50'	472 c	of 6.89'W x 14.06'L x 2.83'H StormTrap ST-1 Units x 2 Inside #1
			548 cf Overall x 86.0% Voids
		678 c	of Total Available Storage
Device	Routing	Invert Ou	utlet Devices
#1	Discarded	5.00' 0.	520 in/hr Exfiltration over Surface area
#2	Primary	9.50' 6.0	0" x 240.0" Horiz. Orifice/Grate C= 0.600
	,	Lir	mited to weir flow at low heads

Discarded OutFlow Max=0.0 cfs @ 8.31 hrs HW=5.05' (Free Discharge) **1=Exfiltration** (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=5.00' (Free Discharge) 2=Orifice/Grate (Controls 0.0 cfs)



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Summary for Link 1L: Towards Wetlands

Inflow Area =	147,384 sf,	49.02% Impervious,	Inflow Depth = 2.84"	for 10-Year event
Inflow =	5.7 cfs @	12.12 hrs, Volume=	34,891 cf	
Primary =	5.7 cfs @	12.12 hrs, Volume=	34,891 cf, Atte	n= 0%, Lag= 0.0 min

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

Link 1L: Towards Wetlands



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Summary for Link 2L: Towards Street

Inflow Area	a =	11,302 sf,	56.45% Impervious,	Inflow Depth = 1.75"	for 10-Year event
Inflow	=	0.5 cfs @	12.09 hrs, Volume=	1,653 cf	
Primary	=	0.5 cfs @	12.09 hrs, Volume=	1,653 cf, Att	en= 0%, Lag= 0.0 min

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



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Summary for Link 100L: Total Flows

Inflow Area	a =	158,686 sf,	49.55% Impervious,	Inflow Depth = 2.76"	for 10-Year event
Inflow	=	6.2 cfs @	12.11 hrs, Volume=	36,543 cf	
Primary	=	6.2 cfs @	12.11 hrs, Volume=	36,543 cf, Atte	en= 0%, Lag= 0.0 min

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

Link 100L: Total Flows



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Time span=0.0 Runoff by SCS 1 Reach routing by Stor-Ind+	10-72.00 hrs, dt=0.01 hrs, 7201 points FR-20 method, UH=SCS, Weighted-CN Trans method - Pond routing by Stor-Ind method	Pond 3P: Rain garden	Peak Elev=6.41' Storage=214 cf Inflow=1.9 cfs 6,090 cf Discarded=0.0 cfs 452 cf Primary=1.9 cfs 5,638 cf Outflow=1.9 cfs 6,090 cf
Subcatchment 1S: CB-1	Runoff Area=22,742 sf 72.16% Impervious Runoff Depth=6.42"	Pond TD2:	Peak Elev=7.95' Storage=445 cf Inflow=0.2 cfs 661 cf Discarded=0.0 cfs 661 cf Primary=0.0 cfs 0 cf Outflow=0.0 cfs 661 cf
Subcatchment 2.1S: Building	Runoff Area=14,140 sf 100.00% Impervious Runoff Depth=7.25" Tc=6.0 min CN=98 Runoff=2.4 cfs 8,544 cf	Pond TD3:	Peak Elev=7.93' Storage=442 cf Inflow=0.2 cfs 657 cf Discarded=0.0 cfs 657 cf Primary=0.0 cfs 0 cf Outflow=0.0 cfs 657 cf
Subcatchment 2S: Building Roof	Runoff Area=18,785 sf 100.00% Impervious Runoff Depth=7.25" Tc=6.0 min CN=98 Runoff=3.2 cfs 11,350 cf	Pond TD4:	Peak Elev=7.93' Storage=442 cf Inflow=0.2 cfs 656 cf Discarded=0.0 cfs 656 cf Primary=0.0 cfs 0 cf Outflow=0.0 cfs 656 cf
Subcatchment 3.1S: Backyard ADs	Runoff Area=8,985 sf 3.03% Impervious Runoff Depth=4.58" Flow Length=147' Tc=10.3 min_CN=75_Runoff=1.0 cfs 3.432 cf	Pond TD5:	Peak Elev=7.39' Storage=435 cf Inflow=0.2 cfs 654 cf Discarded=0.0 cfs 654 cf Primary=0.0 cfs 0 cf Outflow=0.0 cfs 654 cf
Subcatchment 3S: Townhouse Roofs	Runoff Area=13,067 sf 100.00% Impervious Runoff Depth=7.25"	Pond TD6:	Peak Elev=7.32' Storage=421 cf Inflow=0.2 cfs 638 cf Discarded=0.0 cfs 638 cf Primary=0.0 cfs 0 cf Outflow=0.0 cfs 638 cf
Subcatchment 4.2S: Townhouse TDs	Runoff Area=1,112 sf 95.68% Impervious Runoff Depth=7.13"	Link 1L: Towards Wetlands	Inflow=8.5 cfs 53,833 cf Primary=8.5 cfs 53,833 cf
Subcatchment 4.3S: Townhouse TDs	Runoff Area=1,105 sf 97.29% Impervious Runoff Depth=7.13"	Link 2L: Towards Street	Inflow=0.8 cfs 2,396 cf Primary=0.8 cfs 2,396 cf
Subcatchment 4.4S: Townhouse TDs	Runoff Area=1,104 sf 97.46% Impervious Runoff Depth=7.13"	Link 100L: Total Flows	Inflow=9.1 cfs 56,229 cf Primary=9.1 cfs 56,229 cf
Subcatchment 4.5S: Townhouse TDs	Runoff Area=1,082 sf 98.06% Impervious Runoff Depth=7.25" Tc=6.0 min CN=98 Runoff=0.2 cfs 654 cf	Total Runoff Area	= 158,686 sf Runoff Volume = 77,197 cf Average Runoff Depth = 5.84" 50.45% Pervious = 80,060 sf 49.55% Impervious = 78,626 sf
Subcatchment 4.6S: Townhouse TDs	Runoff Area=1,056 sf 99.24% Impervious Runoff Depth=7.25" Tc=6.0 min CN=98 Runoff=0.2 cfs 638 cf		
Subcatchment 5S: TD-1	Runoff Area=5,851 sf 51.63% Impervious Runoff Depth=5.84" Tc=6.0 min CN=86 Runoff=0.9 cfs 2,846 cf		
Subcatchment 6.1S: East driveway	Runoff Area=12,275 sf 52.50% Impervious Runoff Depth=5.95" Tc=6.0 min CN=87 Runoff=1.9 cfs 6,090 cf		
Subcatchment 6S: Bypass Towards	Runoff Area=51,539 sf 0.21% Impervious Runoff Depth=4.47" Flow Length=125' Tc=14.0 min CN=74 Runoff=4.8 cfs 19,208 cf		
Subcatchment 7S: To Street	Runoff Area=5,843 sf 18.07% Impervious Runoff Depth=4.92" Tc=6.0 min CN=78 Runoff=0.8 cfs 2,396 cf		
Pond 1P: Underground Infiltration Syste Discarded=0.1	em Peak Elev=8.24' Storage=14,532 cf Inflow=7.8 cfs 37,693 cf cfs 17,250 cf Primary=2.1 cfs 20,443 cf Outflow=2.2 cfs 37,693 cf		
Pond 2P: Rooftop Detention	Peak Elev=57.67' Storage=5,027 cf Inflow=3.2 cfs 11,350 cf Outflow=0.3 cfs 11,350 cf		



	Thorndike Place - Post-Development
2340700-PR-2021-08-18	Type III 24-hr 25-Year Rainfall=7.49"
HydroCAD® 10.00-22 s/p.00904 © 2018 HydroCAD	Software Solutions II C Page 78
Summary for Subcatchme	ent 2.1S: Building Roof-Southeast
Runoff = 2.4 cfs @ 12.08 hrs, Volu	me= 8,544 cf, Depth= 7.25"
Runoff by SCS TR-20 method, UH=SCS, Weight Type III 24-hr 25-Year Rainfall=7.49"	ed-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Area (sf) CN Description	
14,140 98 Roofs, HSG C	
14,140 100.00% Impervious Ar	ea
Tc Length Slope Velocity Capacity (min) (feet) (ft/ft) (ft/sec) (cfs)	Description
6.0	Direct Entry, Min. Tc
Subastahmant 2.15	C Building Boof Southooot
Subcatchinent 2.13	. Building Rooi-Southeast
Hydrog	/aph
2.4 cfs	Type III 24-hr
2-1	
	Runon Area-14, 140 Si
	Runoff Volume=8,544 cf
cts	Runoff Depth=7.25"
	Tc=6.0 min
	CN=98
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 3	16 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72 (hours)



2 34070 Prepare	0-PR-2 d by BS	0 21-08-1 C Group	8			Type I	II 24-hr 25-Yea P	rinted 8/24/202
-lydroCAI	D® 10.00-	22 s/n 00	904 © 2018	8 HydroCAD	Software Solut	ions LLC		Page 8
		Su	mmary f	or Subca	tchment 3.1	S: Back	yard ADs	
Runoff	=	1.0 cf	s@ 12.1	4 hrs, Volu	ime=	3,432 cf,	Depth= 4.58"	
Runoff by	y SCS TR	R-20 meth	od, UH=S	CS, Weigh	ed-CN, Time S	Span= 0.0	0-72.00 hrs, dt=	0.01 hrs
lype III 2	24-hr 25-	Year Rai	ntall=7.49"					
A	rea (sf)	CN D	escription	d pavomor				
	8,302	90 U 74 >	75% Grass	s cover, Go	od, HSG C			
	411	89 G	ravel side	walk, HSG	C			
	8,985	75 W	eighted A	verage				
	272	3.	03% Impe	rvious Area	1			
	272	1(00.00% Ur	nconnected				
Тс	l enath	Slone	Velocity	Capacity	Description			
(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	Decemption			
9.4	50	0.0142	0.09		Sheet Flow,		0 00 0 00"	
0.9	97	0.0154	1.86		Shallow Con	e n= 0.24 Icentrated	D P2= 3.23"	
					Grassed Wat	erway K	v= 15.0 fps	
10.3	147	Total						
			Subo	atchmer	t 3.1S: Bac	kvard A	Ds	
				Hydrod	raph			
(
1-(1.0 cfs	- + - +	·'''''''				[Runoff
							Гуре III 24-ł	nr
					25-	Year R	ainfall=7.49)"
-					Rı	inoff A	rea=8.985	sf
					Runo	ff Volu	1mo=3 432	-f
ls)							Donth=4 59	
x (c					r	kunon	Deptn=4.50	
음						Flow	Lengtn=14	/
-							Tc=10.3 mi	n
							CN=7	5
-								
0	2468	10 12 14 16	18 20 22 24	26 28 30 32 34	36 38 40 42 44 46	48 50 52 54 5	6 58 60 62 64 66 68 70) 72
				rime	(nours)			



2340700-PR-2021-08-18 Prepared by BSC Group HydroCAD® 10.00-22 s/n 00904 © 2018 HydroCAD Software Solution	Thorndike Place - Post-Development Type III 24-hr 25-Year Rainfall=7.49" Printed 8/24/2021 ons LLC Page 82
Summary for Subcatchment 4.2S	: Townhouse TDs
Runoff = 0.2 cfs @ 12.08 hrs, Volume=	661 cf, Depth= 7.13"
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time S Type III 24-hr 25-Year Rainfall=7.49"	pan= 0.00-72.00 hrs, dt= 0.01 hrs
Area (sf) CN Description 1,064 98 Paved parking, HSG C	
48 74 >75% Grass cover, Good, HSG C	
1,112 97 Weighted Average 48 4.32% Pervious Area 1,064 95.68% Impervious Area	
Tc Length Slope Velocity Capacity Description (min) (feet) (ft/ft) (ft/sec) (cfs)	
6.0 Direct Entry,	Min. Tc
Subcatchment 4.2S: Town Hydrograph 0.2 0.9 0.18 0.17 0.18 0.17 0.18 0.17 0.19 0.09 0.19 0.09 0.19 0.09 0.19 0.09 0.19 0.09 0.19 0.09 0.19 0.09 0.19 0.09 0.19 0.09 0.19 0.09 0.19 0.09 0.19 0.09 0.19 0.09 0.19 0.09 0.19 0.09 0.19 0.09 0.19 0.09 0.19 0.09 0.19 0.09 0.09 0.19 0.09 0.09 0.09 0.19 0.09 0	house TDs Type III 24-hr ar Rainfall=7.49" off Area=1,112 sf ff Volume=661 cf noff Depth=7.13" Tc=6.0 min CN=97
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 4 Time (hours)	8 50 52 54 56 58 60 62 64 66 68 70 72

Summary for Subcatchment 4.3S: Townhouse TDs					
HydroCAD® 10.00-22 s/n 00904 © 2018 HydroCAD Software Solutions LLC Page					
Prepared by BSC Group	Printed 8/24/2021				
2340700-PR-2021-08-18	Type III 24-hr 25-Year Rainfall=7.49"				
	Thorndike Place - Post-Development				

Runoff = 0.2 cfs @ 12.08 hrs, Volume= 657 cf, Depth= 7.13"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs Type III 24-hr 25-Year Rainfall=7.49"

A	rea (sf)	CN	Description		
	1,075	98	Paved park	ing, HSG C)
	30	74	>75% Gras	s cover, Go	bod, HSG C
	1,105	97	Weighted A	verage	
	30		2.71% Perv	vious Area	
	1,075		97.29% Imp	pervious Are	ea
_		~		• •	— • • •
IC	Length	Slope	Velocity	Capacity	Description
(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	
6.0					Direct Entry, Min. Tc
			• •		

Subcatchment 4.3S: Townhouse TDs



2340700-PR-2021-08-18	Thorndike Place - Post-Developmer Type III 24-hr 25-Year Rainfall=7.49
Prepared by BSC Group HydroCAD® 10.00-22 s/n 00904 © 2018 HydroCAD Sol	ftware Solutions LLC Printed 8/24/202
Summary for Subcatchr	nent 4.4S: Townhouse TDs
Runoff = 0.2 cfs @ 12.08 hrs, Volume	= 656 cf, Depth= 7.13"
Runoff by SCS TR-20 method, UH=SCS, Weighted- Type III 24-hr 25-Year Rainfall=7.49"	CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Area (sf) CN Description	
1,076 98 Paved parking, HSG C 28 74 >75% Grass cover Good	HSG C
1,104 97 Weighted Average	
28 2.54% Pervious Area	
1,076 97.46% Impervious Area	
Tc Length Slope Velocity Capacity De	scription
(min) (τeet) (π/π) (π/sec) (crs)	rect Entry Min Tc
Subcatchment 4.4	4S: Townhouse TDs
)
	□
	Type III 24-hr
0.17	25 Voor Poinfall-7 40"
0.14	RUNOTT Area=1,104 St
€ 0.12	Runoff Volume=656 cf
0 0.11 0 0 0 0 0 0 0 0 0 0	Runoff Depth=7.13"
	Tc=6.0 min
	CN=97
0.02	
0 0 4 6 9 10 10 14 16 19 00 00 04 06 09 20 20 24 26 3	8 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72

Prepared by BSC Group Printed 8/24/2021 HydroCAD® 10.00-22 s/n 00904 © 2018 HydroCAD Software Solutions LLC Page 85 Summary for Subcatchment 4.5S: Townhouse TDs Runoff = 0.2 cfs @ 12.08 hrs, Volume= 654 cf, Depth= 7.25" Runoff sector 0.0 cfs @ 12.08 hrs, Volume= 654 cf, Depth= 7.25" Runoff sector 0.0 cfs @ 12.08 hrs, Volume= 0.00-72.00 hrs, dt= 0.01 hrs Type III 24-hr 25-Year Rainfall=7.49" 1.061 98 Weighted Average 21 1.94% Pervious Area 1.061 98.06% Impervious Area 1.061 98.06% Impervious Area 1.061 98.06% Impervious Area 1.061 98.06% Impervious Area 1.061 98.06% Impervious Area 1.061 98.06% Impervious Area 1.061 98.06% Impervious Area 1.061 98.06% Impervious Area 1.061 98.06% Impervious Area 1.061 98.06% Impervious Area 1.061 98.06% Impervious Area 1.061 98.06% Impervious Area 1.061 98.06% Impervious Area 1.061 98.06% Impervious Area 1.061 98.06% Impervious Area	234070	0-PR-20	21-08	-18						Th <i>Type</i>	orr ///	ndike Pl 24-hr	ace - I 25-Ye	Post-D ar Ra	evelopmen <i>infall=7.4</i> 9
Summary for Subcatchment 4.5S: Townhouse TDs Runoff = 0.2 cfs @ 12.08 hrs, Volume= 654 cf, Depth= 7.25" Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs Type III 24-hr 25-Year Rainfall=7.49" Area (sf) CN Description 1,061 98 Paved parking, HSG C 21 74 >75% Grass cover, Good, HSG C 1,082 98 Weighted Average 21 1.94% Pervious Area 1,061 98.06% Impervious Area Tc Length Slope Velocity Capacity Description (min) (feet) (ft/ft) (ft/sec) (cfs) 6.0 Direct Entry, Min. Tc Subcatchment 4.5S: Townhouse TDs Hydrograph 0.2 cfs 0.2	Prepare HydroCAI	d by BS(D® 10.00-	C Grou 22 s/n (ip 00904 @	2018	3 Hydro	CAD) Softwar	e Solutio	ons LLC				Printe	d 8/24/202 Page 8
Runoff = 0.2 cfs @ 12.08 hrs, Volume= 654 cf, Depth= 7.25" Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs Type III 24-hr 25-Year Rainfall=7.49" Area (sf) CN Description 1.061 98 Paved parking, HSG C 21 74 >75% Grass cover, Good, HSG C 1.082 98 Weighted Average 21 1.94% Pervious Area 1.061 98.06% Impervious Area 1.07 0.07 0.07 0.07 0.07 0.07 0.07 0.07			Su	ımmai	ry fo	r Sub	cate	chmen	t 4.5S	: Town	nhe	ouse T	Ds		
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs Type III 24-hr 25-Year Rainfall=7.49" Area (sf) CN Description 1,061 98 Paved parking, HSG C 21 74 >75% Grass cover, Good, HSG C 1,082 98 Weighted Average 21 1.94% Pervious Area 1,061 98.06% Impervious Area 1,061 98.06% Impervious Area 1,061 98.06% Impervious Area 1,061 0 98.06% Impervious Area 1,082 0 Impervious Area 1	Runoff	=	0.2	cfs @	12.0	8 hrs,	Volu	ume=		654 cf	f, [Depth=	7.25"		
Area (sf) CN Description 1,061 98 Paved parking, HSG C 21 74 >75% Grass cover, Good, HSG C 1,082 98 Weighted Average 21 1.94% Pervious Area 1,061 98.06% Impervious Area 1,061 98.06% Impervious Area Tc Length Slope Velocity Capacity 0.1 (ft/ft) (ft/scc) 6.0 Direct Entry, Min. Tc Subcatchment 4.5S: Townhouse TDs Hydrograph 0.1 0.2 cfs 0.1 0.2 cfs Cfs Content 4.5S: Townhouse TDs Hydrograph Eunoff Q1 0.2 cfs Content 4.5S: Townhouse TDs Hydrograph Content 4.5S: Townhouse TDs Runoff Area=1,082 sf 0.1 Runoff Area=1,082 sf 0.1 CN=98 0.1 CN=98	Runoff b Type III 2	y SCS TF 24-hr 25-	R-20 me Year R	ethod, L ainfall=	JH=S 7.49"	CS, W	eight	ted-CN,	Time S	pan= 0.0	00	-72.00 h	nrs, dt	= 0.01	hrs
1,061 98 Paved parking, HSG C 21 74 >75% Grass cover, Good, HSG C 1,082 98 Weighted Average 21 1.94% Pervious Area 1,061 98.06% Impervious Area 6.0 Direct Entry, Min. Tc Subcatchment 4.5S: Townhouse TDs Hydrograph 0.2 cfs 0.2 cfs 0.49 0.2 cfs Type-III 24-hr 0.16 25-Year Rainfall=7.49" 0.17 Runoff Area=1,082 sf 0.12 Runoff Depth=7.25" 0.12 Runoff Depth=7.25"	A	rea (sf)	CN	Descri	otion										
1,082 98 Weighted Average 21 1,94% Pervious Area 1,061 98.06% Impervious Area 1,061 98.06% Impervious Area Tc Length Slope Velocity Capacity Description (min) (feet) (ft/ft) (ft/sec) (cfs) 6.0 Direct Entry, Min. Tc Subcatchment 4.5S: Townhouse TDs Hydrograph 0,2 cfs 0,2 cfs 1,9 cf 0,2 cfs 1,9 cf 1,9 cf		1,061 21	98 74	Paved	parki Grass	ng, HS	GC	od HSC	20						
21 1.94% Pervious Area 1,061 98.06% Impervious Area Tc Length Slope Velocity Capacity Description (min) (feet) (ft/ft) (ft/sec) (cfs) 6.0 Direct Entry, Min. Tc Subcatchment 4.5S: Townhouse TDs Hydrograph 0.2 cfs 0.2 cfs		1,082	98	Weight	ted Av	verage	, 00	.ou, 1100							
Tc Length Slope Velocity Capacity Description (min) (feet) (ft/ft) (ft/sec) (cfs) 6.0 Direct Entry, Min. Tc Subcatchment 4.5S: Townhouse TDs Hydrograph 0.2 cfs 0.2 cfs		21		1.94%	Pervi	ous Ar	ea								
Tc Length (feet) Slope Velocity (ft/sec) Capacity (cfs) Description 6.0 Direct Entry, Min. Tc Subcatchment 4.5S: Townhouse TDs Hydrograph 0.2 0.2 cfs		1,061		98.06%	₀ Imp	erviou	s Are	ea							
(min) (reet) (rusec) (crs) 6.0 Direct Entry, Min. Tc Subcatchment 4.5S: Townhouse TDs Hydrograph 0.2 0.2 cfs 0.19 0.2 cfs 0.10 0.2 cfs 0.11 0.14 0.12 0.14 0.14 0.14 0.12 0.11 0.11 0.11 0.12 0.11 0.11 0.11 0.12 0.11 0.11 0.11 0.12 0.11 0.11 0.11 0.12 0.11 0.11 0.11 0.12 0.11 0.11 0.11 0.12 <t< td=""><td>Tc</td><td>Length</td><td>Slop</td><td>e Velo</td><td>ocity</td><td>Capa</td><td>city</td><td>Descri</td><td>otion</td><td></td><td></td><td></td><td></td><td></td><td></td></t<>	Tc	Length	Slop	e Velo	ocity	Capa	city	Descri	otion						
Subcatchment 4.5S: Townhouse TDs Hydrograph	(min) 6.0	(feet)	(π/п	(ft/s	sec)	(0	cts)	Direct	Entry	Min To					
Subcatchment 4.5S: Townhouse TDS Hydrograph 0.2 cfs 0.2 cfs 0.	0.0							Direct	Enu y,	wini. rc					
Hydrograph				S	ubca	atchm	ent	t 4.5S:	Town	house	Т	Ds			
02 0.2 cfs Type III 24-hr 0.18 0.2 cfs Type III 24-hr 0.18 0.2 cfs Type III 24-hr 0.17 0.16 25-Year Rainfall=7.49" 0.16 0.12 Runoff Area=1,082 sf 0.12 Runoff Volume=654 cf 0.11 Tc=6.0 min 0.02 CN=98 0.02 CN=98						н	ydrog	graph							
······································	0.2 0.19 0.18 0.17 0.16 0.15 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.13 0.12 0.12 0.13 0.12 0.13 0.12 0.13 0.12 0.13 0.13 0.13 0.12 0.13 0.13 0.13 0.12 0.13 0.12 0.13 0.13 0.13 0.14 0.15 0.05 0		0.2 cf	S				F	5-Ye Run Luno Ru	T ar Ra off A ff Vol noff I	Y aii Iu De	pe III a=1, me=(epth= Cc=6.	24- =7.4 654 =7.2 0 m	hr 9" 5f 5" 1n	Runoff
	0.01	1 million		Um							1				

0 0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72 Time (hours)

2340700-PR-2 Prepared by BS	Thorndike Place - Post-Development D21-08-18 Type III 24-hr 25-Year Rainfall=7.49" C Group Printed 8/24/2021
HydroCAD® 10.00	22 s/n 00904 © 2018 HydroCAD Software Solutions LLC Page 86
	Summary for Subcatchment 4.6S: Townhouse TDs
Runoff =	0.2 cfs @ 12.08 hrs, Volume= 638 cf, Depth= 7.25"
Runoff by SCS TI	R-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs Vear Rainfall=7.49"
Δrea (sf)	
1,048	98 Paved parking, HSG C 74 575% Grass cover Good HSG C
1,056	98 Weighted Average
8 1,048	0.76% Pervious Area 99.24% Impervious Area
Tc Length	Slope Velocity Capacity Description
(min) (feet)	(ft/ft) (ft/sec) (cfs)
0.19 0.19 0.17 0.16 0.17 0.16 0.17 0.16 0.17 0.16 0.17 0.16 0.17 0.16 0.17 0.16 0.17 0.16 0.17 0.16 0.17 0.16 0.17 0.16 0.17 0.17 0.16 0.17 0.16 0.17 0.17 0.16 0.17 0.17 0.16 0.17 0.08 0.09 0.07 0.08 0.07 0.05 0.08 0.07 0.05 0.08 0.07 0.05 0.08 0.05 0.07 0.08 0.05 0.05 0.08 0.05 0.05 0.08 0.05	0.2 cfs Type III 24-hr 25-Year Rainfall=7.49" Runoff Area=1,056 sf Runoff Volume=638 cf Runoff Depth=7.25" Tc=6.0 min CN=98
0.03	



2340700-PR-2021-08-18 Prepared by BSC Group HydroCAD® 10.00-22 s/n 00904 © 2018 HydroCAD Software So	Thorndike Place - Post-Development Type III 24-hr 25-Year Rainfall=7.49" Printed 8/24/2021 lutions LLC Page 88
Summary for Subcatchment 6	.1S: East driveway
Runoff = 1.9 cfs @ 12.08 hrs, Volume=	6,090 cf, Depth= 5.95"
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Type III 24-hr 25-Year Rainfall=7.49"	e Span= 0.00-72.00 hrs, dt= 0.01 hrs
Area (sf) CN Description	
5,611 74 >75% Grass cover, Good, HSG C 6,444 98 Paved roads w/curbs & sewers, HS 220 89 Gravel roads, HSG C	ig c
12,275 87 Weighted Average 5,831 47.50% Pervious Area 6,444 52.50% Impervious Area	
Tc Length Slope Velocity Capacity Description (min) (feet) (ft/ft) (ft/sec) (cfs)	
6.0 Direct Entr	γ,
Subcatchment 6.1S: Ea Hydrograph	
(fg) Markov	Type III 24-hr -Year Rainfall=7.49" unoff Area=12,275 sf ioff Volume=6,090 cf Runoff Depth=5.95" Tc=6.0 min CN=87
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 4 Time (hours)	16 48 50 52 54 56 58 60 62 64 66 68 70 72

	Thorndike Place - Post-Development
2340700-PR-2021-08-18	Type III 24-hr 25-Year Rainfall=7.49
Prepared by BSC Group	Printed 8/24/2021
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Summary for Subcatchment 6S: Bypass Towards Wetlands

Runoff =

4.8 cfs @ 12.19 hrs, Volume= 19,208 cf, Depth= 4.47"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs Type III 24-hr 25-Year Rainfall=7.49"

A	rea (sf)	CN D	escription		
	4,985	70 V	Voods, Go	od, HSG C	
	46,447	74 >	75% Gras	s cover, Go	ood, HSG C
	107	98 F	loofs, HSG	S C	
	51,539	74 V	Veighted A	verage	
	51,432	9	9.79% Per	vious Area	
	107	0	.21% Impe	ervious Area	а
Тс	Length	Slope	Velocity	Capacity	Description
<u>(min)</u>	(feet)	(ft/ft)	(ft/sec)	(cfs)	
11.8	50	0.0220	0.07		Sheet Flow,
					Woods: Light underbrush n= 0.400 P2= 3.23"
2.2	75	0.0133	0.58		Shallow Concentrated Flow,
					Woodland Kv= 5.0 fps
14.0	125	Total			

Subcatchment 6S: Bypass Towards Wetlands



Prenare	0-PR-2)21-08-18			Type III	24-hr 25-Year R	ainfall=7
HydroCA	ы ру во .D® 10.00-	22 s/n 00904 © 20	18 HydroCAD	Software Solu	itions LLC	FIIII	Paq
		0		4 . 1	4 7 0. T . C	N	
		Summ	ary for Su	ocatchmen	t /S: 10 5	street	
Runoff	=	0.8 cfs @ 12.	.09 hrs, Volu	ume=	2,396 cf,	Depth= 4.92"	
Runoff b	V SCS T	R-20 method. UH=	SCS. Weigh	ted-CN. Time	Span= 0.00)-72.00 hrs. dt= 0.0	1 hrs
Type III 2	24-hr 25	Year Rainfall=7.49	9"	- /		,	
А	vrea (sf)	CN Description	n				
	1,056	98 Paved par	king, HSG C				
	4,787	74 >75% Gra	ss cover, Go	od, HSG C			
	5,843 4 787	78 Weighted	Average				
	1,056	18.07% In	pervious Are	ea			
То	Longth	Slong Valacity	Capacity	Description			
(min)	(feet)	(ft/ft) (ft/sec)	(cfs)	Description			
6.0				Direct Entry	/, Min. Tc		
			Subcatch	ment 7S: To	o Street		
0.95]
0.03		0.8 cfs					Run
0.75					T	ype III 24-hr	-
0.7	┋┟┼┼┼			25	Year Ra	ainfall=7.49"	-
0.65	↓ ∤††	╎╴┥╴┲	{	R	unoff A	rea=5.843 sf	
0.55			1	Run	off Volu	me=2 396 cf	_
0.5 (S	╏┟┼┼┼	· · · · · · · · · · · · · · · · · · ·	 - - - - - - - - - - - - -		Dunoff I	Donth=4 92"	-
€ 0.45	Į/†÷÷:	¦¦ - ¦¦	$\frac{1}{1} - \frac{1}{1} - \frac{1}{1} - \frac{1}{1} - \frac{1}{1} - \frac{1}{1} - \frac{1}{1}$				-
E 0.35			1		- T - T - F - F - F - F I I I I I I - + - + - + - + - +	1C=0.0 mm	
0.3		· · · · · · · · · · · · · · · · · · ·				CN=78	
0.25	11				-+-+		-
0.2					-+-+		1
0.1							1
	1/1	1 Minin					J

 2340700-PR-2021-08-18
 Type III 24-hr
 25-Year Rainfall=7.49"

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Summary for Pond 1P: Underground Infiltration System

Inflow Area =	69,430 sf, 74.25% Impervious,	Inflow Depth = 6.51" for 25-Year event
Inflow =	7.8 cfs @ 12.09 hrs, Volume=	37,693 cf
Outflow =	2.2 cfs @ 12.48 hrs, Volume=	37,693 cf, Atten= 72%, Lag= 23.4 min
Discarded =	0.1 cfs @ 6.41 hrs, Volume=	17,250 cf
Primary =	2.1 cfs @ 12.48 hrs, Volume=	20,443 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs Peak Elev= 8.24' @ 12.48 hrs Surf.Area= 7,556 sf Storage= 14,532 cf

Plug-Flow detention time= 520.8 min calculated for 37,693 cf (100% of inflow) Center-of-Mass det. time= 520.8 min (1,338.6 - 817.7)

Volume	Invert	Avail.Storage	Storage Description
#1	6.00'	19,495 cf	6.89'W x 14.06'L x 3.00'H StormTrap ST-1 Units (Irregular Shape)x 78 22,668 cf Overall x 86.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Discarded	6.00'	0.520 in/hr Exfiltration over Surface area
#2	Primary	7.50'	15.0" Round Culvert
			L= 190.0' CPP, square edge headwall, Ke= 0.500
			Inlet / Outlet Invert= 7.50' / 6.00' S= 0.0079 '/' Cc= 0.900
			n= 0.013, Flow Area= 1.23 sf

Discarded OutFlow Max=0.1 cfs @ 6.41 hrs HW=6.03' (Free Discharge) **1=Exfiltration** (Exfiltration Controls 0.1 cfs)

Primary OutFlow Max=2.1 cfs @ 12.48 hrs HW=8.24' (Free Discharge) -2=Culvert (Barrel Controls 2.1 cfs @ 4.10 fps)



Pond 1P: Underground Infiltration System



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		Sum	mary for Pond	2P: Rooftop Deten	tion
Inflow Ar Inflow Outflow Primary	rea = = = =	18,785 sf,1 3.2 cfs @ 0.3 cfs @ 0.3 cfs @	100.00% Imperviou 12.08 hrs, Volum 12.74 hrs, Volum 12.74 hrs, Volum	us, Inflow Depth = 7.25 e= 11,350 cf e= 11,350 cf, A e= 11,350 cf	" for 25-Year event tten= 89%, Lag= 39.4 min
Routing t Peak Ele	by Stor-Ind r ev= 57.67' @	nethod, Time 212.74 hrs	e Span= 0.00-72.0 Surf.Area= 7,500	0 hrs, dt= 0.01 hrs / 3 sf Storage= 5,027 cf	
Plug-Flo\ Center-o Volume	w detention f of-Mass det. f Invert	time= 180.4 time= 180.7 Avail.St	min calculated for min (922.8 - 742. orage Storage D	11,348 cf (100% of inflo 1) escription	w)
Plug-Flov Center-o <u>Volume</u> #1	w detention f of-Mass det. f <u>Invert</u> 57.00'	time= 180.4 time= 180.7 <u>Avail.St</u> 7,5	min calculated for min (922.8 - 742. orage Storage D 500 cf Rooftop I	11,348 cf (100% of inflo 1) <u>escription</u> Detention (Prismatic)Lis	w) sted below (Recalc)
Plug-Flov Center-o <u>Volume</u> #1 Elevatio (feet	w detention t of-Mass det. t <u>Invert</u> 57.00' on Su	time= 180.4 time= 180.7 <u>Avail.St</u> 7,5 urf.Area (sq-ft)	min calculated for min (922.8 - 742. orage Storage D 500 cf Rooftop I Inc.Store (cubic-feet)	11,348 cf (100% of inflo 1) escription Detention (Prismatic)Lis Cum.Store (cubic-feet)	w) sted below (Recalc)
Plug-Flov Center-o <u>Volume</u> #1 Elevatio (feet 57.0 58.0	w detention t of-Mass det. t 57.00' on Su on Su on Su 00	time= 180.4 time= 180.7 Avail.St 7,5 urf.Area (sq-ft) 7,500 7,500	min calculated for min (922.8 - 742. orage Storage D 500 cf Rooftop I Inc.Store (cubic-feet) 0 7,500	11,348 cf (100% of inflo 1) Description Detention (Prismatic)Lis Cum.Store (cubic-feet) 0 7,500	w) sted below (Recalc)
Plug-Flov Center-o <u>Volume</u> #1 Elevatio (feet 57.0 58.0 Device	w detention f of-Mass det. 1 <u>Invert</u> 57.00' on Su on Su b0 00 Routing	time= 180.4 time= 180.7 Avail.St 7,5 urf.Area (sq-ft) 7,500 7,500 Invert	min calculated for min (922.8 - 742. orage Storage D 500 cf Rooftop I Inc.Store (cubic-feet) 0 7,500	11,348 cf (100% of inflo 1) Description Detention (Prismatic)Lis Cum.Store (cubic-feet) 0 7,500	w) sted below (Recalc)
Plug-Flov Center-o #1 Elevatio (feei 57.0 58.0 Device #1	w detention f f-Mass det. 1 invert 57.00' on Su t) 00 00 Routing Primary	time= 180.4 time= 180.7 Avail.St 7,5 urf.Area (sq-ft) 7,500 7,500 7,500 Invert 8.02	min calculated for min (922.8 - 742. orage Storage D 500 cf Rooftop I Inc.Store (cubic-feet) 0 7,500 : Outlet Devices 12.0" Round F L= 16.0' CPP, Inlet / Outlet Inn n= 0.013 Flow	11,348 cf (100% of inflo 1) Description Detention (Prismatic)Lis Cum.Store (cubic-feet) 0 7,500 Roof Drain mitered to conform to fill rert= 8.02' / 7.70' S= 0. Area= 0.79 sf	w) sted below (Recalc) , Ke= 0.700 0200 '/' Cc= 0.900

1=Roof Drain (Passes 0.3 cfs of 23.4 cfs potential flow) **1=2=Orifice/Grate** (Orifice Controls 0.3 cfs @ 3.94 fps)
 Z340700-PR-2021-08-18
 Type III 24-hr
 25-Year Rainfall=7.49"

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	Thorndike Place - Post-Development
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Summary for Pond 3P: Rain garden

Inflow Area =	12,275 sf,	52.50% Impervious,	Inflow Depth = 5.95" for 25-Year event
Inflow =	1.9 cfs @	12.08 hrs, Volume=	6,090 cf
Outflow =	1.9 cfs @	12.09 hrs, Volume=	6,090 cf, Atten= 0%, Lag= 0.3 min
Discarded =	0.0 cfs @	12.09 hrs, Volume=	452 cf
Primary =	1.9 cfs @	12.09 hrs, Volume=	5,638 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs Peak Elev= 6.41' @ 12.09 hrs Surf.Area= 409 sf Storage= 214 cf

Plug-Flow detention time= 40.5 min calculated for 6,090 cf (100% of inflow) Center-of-Mass det. time= 40.7 min (827.8 - 787.1)

Invert	Avail	.Storage	Storage Description	ו	
5.60'		253 cf	Custom Stage Dat	a (Irregular)Listed	below (Recalc)
Surf (Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
	125 276	46.0 66.0	0 78	0 78	125 305
	350 460	73.0 87.0	94 81	172 253	385 564
	Invert 5.60' Surf	Invert Avail 5.60' Surf.Area (sq-ft) 125 276 350 350 460	Invert Avail.Storage 5.60' 253 cf Surf.Area Perim. (sq-ft) (feet) 125 46.0 276 66.0 350 73.0 460 87.0	Invert Avail.Storage Storage Description 5.60' 253 cf Custom Stage Date Surf.Area Perim. Inc.Store (sq-ft) (feet) (cubic-feet) 125 46.0 0 276 66.0 78 350 73.0 94 460 87.0 81	Invert Avail.Storage Storage Description 5.60' 253 cf Custom Stage Data (Irregular)Listed Surf.Area Perim. (sq-ft) Inc.Store (cubic-feet) Cum.Store (cubic-feet) 125 46.0 0 0 276 66.0 78 78 350 73.0 94 172 460 87.0 81 253

Device	Routing	Invert	Outlet Devices
#1	Discarded	5.60'	0.520 in/hr Exfiltration over Surface area
#2	Primary	6.30'	22.0' 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

Discarded OutFlow Max=0.0 cfs @ 12.09 hrs HW=6.41' (Free Discharge) **1=Exfiltration** (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=1.9 cfs @ 12.09 hrs HW=6.41' (Free Discharge) 2=Broad-Crested Rectangular Weir (Weir Controls 1.9 cfs @ 0.78 fps)





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Summary for Pond TD2:

Inflow Area	=	1,112 sf,	95.68% Impervious,	Inflow Depth = 7.1	3" for 25-Year event
Inflow =	= (0.2 cfs @	12.08 hrs, Volume=	661 cf	
Outflow =	= (0.0 cfs @	7.25 hrs, Volume=	661 cf, /	Atten= 98%, Lag= 0.0 min
Discarded =	= (0.0 cfs @	7.25 hrs, Volume=	661 cf	-
Primary =	= (0.0 cfs @	0.00 hrs, Volume=	0 cf	

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs Peak Elev= 7.95' @ 17.82 hrs Surf.Area= 278 sf Storage= 445 cf

Plug-Flow detention time= 1,156.2 min calculated for 661 cf (100% of inflow) Center-of-Mass det. time= 1,156.4 min (1,904.6 - 748.2)

Volume	Invert	Avail.Storage	Storage Description
#1	5.50'	206 cf	17.06'W x 16.29'L x 3.83'H Stone
			1,064 cf Overall - 548 cf Embedded = 516 cf x 40.0% Voids
#2	6.00'	472 cf	6.89'W x 14.06'L x 2.83'H StormTrap ST-1 Units x 2 Inside #1
			548 cf Overall x 86.0% Voids
		678 cf	Total Available Storage
Device	Routing	Invert Out	let Devices
#1	Discarded	5.50' 0.52	20 in/hr Exfiltration over Surface area
#2	Primary	10.00' 6.0 "	' x 240.0" Horiz. Orifice/Grate C= 0.600
		Limi	ited to weir flow at low heads

Discarded OutFlow Max=0.0 cfs @ 7.25 hrs HW=5.55' (Free Discharge) **1=Exfiltration** (Exfiltration Controls 0.0 cfs)


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Summary for Pond TD3:

Inflow Area =	1,105 sf,	97.29% Impervious,	Inflow Depth = 7.13"	for 25-Year event
Inflow =	0.2 cfs @	12.08 hrs, Volume=	657 cf	
Outflow =	0.0 cfs @	7.29 hrs, Volume=	657 cf, Att	en= 98%, Lag= 0.0 min
Discarded =	0.0 cfs @	7.29 hrs, Volume=	657 cf	-
Primary =	0.0 cfs @	0.00 hrs, Volume=	0 cf	

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs Peak Elev= 7.93' @ 17.79 hrs Surf.Area= 278 sf Storage= 442 cf

Plug-Flow detention time= 1,148.4 min calculated for 657 cf (100% of inflow) Center-of-Mass det. time= 1,148.6 min (1,896.8 - 748.2)

Volume	Invert	Avail.Storage	Storage Description
#1	5.50'	206 cf	17.06'W x 16.29'L x 3.83'H Stone
			1,064 cf Overall - 548 cf Embedded = 516 cf x 40.0% Voids
#2	6.00'	472 cf	6.89'W x 14.06'L x 2.83'H StormTrap ST-1 Units x 2 Inside #1
			548 cf Overall x 86.0% Voids
		678 cf	Total Available Storage
Device	Routing	Invert Out	et Devices
#1	Discarded	5.50' 0.52	20 in/hr Exfiltration over Surface area
#2	Primary	10.30' 6.0 "	x 240.0" Horiz. Orifice/Grate C= 0.600
		Limi	ited to weir flow at low heads

Discarded OutFlow Max=0.0 cfs @ 7.29 hrs HW=5.55' (Free Discharge) **1=Exfiltration** (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=5.50' (Free Discharge)



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Summary for Pond TD4:

Inflow Area =	= 1,104 sf,	97.46% Impervious,	Inflow Depth = 7.13	for 25-Year event
Inflow =	: 0.2 cfs @	12.08 hrs, Volume=	656 cf	
Outflow =	: 0.0 cfs @	7.29 hrs, Volume=	656 cf, At	ten= 98%, Lag= 0.0 min
Discarded =	: 0.0 cfs @	7.29 hrs, Volume=	656 cf	
Primary =	: 0.0 cfs @	0.00 hrs, Volume=	0 cf	

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs Peak Elev= 7.93' @ 17.79 hrs Surf.Area= 278 sf Storage= 442 cf

Plug-Flow detention time= 1,146.6 min calculated for 656 cf (100% of inflow) Center-of-Mass det. time= 1,146.8 min (1,895.0 - 748.2)

Volume	Invert	Avail.Storage	Storage Description
#1	5.50'	206 cf	17.06'W x 16.29'L x 3.83'H Stone
			1,064 cf Overall - 548 cf Embedded = 516 cf x 40.0% Voids
#2	6.00'	472 cf	6.89'W x 14.06'L x 2.83'H StormTrap ST-1 Units x 2 Inside #1
			548 cf Overall x 86.0% Voids
		678 cf	Total Available Storage
Device	Routing	Invert Out	et Devices
#1	Discarded	5.50' 0.52	20 in/hr Exfiltration over Surface area
#2	Primary	10.20' 6.0 "	x 240.0" Horiz. Orifice/Grate C= 0.600
		Limi	ited to weir flow at low heads

Discarded OutFlow Max=0.0 cfs @ 7.29 hrs HW=5.55' (Free Discharge) **1=Exfiltration** (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=5.50' (Free Discharge) -2=Orifice/Grate (Controls 0.0 cfs)



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Summary for Pond TD5:

Inflow Area	=	1,082 sf,	98.06% Impervious,	Inflow Depth = 7.25"	for 25-Year event
Inflow	=	0.2 cfs @	12.08 hrs, Volume=	654 cf	
Outflow	=	0.0 cfs @	7.14 hrs, Volume=	654 cf, Atte	en= 98%, Lag= 0.0 min
Discarded	=	0.0 cfs @	7.14 hrs, Volume=	654 cf	-
Primary	=	0.0 cfs @	0.00 hrs, Volume=	0 cf	

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs Peak Elev= 7.39' @ 17.72 hrs Surf.Area= 278 sf Storage= 435 cf

Plug-Flow detention time= 1,119.4 min calculated for 654 cf (100% of inflow) Center-of-Mass det. time= 1,119.5 min (1,861.6 - 742.1)

Volume	Invert	Avail.Storage	Storage Description
#1	5.00'	206 cf	17.06'W x 16.29'L x 3.83'H Stone
			1,064 cf Overall - 548 cf Embedded = 516 cf x 40.0% Voids
#2	5.50'	472 cf	6.89'W x 14.06'L x 2.83'H StormTrap ST-1 Units x 2 Inside #1
			548 cf Overall x 86.0% Voids
		678 cf	Total Available Storage
Device	Routing	Invert Out	let Devices
#1	Discarded	5.00' 0.52	20 in/hr Exfiltration over Surface area
#2	Primary	9.80' 6.0"	' x 240.0" Horiz. Orifice/Grate C= 0.600
		Limi	ited to weir flow at low heads

Discarded OutFlow Max=0.0 cfs @ 7.14 hrs HW=5.05' (Free Discharge) **1=Exfiltration** (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=5.00' (Free Discharge)



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Summary for Pond TD6:

Inflow Area	=	1,056 sf,	99.24% Impervious,	Inflow Depth = 7.25" for 25-Year event
Inflow	=	0.2 cfs @	12.08 hrs, Volume=	638 cf
Outflow	=	0.0 cfs @	7.20 hrs, Volume=	638 cf, Atten= 98%, Lag= 0.0 min
Discarded	=	0.0 cfs @	7.20 hrs, Volume=	638 cf
Primary	=	0.0 cfs @	0.00 hrs, Volume=	0 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs Peak Elev= 7.32' @ 17.64 hrs Surf.Area= 278 sf Storage= 421 cf

Plug-Flow detention time= 1,083.3 min calculated for 638 cf (100% of inflow) Center-of-Mass det. time= 1,083.5 min (1,825.5 - 742.1)

Volume	Invert	Avail.Storage	Storage Description
#1	5.00'	206 cf	17.06'W x 16.29'L x 3.83'H Stone
			1,064 cf Overall - 548 cf Embedded = 516 cf x 40.0% Voids
#2	5.50'	472 cf	6.89'W x 14.06'L x 2.83'H StormTrap ST-1 Units x 2 Inside #1
			548 cf Overall x 86.0% Voids
		678 cf	Total Available Storage
Device	Routing	Invert Out	let Devices
#1	Discarded	5.00' 0.52	20 in/hr Exfiltration over Surface area
#2	Primary	9.50' 6.0 "	' x 240.0" Horiz. Orifice/Grate C= 0.600
	-	Limi	ited to weir flow at low heads

Discarded OutFlow Max=0.0 cfs @ 7.20 hrs HW=5.05' (Free Discharge) **1=Exfiltration** (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=5.00' (Free Discharge) -2=Orifice/Grate (Controls 0.0 cfs)



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Summary for Link 1L: Towards Wetlands

Inflow Area	a =	147,384 sf, 49.02% Impervious, Inflow Depth = 4.38" for 25-Year e	vent
Inflow	=	8.5 cfs @ 12.15 hrs, Volume= 53,833 cf	
Primary	=	8.5 cfs @ 12.15 hrs, Volume= 53,833 cf, Atten= 0%, Lag= 0).0 min

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



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Summary for Link 2L: Towards Street

Inflow Area	=	11,302 sf,	56.45% Impervious,	Inflow Depth = 2.54"	for 25-Year event
Inflow =	=	0.8 cfs @	12.09 hrs, Volume=	2,396 cf	
Primary =	=	0.8 cfs @	12.09 hrs, Volume=	2,396 cf, Atte	en= 0%, Lag= 0.0 min

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

Link 2L: Towards Street



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Summary for Link 100L: Total Flows

Inflow Area	a =	158,686 sf,	49.55% Impervious,	Inflow Depth = 4.25"	for 25-Year event
Inflow	=	9.1 cfs @	12.14 hrs, Volume=	56,229 cf	
Primary	=	9.1 cfs @	12.14 hrs, Volume=	56,229 cf, Atte	en= 0%, Lag= 0.0 min

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

Link 100L: Total Flows



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Time span=0.00 Runoff by SCS TR Reach routing by Stor-Ind+Tr	-72.00 hrs, dt=0.01 hrs, 7201 points -20 method, UH=SCS, Weighted-CN ans method - Pond routing by Stor-Ind method
Subcatchment 1S: CB-1	Runoff Area=22,742 sf 72.16% Impervious Runoff Depth=7.64" Tc=6.0 min CN=91 Runoff=4.3 cfs 14,472 cf
Subcatchment 2.1S: Building	Runoff Area=14,140 sf 100.00% Impervious Runoff Depth=8.48" Tc=6.0 min CN=98 Runoff=2.8 cfs 9,992 cf
Subcatchment 2S: Building Roof	Runoff Area=18,785 sf 100.00% Impervious Runoff Depth=8.48" Tc=6.0 min CN=98 Runoff=3.7 cfs 13,274 cf
Subcatchment 3.1S: Backyard ADs	eq:RunoffArea=8,985 sf 3.03% Impervious Runoff Depth=5.70" Flow Length=147' Tc=10.3 min CN=75 Runoff=1.2 cfs 4,265 cf
Subcatchment 3S: Townhouse Roofs	Runoff Area=13,067 sf 100.00% Impervious Runoff Depth=8.48" Tc=6.0 min CN=98 Runoff=2.6 cfs 9,234 cf
Subcatchment 4.2S: Townhouse TDs	Runoff Area=1,112 sf 95.68% Impervious Runoff Depth=8.36" Tc=6.0 min CN=97 Runoff=0.2 cfs 775 cf
Subcatchment 4.3S: Townhouse TDs	Runoff Area=1,105 sf 97.29% Impervious Runoff Depth=8.36" Tc=6.0 min CN=97 Runoff=0.2 cfs 770 cf
Subcatchment 4.4S: Townhouse TDs	Runoff Area=1,104 sf 97.46% Impervious Runoff Depth=8.36" Tc=6.0 min CN=97 Runoff=0.2 cfs 769 cf
Subcatchment 4.5S: Townhouse TDs	Runoff Area=1,082 sf 98.06% Impervious Runoff Depth=8.48" Tc=6.0 min CN=98 Runoff=0.2 cfs 765 cf
Subcatchment 4.6S: Townhouse TDs	Runoff Area=1,056 sf 99.24% Impervious Runoff Depth=8.48" Tc=6.0 min CN=98 Runoff=0.2 cfs 746 cf
Subcatchment 5S: TD-1	Runoff Area=5,851 sf 51.63% Impervious Runoff Depth=7.03" Tc=6.0 min CN=86 Runoff=1.1 cfs 3,428 cf
Subcatchment 6.1S: East driveway	Runoff Area=12,275 sf 52.50% Impervious Runoff Depth=7.15" Tc=6.0 min CN=87 Runoff=2.2 cfs 7,316 cf
Subcatchment 6S: Bypass Towards	Runoff Area=51,539 sf 0.21% Impervious Runoff Depth=5.57" Flow Length=125' Tc=14.0 min CN=74 Runoff=6.0 cfs 23,941 cf
Subcatchment 7S: To Street	Runoff Area=5,843 sf 18.07% Impervious Runoff Depth=6.06" Tc=6.0 min CN=78 Runoff=0.9 cfs 2,951 cf
Pond 1P: Underground Infiltration System Discarded=0.1 ct	Peak Elev=8.47' Storage=16,066 cf Inflow=9.3 cfs 44,673 cf is 17,581 cf Primary=3.4 cfs 27,092 cf Outflow=3.5 cfs 44,673 cf
Pond 2P: Rooftop Detention	Peak Elev=57.80' Storage=5,966 cf Inflow=3.7 cfs 13,274 cf Outflow=0.4 cfs 13,274 cf

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Pond 3P: Rain garden	Peak Elev=6.42' Storage=219 cf Inflow=2.2 cfs 7,316 cf Discarded=0.0 cfs 462 cf Primary=2.2 cfs 6,854 cf Outflow=2.2 cfs 7,316 cf
Pond TD2:	Peak Elev=8.43' Storage=543 cf Inflow=0.2 cfs 775 cf Discarded=0.0 cfs 775 cf Primary=0.0 cfs 0 cf Outflow=0.0 cfs 775 cf
Pond TD3:	Peak Elev=8.41' Storage=539 cf Inflow=0.2 cfs 770 cf Discarded=0.0 cfs 770 cf Primary=0.0 cfs 0 cf Outflow=0.0 cfs 770 cf
Pond TD4:	Peak Elev=8.41' Storage=538 cf Inflow=0.2 cfs 769 cf Discarded=0.0 cfs 769 cf Primary=0.0 cfs 0 cf Outflow=0.0 cfs 769 cf
Pond TD5:	Peak Elev=7.87' Storage=529 cf Inflow=0.2 cfs 765 cf Discarded=0.0 cfs 765 cf Primary=0.0 cfs 0 cf Outflow=0.0 cfs 765 cf
Pond TD6:	Peak Elev=7.78' Storage=513 cf Inflow=0.2 cfs 746 cf Discarded=0.0 cfs 746 cf Primary=0.0 cfs 0 cf Outflow=0.0 cfs 746 cf
Link 1L: Towards Wetlands	Inflow=11.8 cfs 67,879 cf Primary=11.8 cfs 67,879 cf
Link 2L: Towards Street	Inflow=0.9 cfs 2,951 cf Primary=0.9 cfs 2,951 cf
Link 100L: Total Flows	Inflow=12.5 cfs 70,830 cf Primary=12.5 cfs 70,830 cf

 Total Runoff Area = 158,686 sf
 Runoff Volume = 92,697 cf
 Average Runoff Depth = 7.01"

 50.45%
 Pervious = 80,060 sf
 49.55%
 Impervious = 78,626 sf

224070		24 00 4	10			Thorr	ndike Place - Post-	Development
Z340/U	d by DSC	21-00-1	10			i ype iii	24-III JU-I Cal Ro	all liali = 0.72
HvdroCA	DR 10 00-2	2 s/n 00	904 © 201	8 HydroCAI	C Software Sol	utions LLC	1 TITLE	Page 112
<u></u>			001 0 201	5 1 1 j u 1 0 0 / 12				Tugo Tiz
			Sumn	nary for S	Subcatchm	ent 1S: CB	8-1	
Runoff	=	4.3 ct	fs @ 12.0	8 hrs, Vol	ume=	14,472 cf, [Depth= 7.64"	
Runoff b Type III :	y SCS TR 24-hr 50-`	-20 meth Year Rai	nod, UH=S nfall=8.72"	CS, Weigh	nted-CN, Time	e Span= 0.00-	-72.00 hrs, dt= 0.01	l hrs
A	rea (sf)	CN D	escription					
	16,410	98 P 74 >	aved parki	ng, HSG C	Cond HSG C			
	22.742	91 V	Veighted A	verage				
	6,332	2	7.84% Per	vious Area	1			
	16,410	7	2.16% Imp	ervious Ar	ea			
Tc (min)	Length	Slope	Velocity	Capacity	Description			
<u> (IIIIII)</u> 60	(leet)	(1011)	(It/Sec)	(CIS)	Direct Entr	w Min To		
0.0					Direct Entr	y, Min. ic		
				Subcate	chment 1S	: CB-1		
				Hydro	graph			
1		13 ofc						Runoff
-	, ↓ ↓ ↓ ↓ ↓		$-\frac{1}{1} - \frac{1}{1} - \frac{1}{1} - \frac{1}{1} - \frac{1}{1} - \frac{1}{1} - \frac{1}{1} - \frac{1}{1}$			T	ype III 24-hr	
4-					5	0-Year Ra	infall=8.72"	
-					R	unoff Are	a=22,742 sf	
3-	/				Run	off Volum	ne=14,472 cf	
cts)						Runoff [Depth=7.64"	
) MO							Tc=6.0 min	
Ē 2-	41111						CN-01	
-							CIN-31	
	<u>_</u> }++++		-+-+		$-\frac{1}{1} - \frac{1}{1} - \frac{1}{1} - \frac{1}{1} - \frac{1}{1} - \frac{1}{1} - \frac{1}{1} - \frac{1}{1}$		+ - + - + - + - + - + - + - + - + - + -	
1-								
-								
0	2468	10 12 14 16	6 18 20 22 24	26 28 30 32 34	1 36 38 40 42 44 4	6 48 50 52 54 56	58 60 62 64 66 68 70 72	
-				Time	e (hours)			



2240700 00 2024 00 40	Thorndike Place - Post-Development
2340/00-PR-2021-00-10	Type III 24-III 50-Teal Raillain-0.72
Ртератео by BSC Group HydroCAD® 10.00-22 s/n 00904 © 201	18 HydroCAD Software Solutions LLC Page 114
Summary	<pre>/ for Subcatchment 2S: Building Roof</pre>
Runoff = 3.7 cfs @ 12.	08 hrs, Volume= 13,274 cf, Depth= 8.48"
Runoff by SCS TR-20 method, UH=5 Type III 24-hr 50-Year Rainfall=8.72	SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs ."
Area (sf) CN Descriptior	1
18,785 98 Roofs, HS	GC
18,785 100.00% Ir	npervious Area
Tc Length Slope Velocity (min) (feet) (ft/ft) (ft/sec)	Capacity Description (cfs)
6.0	Direct Entry, Min. Tc
Su	bcatchment 2S: Building Roof
	Hydrograph
4	Type III 24-hr 50-Year Rainfall=8.72"
3-1	Runoff Area=18.785 sf
	Runoff Volume=13 274 cf
G	
	IC=6.0 min
	CN=98
0 2 4 6 8 10 12 14 16 18 20 22 24	2 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72
	Time (hours)

234070 Prepare	0-PR-2	0 21-08-	18		Thorndike Place - Post-I Type III 24-hr 50-Year Ra Printe	Development ainfall=8.72" d 8/24/2021	2340 Pren
HydroCA	D® 10.00-	-22 s/n 00	, 0904 © 201	8 HydroCAD) Software Solutions LLC	Page 115	Hydro
		Sı	ummary f	or Subca	tchment 3.1S: Backyard ADs		
Runoff	=	1.2 c	cfs @ 12.1	l4 hrs, Volu	ume= 4,265 cf, Depth= 5.70"		Runo
Runoff b	y SCS TR	R-20 met	hod, UH=S	CS, Weigh	ted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01	hrs	Runo
Type III 2	24-nr 50-	-Year Ra	infall=8.72				Туре
A	rea (st) 272	<u>08</u>	Jescription	ed pavemer	nt HSG C		
*	8,302 411	74 >	>75% Gras Gravel side	s cover, Go walk HSG	ind, HSG C C		
	8,985	75 V	Neighted A	verage	5		
	8,713 272	9	96.97% Pei 3.03% Impe	rvious Area	a		(mi
	272	1	100.00% U	nconnected			
Tc (min)	Length	Slope	Velocity	Capacity	Description		
9.4	50	0.0142	0.09	(013)	Sheet Flow,		
0.9	97	0.0154	1.86		Grass: Dense n= 0.240 P2= 3.23" Shallow Concentrated Flow, Grassed Waterway Ky= 15.0 fps		
10.3	147	Total					
1 1 -		1.2 cfs	Sub	catchmer Hydrog	nt 3.1S: Backyard ADs graph 50-Year Rainfall=8.72" Runoff Area=8,985 sf Runoff Volume=4,265 cf Runoff Depth=5.70" Flow Length=147' Tc=10.3 min CN=75	E Runoff	Flow (cfs)
0	2468	10 12 14 1	16 18 20 22 24	26 28 30 32 34	36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72 (hours)		
				l'ime	(nours)		

Summary for Subcatchment 3S: Townhouse Roofs
Runoff = 2.6 cfs @ 12.08 hrs, Volume= 9,234 cf, Depth= 8.48"
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs Type III 24-hr 50-Year Rainfall=8.72"
Area (sf) CN Description
13,067 98 Roofs, HSG C
13,067 100.00% Impervious Area
Tc Length Slope Velocity Capacity Description (min) (feet) (ft/ft) (ft/sec) (cfs)
6.0 Direct Entry, Min. Tc
Subcatchment 3S: Townhouse Roofs
Hydrograph
(1) (1) (2) (2) (3) (4) (4) (4) (5) (4) (5) (5) (7) (7) (7) (7) (7) (7) (7) (7
0 2 4 0 0 10 12 14 10 10 20 22 24 20 20 30 32 34 30 30 40 42 44 40 40 30 32 34 30 30 00 02 04 00 08 /0 /2 Time (hours)

2340700-PR-2021-08-18 Prepared by BSC Group	Thorndike Place - Post-Development Type III 24-hr 50-Year Rainfall=8.72" Printed 8/24/2021
HydroCAD® 10.00-22 s/n 00904 © 2018 HydroCAD Software Sof	olutions LLC Page 117
Summary for Subcatchment 4	.2S: Townhouse TDs
Runoff = 0.2 cfs @ 12.08 hrs, Volume=	775 cf, Depth= 8.36"
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Tin Type III 24-hr 50-Year Rainfall=8.72"	ne Span= 0.00-72.00 hrs, dt= 0.01 hrs
Area (sf) CN Description	

	1 064	98 F	aved nark	ing HSG C	2
	1,004	74 5	75% Grac	a covor Co	, and HSC C
	40	/4 /	15/0 Glas		Juu, 1130 C
	1,112	97 V	Veighted A	verage	
	48	4	.32% Perv	ious Area	
	1.064	g	5.68% Imp	pervious Ar	ea
	,				
Тс	Length	Slope	Velocity	Capacity	Description
(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	Description
60	/				Direct Entry Min To
0.0					Breet Entry, Min. Te
			Subc	atchmen	t 4 2S [.] Townhouse TDs



Prepared by BSC Group Printed 8/24/24 HydroCAD® 10.00-22 s/n 00904 © 2018 HydroCAD Software Solutions LLC Page Summary for Subcatchment 4.3S: Townhouse TDs Runoff = 0.2 cfs @ 12.08 hrs, Volume= 770 cf, Depth= 8.36" Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs Type III 24-hr 50-Year Rainfall=8.72" Area (sf) CN Description 1,075 98 Paved parking, HSG C 30 74 >75% Grass cover, Good, HSG C 1,075 97.29% Impervious Area 1,075 97.29% Impervious Area <th>540100-</th> <th>•PR-202</th> <th>1-08-</th> <th>-18</th> <th></th> <th></th> <th></th> <th>Thorno Type III 2</th> <th>dike Place - Post- 4-hr 50-Year R</th> <th>Developmer ainfall=8.72</th>	540100-	•PR-202	1-08-	-18				Thorno Type III 2	dike Place - Post- 4-hr 50-Year R	Developmer ainfall=8.72
Page Summary for Subcatchment 4.3S: Townhouse TDs Runoff = 0.2 cfs @ 12.08 hrs, Volume= 770 cf, Depth= 8.36" Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs Type III 24-hr Area (sf) CN Description	repared b	by BSC 0	Group	2					Printe	ed 8/24/202
Summary for Subcatchment 4.3S: Townhouse TDS Runoff = 0.2 cfs @ 12.08 hrs, Volume= 770 cf, Depth= 8.36" Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs Type III 24-hr 50-Year Rainfall=8.72" Area (sf) CN Description 1.075 98 Paved parking, HSG C 30 74 >75% Grass cover, Good, HSG C 1.105 97 Weighted Average 30 2.71% Pervious Area 1.075 97.29% Impervious Area 1.075 0.2 cfs 6.0 Direct Entry, Min. Tc Subcatchment 4.3S: Townhouse TDS Hydrograph 1.076 97.200 Cfs 1.000 Core 1.100 Sf Runoff Area = 1,105 Sf Runoff Area = 1,105 Sf Runoff Depth=8.36" CN=97. 000 000 000 000 000 000 000 000 000 00	/droCAD®) 10.00-22	s/n 00	<u>0904 ©</u>	2018	3 HydroCA	D Software Solu	tions LLC		Page 11
Runoff = 0.2 cfs @ 12.08 hrs, Volume= 770 cf, Depth= 8.36" Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs Prea (sf) CN Description 1,075 98 Paved parking, HSG C 30 74 >75% Grass cover, Good, HSG C 1,075 97 Weighted Average 30 2.71% Pervious Area 1,075 97.29% Impervious Area 1,076 0.2 cfs <t< td=""><td></td><td></td><td>Su</td><td>mmar</td><td>y fo</td><td>r Subca</td><td>tchment 4.3</td><td>S: Townho</td><td>use TDs</td><td></td></t<>			Su	mmar	y fo	r Subca	tchment 4.3	S: Townho	use TDs	
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs Type III 24-hr 50-Year Rainfall=8.72" Area (sf) CN Description 1.075 98 Paved parking, HSG C 30 74 >75% Grass cover, Good, HSG C 1.075 97 Weighted Average 30 2.71% Pervious Area 1.075 97.29% Impervious Area 1.075 97.20% Impervious Area 1.	unoff	=	0.2 c	cfs @	12.0	8 hrs, Vo	olume=	770 cf, De	epth= 8.36"	
Type III 24-hr 50-Year Rainfall=8.72" Area (sf) CN Description 1,075 98 Paved parking, HSG C 30 74 >75% Grass cover, Good, HSG C 1,015 97 Weighted Average 30 2.71% Pervious Area 1,075 97.29% Impervious Area 1,075 97.29% Impervious Area 1,075 97.29% Impervious Area 1,075 97.29% Impervious Area C Length Slope 6.0 Direct Entry, Min. Tc Subcatchment 4.3S: Townhouse TDs Hydrograph Type III 24-hr 0.2 0.2 cfs Colspan="2">Colspan="2" Output Colspan= 2 Colspa	unoff by S	SCS TR-2	20 met	thod, U	H=S	CS, Weig	hted-CN, Time	Span= 0.00-7	2.00 hrs, dt= 0.0	1 hrs
Area (sf) CN Description 1,075 98 Paved parking, HSG C 30 74 >75% Grass cover, Good, HSG C 1,105 97 Weighted Average 30 2.71% Pervious Area 1,075 97.29% Impervious Area 1,075 97.29% Impervious Area 1,075 97.29% Impervious Area 6.0 Direct Entry, Min. Tc Subcatchment 4.3S: Townhouse TDs Hydrograph 0.2 cfs 0.2 cfs Type III 24-hr 0.2 dfs 0.2 cfs Colspan="2">Type III 24-hr Operation of the standard standa	/pe III 24-	∙hr 50-Ye	ear Ra	intall=8	3.72"					
1,075 74 >75% Grass cover, Good, HSG C 1,105 97 Weighted Average 30 2.71% Pervious Area 1,075 97.29% Impervious Area 1,075 97.29% Impervious Area Tc Length Slope Velocity Capacity Description (min) (feet) (ft/ft) (ft/sec) (cfs) 6.0 Direct Entry, Min. Tc Subcatchment 4.3S: Townhouse TDs Hydrograph 0.2 cfs 0.2 cfs Type III 24-hr 0.2 cfs 50-Year Rainfall=8.72" Runoff Area=1,105 sf 0.1 Runoff Area=1,105 sf Runoff Depth=8.36" 0.1 0.1 Runoff Depth=8.36" CN=97 0.1 0.1 CN=97 CN	Area	<u>a (sf) C</u>	<u>2N [</u> 98 [Descrip Paved	otion narki	ng HSG	<u>.</u>			
1,105 97 Weighted Average 30 2.71% Pervious Area 1,075 97.29% Impervious Area Tc Length Slope Velocity Capacity Description (min) (feet) (ft/ft) (ft/sec) (cfs) 6.0 Direct Entry, Min. Tc Subcatchment 4.3S: Townhouse TDS Hydrograph 0.2 cfs 0.2 cfs		30 7	74 >	>75% (Grass	s cover, G	iood, HSG C			
1,075 97.29% Impervious Area Tc Length Slope Velocity Capacity Description (ft/ft) (ft/sec) (cfs) 6.0 Direct Entry, Min. Tc Subcatchment 4.3S: Townhouse TDs Hydrograph 0.2 cfs 0.2 cfs	1	,105 9 30	97 N	Weight 2.71%	ed Av Pervi	verage ious Area				
Tc Length Slope Velocity Capacity Description 6.0 Direct Entry, Min. Tc Subcatchment 4.3S: Townhouse TDs Hydrograph 0.2 0.2 cfs Type III 24-hr 0.1 0.2 cfs 50-Year Rainfall=8.72" 0.1 0.1 Runoff Area=1,105 sf 0.1 0.1 Runoff Depth=8.36" 0.1 0.1 CN=97 0.2 0.1 CN=97	1	,075	ę	97.29%	5 Imp	ervious A	rea			
(min) (reet) (roth) (rosec) (crs) 6.0 Direct Entry, Min. Tc Subcatchment 4.3S: Townhouse TDs Hydrograph 0.2 cfs 0.2 cfs 0.10 0.2 cfs 0.2 dfs 0.2 cfs 0.10 0.2 cfs 0.11 0.2 cfs 0.12 0.11 0.13 0.12 0.14 0.14 0.15 Runoff Area=1,105 sf 0.14 0.11 0.15 Runoff Depth=8.36" 0.11 0.11 0.12 0.12 0.13 0.11 0.14 0.11 0.15 0.12 0.11 0.11 0.12 0.11 0.13 0.11 0.14 0.11 0.15 0.11 0.11 0.11 0.12 0.11 0.13 0.11 0.14 0.11 0.15 0.11 <td>Tc L</td> <td>ength</td> <td>Slope</td> <td>Velo</td> <td>city</td> <td>Capacity</td> <td>Description</td> <td></td> <td></td> <td></td>	Tc L	ength	Slope	Velo	city	Capacity	Description			
Subcatchment 4.3S: Townhouse TDs Hydrograph	(min) 6.0	(teet)	(π/π)	(11/S	sec)	(CIS)	Direct Entry	. Min. Tc		
Subcatchment 4.35: Townhouse TDS Hydrograph 0.2 cfs 0.2 cfs 0.				•					_	
Outgram Type III 24-hr 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.19 0.10 0.19 0.11 0.10 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.12 0.13 0.12 0.14 0.12 0.15 0.12 0.11 0.12 0.12 <t< td=""><td></td><td></td><td></td><td>5</td><td>ubca</td><td>atchmer</td><td>1t 4.35: TOWI</td><td>nnouse ID:</td><td>S</td><td></td></t<>				5	ubca	atchmer	1t 4.35: TOWI	nnouse ID:	S	
0.2 cfs Type III 24-hr 0.2 cfs 50-Year Rainfall=8.72" 0.18 0.17 0.16 0.16 0.16 0.16 0.16 0.16 0.16 0.16	0.24				-!!-					
021 019 019 017 017 018 016 015 016 016 015 014 013 012 012 017 014 013 012 014 013 012 014 013 012 014 014 014 014 014 014 014 017 014 017 017 017 017 017 017 017 017 017 017	0.23	0).2 cfs		$-\frac{1}{1}$		·	- + - + - + - + - + - + - +		
0.19 0.18 0.16 0.16 0.16 0.16 0.16 0.16 0.16 0.16	0.21 0.2	╆╺╎╴┥╴┥╴┥ ╆╺╠╺╠╺╎╴┥╴┥		-+-+-+				іур	e III 24-nr	-
0.16 0.16 0.14 0.13 0.10 0.10 0.10 0.11 0.11 0.11 0.11	0.19	} -iiii } -¦¦¦¦		- + - + - + - + - + - +	-ii- -ii-	-iiii - -iii -	50-Y	ear Rain	fall=8.72	-
(g) 0.14 (g) 0.13 (g) 0.13 (g) 0.13 (g) 0.14 (g) 0.14 (g) 0.14 (g) 0.14 (g) 0.15 (g) 0.14 (g) 0.15 (g) 0	0.17						Rur	noff Area	1=1,105 sf	-
© 012 0 012 0 012 0 01 0	(s) 0.14 (s) 0.13				-¦¦-		Runo	off Volun	ne=770 cf	
" 0.1 0.00 0.00 0.00 0.00 0.00 0.00 0.00	0.12 0.11	*		-+-+-+	-11-		Ri	unoff De	pth=8.36"	-
		, _iii _i _i		- L - L - L - + - + - H	_!!_ _!!_		· L - L - L - I - I - I - I - I - I - I -	-+-+- ----	c=6.0 min	_
	0.1 0.09			-+-+-			·	- + - + - + - + - + - + - + - + - + - +	CN=97	-
	0.1 0.09 0.08 0.07				-ii-	j-j-i-i-	·	- † - † - † - † - † - † - † - † - † - †		-
	L 0.1 0.09 0.08 0.07 0.06 0.05				$\overset{- -}{\underset{l}{\overset{-}{\underset{l}{\overset{-}{\atop}}}}}\overset{- -}{\underset{l}{\overset{-}{\underset{l}{\overset{-}{\atop}}}}}$	1 1 1			+ - + - + - +	-
	0.1 0.09 0.08 0.07 0.06 0.05 0.04 0.03			-+-+-+		$\frac{1}{2} - \frac{1}{2} - \frac{1}$	·	-+-+		-
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72 Time (hours)	0.13 0.09 0.08 0.06 0.05 0.04 0.03 0.04 0.03 0.02 0.01									-
	L 0.1 0.09 0.08 0.06 0.06 0.04 0.04 0.02 0.02 0.01 0.02	2 4 6 8 1		16 18 20	 	4 - 4 - 4 - 4 - 4 - 4 - 4 - 4 - 4 - 4 -	34 36 38 40 42 44 46 ne (hours)		3 60 62 64 66 68 70 72	

	Thorndike Place - Post-Developmen
2340700-PR-2021-08-18	Type III 24-hr 50-Year Rainfall=8.72
Prepared by BSC Group	Printed 8/24/2021
HydroCAD® 10.00-22 s/n 00904 © 2018 HydroCAD Software Solut	tions LLC Page 119

Summary for Subcatchment 4.4S: Townhouse TDs

Runoff =

0.2 cfs @ 12.08 hrs, Volume= 769 cf, Depth= 8.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs Type III 24-hr 50-Year Rainfall=8.72"

A	rea (sf)	CN	Description		
	1,076	98	Paved park	ing, HSG C	;
	28	74	>75% Ġras	s cover, Go	bod, HSG C
	1,104	97	Weighted A	verage	
	28		2.54% Perv	ious Area	
	1,076		97.46% Im	pervious Ar	ea
Тс	Length	Slope	e Velocity	Capacity	Description
<u>(min)</u>	(feet)	(ft/ft) (ft/sec)	(cfs)	
6.0					Direct Entry, Min. Tc

Subcatchment 4.4S: Townhouse TDs



234070	0-PR-2021	-08-18			Thorndike Place - Pos Type III 24-hr 50-Year	st-Developmer Rainfall=8.72
repare	d by BSC G	roup			Prir	nted 8/24/202
lydroCA	D® 10.00-22 :	<u>s/n 00904 © 201</u>	8 HydroCAD	Software Soluti	ons LLC	Page 12
		Summary fo	or Subcate	chment 4.5S	: Townhouse TDs	
Runoff	=	0.2 cfs @ 12.0	08 hrs, Volu	ıme=	765 cf, Depth= 8.48"	
Runoff b	y SCS TR-20	method, UH=S	SCS, Weight	ted-CN, Time S	Span= 0.00-72.00 hrs, dt= 0.	.01 hrs
ype III 2	24-hr 50-Yea	r Rainfall=8.72				
A	rea (sf) Cl	Description				
	1,061 9	3 Paved park 4 >75% Gras	ang, HSG C s cover, Go	od, HSG C		
	1,082 9	8 Weighted A	verage	,		
	21 1.061	1.94% Perv 98.06% Im	/lous Area pervious Are	ea		
То	longth S	lana Valaaitu	Consoity	Description		
(min)	(feet)	(ft/ft) (ft/sec)	(cfs)	Description		
6.0				Direct Entry,	Min. Tc	
		Subc	atchment	4.5S: Town	house TDs	
			Hydrog	graph		
0.00		+-+-+-+	+-+-+		+ + + + + + + + + + + + + + + + + + +	⊢ –
0.23	0.	2 cfs				[]
0.2	1:::::				rype m 24-m	
0.18	11	-+-+-+	+ - + - +	5U-Y e	ar Raintali=8.72	
0.16				Run	off Area=1,082 sf	
0.14				Runo	ff Volume=765 cf	
€ 0.13						
(SD 0.13 0.12 0.12				Ru	noff Depth=8.48"	- - -
Line (cts) 0.13 0.12 0.11 0.11 0.01				Ru	noff Depth=8.48" Tc=6.0 min	
(\$5) 0.13 0.12 0.11 0.11 0.09 0.08 0.07				Ru	noff Depth=8.48" Tc=6.0 min CN=98	
(c) 0.14 0.13 0.12 0.11 0.09 0.08 0.07 0.06 0.05				Ru	noff Depth=8.48" Tc=6.0 min CN=98	
(cts) 0.13 0.12 0.12 0.11 0.09 0.08 0.07 0.06 0.05 0.04 0.03				Ru	noff Depth=8.48" Tc=6.0 min CN=98	
(c) 0.13 0.12 0.11 0.09 0.08 0.07 0.06 0.05 0.04 0.02 0.01				Ru	noff Depth=8.48" Tc=6.0 min CN=98	

340700-PR-2021-08-18 repared by BSC Group ydroCAD® 10.00-22_s/n 00904_© 2018 HydroCAD Software Soli	Thorndike Place - Post-Development <i>Type III 24-hr 50-Year Rainfall=8.72"</i> Printed 8/24/2021 utions LLC Page 121
Summary for Subcatchment 4.6	S: Townhouse TDs
unoff = 0.2 cfs @ 12.08 hrs, Volume=	746 cf, Depth= 8.48"
unoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time ype III 24-hr 50-Year Rainfall=8.72"	Span= 0.00-72.00 hrs, dt= 0.01 hrs
Area (sf) CN Description	
1,048 98 Paved parking, HSG C 8 74 >75% Grass cover, Good, HSG C	
1,056 98 Weighted Average	
1,048 99.24% Impervious Area	
Tc Length Slope Velocity Capacity Description (min) (feet) (ft/ft) (ft/sec) (cfs)	
6.0 Direct Entry	y, Min. Tc
Hydrograph 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2	Type III 24-hr ear Rainfall=8.72" noff Area=1,056 sf off Volume=746 cf unoff Depth=8.48" Tc=6.0 min CN=98

Prepared by BSC Group Printed 8/2 HydroCAD® 10.00-22 s/n 00904 © 2018 HydroCAD Software Solutions LLC Pa Summary for Subcatchment 5S: TD-1 Runoff = 1.1 cfs @ 12.08 hrs, Volume= 3,428 cf, Depth= 7.03" Runoff = 1.1 cfs @ 12.08 hrs, Volume= 3,428 cf, Depth= 7.03" Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs Type III 24-hr 50-Year Rainfall=8.72" Area (sf) CN Description	Thorndike Place - Post-Development Type III 24-hr 50-Year Rainfall=8.72"	2340700-PR-2021-08-18
HydroCAD® 10.00-22 s/n 00904 © 2018 HydroCAD Software Solutions LLC Pa Summary for Subcatchment 5S: TD-1 Runoff = 1.1 cfs @ 12.08 hrs, Volume= 3,428 cf, Depth= 7.03" Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs Type III 24-hr 50-Year Rainfall=8.72" Area (sf) CN Description 3,021 98 Paved parking, HSG C	Printed 8/24/2021	Prepared by BSC Group
Summary for Subcatchment 5S: TD-1 Runoff = 1.1 cfs @ 12.08 hrs, Volume 3,428 cf, Depth= 7.03" Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs Type III 24-hr 50-Year Rainfall=8.72"	CAD Software Solutions LLC Page 122	HydroCAD® 10.00-22 s/n 00904 © 2018 HydroCAD
Runoff = 1.1 cfs @ 12.08 hrs, Volume= 3,428 cf, Depth= 7.03" Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs Type III 24-hr 50-Year Rainfall=8.72" Area (sf) CN Description 3,021 98 Paved parking, HSG C 2,830 74 >75% Grass cover, Good, HSG C 5,851 86 Weighted Average 2,830 48.37% Pervious Area 3,021 51.63% Impervious Area 50-Year Rainfall=8.72" Fype III 24-hr Type III 24-hr Fype III 24-hr So-Year Rainfall=8.72" Runoff Volume=3,428 cf Runoff Volume=3,428 cf Runoff Depth=7.03" Tc=6.0 min	or Subcatchment 5S: TD-1	Summary for S
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs Type III 24-hr 50-Year Rainfall=8.72" Area (sf) CN Description 3.021 98 Paved parking, HSG C 2.830 74 >75% Grass cover, Good, HSG C 5.851 86 Weighted Average 2.830 48.37% Pervious Area 3.021 51.63% Impervious Area Tc Length Slope Velocity Capacity Description (min) (feet) (ft/ft) (ft/sec) (cfs) 6.0 Direct Entry, Min. Tc Subcatchment 5S: TD-1 Hydrograph 1.1 cfs 1.1 c	Volume= 3,428 cf, Depth= 7.03"	Runoff = 1.1 cfs @ 12.08 hrs, Vol
Area (sf) CN Description 3,021 98 Paved parking, HSG C 2,830 74 >75% Grass cover, Good, HSG C 5,851 86 Weighted Average 2,830 48.37% Pervious Area 3,021 51.63% Impervious Area 3,021 51.63% Impervious Area Tc Length Slope Velocity Capacity Description (min) (feet) (ft/ft) (ft/sec) (cfs) 6.0 Direct Entry, Min. Tc Subcatchment 5S: TD-1 Hydrograph 1,1 cfs 1,1 c	əighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs	Runoff by SCS TR-20 method, UH=SCS, Weigh Type III 24-hr 50-Year Rainfall=8.72"
3,021 98 Paved parking, HSG C 2,830 74 >75% Grass cover, Good, HSG C 5,851 86 Weighted Average 2,830 48.37% Pervious Area 3,021 51.63% Impervious Area 3,021 51.63% Impervious Area Tc Length Slope Velocity Capacity Description (min) (feet) (ft/ft) (ft/sec) (cfs) 6.0 Direct Entry, Min. Tc Subcatchment 5S: TD-1 Hydrograph 1.1 cfs 1.1		Area (sf) CN Description
2,830 74 >75% Grass cover, Good, HSG C 5,851 86 Weighted Average 2,830 48.37% Pervious Area 3,021 51.63% Impervious Area Tc Length Slope Velocity Capacity Description (min) (feet) (ft/ft) (ft/sec) (cfs) 6.0 Direct Entry, Min. Tc Subcatchment 5S: TD-1 Hydrograph 1.1 cfs 1.1 cfs 1.	GC	3,021 98 Paved parking, HSG C
5,851 86 Weighted Average 2,830 48.37% Pervious Area 3,021 51.63% Impervious Area Tc Length Slope Velocity Capacity Description (min) (feet) (ft/ft) (ft/sec) (cfs) 6.0 Direct Entry, Min. Tc Subcatchment 5S: TD-1 Hydrograph 1_1_cfs 1_1_cf	, Good, HSG C	2,830 74 >75% Grass cover, Go
1 1 <td>rea.</td> <td>5,851 86 Weighted Average</td>	rea.	5,851 86 Weighted Average
Tc Length (feet) Slope (tf/ft) Velocity (ft/sec) Capacity (cfs) Description 6.0 Direct Entry, Min. Tc Subcatchment 5S: TD-1 Hydrograph 1	s Area	3,021 51.63% Impervious Ar
(min) (feet) Slope Velocity Capacity Description 6.0 Direct Entry, Min. Tc Subcatchment 5S: TD-1 Hydrograph Type III 24-hr 50-Year Rainfall=8.72" Runoff Area=5,851 sf Runoff Volume=3,428 cf Runoff Depth=7.03" Tc=6.0 min CN=86		T I II OL MI II O II
6.0 Direct Entry, Min. Tc Subcatchment 5S: TD-1 Hydrograph 1.1 cfs 1.1 cfs 50-Year Rainfall=8.72" Runoff Area=5,851 sf Runoff Volume=3,428 cf Runoff Depth=7.03" Tc=6.0 min CN=86	rity Description	Ic Length Slope Velocity Capacity (min) (feet) (ff/ff) (ff/sec) (cfs)
Subcatchment 5S: TD-1 Hydrograph Type III 24-hr 50-Year Rainfall=8.72" Runoff Area=5,851 sf Runoff Volume=3,428 cf Runoff Depth=7.03" Tc=6.0 min CN=86	Direct Entry. Min. Tc	6.0
Subcatchment 5S: TD-1 Hydrograph Type III 24-hr 50-Year Rainfall=8.72" Runoff Area=5,851 sf Runoff Volume=3,428 cf Runoff Depth=7.03" Tc=6.0 min CN=86		
(f) (f) (f) (f) (f) (f) (f) (f)	atchment 5S: TD-1	Subcate
(*) (*) (*) (*) (*) (*) (*) (*)	/drograph	Hydro
Type III 24-hr 50-Year Rainfall=8.72" Runoff Area=5,851 sf Runoff Volume=3,428 cf Runoff Depth=7.03" Tc=6.0 min CN=86	Runoff	1.1 cfs
(9) (9) (9) (9) (9) (9) (9) (9)	Type III 24-hr	
(f) (f) (f) (f) (f) (f) (f) (f)	50-Year Rainfall=8.72"	1
Runoff Volume=3,428 cf Runoff Depth=7.03" Tc=6.0 min CN=86	Punoff Area=5.851 sf	
e		
ع Runoff Depth=7.03" Tc=6.0 min CN=86	RUNOTT VOIUME=3,428 CT	
تو 2013 Tc=6.0 min CN=86	Runoff Depth=7.03"	− − − − − − − − − − − − − − − − − − −
CN=86	Tc=6.0 min	
	CN=86	
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72 Time (hours)	32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72 Time (hours)	0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 Time

Filled Pilled	nfall=8.72" 8/24/2021
HydroCAD® 10.00-22 s/n 00904 © 2018 HydroCAD Software Solutions LLC Summary for Subcatchment 6.1S: East driveway	Page 123
Runoff = 2.2 cfs @ 12.08 hrs, Volume= 7,316 cf, Depth= 7.15"	
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 h Type III 24-hr 50-Year Rainfall=8.72"	nrs
Area (sf) CN Description	
5,611 74 >75% Grass cover, Good, HSG C 6,444 98 Paved roads w/curbs & sewers, HSG C 220 89 Gravel roads. HSG C	
12,275 87 Weighted Average	
6,444 52.50% Impervious Area	
Tc Length Slope Velocity Capacity Description (min) (feet) (ft/ft) (ft/sec) (cfs)	
6.0 Direct Entry,	
Subcatchment 6.1S: East driveway	
Hydrograph	
2.2 cfs Type III 24-hr 50-Year Painfall=8 72"	Runoff
Runoff Area=12,275 sf Runoff Volume=7,316 cf Runoff Depth=7.15"	
^e 1 CN≒87	
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72	

2340700-PR-2 Prepared by BS HydroCAD® 10.00	021-08- C Group -22_s/n 00	18)904 © 201 ry for Su	8 HydroCAE) Software Soluti ent 6S: Byp	Thorndike Pl Type III 24-hr ions LLC ass Towards W	ace - Post-Development 50-Year Rainfall=8.72" Printed 8/24/2021 Page 124 Vetlands
Runoff =	6.0 c	fs @ 12.1	9 hrs, Volu	ume= 2	23,941 cf, Depth=	5.57"
Runoff by SCS TI Type III 24-hr 50	R-20 metl -Year Rai	hod, UH=S infall=8.72'	CS, Weigh	ted-CN, Time S	Span= 0.00-72.00 ł	nrs, dt= 0.01 hrs
Area (sf)	CN E	Description				
4,985	70 V	Voods, Go	od, HSG C			
46,447	74 >	75% Gras	s cover, Go	ood, HSG C		
107	98 F	Roofs, HSG	G C			
51,539	74 V	Veighted A	verage			
51,432	9	9.79% Per	vious Area			
10 <i>7</i>	0	.21% Impe	ervious Area	а		
Tc Length (min) (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description		
11.8 50	0.0220	0.07		Sheet Flow,		
				Woods: Light	underbrush n= 0.	400 P2= 3.23"
2.2 75	0.0133	0.58		Shallow Con	centrated Flow,	
				Woodland K	v= 5.0 fps	

14.0 125 Total

Subcatchment 6S: Bypass Towards Wetlands



2340700-PR-2021-08-18 Prepared by BSC Group <u>HydroCAD® 10.00-22 s/n 00904 © 2018 HydroCAD Softwar</u>	Thorndike Place - Post-Development Type III 24-hr 50-Year Rainfall=8.72" Printed 8/24/2021 e Solutions LLC Page 125
Summary for Subcatch	ment 7S: To Street
Runoff = 0.9 cfs @ 12.09 hrs, Volume=	2,951 cf, Depth= 6.06"
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Type III 24-hr 50-Year Rainfall=8.72"	Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Area (sf) CN Description	
1,056 98 Paved parking, HSG C 4,787 74 >75% Grass cover, Good, HSC	G C
5,843 78 Weighted Average 4,787 81.93% Pervious Area 1,056 18.07% Impervious Area	
Tc Length Slope Velocity Capacity Descri (min) (feet) (ft/ft) (ft/sec) (cfs)	ption
6.0 Direct	Entry, Min. Tc
Subcatchment 7	S: To Street
	Type III 24-hr 50-Year Rainfall=8.72" Runoff Area=5,843 sf Runoff Volume=2,951 cf Runoff Depth=6.06" Tc=6.0 min CN=78
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 4 Time (hours)	12 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72

Prepare	ND DD 2024	1 00 10			Type III 1	$\Delta hr 50 V_{a}$	r Rainfall=8 72"
Fiepare	DU-PR-202	2-00-10			Type III 2	Pr	inted 8/24/2021
HvdroCA	DR 10.00-22	s/n 00904 ©:	2018 HvdroCAE) Software Sol	utions LLC		Page 126
							<u> </u>
	S	Summary fo	or Pond 1P:	Undergrou	und Infiltrat	on System	
Inflow A	rea =	69,430 sf,	4.25% Imperv	vious, Inflow	Depth = 7.72	for 50-Yea	ar event
Inflow	=	9.3 cfs @ 1	2.09 hrs, Vol	ume=	44,673 cf	Hon= 620/ 1 a	a= 17.4 min
Discarde	– = be	0.1 cfs @	5.56 hrs Vol	ume=	44,073 Cl, A	llen- 03%, La	ig- 17.4 min
Primary	=	3.4 cfs @ 1	2.38 hrs, Volu	ume=	27,092 cf		
Routing	by Stor-Ind i	method, Time	Span= 0.00-7	2.00 hrs, dt=	0.01 hrs		
Peak Ele	ev= 8.47' @	12.38 hrs St	urf.Area= 7,55	6 sf Storage	e= 16,066 cf		
Plug-Flo	w detention	time= 455.4 r	nin calculated	for 44,673 cf	(100% of inflo	w)	
Center-c	of-Mass det.	time= 455.5 r	nin (1,273.0 -	817.5)			
Volume	Invert	Avail.Sto	rage Storage	e Description	l		
#1	6.00'	19,4	95 cf 6.89'W 22.668	cf Overall x	3.00'H Storm 86.0% Voids	rap ST-1 Uni	ts (Irregular Shape)
Device	Routing	Invert	Outlet Device	85			
#1	Discarded	6.00'	0.520 in/hr E	Exfiltration o	ver Surface a	rea	
#2	Primary	7.50'	15.0" Roun	d Culvert			
			L= 190.0' C	PP, square	edge headwall	Ke= 0.500	
			Inlet / Outlet	Invert= 7.50	/6.00' S=0.	J079'/' Cc=0).900
			n= 0.013 El	low Aroo- 1 '	23 of		
			n= 0.013, Fl	low Area= 1.2	23 sf		
Discard	ed OutFlow	Max=0.1 cfs	n= 0.013, Fl @ 5.56 hrs H	low Area= 1.2 IW=6.03' (F	23 sf ree Discharge		
Discard 1=Ex	ed OutFlow filtration (E	Max=0.1 cfs xfiltration Cor	n= 0.013, Fl @ 5.56 hrs H htrols 0.1 cfs)	low Area= 1.: IW=6.03' (F	23 sf ree Discharge		
Discard 1=Ex Primary	ed OutFlow filtration (E	Max=0.1 cfs xfiltration Cor	n= 0.013, Fl @ 5.56 hrs H htrols 0.1 cfs)	low Area= 1.: IW=6.03' (F	23 sf ree Discharge		
Discard 1=Ex Primary 1−2=Cu	ed OutFlow filtration (E ^r OutFlow M livert (Barre	Max=0.1 cfs xfiltration Cor lax=3.4 cfs @ l Controls 3.4	n= 0.013, Fl @ 5.56 hrs H htrols 0.1 cfs) 12.38 hrs HV cfs @ 4.55 fp	low Area= 1.: IW=6.03' (F N=8.47' (Fre s)	23 sf ree Discharge ee Discharge)		
Discard ¹ —1=Ex Primary ¹ —2=Cu	ed OutFlow filtration (E OutFlow M Ilvert (Barre	Max=0.1 cfs xfiltration Cor lax=3.4 cfs @ l Controls 3.4	n= 0.013, Fl @ 5.56 hrs H trols 0.1 cfs) 12.38 hrs HV cfs @ 4.55 fp	low Area= 1.: IW=6.03' (F W=8.47' (Fre s)	23 sf ree Discharge ee Discharge)		
Discard 1=Ex Primary 1−2=Cu	ed OutFlow filtration (E OutFlow M Ilvert (Barre	Max=0.1 cfs xfiltration Cor lax=3.4 cfs @ I Controls 3.4	n= 0.013, Fl @ 5.56 hrs H ttrols 0.1 cfs) 12.38 hrs HV cfs @ 4.55 fp	low Area= 1.: IW=6.03' (F W=8.47' (Fre s)	23 sf ree Discharge ee Discharge)		
Discard 1=Ex Primary 1—2=Cu	ed OutFlow filtration (E 7 OutFlow M Ilvert (Barre	Max=0.1 cfs xfiltration Cor lax=3.4 cfs @ l Controls 3.4	n= 0.013, Fl @ 5.56 hrs H ttrols 0.1 cfs) 12.38 hrs HV cfs @ 4.55 fp	low Area= 1.: IW=6.03' (F W=8.47' (Fre s)	23 sf ree Discharge ee Discharge)		
Discard 1=Ex Primary 12=Cu	ed OutFlow filtration (E OutFlow M Ivert (Barre	Max=0.1 cfs xfiltration Cor lax=3.4 cfs @ I Controls 3.4	n= 0.013, Fl @ 5.56 hrs H throis 0.1 cfs) 12.38 hrs HV cfs @ 4.55 fp	low Area= 1.1 IW=6.03' (F N=8.47' (Fré s)	23 sf ree Discharge ee Discharge)		
Discard 1−1=Ex Primary 1−2=Cu	ed OutFlow filtration (E OutFlow M Ivert (Barre	Max=0.1 cfs xfiltration Cor lax=3.4 cfs @ I Controls 3.4	n= 0.013, Fl @ 5.56 hrs H throis 0.1 cfs) 12.38 hrs HV cfs @ 4.55 fp	low Area= 1.: IW=6.03' (F N=8.47' (Fre s)	23 sf ree Discharge ee Discharge)		
Discard Î−1=Ex Primary Î−2=Cu	ed OutFlow filtration (E OutFlow M Ivert (Barre	Max=0.1 cfs xfiltration Cor lax=3.4 cfs @ I Controls 3.4	n= 0.013, Fl @ 5.56 hrs H throis 0.1 cfs) 12.38 hrs HV cfs @ 4.55 fp	low Area= 1.: IW=6.03' (F N=8.47' (Fre s)	23 sf ree Discharge ee Discharge)		
Discard 1=Ex Primary 2=Cu	ed OutFlow filtration (E OutFlow M Ivert (Barre	Max=0.1 cfs xfiltration Cor lax=3.4 cfs @ l Controls 3.4	n= 0.013, Fl @ 5.56 hrs H ttrols 0.1 cfs) 12.38 hrs HV cfs @ 4.55 fp	low Area= 1.: IW=6.03' (F N=8.47' (Fre S)	23 sf ree Discharge ee Discharge)		
Discard 1=Ex Primary 2=Cu	ed OutFlow filtration (E OutFlow M Ilvert (Barre	Max=0.1 cfs xfiltration Cor lax=3.4 cfs @ l Controls 3.4	n= 0.013, Fl @ 5.56 hrs H ttrols 0.1 cfs) 12.38 hrs HV cfs @ 4.55 fp	low Area= 1.: IW=6.03' (F N=8.47' (Fre s)	23 sf ree Discharge ee Discharge)		
Discard 1=Ex Primary 1−2=Cu	ed OutFlow filtration (E OutFlow M Ivert (Barre	Max=0.1 cfs xfiltration Cor lax=3.4 cfs @ l Controls 3.4	n= 0.013, Fl @ 5.56 hrs H htrois 0.1 cfs) 12.38 hrs HV cfs @ 4.55 fp	low Area= 1.: IW=6.03' (F N=8.47' (Fre S)	23 sf ree Discharge ee Discharge)		
Discard 1=Ex Primary 1−2=Cu	ed OutFlow filtration (E OutFlow M Ivert (Barre	Max=0.1 cfs xfiltration Cor lax=3.4 cfs @ I Controls 3.4	n= 0.013, Fl @ 5.56 hrs H throls 0.1 cfs) 12.38 hrs HV cfs @ 4.55 fp	low Area= 1.: IW=6.03' (F N=8.47' (Fre S)	23 sf ree Discharge ee Discharge)		
Discard 1 = Ex Primary 1 2=Cu	ed OutFlow filtration (E OutFlow M Ivert (Barre	Max=0.1 cfs xfiltration Cor lax=3.4 cfs @ l Controls 3.4	n= 0.013, Fl @ 5.56 hrs H throis 0.1 cfs) 12.38 hrs HV cfs @ 4.55 fp	low Area= 1.: IW=6.03' (F N=8.47' (Fre s)	23 sf ree Discharge ee Discharge)		
Discard 1 1=Ex Primary 1 2=Cu	ed OutFlow filtration (E OutFlow M Ivert (Barre	Max=0.1 cfs xfiltration Cor lax=3.4 cfs @ l Controls 3.4	n= 0.013, FI @ 5.56 hrs H ttrols 0.1 cfs) 12.38 hrs HV cfs @ 4.55 fp	low Area= 1.: IW=6.03' (F N=8.47' (Fre S)	23 sf ree Discharge ee Discharge)		
Discard 1−1=Ex Primary 1−2=Cu	ed OutFlow filtration (E OutFlow M Ivert (Barre	Max=0.1 cfs xfiltration Cor lax=3.4 cfs @ l Controls 3.4	n= 0.013, FI @ 5.56 hrs H ttrols 0.1 cfs) 12.38 hrs HV cfs @ 4.55 fp	low Area= 1.: IW=6.03' (F N=8.47' (Fre s)	23 sf ree Discharge ee Discharge)		
Discard 1 1=Ex Primary 1 2=Cu	ed OutFlow filtration (E OutFlow M Ilvert (Barre	Max=0.1 cfs xfiltration Cor lax=3.4 cfs @ l Controls 3.4	n= 0.013, Fl @ 5.56 hrs H htrols 0.1 cfs) 12.38 hrs HV cfs @ 4.55 fp	low Area= 1.: IW=6.03' (F N=8.47' (Fre S)	23 sf ree Discharge ee Discharge)		
Discard 1=Ex Primary 1−2=Cu	ed OutFlow filtration (E OutFlow M Ivert (Barre	Max=0.1 cfs xfiltration Cor lax=3.4 cfs @ l Controls 3.4	n= 0.013, FI @ 5.56 hrs H ttrols 0.1 cfs) 12.38 hrs HV cfs @ 4.55 fp	low Area= 1.: IW=6.03' (F N=8.47' (Fre s)	23 sf ree Discharge ee Discharge)		

Thorndike Place - Post-Development Type III 24-hr 50-Year Rainfall=8.72" 2340700-PR-2021-08-18 Prepared by BSC Group HydroCAD® 10.00-22 s/n 00904 © 2018 HydroCAD Software Solutions LLC Printed 8/24/2021

Pond 1P: Underground Infiltration System

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	I horndike Place - Post-Development
2340700-PR-2021-08-18	Type III 24-hr 50-Year Rainfall=8.72"
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Summary for Pond 2P: Rooftop Detention

Inflow Are	ea =	18,785 sf,100.00% Impervious,	Inflow Depth = 8.48" for 50-Year event	
Inflow	=	3.7 cfs @ 12.08 hrs, Volume=	13,274 cf	
Outflow	=	0.4 cfs @ 12.81 hrs, Volume=	13,274 cf, Atten= 90%, Lag= 43.7	min
Primary	=	0.4 cfs @, 12.81 hrs, Volume=	13,274 cf	

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3 Peak Elev= 57.80' @ 12.81 hrs Surf.Area= 7,500 sf Storage= 5,966 cf

Plug-Flow detention time= 192.1 min calculated for 13,274 cf (100% of inflow) Center-of-Mass det. time= 192.1 min (932.2 - 740.2)

Volum	ne	Invert	Avail.Sto	rage	Storage D	escription		
#1		57.00'	7,50	00 cf	Rooftop I	Detention (Pr	ismatic)Listed below (Recalc)	
Eleva	ation feet)	Surf. (.Area sq-ft)	Inc (cubic	.Store :-feet)	Cum.Store (cubic-feet)		
5 5	7.00 8.00	7	7,500 7,500		0 7,500	0 7,500		
Devic	e Rou	iting	Invert	Outle	et Devices			
#1	Prin	nary	8.02'	12.0 L= 1 Inlet	' Round F 6.0' CPP, / Outlet Inv 012 Elow	Roof Drain mitered to co vert= 8.02' / 7.	nform to fill, Ke= 0.700 70' S= 0.0200 '/' Cc= 0.900	
#2	2 Dev	rice 1	57.00'	4.0" Limit	Horiz. Orif ed to weir	flow at low he	= 0.600 ads	

Primary OutFlow Max=0.4 cfs @ 12.81 hrs HW=57.80' (Free Discharge) 1=Roof Drain (Passes 0.4 cfs of 23.4 cfs potential flow) 2=Orifice/Grate (Orifice Controls 0.4 cfs @ 4.29 fps)

 Thorndike Place - Post-Development

 2340700-PR-2021-08-18
 Type III 24-hr
 50-Year Rainfall=8.72"

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	i nornaike i	Place - Post-Development
2340700-PR-2021-08-18	Type III 24-hr	50-Year Rainfall=8.72"
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Summary for Pond 3P: Rain garden

Inflow Area	ı =	12,275 sf,	52.50% Impervious,	Inflow Depth = 7.15" for 50-Year event
Inflow	=	2.2 cfs @	12.08 hrs, Volume=	7,316 cf
Outflow	=	2.2 cfs @	12.09 hrs, Volume=	7,316 cf, Atten= 0%, Lag= 0.3 min
Discarded	=	0.0 cfs @	12.09 hrs, Volume=	462 cf
Primary	=	2.2 cfs @	12.09 hrs, Volume=	6,854 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs Peak Elev= 6.42' @ 12.09 hrs Surf.Area= 416 sf Storage= 219 cf

Plug-Flow detention time= 34.9 min calculated for 7,316 cf (100% of inflow) Center-of-Mass det. time= 34.9 min (817.1 - 782.2)

Volume	Invert	Avail Sto	orado	Storage Description		
#1	5.60	2	53 cf	Custom Stage Dat	a (Irregular)Listed	l below (Recalc)
Elevatio (fee	on S et)	urf.Area F (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
5.6 6.0 6.3	50 00 30	125 276 350	46.0 66.0 73.0	0 78 94	0 78 172	125 305 385
6.5 Device	50 Routing	460	87.0 Outle	81 et Devices	253	564
#1 #2	Discarded Primary	5.60' 6.30'	0.52 22.0 Head 2.50 Coef 2.65	0 in/hr Exfiltration of 'long x 5.0' breadtl d (feet) 0.20 0.40 0 3.00 3.50 4.00 4.5 f. (English) 2.34 2.5 2.67 2.66 2.68 2.7	Over Surface area h Broad-Crested .60 0.80 1.00 1 50 5.00 5.00 5.50 0 2.70 2.68 70 2.74 2.79 2.8	Rectangular Weir 20 1.40 1.60 1.80 2.00 5 2.66 2.65 2.65 2.65 8

Discarded OutFlow Max=0.0 cfs @ 12.09 hrs HW=6.42' (Free Discharge) **1=Exfiltration** (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=2.2 cfs @ 12.09 hrs HW=6.42' (Free Discharge) —2=Broad-Crested Rectangular Weir (Weir Controls 2.2 cfs @ 0.82 fps)





	I norndike Place - Post-Developmen	τ
2340700-PR-2021-08-18	Type III 24-hr 50-Year Rainfall=8.72	"
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HydroCAD® 10.00-22 s/n 00904 © 2018 HydroCAD Software Solu	utions LLC Page 132	2

Summary for Pond TD2:

Inflow Area	a =	1,112 sf,	95.68% Impervious,	Inflow Depth = 8.36" for 50-Year event
Inflow	=	0.2 cfs @	12.08 hrs, Volume=	775 cf
Outflow	=	0.0 cfs @	6.62 hrs, Volume=	775 cf, Atten= 98%, Lag= 0.0 min
Discarded	=	0.0 cfs @	6.62 hrs, Volume=	775 cf
Primary	=	0.0 cfs @	0.00 hrs, Volume=	0 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs Peak Elev= 8.43' @ 18.81 hrs Surf.Area= 278 sf Storage= 543 cf

Plug-Flow detention time= 1,403.3 min calculated for 775 cf (100% of inflow) Center-of-Mass det. time= 1,403.3 min (2,149.1 - 745.8)

Volume	Invert	Avail.Storage	e Storage Description
#1	5.50'	206 c	f 17.06'W x 16.29'L x 3.83'H Stone
			1,064 cf Overall - 548 cf Embedded = 516 cf x 40.0% Voids
#2	6.00'	472 c	6.89'W x 14.06'L x 2.83'H StormTrap ST-1 Units x 2 Inside #1
			548 cf Overall x 86.0% Voids
		678 c	f Total Available Storage
Device	Routing	Invert Ou	utlet Devices
#1	Discarded	5.50' 0.	520 in/hr Exfiltration over Surface area
#2	Primary	10.00' 6.0	0" x 240.0" Horiz. Orifice/Grate C= 0.600
		Lir	mited to weir flow at low heads

Discarded OutFlow Max=0.0 cfs @ 6.62 hrs HW=5.55' (Free Discharge) **1=Exfiltration** (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=5.50' (Free Discharge)



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Summary for Pond TD3:

Inflow Area	a =	1,105 sf,	97.29% Impervious,	Inflow Depth = 8.36" for 50-Year event
Inflow	=	0.2 cfs @	12.08 hrs, Volume=	770 cf
Outflow	=	0.0 cfs @	6.66 hrs, Volume=	770 cf, Atten= 98%, Lag= 0.0 min
Discarded	=	0.0 cfs @	6.66 hrs, Volume=	770 cf
Primary	=	0.0 cfs @	0.00 hrs, Volume=	0 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs Peak Elev= 8.41' @ 18.75 hrs Surf.Area= 278 sf Storage= 539 cf

Plug-Flow detention time= 1,393.8 min calculated for 770 cf (100% of inflow) Center-of-Mass det. time= 1,393.8 min (2,139.6 - 745.8)

Volume	Invert	Avail.Storage	e Storage Description
#1	5.50'	206 c	f 17.06'W x 16.29'L x 3.83'H Stone
#2	6.00'	472 c	1,064 cf Overall - 548 cf Embedded = 516 cf x 40.0% Voids f 6.89'W x 14.06'L x 2.83'H StormTrap ST-1 Units x 2 Inside #1 548 cf Overall x 86.0% Voids
		678 ct	f Total Available Storage
Device	Routing	Invert Ou	utlet Devices
#1 #2	Discarded Primary	5.50' 0.5 10.30' 6.0 Lin	520 in/hr Exfiltration over Surface area)" x 240.0" Horiz. Orifice/Grate C= 0.600 nited to weir flow at low heads

Discarded OutFlow Max=0.0 cfs @ 6.66 hrs HW=5.55' (Free Discharge) **1=Exfiltration** (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=5.50' (Free Discharge) 2=Orifice/Grate (Controls 0.0 cfs)



0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72 Time (hours)

0.04

0.0 cfs

<u>00cfs</u> 0.0 cfs

	Thorndike Place - Post-Development
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Summary for Pond TD4:

Inflow Area	a =	1,104 sf,	97.46% Impervious,	Inflow Depth = 8.36" for 50-Year event
Inflow	=	0.2 cfs @	12.08 hrs, Volume=	769 cf
Outflow	=	0.0 cfs @	6.66 hrs, Volume=	769 cf, Atten= 98%, Lag= 0.0 min
Discarded	=	0.0 cfs @	6.66 hrs, Volume=	769 cf
Primary	=	0.0 cfs @	0.00 hrs, Volume=	0 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs Peak Elev= 8.41' @ 18.74 hrs Surf.Area= 278 sf Storage= 538 cf

Plug-Flow detention time= 1,391.5 min calculated for 769 cf (100% of inflow) Center-of-Mass det. time= 1,391.7 min (2,137.5 - 745.8)

Volume	e Invert	Avail.Storage	e Storage Description
#1	5.50'	206 c	f 17.06'W x 16.29'L x 3.83'H Stone
#2	6.00'	472 c	1,064 cf Overall - 548 cf Embedded = 516 cf x 40.0% Voids 6.89'W x 14.06'L x 2.83'H StormTrap ST-1 Units x 2 Inside #1 548 cf Overall x 86.0% Voids
		678 c	f Total Available Storage
Device	Routing	Invert Ou	itlet Devices
#1	Discarded	5.50' 0.5	520 in/hr Exfiltration over Surface area
#2	r mindly	Lin	nited to weir flow at low heads

Discarded OutFlow Max=0.0 cfs @ 6.66 hrs HW=5.55' (Free Discharge) **1=Exfiltration** (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=5.50' (Free Discharge) 2=Orifice/Grate (Controls 0.0 cfs)



0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72 Time (hours)

	I nornalke Place - Post-Development
2340700-PR-2021-08-18	Type III 24-hr 50-Year Rainfall=8.72"
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Summary for Pond TD5:

Inflow Area	a =	1,082 sf,	98.06% Impervious,	Inflow Depth = 8.48" for 50-Year event
Inflow	=	0.2 cfs @	12.08 hrs, Volume=	765 cf
Outflow	=	0.0 cfs @	6.50 hrs, Volume=	765 cf, Atten= 98%, Lag= 0.0 min
Discarded	=	0.0 cfs @	6.50 hrs, Volume=	765 cf
Primary	=	0.0 cfs @	0.00 hrs, Volume=	0 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs Peak Elev= 7.87' @ 18.54 hrs Surf.Area= 278 sf Storage= 529 cf

Plug-Flow detention time= 1,358.4 min calculated for 764 cf (100% of inflow) Center-of-Mass det. time= 1,358.6 min (2,098.8 - 740.2)

Volume	Invert	Avail.Storage	e Storage Description
#1	5.00'	206 c	f 17.06'W x 16.29'L x 3.83'H Stone
#2	5.50'	472 c	1,064 cf Overall - 548 cf Embedded = 516 cf x 40.0% Voids f 6.89'W x 14.06'L x 2.83'H StormTrap ST-1 Units x 2 Inside #1 548 cf Overall x 86.0% Voids
		678 c	f Total Available Storage
Device	Routing	Invert Ou	utlet Devices
#1	Discarded	5.00' 0.	520 in/hr Exfiltration over Surface area
#2	Primary	9.80' 6.0 Lir	D" x 240.0" Horiz. Orifice/Grate C= 0.600 nited to weir flow at low heads

Discarded OutFlow Max=0.0 cfs @ 6.50 hrs HW=5.05' (Free Discharge) **1=Exfiltration** (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=5.00' (Free Discharge) 2=Orifice/Grate (Controls 0.0 cfs)



	I norndike Place - Post-Developm	ient
2340700-PR-2021-08-18	Type III 24-hr 50-Year Rainfall=8.	72″
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Summary for Pond TD6:

Inflow Area	a =	1,056 sf,	99.24% Impervious,	Inflow Depth = 8.48" for 50-Year event
Inflow	=	0.2 cfs @	12.08 hrs, Volume=	746 cf
Outflow	=	0.0 cfs @	6.58 hrs, Volume=	746 cf, Atten= 98%, Lag= 0.0 min
Discarded	=	0.0 cfs @	6.58 hrs, Volume=	746 cf
Primary	=	0.0 cfs @	0.00 hrs, Volume=	0 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs Peak Elev= 7.78' @ 18.29 hrs Surf.Area= 278 sf Storage= 513 cf

Plug-Flow detention time= 1,315.8 min calculated for 746 cf (100% of inflow) Center-of-Mass det. time= 1,315.9 min (2,056.1 - 740.2)

Volume	e Invert	Avail.Storage	e Storage Description
#1	5.00'	206 c	f 17.06'W x 16.29'L x 3.83'H Stone
#2	5 50'	472 c	1,064 cf Overall - 548 cf Embedded = 516 cf x 40.0% Voids 6.89'W x 14.06'L x 2.83'H StormTrap ST-1 Units x 2 Inside #1
			548 cf Overall x 86.0% Voids
		678 c	f Total Available Storage
Device	Routing	Invert Ou	utlet Devices
#1	Discarded	5.00' 0.	520 in/hr Exfiltration over Surface area
#2	Primary	9.50' 6.	0" x 240.0" Horiz. Orifice/Grate C= 0.600
		Lir	mited to weir flow at low heads

Discarded OutFlow Max=0.0 cfs @ 6.58 hrs HW=5.05' (Free Discharge) **1=Exfiltration** (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=5.00' (Free Discharge) 2=Orifice/Grate (Controls 0.0 cfs)



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Summary for Link 1L: Towards Wetlands

Inflow Are	a =	147,384 sf,	49.02% Impervious,	Inflow Depth = 5.53"	for 50-Year event
Inflow	=	11.8 cfs @	12.16 hrs, Volume=	67,879 cf	
Primary	=	11.8 cfs @	12.16 hrs, Volume=	67,879 cf, Atte	en= 0%, Lag= 0.0 min

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





	Thorndike Place - Post-Development
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Summary for Link 2L: Towards Street

Inflow Area	a =	11,302 sf,	56.45% Impervious,	Inflow Depth = 3.13"	for 50-Year event
Inflow	=	0.9 cfs @	12.09 hrs, Volume=	2,951 cf	
Primary	=	0.9 cfs @	12.09 hrs, Volume=	2,951 cf, Atte	n= 0%, Lag= 0.0 min

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



	I norndike Place - Post-Development
2340700-PR-2021-08-18	Type III 24-hr 50-Year Rainfall=8.72"
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Summary for Link 100L: Total Flows

Inflow Area	a =	158,686 sf,	49.55% Impervious,	Inflow Depth = 5.36"	for 50-Year event
Inflow	=	12.5 cfs @	12.15 hrs, Volume=	70,830 cf	
Primary	=	12.5 cfs @	12.15 hrs, Volume=	70,830 cf, Atte	en= 0%, Lag= 0.0 min

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

Link 100L: Total Flows



2340700-PR-2021-08-18 Prepared by BSC Group HydroCAD® 10.00-22 s/n 00904 © 2018 Hy	Thorndike Place - Post-Development Type III 24-hr 100-Year Rainfall=10.35" Printed 8/24/2021 droCAD Software Solutions LLC Page 145	2340700-PR-2021-08-18 Prepared by BSC Group <u>HydroCAD® 10.00-22 s/n 00904</u>	Thorndike Place - Post-Development Type III 24-hr 100-Year Rainfall=10.35" Printed 8/24/2021 © 2018 HydroCAD Software Solutions LLC Page 146
Time span=0.0 Runoff by SCS ⁻ Reach routing by Stor-Ind+	00-72.00 hrs, dt=0.01 hrs, 7201 points TR-20 method, UH=SCS, Weighted-CN -Trans method - Pond routing by Stor-Ind method	Pond 3P: Rain garden	Peak Elev=6.44' Storage=226 cf Inflow=2.7 cfs 8,951 cf Discarded=0.0 cfs 473 cf Primary=2.7 cfs 8,478 cf Outflow=2.7 cfs 8,951 cf
Subcatchment 1S: CB-1	Runoff Area=22,742 sf 72.16% Impervious Runoff Depth=9.25"	Pond TD2:	Peak Elev=9.33' Storage=678 cf Inflow=0.3 cfs 926 cf Discarded=0.0 cfs 832 cf Primary=0.0 cfs 0 cf Outflow=0.0 cfs 832 cf
Subcatchment 2.1S: Building	Runoff Area=14,140 sf 100.00% Impervious Runoff Depth=10.11" Tc=6.0 min CN=98 Runoff=3.3 cfs 11,912 cf	Pond TD3:	Peak Elev=9.28' Storage=673 cf Inflow=0.3 cfs 920 cf Discarded=0.0 cfs 831 cf Primary=0.0 cfs 0 cf Outflow=0.0 cfs 831 cf
Subcatchment 2S: Building Roof	Runoff Area=18,785 sf 100.00% Impervious Runoff Depth=10.11" Tc=6.0 min CN=98 Runoff=4.4 cfs 15,825 cf	Pond TD4:	Peak Elev=9.28' Storage=672 cf Inflow=0.3 cfs 919 cf Discarded=0.0 cfs 831 cf Primary=0.0 cfs 0 cf Outflow=0.0 cfs 831 cf
Subcatchment 3.1S: Backyard ADs	Runoff Area=8,985 sf 3.03% Impervious Runoff Depth=7.20" Flow Length=147' Tc=10.3 min CN=75 Runoff=1.5 cfs 5.394 cf	Pond TD5:	Peak Elev=8.67' Storage=660 cf Inflow=0.3 cfs 912 cf Discarded=0.0 cfs 836 cf Primary=0.0 cfs 0 cf Outflow=0.0 cfs 836 cf
Subcatchment 3S: Townhouse Roofs	Runoff Area=13,067 sf 100.00% Impervious Runoff Depth=10.11"	Pond TD6:	Peak Elev=8.49' Storage=640 cf Inflow=0.2 cfs 890 cf Discarded=0.0 cfs 836 cf Primary=0.0 cfs 0 cf Outflow=0.0 cfs 836 cf
Subcatchment 4.2S: Townhouse TDs	Runoff Area=1,112 sf 95.68% Impervious Runoff Depth=9.99" Tc=6 0 min CN=97 Runoff=0.3 cfs 926 cf	Link 1L: Towards Wetlands	Inflow=16.1 cfs 86,770 cf Primary=16.1 cfs 86,770 cf
Subcatchment 4.3S: Townhouse TDs	Runoff Area=1,105 sf 97.29% Impervious Runoff Depth=9.99" Tc=6.0 min CN=97 Runoff=0.3 cfs 920 cf	Link 2L: Towards Street	Inflow=1.2 cfs 3,699 cf Primary=1.2 cfs 3,699 cf
Subcatchment 4.4S: Townhouse TDs	Runoff Area=1,104 sf 97.46% Impervious Runoff Depth=9.99" Tc=6.0 min CN=97 Runoff=0.3 cfs 919 cf	Link 100L: Total Flows	Inflow=17.0 cfs 90,469 cf Primary=17.0 cfs 90,469 cf
Subcatchment 4.5S: Townhouse TDs	Runoff Area=1,082 sf 98.06% Impervious Runoff Depth=10.11" Tc=6.0 min CN=98 Runoff=0.3 cfs 912 cf	Total Runoff Area =	158,686 sf Runoff Volume = 113,463 cf Average Runoff Depth = 8.58" 50.45% Pervious = 80,060 sf 49.55% Impervious = 78,626 sf
Subcatchment 4.6S: Townhouse TDs	Runoff Area=1,056 sf 99.24% Impervious Runoff Depth=10.11" Tc=6.0 min CN=98 Runoff=0.2 cfs 890 cf		
Subcatchment 5S: TD-1	Runoff Area=5,851 sf 51.63% Impervious Runoff Depth=8.62" Tc=6.0 min CN=86 Runoff=1.3 cfs 4,205 cf		
Subcatchment 6.1S: East driveway	Runoff Area=12,275 sf 52.50% Impervious Runoff Depth=8.75" Tc=6.0 min CN=87 Runoff=2.7 cfs 8,951 cf		
Subcatchment 6S: Bypass Towards	Runoff Area=51,539 sf 0.21% Impervious Runoff Depth=7.07" Flow Length=125' Tc=14.0 min CN=74 Runoff=7.6 cfs 30,373 cf		
Subcatchment 7S: To Street	Runoff Area=5,843 sf 18.07% Impervious Runoff Depth=7.60" Tc=6.0 min CN=78 Runoff=1.2 cfs 3,699 cf		
Pond 1P: Underground Infiltration Syste Discarded=0.1	em Peak Elev=8.79' Storage=18,113 cf Inflow=11.1 cfs 53,963 cf cfs 17,955 cf Primary=4.8 cfs 36,008 cf Outflow=4.9 cfs 53,963 cf		
Pond 2P: Rooftop Detention	Peak Elev=57.97' Storage=7,252 cf Inflow=4.4 cfs 15,825 cf Outflow=0.4 cfs 15,825 cf		



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Summary for Subcatchment 2.1S: B	uilding Roof-Southeast
Runoff = 3.3 cfs @ 12.08 hrs, Volume=	11,912 cf, Depth=10.11"
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Type III 24-hr 100-Year Rainfall=10.35"	Span= 0.00-72.00 hrs, dt= 0.01 hrs
Area (sf) CN Description	
14,140 98 Roofs, HSG C	
14,140 100.00% Impervious Area	
Tc Length Slope Velocity Capacity Description (min) (feet) (ft/ft) (ft/sec) (cfs)	
6.0 Direct Entry	/, Min. Tc
Subcatchment 2 1S: Building	Roof-Southeast
Hydrograph	
3.3 cfs	Type III 24-hr
³ -1	Year Rainfall=10.35"
	unoff Area=14,140 sf
Runc	off Volume=11,912 cf
£ 2-	Runoff Depth=10.11"
E E E E E E E E E E E E E E E E E E E	Tc=6.0 min CN=98



234070	0-PR-20	021-08-1	18			The Type III 2	orndike Place - Pos 24-hr 100-Year F	st-Developmer Rainfall=10.35
Prepare	d by BS	C Group			••	Prir	nted 8/24/202	
HydroCA	D® 10.00-	22 s/n 00	904 © 201	8 HydroCAD	Software Solu	utions LLC		Page 15
		Su	mmary f	or Subca	tchment 3.	1S: Back	yard ADs	
Runoff	=	1.5 ct	fs @ 12.1	4 hrs, Volu	ime=	5,394 cf,	Depth= 7.20"	
Runoff b	y SCS TF	R-20 meth	nod, UH=S	CS, Weight	ed-CN, Time	Span= 0.0	0-72.00 hrs, dt= 0.	.01 hrs
Type III 2	24-nr 100	J-Year Ra	ainfall=10.3	35"				
A	rea (sf)	CN D	escription					
	8,302	98 U 74 >	75% Gras	ed pavemen s cover, Go	od, HSG C			
*	411	89 G	Fravel side	walk, HSG	CÍ			
	8,985 8,713	75 V 9	Veighted A 6.97% Pei	verage vious Area				
	272	3	.03% Impe	ervious Area	I			
	212	1	00.00% 01	nconnected				
Tc (min)	Length	Slope	Velocity	Capacity	Description			
9.4	50	0.0142	0.09	(03)	Sheet Flow	,		
0 9	97	0 0154	1 86		Grass: Dens Shallow Co	se n= 0.24	0 P2= 3.23"	
0.5	51	0.0104	1.00		Grassed Wa	aterway K	/= 15.0 fps	
10.3	147	Total						
			Sub	catchmen	t 3.1S: Ba	ckyard A	Ds	
				Hydrog	raph	-		
1		1.5 cfs			100-\ R	rear Ra unoff A	Гуре III 24-hı infall=10.35" .rea=8,985 st	Runoff
 w (cfs)					Run		Ime=5,394 Cl	
						Runoff	Deptn=7.20	
Ъ						HIOW	Lengtn=14/	
-							1C=10.3 min	
-							CN=75	
1			The second secon					
0								7

Time (hours)



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Summary for Subcatchment 4.2	2S: Townhouse TDs
Runoff = 0.3 cfs @ 12.08 hrs, Volume=	926 cf, Depth= 9.99"
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Type III 24-hr 100-Year Rainfall=10.35"	e Span= 0.00-72.00 hrs, dt= 0.01 hrs
Area (sf) CN Description	
1,064 98 Paved parking, HSG C	
48 74 >75% Grass cover, Good, HSG C	
48 4.32% Pervious Area	
1,064 95.68% Impervious Area	
To Length Slope Velocity Canacity Description	
(min) (feet) (ft/ft) (ft/sec) (cfs)	
6.0 Direct Entry	y, Min. Tc
Subcatchment 4.2.5: Fow Hydrograph 0.28 0.26 0.24 0.26 0.24 0.26 0.24 0.22 0.18 0.22 0.18 0.22 0.18 0.22 0.18 0.22 0.14 0.22 0.14 0.22 0.14 0.22 0.14 0.22 0.14 0.22 0.14 0.22 0.14 0.12 0.14 0.12 0.14 0.12 0.14	Type III 24-hr -Year Rainfall=10.35" Runoff Area=1,112 sf unoff Volume=926 cf Runoff Depth=9.99" Tc=6.0 min CN=97

	Thorndike Place - Post-Development
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Summary for Subcatchment 4.3S: Townhouse TDs

Runoff =

0.3 cfs @ 12.08 hrs, Volume= 920 cf, Depth= 9.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs Type III 24-hr 100-Year Rainfall=10.35"

A	rea (sf)	CN	Description		
	1,075	98	Paved park	ing, HSG C	
	30	74	>75% Gras	s cover, Go	bod, HSG C
	1,105	97	Weighted A	verage	
	30		2.71% Perv	ious Area	
	1,075		97.29% Imp	pervious Are	ea
Tc	Length	Slope	e Velocity	Capacity	Description
(min)	(feet)	(ft/ft) (ft/sec)	(cfs)	
6.0					Direct Entry, Min. Tc
					-

Subcatchment 4.3S: Townhouse TDs



HydroCAD® 10.00-22 s/n 00904 © 2018 HydroCAD Software Solutions LLC Summary for Subcatchment 4.4S: Townhouse TDs Runoff = 0.3 cfs @ 12.08 hrs, Volume= 919 cf, Depth= 9.99" Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hr Type III 24-hr 100-Year Rainfall=10.35" Area (sf) CN Description 1 100-Year Rainfall=10.35" 1,076 98 Paved parking, HSG C 28 74 >75% Grass cover, Good, HSG C 1,104 97 Weighted Average 28 2.54% Pervious Area 1,076 97.46% Impervious Area 1,076 97.46% Impervious Area 1,076 97.46% Impervious Area 1,076 0.3 cfs 6.0 Direct Entry, Min. Tc Subcatchment 4.4S: Townhouse TDs 100-Year Rainfall=10.35" Hydrograph 0.3 cfs Type III 24-hr 100-Year Rainfall=10.35" Runoff Area=1, 104 sf 100 Runoff Depth=9.99" 100 Runoff Depth=9.99" 100 Runoff Depth=9.99"	an=10. 8/24/20
Summary for Subcatchment 4.4S: Townhouse TDsRunoff= 0.3 cfs @ $12.08 \text{ hrs, Volume}$ $919 \text{ cf, Depth} = 9.99"$ Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= $0.00-72.00 \text{ hrs, dt} = 0.01 \text{ hr}$ Trype III 24-hr1.07698Paved parking, HSG C2874>75% Grass cover, Good, HSG C1.07697.46% Impervious Area1.07697.46% Impervious Area1.07697.46% Impervious Area1.0760.3 cfs6.0Direct Entry, Min. TcSubcatchment 4.4S: Townhouse TDsHydrograph0.3 cfs	Page 1
Runoff = 0.3 cfs @ 12.08 hrs, Volume= 919 cf, Depth= 9.99" Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hr Type III 24-hr 100-Year Rainfall=10.35" Area (sf) CN Description 1,076 98 Paved parking, HSG C 28 74 >75% Grass cover, Good, HSG C 1,104 97 Weighted Average 28 2.54% Pervious Area 1,076 97.46% Impervious Area 1,076 97.46% Impervious Area 1,076 97.46% Impervious Area 1,076 0.3 cfs 6.0 Direct Entry, Min. Tc Subcatchment 4.4S: Townhouse TDs Hydrograph 0.3 cfs 100-Year Rainfall=10.35" 0.3 cfs Runoff Area=1,104 sf 0.3 dfs Runoff Depth=9.99" 0.3 dfs Runoff Depth=9.99"	
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hr Type III 24-hr 100-Year Rainfall=10.35" Area (sf) CN Description 1,076 98 Paved parking, HSG C 28 74 >75% Grass cover, Good, HSG C 1,104 97 Weighted Average 28 2.54% Pervious Area 1,076 97.46% Impervious Area 1,076 97.46% Impervious Area Tc Length Slope Velocity Capacity Description (min) (feet) (ft/ft) (ft/sec) (cfs) 6.0 Direct Entry, Min. Tc Subcatchment 4.4S: Townhouse TDS Hydrograph 0.3 cfs 0.3 cf	
Type III 24-hr 100-Year Rainfall=10.35" Area (sf) CN Description 1,076 98 Paved parking, HSG C 28 74 >75% Grass cover, Good, HSG C 1,104 97 Weighted Average 28 2.54% Pervious Area 1,076 97.46% Impervious Area 1,076 97.46% Impervious Area 1,076 97.46% Impervious Area 1,076 97.46% Impervious Area 6.0 Direct Entry, Min. Tc Subcatchment 4.4S: Townhouse TDs Hydrograph	s
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1004 01 Descripting, HSG C 1,076 98 Paved parking, HSG C 28 74 >75% Grass cover, Good, HSG C 1,104 97 Weighted Average 28 2.54% Pervious Area 1,076 97.46% Impervious Area 1,076 97.46% Impervious Area 1,076 97.46% Impervious Area Tc Length Slope Velocity 6.0 Direct Entry, Min. Tc Subcatchment 4.4S: Townhouse TDs Hydrograph 0.3 cfs 0.3 cfs Type III 24-hr 0.28 0.3 cfs Type III 24-hr 0.28 0.3 cfs Type III 24-hr 0.28 0.3 cfs Runoff Area=1,104 sf Runoff Area=1,104 sf 0.1 Class 0.1 Class 0.1 Class 0.28 Class Class <td></td>	
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6.0 Direct Entry, Min. Tc Subcatchment 4.4S: Townhouse TDs Hydrograph 0.3 cfs 0.3 cfs 0.4 cfs 0.5 cfs 0.7 cfs 0.	
Subcatchment 4.4S: Townhouse TDs Hydrograph	
Subcatchment 4.4.5: Townhouse TDS Hydrograph 0.3 cfs 0.3 cfs 0.3 cfs 100-Year Rainfall=10.35" Runoff Area=1,104 sf Runoff Depth=9.99" 0.14 0.12 0.15 0.14 0.12 0.14 0.12 0.14 0.12 0.14 0.12 0.14 0.12 0.14 0.12 0.15 0.14 0.12 0.14 0.12 0.14 0.12 0.14 0.12 0.14 0.12 0.14 0.12 0.14 0.12 0.14 0.12 0.14 0.12 0.14 0.12 0.14 0.12 0.14 0.	
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0.26 0.24 0.22 0.2 0.2 0.2 0.18 0.16 0.12 0.1	Runoff
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0.06	
0 2 4 0 0 10 12 14 10 18 20 22 24 20 28 30 32 34 30 38 40 42 44 40 48 30 32 34 36 58 60 62 64 66 68 70 72 Time (hours)	

	Thorndike Place - Post-Development
2340700-PR-2021-08-18 Typ	be III 24-hr 100-Year Rainfall=10.35"
Prepared by BSC Group	Printed 8/24/2021
HydroCAD® 10.00-22 s/n 00904 © 2018 HydroCAD Software Solutions	LLC Page 155

Summary for Subcatchment 4.5S: Townhouse TDs

Runoff =

0.3 cfs @ 12.08 hrs, Volume= 912 cf, Depth=10.11"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs Type III 24-hr 100-Year Rainfall=10.35"

Α	rea (sf)	CN	Description				
	1,061	98	Paved park	ing, HSG C)		
	21	74	>75% Grass cover, Good, HSG C				
	1,082	98	Weighted A	verage			
	21		1.94% Perv	vious Area			
	1,061		98.06% Imp	pervious Are	ea		
Tc	Length	Slop	e Velocity	Capacity	Description		
<u>(min)</u>	(feet)	(ft/ft) (ft/sec)	(cfs)			
6.0					Direct Entry, Min. Tc		
					-		

Subcatchment 4.5S: Townhouse TDs



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Runoff		=		(0.2 (cfs	@	12.	08	hrs,	Vol	lume) =				8	890) cf	, C	Dep	th=	10	.11	"		
Runoff	by	scs	TR	R-20	me	tho	d, U	H=	scs	3. N	/eigł	nted	-CI	N	Гin	ne S	Spa	in=	0.	00-	72.	00	hrs	s, d	t= C).01	hrs
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2340700-PR-2021-08-18	Thorndike Place - Post-Development Type III 24-hr 100-Year Rainfall=10.35"
Prepared by BSC Group	Printed 8/24/2021
HydroCAD® 10.00-22 s/n 00904 © 2018 HydroCAD Software Sol	utions LLC Page 158
Summary for Subcatchment 6	.1S: East driveway
Runoff = 2.7 cfs @ 12.08 hrs, Volume=	8,951 cf, Depth= 8.75"
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Type III 24-hr 100-Year Rainfall=10.35"	∋ Span= 0.00-72.00 hrs, dt= 0.01 hrs
Area (sf) CN Description	
5,611 74 >75% Grass cover, Good, HSG C 6,444 98 Paved roads w/curbs & sewers, HS 220 89 Gravel roads, HSG C	GC
12,275 87 Weighted Average 5,831 47.50% Pervious Area 6,444 52.50% Impervious Area	
Tc Length Slope Velocity Capacity Description	
(min) (feet) (ft/ft) (ft/sec) (cfs) 6.0 Direct Entr	
	J ,
Subcatchment 6.1S: Ea	st driveway
Hydrograph 3 2.7 cfs 100- Run Run 1	Type III 24-hr Year Rainfall=10.35" Inoff Area=12,275 sf off Volume=8,951 cf Runoff Depth=8.75" Tc=6.0 min CN=87
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 4 Time thouses	6 48 50 52 54 56 58 60 62 64 66 68 70 72
inne (nouis)	

	Thorndike Place - Post-Development
2340700-PR-2021-08-18	Type III 24-hr 100-Year Rainfall=10.35"
Prepared by BSC Group	Printed 8/24/2021
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Summary for Subcatchment 6S: Bypass Towards Wetlands

Runoff =

7.6 cfs @ 12.19 hrs, Volume= 30,373 cf, Depth= 7.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs Type III 24-hr 100-Year Rainfall=10.35"

A	rea (sf)	CN D	escription							
	4,985	70 V	Woods, Good, HSG C							
	46,447	74 >	75% Gras	s cover, Go	ood, HSG C					
	107	98 F	loofs, HSG	S C						
	51,539	74 V	Veighted A	verage						
	51,432	9	9.79% Per	vious Area						
	107	0	.21% Impe	ervious Area	а					
Тс	Length	Slope	Velocity	Capacity	Description					
<u>(min)</u>	(feet)	(ft/ft)	(ft/sec)	(cfs)						
11.8	50	0.0220	0.07		Sheet Flow,					
					Woods: Light underbrush n= 0.400 P2= 3.23"					
2.2	75	0.0133	0.58		Shallow Concentrated Flow,					
					Woodland Kv= 5.0 fps					
14.0	125	Total								

Subcatchment 6S: Bypass Towards Wetlands



234070	0-PR-20	21-08-1	18			Tho Type III 2	orndike Place - Post- 24-hr 100-Year Ra	Developmen infall=10.35
Prepare	d by BS	Group	-		0.0-#	, , Oslutions 11.0	Printe	ed 8/24/202
HydroCA	D® 10.00-	22 s/n 00	904 © 201	18 HydroCAL) Software :	Solutions LLC		Page 160
			Summa	ary for Su	bcatchm	nent 7S: To	Street	
Runoff	=	1.2 ct	is @ 12.	09 hrs, Vol	ume=	3,699 cf,	Depth= 7.60"	
Runoff b Type III 2	y SCS TF 24-hr 100	R-20 meth A-Year Ra	nod, UH=9 ainfall=10.	SCS, Weigł .35"	ited-CN, Ti	ime Span= 0.0	00-72.00 hrs, dt= 0.0 ⁻	1 hrs
Α	rea (sf)	CN D	escription	ı				
	1,056 4 787	98 P 74 >	aved park	king, HSG () and HSG (C		
	5,843	78 V	Veighted /	Average	<u>, 100 (</u>	0		
	4,787	8	1.93% Pe	ervious Area				
	1,050	1	0.07 70 1111	pervious Ar	ea			
Tc (min)	Length	Slope	Velocity	Capacity	Descripti	on		
6.0	(ieet)	(1011)	(10560)	(015)	Direct E	ntrv. Min. Tc		
				.				
				Subcatch	ment /S	: To Street		
ſ		1.2 cfs			grapn		Type III 24-hr	Runoff
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 2340700-PR-2021-08-18
 Type III 24-hr 100-Year Rainfall=10.35"

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Summary for Pond 1P: Underground Infiltration System

Inflow Area =	69,430 sf, 74.25% Impervious,	Inflow Depth = 9.33" for 100-Year event
Inflow =	11.1 cfs @ 12.09 hrs, Volume=	53,963 cf
Outflow =	4.9 cfs @ 12.31 hrs, Volume=	53,963 cf, Atten= 56%, Lag= 13.4 min
Discarded =	0.1 cfs @ 4.68 hrs, Volume=	17,955 cf
Primary =	4.8 cfs @ 12.31 hrs, Volume=	36,008 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs Peak Elev= 8.79' @ 12.31 hrs Surf.Area= 7,556 sf Storage= 18,113 cf

Plug-Flow detention time= 394.8 min calculated for 53,963 cf (100% of inflow) Center-of-Mass det. time= 394.8 min (1,213.2 - 818.3)

.

Volume	Invert	Avail.Storage	Storage Description
#1	6.00'	19,495 cf	6.89'W x 14.06'L x 3.00'H StormTrap ST-1 Units (Irregular Shape) 78 22,668 cf Overall x 86.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Discarded	6.00'	0.520 in/hr Exfiltration over Surface area
#2	Primary	7.50'	15.0" Round Culvert
			L= 190.0' CPP, square edge headwall, Ke= 0.500
			Inlet / Outlet Invert= 7.50' / 6.00' S= 0.0079 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf

Discarded OutFlow Max=0.1 cfs @ 4.68 hrs HW=6.03' (Free Discharge) **1=Exfiltration** (Exfiltration Controls 0.1 cfs)

Primary OutFlow Max=4.8 cfs @ 12.31 hrs HW=8.79' (Free Discharge) -2=Culvert (Inlet Controls 4.8 cfs @ 3.92 fps)

	mornaike Place - Post-Developmen
2340700-PR-2021-08-18	Type III 24-hr 100-Year Rainfall=10.35
Prepared by BSC Group	Printed 8/24/2021
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Pond 1P: Underground Infiltration System



	Thorndike Place - Post-Development
2340700-PR-2021-08-18	Type III 24-hr 100-Year Rainfall=10.35"
Prepared by BSC Group	Printed 8/24/2021
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Summary for Pond 2P: Rooftop Detention

Inflow Area	a =	18,785 sf,100.00% Impervious, Inflow Depth = 10.11" for 100-Year e	event
Inflow	=	1.4 cfs @ 12.08 hrs, Volume= 15,825 cf	
Outflow	=	0.4 cfs @ 12.89 hrs, Volume= 15,825 cf, Atten= 91%, Lag= 4	48.3 min
Primary	=).4 cfs @ 12.89 hrs, Volume= 15,825 cf	

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3 Peak Elev= 57.97' @ 12.89 hrs Surf.Area= 7,500 sf Storage= 7,252 cf

Plug-Flow detention time= 207.5 min calculated for 15,823 cf (100% of inflow) Center-of-Mass det. time= 207.8 min (946.0 - 738.3)

Volume	Inve	rt Avail.Stor	age Storage	Description	
#1	57.00	0' 7,50	0 cf Rooftop	Detention (Prisn	natic)Listed below (Recalc)
Elevatio (fee 57.0 58.0	on s et) 00 00	Surf.Area (sq-ft) 7,500 7,500	Inc.Store (cubic-feet) 0 7,500	Cum.Store (cubic-feet) 0 7,500	
Device	Routing	Invert	Outlet Devices	S	
#1	Primary	8.02'	12.0" Round	Roof Drain	
#2	Device 1	57.00'	L= 16.0' CPF Inlet / Outlet II n= 0.013, Flo 4.0" Horiz. On Limited to wei	P, mitered to confo nvert= 8.02' / 7.70' w Area= 0.79 sf rifice/Grate C= 0 r flow at low heads	rm to fill, Ke= 0.700 S= 0.0200 '/' Cc= 0.900 0.600 S

Primary OutFlow Max=0.4 cfs @ 12.89 hrs HW=57.97' (Free Discharge) 1=Roof Drain (Passes 0.4 cfs of 23.5 cfs potential flow) 2=Orifice/Grate (Orifice Controls 0.4 cfs @ 4.73 fps)

 2340700-PR-2021-08-18
 Type III 24-hr 100-Year Rainfall=10.35"

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	Thorndik	e Place - Post-Development
2340700-PR-2021-08-18	Type III 24-hr	100-Year Rainfall=10.35"
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Summary for Pond 3P: Rain garden

Inflow Area =	12,275 sf, 52.50	% Impervious,	Inflow Depth = 8.75"	for 100-Year event
Inflow =	2.7 cfs @ 12.08	hrs, Volume=	8,951 cf	
Outflow =	2.7 cfs @ 12.09	hrs, Volume=	8,951 cf, Att	en= 0%, Lag= 0.2 min
Discarded =	0.0 cfs @ 12.09	hrs, Volume=	473 cf	-
Primary =	2.7 cfs @ 12.09	hrs, Volume=	8,478 cf	

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs Peak Elev= 6.44' @ 12.09 hrs Surf.Area= 425 sf Storage= 226 cf

Plug-Flow detention time= 29.5 min calculated for 8,951 cf (100% of inflow) Center-of-Mass det. time= 29.5 min (806.5 - 777.0)

Volume	Invert	Avail	.Storage	Storage Description	ו	
#1	5.60'		253 cf	Custom Stage Dat	a (Irregular)Listed	below (Recalc)
Elevation	Surf	.Area	Perim.	Inc.Store	Cum.Store	Wet.Area
(feet)	(sq-ft)	(feet)	(cubic-feet)	(cubic-feet)	(sq-ft)
5.60		125	46.0	0	0	125
6.00		276	66.0	78	78	305
6.30		350	73.0	94	172	385
6.50		460	87.0	81	253	564

Device	Routing	Invert	Outlet Devices
#1	Discarded	5.60'	0.520 in/hr Exfiltration over Surface area
#2	Primary	6.30'	22.0' 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

Discarded OutFlow Max=0.0 cfs @ 12.09 hrs HW=6.44' (Free Discharge) **1=Exfiltration** (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=2.7 cfs @ 12.09 hrs HW=6.44' (Free Discharge) 2=Broad-Crested Rectangular Weir (Weir Controls 2.7 cfs @ 0.88 fps)

	Thorndike Place - Post-Develop	ment
2340700-PR-2021-08-18	Type III 24-hr 100-Year Rainfall=10	0.35″
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	Thorndike Place - Post-Development
2340700-PR-2021-08-18	Type III 24-hr 100-Year Rainfall=10.35"
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Summary for Pond TD2:

Inflow Area	ı =	1,112 sf,	95.68% Impervious,	Inflow Depth = 9.99"	for 100-Year event
Inflow	=	0.3 cfs @	12.08 hrs, Volume=	926 cf	
Outflow	=	0.0 cfs @	5.54 hrs, Volume=	832 cf, Atte	en= 99%, Lag= 0.0 min
Discarded	=	0.0 cfs @	5.54 hrs, Volume=	832 cf	
Primary	=	0.0 cfs @	0.00 hrs, Volume=	0 cf	

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs Peak Elev= 9.33' @ 20.48 hrs Surf.Area= 278 sf Storage= 678 cf

Plug-Flow detention time= 1,555.1 min calculated for 832 cf (90% of inflow) Center-of-Mass det. time= 1,504.5 min (2,247.8 - 743.3)

Volume	Invert	Avail.Storage	Storage Description
#1	5.50'	206 cf	17.06'W x 16.29'L x 3.83'H Stone
			1,064 cf Overall - 548 cf Embedded = 516 cf x 40.0% Voids
#2	6.00'	472 cf	6.89'W x 14.06'L x 2.83'H StormTrap ST-1 Units x 2 Inside #1
			548 cf Overall x 86.0% Voids
		678 cf	Total Available Storage
Device	Routing	Invert Out	let Devices
#1	Discarded	5.50' 0.5 2	20 in/hr Exfiltration over Surface area
#2	Primary	10.00' 6.0'	' x 240.0" Horiz. Orifice/Grate C= 0.600
		Lim	ited to weir flow at low heads

Discarded OutFlow Max=0.0 cfs @ 5.54 hrs HW=5.55' (Free Discharge) **1=Exfiltration** (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=5.50' (Free Discharge)



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Summary for Pond TD3:

Inflow Area	=	1,105 sf,	97.29% Impervious,	Inflow Depth = 9.99"	for 100-Year event
Inflow	=	0.3 cfs @	12.08 hrs, Volume=	920 cf	
Outflow	=	0.0 cfs @	5.61 hrs, Volume=	831 cf, Att	en= 99%, Lag= 0.0 min
Discarded	=	0.0 cfs @	5.61 hrs, Volume=	831 cf	
Primary	=	0.0 cfs @	0.00 hrs, Volume=	0 cf	

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs Peak Elev= 9.28' @ 20.41 hrs Surf.Area= 278 sf Storage= 673 cf

Plug-Flow detention time= 1,554.5 min calculated for 831 cf (90% of inflow) Center-of-Mass det. time= 1,505.8 min (2,249.0 - 743.3)

Volume	Invert	Avail.Storage	Storage Description
#1	5.50'	206 cf	17.06'W x 16.29'L x 3.83'H Stone
			1,064 cf Overall - 548 cf Embedded = 516 cf x 40.0% Voids
#2	6.00'	472 cf	6.89'W x 14.06'L x 2.83'H StormTrap ST-1 Units x 2 Inside #1
			548 cf Overall x 86.0% Voids
		678 cf	Total Available Storage
Device	Routing	Invert Out	let Devices
#1	Discarded	5.50' 0.5 2	20 in/hr Exfiltration over Surface area
#2	Primary	10.30' 6.0'	' x 240.0" Horiz. Orifice/Grate C= 0.600
	-	Lim	ited to weir flow at low heads

Discarded OutFlow Max=0.0 cfs @ 5.61 hrs HW=5.55' (Free Discharge) **1=Exfiltration** (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=5.50' (Free Discharge)


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Summary for Pond TD4:

Inflow Area =	1,104 sf,	97.46% Impervious,	Inflow Depth = 9.99" for 100-Year event
Inflow =	0.3 cfs @	12.08 hrs, Volume=	919 cf
Outflow =	0.0 cfs @	5.61 hrs, Volume=	831 cf, Atten= 99%, Lag= 0.0 min
Discarded =	0.0 cfs @	5.61 hrs, Volume=	831 cf
Primary =	0.0 cfs @	0.00 hrs, Volume=	0 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs Peak Elev= 9.28' @ 20.39 hrs Surf.Area= 278 sf Storage= 672 cf

Plug-Flow detention time= 1,554.0 min calculated for 831 cf (90% of inflow) Center-of-Mass det. time= 1,505.6 min (2,248.9 - 743.3)

Volume	Invert	Avail.Storage	Storage Description
#1	5.50'	206 cf	17.06'W x 16.29'L x 3.83'H Stone
			1,064 cf Overall - 548 cf Embedded = 516 cf x 40.0% Voids
#2	6.00'	472 cf	6.89'W x 14.06'L x 2.83'H StormTrap ST-1 Units x 2 Inside #1
			548 cf Overall x 86.0% Voids
		678 cf	Total Available Storage
Device	Routing	Invert Out	et Devices
#1	Discarded	5.50' 0.52	20 in/hr Exfiltration over Surface area
#2	Primary	10.20' 6.0 "	x 240.0" Horiz. Orifice/Grate C= 0.600
	-	Limi	ited to weir flow at low heads

Discarded OutFlow Max=0.0 cfs @ 5.61 hrs HW=5.55' (Free Discharge) **1=Exfiltration** (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=5.50' (Free Discharge)



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Summary for Pond TD5:

Inflow Area	ı =	1,082 sf,	98.06% Impervious,	Inflow Depth = 10.11'	for 100-Year event
Inflow	=	0.3 cfs @	12.08 hrs, Volume=	912 cf	
Outflow	=	0.0 cfs @	5.26 hrs, Volume=	836 cf, Att	ten= 99%, Lag= 0.0 min
Discarded	=	0.0 cfs @	5.26 hrs, Volume=	836 cf	-
Primary	=	0.0 cfs @	0.00 hrs, Volume=	0 cf	

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs Peak Elev= 8.67' @ 20.17 hrs Surf.Area= 278 sf Storage= 660 cf

Plug-Flow detention time= 1,541.3 min calculated for 836 cf (92% of inflow) Center-of-Mass det. time= 1,497.5 min (2,235.8 - 738.3)

Volume	Invert	Avail.Storage	Storage Description
#1	5.00'	206 cf	17.06'W x 16.29'L x 3.83'H Stone
			1,064 cf Overall - 548 cf Embedded = 516 cf x 40.0% Voids
#2	5.50'	472 cf	6.89'W x 14.06'L x 2.83'H StormTrap ST-1 Units x 2 Inside #1
			548 cf Overall x 86.0% Voids
		678 cf	Total Available Storage
Device	Routing	Invert Out	let Devices
#1	Discarded	5.00' 0.5 2	20 in/hr Exfiltration over Surface area
#2	Primary	9.80' 6.0'	' x 240.0" Horiz. Orifice/Grate C= 0.600
	-	Lim	ited to weir flow at low heads

Discarded OutFlow Max=0.0 cfs @ 5.26 hrs HW=5.05' (Free Discharge) **1=Exfiltration** (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=5.00' (Free Discharge)



	Thorndike	Place - Post-Development
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Summary for Pond TD6:

Inflow Area	=	1,056 sf,	99.24% Impervious,	Inflow Depth = 10.11'	for 100-Year event
Inflow	=	0.2 cfs @	12.08 hrs, Volume=	890 cf	
Outflow	=	0.0 cfs @	5.41 hrs, Volume=	836 cf, Att	en= 99%, Lag= 0.0 min
Discarded	=	0.0 cfs @	5.41 hrs, Volume=	836 cf	
Primary	=	0.0 cfs @	0.00 hrs, Volume=	0 cf	

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs Peak Elev= 8.49' @ 19.94 hrs Surf.Area= 278 sf Storage= 640 cf

Plug-Flow detention time= 1,533.3 min calculated for 836 cf (94% of inflow) Center-of-Mass det. time= 1,498.7 min (2,237.0 - 738.3)

Volume	Invert	Avail.Storage	Storage Description
#1	5.00'	206 cf	17.06'W x 16.29'L x 3.83'H Stone
			1,064 cf Overall - 548 cf Embedded = 516 cf x 40.0% Voids
#2	5.50'	472 cf	6.89'W x 14.06'L x 2.83'H StormTrap ST-1 Units x 2 Inside #1
			548 cf Overall x 86.0% Voids
		678 cf	Total Available Storage
Device	Routing	Invert Out	let Devices
#1	Discarded	5.00' 0.52	20 in/hr Exfiltration over Surface area
#2	Primary	9.50' 6.0 "	' x 240.0" Horiz. Orifice/Grate C= 0.600
	-	Limi	ited to weir flow at low heads

Discarded OutFlow Max=0.0 cfs @ 5.41 hrs HW=5.05' (Free Discharge) **1=Exfiltration** (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=5.00' (Free Discharge) -2=Orifice/Grate (Controls 0.0 cfs)



	Thorndike Place - Post-Development
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Summary for Link 1L: Towards Wetlands

Inflow Area	a =	147,384 sf,	49.02% Impervious,	Inflow Depth = 7.06"	for 100-Year event
Inflow	=	16.1 cfs @	12.15 hrs, Volume=	86,770 cf	
Primary	=	16.1 cfs @	12.15 hrs, Volume=	86,770 cf, Att	en= 0%, Lag= 0.0 min

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

Link 1L: Towards Wetlands



	Thorndike Place - Post-Development
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Summary for Link 2L: Towards Street

Inflow Area	a =	11,302 sf,	56.45% Impervious,	Inflow Depth = 3.93"	for 100-Year event
Inflow	=	1.2 cfs @	12.09 hrs, Volume=	3,699 cf	
Primary	=	1.2 cfs @	12.09 hrs, Volume=	3,699 cf, Atte	en= 0%, Lag= 0.0 min

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





	Thorndike Place - Post-Development
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Summary for Link 100L: Total Flows

Inflow Area =	158,686 sf,	49.55% Impervious,	Inflow Depth = 6.84"	for 100-Year event
Inflow =	17.0 cfs @	12.14 hrs, Volume=	90,469 cf	
Primary =	17.0 cfs @	12.14 hrs, Volume=	90,469 cf, Atte	n= 0%, Lag= 0.0 min

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

Link 100L: Total Flows



SECTION 6.0

ADDITIONAL DRAINAGE CALCULATIONS

6.01 TSS REMOVAL CALCULATIONS

TSS Removal Calculation Worksheet

Location: Thorndike Place, Arlington, MA Project: 23407.00



AREA 1 - CB-1								
Total Impervious Area, Acres= 0.377								
A	В	С	D	Е				
	TSS Removal	Starting TSS	Amount	Remaining Load				
BMP	Rate	Load*	Removed (BxC)	(C-D)				
Deep Sump and Hooded								
Catchbasins	0.25	1.00	0.25	0.75				
Hydrodynamic Separator	0.7	0.75	0.53	0.23				
Infiltration Basin	0.8	0.23	0.18	0.05				

TSS Removal =

0.96

AREA 2 - TD-1								
Total Impervious Area, Acres= 0.069								
A	В	С	D	E				
	TSS Removal	Starting TSS	Amount	Remaining Load				
BMP	Rate	Load*	Removed (BxC)	(C-D)				
Hydrodynamic Separator	0.7	1.00	0.70	0.30				
Infiltration Basin	0.8	0.30	0.24	0.06				
		•	•	•				

TSS Removal = 0.94

AREA 3 - TD-2-6								
ous Area, Acres=	0.056							
В	С	D	E					
TSS Removal	Starting TSS	Amount	Remaining Load					
Rate	Load*	Removed (BxC)	(C-D)					
0.8	1.00	0.80	0.20					
	B TSS Removal Rate 0.8	BCTSS Removal RateStarting TSS Load*0.81.00	Dus Area, Acres= 0.056BCDTSS Removal RateStarting TSS Load*Amount Removed (BxC)0.81.000.80					

TSS Removal = 0.80

AREA 4 - Bypass to Street

Total Impervious Area, Acres= 0.021								
A	В	С	D	E				
	TSS Removal	Starting TSS	Amount	Remaining Load				
BMP	Rate	Load*	Removed (BxC)	(C-D)				
		1.00						

TSS Removal =

AREA 5 - East Driveway									
Total Impervious Area, Acres= 0.148									
A	В	С	D	E					
	TSS Removal	Starting TSS	Amount	Remaining Load					
BMP	Rate	Load*	Removed (BxC)	(C-D)					
Rain Garden	0.8	1.00	0.80	0.20					

TSS Removal = 0.80

Weighted Annual Average TSS Removal Rate

[TSS Removal-1 (Area-1) + TSS Revoval-2 (Area-2)+] / [Area-1 + Area-2 + ...] = 0.88

Project Site TSS Removal = 0.88

6.02 GROUNDWATER RECHARGE VOLUME CALCULATIONS

Required Recharge Volume

Rv = F x Impervious Area

Where:

Rv = Recharge Volume

F=Target Depth Factor associated with each Hydrologic Soil Group

(F=0.25-inch for Soil Type C)

Impervious Area = Proposed Pavement and Rooftop area on-site

$$Rv = \left(\frac{0.25in}{12}\right)(78,629sft) =$$

Rv = 1,638 cf (required recharge volume)

As not all impervious surfaces are directed to an infiltration BMP, an adjusted Required Volume must be provided. The adjusted Required Volume (Rva) is calculated as:

$$Rva = \frac{Total Imp.Area}{Imp.Area to BMP} (Rv) =$$
$$Rva = \left(\frac{78,629sft}{62,920sft}\right) (1,638cf) =$$

Rva = 2,047 cf

Storage Provided

Underground Infiltration System = 9,747 cubic feet provided.
Rain garden & duplex infiltration systems not required to meet volume, but provide additional infiltration above and beyond that required.
Refer to the HydroCAD storage table provided for more information.

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Stage-Area-Storage for Pond 1P: Underground Infiltration System

$\begin{array}{ c c c c c c c c c c c c c c c c c c c$	Elevation	Surface	Storage	Elevation	Surface	Storage
0.00 $1,500$ $1,500$ $1,740$ 0.05 $7,556$ $17,450$ $17,470$ 6.10 $7,556$ 650 8.75 $7,556$ $17,470$ 6.15 $7,556$ $1,300$ 8.85 $7,556$ $18,495$ 6.20 $7,556$ $1,625$ 8.90 $7,556$ $18,445$ 6.25 $7,556$ $1,249$ 8.95 $7,556$ $18,445$ 6.30 $7,556$ $2,224$ 9.00 $7,556$ $19,495$ 6.40 $7,556$ $2,224$ 9.00 $7,556$ $19,495$ 6.45 $7,556$ $3,249$ 6.55 $7,556$ $3,249$ 6.55 $7,556$ $3,249$ 6.66 $7,556$ $4,224$ 6.50 $7,556$ $4,224$ 6.70 $7,556$ $4,224$ 6.75 $7,556$ $4,224$ 6.70 $7,556$ $4,224$ 6.80 $7,556$ $5,244$ 6.90 $7,556$ $5,244$ 6.90 $7,556$ $5,199$ 6.85 $7,556$ $6,498$ 7.00 $7,556$ $6,423$ $7,148$ $7,15$ $7,556$ 7.00 $7,556$ $10,397$ $7,556$ $10,397$ $7,85$ $7,556$ $10,397$ $7,556$ $13,221$ 7.85 $7,556$ $13,221$ $7,556$ $13,221$ 7.90 $7,556$ $14,296$ $8,25$ $7,556$ $7,556$ $14,296$ $8,25$ $7,556$ $15,291$ $8,00$ $7,556$ $15,291$ $8,20$ $7,556$ $8,2$	6.00	7 556		8.65	7 556	17 220
1,250 $1,250$ $1,250$ $1,250$ $1,7,570$ $6,10$ $7,556$ 975 $8,80$ $7,556$ $18,195$ $6,20$ $7,556$ $1,225$ $8,90$ $7,556$ $18,220$ $6,25$ $7,556$ $1,242$ $8,95$ $7,556$ $19,170$ $6,33$ $7,556$ $2,294$ $9,00$ $7,556$ $19,170$ $6,45$ $7,556$ $2,294$ $9,00$ $7,556$ $19,495$ $6,46$ $7,556$ $2,294$ $9,00$ $7,556$ $19,495$ $6,45$ $7,556$ $3,249$ $6,55$ $7,556$ $3,249$ $6,55$ $7,556$ $3,249$ $6,55$ $7,556$ $3,574$ $6,60$ $7,556$ $3,249$ $6,55$ $7,556$ $3,574$ $6,85$ $7,556$ $4,224$ $6,70$ $7,556$ $4,224$ $6,75$ $7,556$ $4,224$ $6,70$ $7,556$ $4,649$ $6,75$ $7,556$ $5,524$ $6,90$ $7,556$ $5,524$ $6,90$ $7,556$ $5,524$ $6,923$ $7,556$ $7,798$ $7,20$ $7,556$ $7,798$ $7,256$ $7,798$ $7,25$ $7,556$ $10,072$ $7,60$ $7,556$ $12,022$ $7,90$ $7,556$ $12,997$ $8,05$ $7,556$ $13,221$ $7,90$ $7,556$ $14,296$ $8,25$ $7,556$ $14,296$ $8,25$ $7,556$ $16,246$ $8,35$ $7,556$ $16,246$ $8,30$ $7,556$ $16,246$ $8,35$ $7,556$ $16,246$	6.05	7,556	325	8 70	7,556	17,220
6.15 7.556 975 8.80 7.556 $18,95$ 6.20 7.556 1.300 8.85 7.556 $18,920$ 6.25 7.556 1.949 8.95 7.556 $18,945$ 6.30 7.556 2.274 9.00 7.556 $19,495$ 6.40 7.556 2.924 9.00 7.556 $19,495$ 6.40 7.556 2.924 9.00 7.556 $19,495$ 6.45 7.556 3.574 6.60 7.556 3.574 6.65 7.556 4.549 6.75 7.556 4.549 6.75 7.556 4.649 6.75 7.556 4.549 6.75 7.556 5.524 6.80 7.556 5.524 6.80 7.556 5.524 6.90 7.556 6.173 7.00 7.556 6.173 7.70 7.556 7.798 7.20 7.556 7.798 7.256 9.098 7.45 7.556 10.072 7.70 7.556 10.397 7.80 7.556 10.327 7.80 7.556 12.947 8.00 7.556 12.997 8.05 7.556 12.997 8.00 7.556 14.226 8.25 7.556 14.296 8.25 7.556 14.296 8.25 7.556 14.296 8.25 7.556 14.296 8.25 7.556 14.296 8.44 7.556 15.596 8.421 8.30 </td <td>6 10</td> <td>7,556</td> <td>650</td> <td>8 75</td> <td>7,556</td> <td>17 870</td>	6 10	7,556	650	8 75	7,556	17 870
	6.15	7,556	975	8.80	7,556	18,195
	6.20	7,556	1.300	8.85	7,556	18.520
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	6.25	7,556	1,625	8.90	7,556	18.845
6.35 7,556 2,274 9.00 7,556 19,495 6.40 7,556 2,924 9.00 7,556 19,495 6.50 7,556 3,249 6.55 7,556 3,249 6.55 7,556 3,574 6.60 7,556 4,244 6.60 7,556 4,244 6.70 7,556 4,549 6.75 7,556 4,874 6.80 7,556 5,524 6.90 7,556 5,524 6.90 7,556 6,498 7.00 7,556 7,488 7,556 7,488 7.15 7,556 7,798 7,20 7,556 8,423 7.30 7,556 9,427 7,557 9,566 10,397 7.65 7,556 10,072 7,60 7,556 10,327 7.85 7,556 11,697 7,85 7,556 12,347 7.95 7,556 11,697 7,85 7,556 12,347 7.95 7,556 12,347 7,95 7,556 13,321 8.10 7	6.30	7.556	1,949	8.95	7,556	19,170
6.40 7.556 2.599 6.45 7.556 2.924 6.50 7.556 3.574 6.60 7.556 3.899 6.65 7.556 4.224 6.70 7.556 4.974 6.80 7.556 5.199 6.85 7.556 5.244 6.90 7.556 5.244 6.90 7.556 6.498 7.05 7.556 6.498 7.05 7.556 7.473 7.20 7.556 7.473 7.20 7.556 8.123 7.30 7.556 9.098 7.45 7.556 9.098 7.45 7.556 10.397 7.65 7.556 10.397 7.65 7.556 10.397 7.65 7.556 11.697 7.85 7.556 12.997 8.00 7.556 13.321 8.10 7.556 13.971 8.20 7.556 14.296 8.25 7.556 15.271 8.40 7.556 15.291 8.40 7.556 15.291 8.40 7.556 15.291 8.40 7.556 15.291 8.40 7.556 15.291 8.40 7.556 15.291 8.40 7.556 15.291 8.40 7.556 16.246 8.55 7.556 16.246 8.55 7.556 16.246 8.55 7.556 16.246 <	6.35	7,556	2,274	9.00	7,556	19,495
6.45 7.556 2.924 6.50 7.556 3.674 6.60 7.556 3.899 6.65 7.556 4.224 6.70 7.556 4.244 6.70 7.556 4.874 6.85 7.556 5.524 6.90 7.556 6.473 7.00 7.556 6.4823 7.00 7.556 6.4823 7.00 7.556 6.498 7.05 7.556 7.738 7.25 7.556 7.738 7.25 7.556 7.738 7.25 7.556 9.747 7.40 7.556 9.747 7.55 7.556 9.747 7.55 7.556 10.072 7.65 7.556 10.397 7.65 7.556 11.372 7.80 7.556 11.697 7.85 7.556 12.947 7.95 7.556 12.947 7.95 7.556 12.947 7.95 7.556 12.947 7.95 7.556 12.947 7.95 7.556 12.947 8.10 7.556 13.321 8.10 7.556 14.296 8.25 7.556 14.296 8.25 7.556 14.296 8.25 7.556 15.991 8.00 7.556 16.871 8.00 7.556 16.895 8.00 7.556 16.895	6.40	7,556	2,599			,
6.507,5563,249 6.55 7,5563,574 6.60 7,5564,224 6.70 7,5564,44 6.75 7,5564,874 6.80 7,5565,524 6.90 7,5565,848 6.90 7,5566,488 7.05 7,5566,488 7.05 7,5566,498 7.05 7,5566,423 7.10 7,5567,473 7.20 7,5567,798 7.25 7,5568,448 7.35 7,5568,747 7.30 7,5569,747 7.55 7,5569,747 7.55 7,55610,397 7.65 7,55611,047 7.75 7,55611,072 7.65 7,55612,092 7.90 7,55612,997 8.05 7,55613,321 8.10 7,55613,321 8.10 7,55614,296 8.25 7,55614,296 8.25 7,55614,296 8.25 7,55615,271 8.40 7,55615,221 8.50 7,55616,571 8.60 7,55616,895	6.45	7,556	2,924			
6.557,5563,574 6.60 7,5563,899 6.65 7,5564,224 6.70 7,5564,549 6.75 7,5565,5199 6.85 7,5565,524 6.90 7,5565,548 6.95 7,5566,498 7.00 7,5566,498 7.05 7,5567,148 7.10 7,5567,148 7.15 7,5567,798 7.25 7,5568,123 7.30 7,5568,123 7.30 7,5569,098 7.40 7,5569,422 7.50 7,55610,397 7.65 7,55610,397 7.65 7,55611,047 7.75 7,55611,372 7.80 7,55612,022 7.90 7,55613,321 8.10 7,55613,321 8.10 7,55613,321 8.10 7,55613,971 8.20 7,55615,296 8.25 7,55615,291 8.35 7,55615,291 8.30 7,55615,291 8.35 7,55615,291 8.45 7,55615,291 8.50 7,55615,291 8.60 7,55616,895	6.50	7,556	3,249			
6.607,5563,899 6.65 7,5564,224 6.70 7,5564,874 6.80 7,5565,199 6.85 7,5565,848 6.90 7,5566,498 7.00 7,5566,498 7.00 7,5567,473 7.00 7,5567,473 7.20 7,5568,448 7.35 7,5568,448 7.35 7,5568,448 7.30 7,5569,422 7.50 7,5569,422 7.50 7,55610,072 7.65 7,55610,072 7.65 7,55611,047 7.75 7,55611,047 7.75 7,55611,047 7.75 7,55612,022 7.90 7,55613,321 8.05 7,55613,321 8.00 7,55613,321 8.10 7,55613,321 8.20 7,55614,296 8.25 7,55615,271 8.445 7,55615,271 8.40 7,55615,221 8.50 7,55615,271 8.45 7,55615,271 8.60 7,55616,895	6.55	7,556	3,574			
6.65 $7,556$ $4,224$ 6.70 $7,556$ $4,649$ 6.75 $7,556$ $5,199$ 6.85 $7,556$ $5,524$ 6.90 $7,556$ $6,498$ 7.00 $7,556$ $6,498$ 7.05 $7,556$ $6,498$ 7.05 $7,556$ $7,473$ 7.20 $7,556$ $7,798$ 7.25 $7,556$ $8,428$ 7.30 $7,556$ $8,428$ 7.30 $7,556$ $8,428$ 7.35 $7,556$ $8,773$ 7.40 $7,556$ $9,998$ 7.45 $7,556$ $9,747$ 7.55 $7,556$ $10,072$ 7.60 $7,556$ $10,072$ 7.60 $7,556$ $11,047$ 7.75 $7,556$ $12,022$ 7.90 $7,556$ $12,022$ 7.90 $7,556$ $12,022$ 7.90 $7,556$ $12,997$ 8.05 $7,556$ $13,971$ 8.15 $7,556$ $13,971$ 8.20 $7,556$ $14,296$ 8.25 $7,556$ $15,271$ 8.00 $7,556$ $15,271$ 8.00 $7,556$ $15,291$ 8.50 $7,556$ $15,271$ 8.60 $7,556$ $15,291$ 8.60 $7,556$ $16,895$	6.60	7,556	3,899			
6.707,5564,549 6.75 7,5565,199 6.80 7,5565,524 6.90 7,5565,848 6.95 7,5566,498 7.00 7,5566,498 7.00 7,5567,473 7.00 7,5567,473 7.20 7,5567,473 7.20 7,5567,473 7.25 7,5568,123 7.30 7,5568,422 7.55 7,5569,098 7.45 7,5569,098 7.45 7,55610,072 7.60 7,55610,072 7.60 7,55611,047 7.75 7,55611,047 7.75 7,55611,047 7.85 7,55612,022 7.90 7,55612,022 7.90 7,55613,821 8.00 7,55613,821 8.15 7,55613,971 8.20 7,55614,296 8.25 7,55614,296 8.25 7,55615,996 8.45 7,55615,271 8.00 7,55615,271 8.00 7,55615,271 8.00 7,55615,271 8.00 7,55616,246 8.55 7,55616,246 8.55 7,55616,246 8.55 7,55616,895	6.65	7,556	4,224			
6.75 7.556 4.874 6.80 7.556 5.524 6.90 7.556 5.848 6.95 7.556 6.473 7.00 7.556 6.498 7.05 7.556 6.423 7.10 7.556 7.473 7.20 7.556 7.473 7.20 7.556 8.123 7.30 7.556 8.123 7.30 7.556 8.123 7.30 7.556 9.098 7.45 7.556 9.098 7.45 7.556 9.098 7.45 7.556 10.072 7.60 7.556 10.072 7.60 7.556 10.072 7.60 7.556 11.047 7.75 7.556 11.047 7.75 7.556 12.022 7.90 7.556 12.997 8.05 7.556 13.971 8.00 7.556 14.296 8.25 7.556 15.996 8.25 7.556 15.271 8.40 7.556 15.271 8.40 7.556 15.271 8.45 7.556 15.271 8.60 7.556 15.271 8.60 7.556 15.271 8.60 7.556 15.271 8.60 7.556 15.271 8.60 7.556 15.271 8.60 7.556 15.271 8.60 7.556 15.246 8.55 7.556 16.246 <td>6.70</td> <td>7,556</td> <td>4,549</td> <td></td> <td></td> <td></td>	6.70	7,556	4,549			
6.807,5565,199 6.85 7,5565,524 6.90 7,5566,448 6.95 7,5566,498 7.05 7,5566,498 7.05 7,5567,148 7.10 7,5567,473 7.20 7,5567,798 7.25 7,5568,123 7.30 7,5568,148 7.35 7,5568,173 7.40 7,5569,098 7.45 7,5569,042 7.50 7,55610,072 7.60 7,55610,0397 7.65 7,55610,0397 7.65 7,55611,047 7.75 7,55611,047 7.75 7,55611,047 7.90 7,55612,072 8.00 7,55612,672 8.00 7,55613,971 8.20 7,55614,996 8.25 7,55615,996 8.45 7,55615,921 8.50 7,55615,921 8.60 7,55615,921 8.60 7,55616,895	6.75	7,556	4,874			
6.857,5565,524 6.90 7,5566,498 7.00 7,5566,498 7.05 7,5566,498 7.05 7,5567,473 7.10 7,5567,473 7.20 7,5567,473 7.25 7,5568,123 7.30 7,5568,448 7.35 7,5569,098 7.45 7,5569,098 7.45 7,5569,092 7.55 7,5569,747 7.55 7,55610,072 7.60 7,55610,072 7.60 7,55611,047 7.75 7,55611,047 7.75 7,55611,047 7.85 7,55612,022 7.90 7,55612,022 7.90 7,55612,672 8.00 7,55613,821 8.15 7,55613,971 8.20 7,55614,296 8.25 7,55615,996 8.45 7,55615,271 8.00 7,55615,271 8.00 7,55615,221 8.00 7,55615,271 8.45 7,55615,271 8.60 7,55616,895	6.80	7,556	5,199			
6.907,5505,848 6.95 7,556 $6,173$ 7.00 7,556 $6,498$ 7.05 7,556 $7,148$ 7.15 7,556 $7,473$ 7.20 7,556 $7,473$ 7.25 7,556 $8,123$ 7.30 7,556 $8,123$ 7.30 7,556 $8,448$ 7.35 7,556 $9,098$ 7.45 7,556 $9,098$ 7.45 7,556 $9,098$ 7.45 7,556 $10,072$ 7.60 7,556 $10,072$ 7.60 7,556 $10,072$ 7.65 7,556 $11,047$ 7.75 7,556 $11,047$ 7.75 7,556 $12,022$ 7.90 7,556 $12,022$ 7.90 7,556 $12,022$ 7.90 7,556 $13,821$ 8.05 7,556 $13,971$ 8.20 7,556 $14,296$ 8.25 7,556 $15,921$ 8.00 7,556 $15,271$ 8.45 7,556 $15,221$ 8.60 7,556 $16,895$	6.85	7,556	5,524			
0.95 $7,556$ $0,1/3$ 7.00 $7,556$ $6,498$ 7.05 $7,556$ $7,148$ 7.10 $7,556$ $7,148$ 7.15 $7,556$ $7,473$ 7.20 $7,556$ $8,123$ 7.30 $7,556$ $8,123$ 7.35 $7,556$ $8,123$ 7.35 $7,556$ $8,123$ 7.40 $7,556$ $9,098$ 7.45 $7,556$ $9,422$ 7.50 $7,556$ $10,072$ 7.60 $7,556$ $10,397$ 7.65 $7,556$ $10,397$ 7.65 $7,556$ $11,047$ 7.75 $7,556$ $11,047$ 7.75 $7,556$ $12,022$ 7.90 $7,556$ $12,022$ 7.90 $7,556$ $12,022$ 7.90 $7,556$ $12,672$ 8.00 $7,556$ $13,241$ 8.10 $7,556$ $13,646$ 8.15 $7,556$ $14,996$ 8.25 $7,556$ $14,946$ 8.35 $7,556$ $15,996$ 8.45 $7,556$ $15,921$ 8.60 $7,556$ $16,895$	6.90	7,556	5,848			
7.00 7.556 6.823 7.10 7.556 7.148 7.15 7.556 7.473 7.20 7.556 7.798 7.25 7.556 8.123 7.30 7.556 8.123 7.30 7.556 8.773 7.40 7.556 9.098 7.45 7.556 9.422 7.50 7.556 9.747 7.60 7.556 10.072 7.60 7.556 10.072 7.60 7.556 11.047 7.75 7.556 11.047 7.75 7.556 12.022 7.80 7.556 12.022 7.80 7.556 12.022 7.90 7.556 12.022 7.90 7.556 12.672 8.00 7.556 13.846 8.15 7.556 13.971 8.20 7.556 14.296 8.25 7.556 15.996 8.45 7.556 15.271 8.40 7.556 15.271 8.45 7.556 15.221 8.50 7.556 15.271 8.60 7.556 15.271 8.60 7.556 15.271 8.60 7.556 15.271 8.60 7.556 15.271 8.60 7.556 15.896 8.45 7.556 15.271 8.60 7.556 16.895	0.95	7,550	0,173			
7.03 7.556 7.448 7.15 7.556 7.473 7.20 7.556 7.798 7.25 7.556 8.123 7.30 7.556 8.448 7.35 7.556 8.773 7.40 7.556 9.098 7.45 7.556 9.422 7.50 7.556 9.747 7.55 7.556 10.072 7.60 7.556 10.072 7.60 7.556 11.047 7.75 7.556 11.047 7.75 7.556 11.047 7.75 7.556 12.022 7.90 7.556 12.022 7.90 7.556 12.997 8.00 7.556 13.321 8.10 7.556 13.971 8.20 7.556 14.296 8.25 7.556 15.996 8.45 7.556 15.921 8.40 7.556 15.921 8.60 7.556 16.895	7.00	7,550	0,490			
7.10 7.556 7.473 7.20 7.556 7.798 7.25 7.556 8.123 7.30 7.556 8.123 7.30 7.556 8.773 7.40 7.556 9.998 7.45 7.556 9.422 7.50 7.556 9.422 7.50 7.556 10.072 7.66 7.556 10.397 7.65 7.556 10.397 7.65 7.556 11.372 7.80 7.556 11.372 7.80 7.556 12.347 7.95 7.556 12.672 8.00 7.556 12.347 7.95 7.556 13.211 8.10 7.556 13.646 8.15 7.556 14.996 8.25 7.556 14.946 8.35 7.556 15.996 8.45 7.556 15.921 8.60 7.556 16.895	7.03	7,556	7 1/8			
7.10 $7,556$ $7,798$ 7.25 $7,556$ $8,123$ 7.30 $7,556$ $8,448$ 7.35 $7,556$ $8,773$ 7.40 $7,556$ $9,098$ 7.45 $7,556$ $9,422$ 7.50 $7,556$ $9,747$ 7.55 $7,556$ $10,072$ 7.60 $7,556$ $10,222$ 7.70 $7,556$ $11,047$ 7.75 $7,556$ $11,047$ 7.75 $7,556$ $12,022$ 7.80 $7,556$ $12,022$ 7.90 $7,556$ $12,022$ 7.90 $7,556$ $12,022$ 7.90 $7,556$ $12,022$ 7.90 $7,556$ $12,997$ 8.05 $7,556$ $13,946$ 8.15 $7,556$ $13,971$ 8.20 $7,556$ $14,946$ 8.35 $7,556$ $15,996$ 8.45 $7,556$ $15,921$ 8.60 $7,556$ $15,921$ 8.60 $7,556$ $16,895$	7.10	7,556	7,140			
7.25 7.556 8.123 7.30 7.556 8.123 7.35 7.556 8.773 7.40 7.556 9.098 7.45 7.556 9.098 7.45 7.556 9.422 7.50 7.556 9.747 7.60 7.556 10.722 7.70 7.556 11.047 7.75 7.556 11.047 7.75 7.556 11.047 7.75 7.556 11.097 7.85 7.556 12.022 7.90 7.556 12.022 7.90 7.556 12.022 7.90 7.556 12.997 8.05 7.556 13.921 8.10 7.556 13.971 8.20 7.556 14.296 8.25 7.556 14.296 8.25 7.556 14.946 8.35 7.556 15.996 8.45 7.556 15.921 8.60 7.556 16.895	7.13	7,556	7 798			
7.30 7.556 8.448 7.35 7.556 8.773 7.40 7.556 9.098 7.45 7.556 9.422 7.50 7.556 9.747 7.55 7.556 10.722 7.60 7.556 10.397 7.65 7.556 11.372 7.70 7.556 11.372 7.80 7.556 11.697 7.85 7.556 12.022 7.90 7.556 12.672 8.00 7.556 12.672 8.00 7.556 13.321 8.10 7.556 13.821 8.10 7.556 14.296 8.25 7.556 14.946 8.35 7.556 15.971 8.40 7.556 15.921 8.60 7.556 16.895	7.25	7,556	8 123			
7.35 7.556 8.773 7.40 7.556 9.098 7.45 7.556 9.0422 7.50 7.556 9.747 7.55 7.556 10.072 7.60 7.556 10.397 7.65 7.556 11.047 7.75 7.556 11.047 7.75 7.556 11.047 7.80 7.556 11.697 7.85 7.556 12.022 7.90 7.556 12.022 7.90 7.556 12.672 8.00 7.556 12.672 8.00 7.556 13.241 8.10 7.556 13.646 8.15 7.556 14.996 8.25 7.556 14.946 8.35 7.556 15.996 8.45 7.556 15.996 8.45 7.556 15.921 8.60 7.556 16.895	7.30	7 556	8 448			
7.40 7.556 $9,098$ 7.45 7.556 $9,422$ 7.50 7.556 $9,747$ 7.55 7.556 $10,072$ 7.60 7.556 $10,722$ 7.70 7.556 $11,047$ 7.75 7.556 $11,047$ 7.75 7.556 $11,047$ 7.85 7.556 $11,097$ 7.85 7.556 $12,022$ 7.90 7.556 $12,022$ 7.90 7.556 $12,997$ 8.00 7.556 $13,846$ 8.15 7.556 $13,971$ 8.20 7.556 $14,296$ 8.25 7.556 $14,296$ 8.25 7.556 $15,996$ 8.45 7.556 $15,271$ 8.40 7.556 $15,291$ 8.50 7.556 $15,291$ 8.60 7.556 $16,895$	7.35	7,556	8,773			
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	7.40	7,556	9,098			
7.50 7.556 9.747 7.55 7.556 10.072 7.60 7.556 10.397 7.65 7.556 10.722 7.70 7.556 11.372 7.75 7.556 11.372 7.80 7.556 11.697 7.85 7.556 12.022 7.90 7.556 12.672 8.00 7.556 12.997 8.05 7.556 13.241 8.10 7.556 13.646 8.15 7.556 14.296 8.25 7.556 14.946 8.35 7.556 15.271 8.40 7.556 15.996 8.45 7.556 15.921 8.60 7.556 16.246 8.55 7.556 16.895	7.45	7.556	9,422			
7.55 7.556 10.072 7.60 7.556 10.397 7.65 7.556 11.047 7.70 7.556 11.047 7.75 7.556 11.697 7.80 7.556 12.022 7.90 7.556 12.022 7.90 7.556 12.672 8.00 7.556 12.997 8.05 7.556 13.946 8.15 7.556 13.971 8.20 7.556 14.996 8.25 7.556 14.946 8.35 7.556 15.996 8.45 7.556 15.921 8.60 7.556 16.246 8.55 7.556 16.895	7.50	7,556	9,747			
7.60 7.556 10.397 7.65 7.556 10.722 7.70 7.556 11.047 7.75 7.556 11.372 7.80 7.556 11.997 7.85 7.556 12.022 7.90 7.556 12.347 7.95 7.556 12.997 8.00 7.556 13.921 8.00 7.556 13.971 8.15 7.556 14.296 8.25 7.556 14.296 8.25 7.556 15.996 8.45 7.556 15.996 8.45 7.556 16.246 8.55 7.556 16.895	7.55	7,556	10,072			
7.65 7.556 10.722 7.70 7.556 11.047 7.75 7.556 11.372 7.80 7.556 11.697 7.85 7.556 12.022 7.90 7.556 12.022 7.90 7.556 12.997 8.05 7.556 13.321 8.10 7.556 13.321 8.10 7.556 14.296 8.25 7.556 14.296 8.25 7.556 14.946 8.35 7.556 15.271 8.40 7.556 15.996 8.45 7.556 15.921 8.60 7.556 16.246 8.55 7.556 16.246 8.55 7.556 16.895	7.60	7,556	10,397			
7.70 7.556 $11,047$ 7.75 7.556 $11,372$ 7.80 7.556 $11,697$ 7.85 7.556 $12,022$ 7.90 7.556 $12,022$ 7.90 7.556 $12,672$ 8.00 7.556 $12,997$ 8.05 7.556 $13,321$ 8.10 7.556 $13,971$ 8.20 7.556 $14,296$ 8.25 7.556 $14,621$ 8.30 7.556 $15,271$ 8.45 7.556 $15,921$ 8.45 7.556 $16,246$ 8.55 7.556 $16,895$	7.65	7,556	10,722			
7.75 7.556 11.372 7.80 7.556 11.697 7.85 7.556 12.022 7.90 7.556 12.347 7.95 7.556 12.997 8.00 7.556 13.921 8.00 7.556 13.921 8.15 7.556 13.971 8.20 7.556 14.296 8.25 7.556 14.621 8.30 7.556 15.996 8.45 7.556 15.996 8.45 7.556 16.246 8.55 7.556 16.895	7.70	7,556	11,047			
7.80 $7,556$ $11,697$ 7.85 $7,556$ $12,022$ 7.90 $7,556$ $12,347$ 7.95 $7,556$ $12,672$ 8.00 $7,556$ $13,321$ 8.10 $7,556$ $13,321$ 8.10 $7,556$ $13,971$ 8.20 $7,556$ $14,296$ 8.25 $7,556$ $14,296$ 8.35 $7,556$ $14,296$ 8.35 $7,556$ $15,271$ 8.40 $7,556$ $15,996$ 8.45 $7,556$ $15,921$ 8.50 $7,556$ $16,246$ 8.55 $7,556$ $16,895$	7.75	7,556	11,372			
7.80 7.556 $12,022$ 7.90 $7,556$ $12,672$ 8.00 $7,556$ $12,997$ 8.05 $7,556$ $13,321$ 8.10 $7,556$ $13,646$ 8.15 $7,556$ $14,296$ 8.25 $7,556$ $14,296$ 8.30 $7,556$ $14,946$ 8.35 $7,556$ $15,596$ 8.40 $7,556$ $15,596$ 8.45 $7,556$ $15,921$ 8.50 $7,556$ $16,246$ 8.55 $7,556$ $16,895$	7.80	7,550	11,697			
7.90 $7,550$ $12,947$ 8.00 $7,556$ $12,672$ 8.00 $7,556$ $12,997$ 8.05 $7,556$ $13,921$ 8.10 $7,556$ $13,971$ 8.20 $7,556$ $14,996$ 8.25 $7,556$ $14,946$ 8.30 $7,556$ $15,596$ 8.45 $7,556$ $15,921$ 8.45 $7,556$ $16,246$ 8.55 $7,556$ $16,895$	7.00	7,550	12,022			
1.50 7.556 12.997 8.05 7.556 13.321 8.10 7.556 13.646 8.15 7.556 13.971 8.20 7.556 14.296 8.25 7.556 14.621 8.30 7.556 15.271 8.40 7.556 15.996 8.45 7.556 15.921 8.50 7.556 16.246 8.55 7.556 16.895 8.60 7.556 16.895	7.90	7,556	12,347			
8.05 $7,556$ $13,321$ 8.10 $7,556$ $13,646$ 8.15 $7,556$ $13,971$ 8.20 $7,556$ $14,296$ 8.25 $7,556$ $14,621$ 8.30 $7,556$ $14,296$ 8.35 $7,556$ $15,271$ 8.40 $7,556$ $15,596$ 8.45 $7,556$ $15,921$ 8.50 $7,556$ $16,246$ 8.55 $7,556$ $16,895$	8.00	7,556	12,072			
	8.05	7,556	13 321			
	8.10	7,556	13.646			
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	8.15	7,556	13,971			
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	8.20	7,556	14,296			
$ \begin{array}{rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr$	8.25	7,556	14,621			
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	8.30	7,556	14,946			
8.40 7,556 15,596 8.45 7,556 15,921 8.50 7,556 16,246 8.55 7,556 16,571 8.60 7,556 16,895	8.35	7,556	15,271			
8.45 7,556 15,921 8.50 7,556 16,246 8.55 7,556 16,571 8.60 7,556 16,895	8.40	7,556	15,596			
8.50 7,556 16,246 8.55 7,556 16,571 8.60 7,556 16,895	8.45	7,556	15,921			
8.55 /,556 16,5/1 8.60 7,556 16,895	8.50	7,556	16,246			
0.00 1,500 10,895	8.55	7,556	16,5/1			
·	0.00	7,550	10,895			

System outlet at elevation 7.50 9,747 cu.ft. > 2,047 cu.ft.

Drawdown Within 72-Hours

Pond 1P

Rv = Recharge Volume, cu.ft. (see above)

K = Saturated Hydraulic Conductivity, in/hr (from Rawls Table)

Bottom Area = Area of Infiltration System Bottom, sq.ft.

$$Time = \frac{Rv}{(K)(Bottom Area)}$$

$$Time = \left(\frac{9,747 \ cu. ft.}{(0.043 \ ft/hr)(7,556 \ sq. ft.)}\right) =$$

Time = 30 hours

 \circ 30 hours < 72 hours

Pond TD2 to TD6

Rv = Recharge Volume, 678 cu.ft. (see HydroCAD)

K = Saturated Hydraulic Conductivity, in/hr (from Rawls Table)

Bottom Area = Area of Infiltration System Bottom, sq.ft.

$$Time = \frac{Rv}{(K)(Bottom Area)}$$
$$Time = \left(\frac{678 \, cu. ft.}{(0.043 \, ft/hr)(278 sq. ft.)}\right) =$$

Time = 57 hours

$$\circ$$
 57 hours < 72 hours

Pond 3P (Rain Garden)

Rv = Recharge Volume, 172 cu.ft. (see HydroCAD)

K = Saturated Hydraulic Conductivity, in/hr (from Rawls Table)

Bottom Area = Area of Infiltration System Bottom, sq.ft.

$$Time = \frac{Rv}{(K)(Bottom Area)}$$

$$Time = \left(\frac{172 \, cu. ft.}{(0.043 \, ft/hr)(125 sq. ft.)}\right) =$$

Time = 32 hours

$$\circ$$
 32 hours < 72 hours

6.03 WATER QUALITY VOLUME CALCULATIONS

Water Quality Volume Calculation

 $V_{WQ} = (D_{WQ}/12 \text{ inches/foot}) * (A_{IMP} \text{ square feet})$

$$\begin{split} V_{WQ} &= \text{Required Water Quality Volume (in cubic feet)} \\ D_{WQ} &= \text{Water Quality Depth: 0.5-inch} \\ A_{IMP} &= \text{Total Impervious Area (in acres) used for driveways, parking, etc.} \end{split}$$

Underground Infiltration Systems and Bio-Retention Areas

 $A_{IMP} = 78,629$ sq.ft.

 $V_{WQ} = (0.5 \text{ inches}/12 \text{ inches}/foot) * (78,629 \text{ sq.ft.})$

 $V_{WQ} = 3,276$ cubic feet (required volume), provided volume = 9,747 cubic feet in Underground Infiltration System (refer to the HydroCAD storage tables provided in groundwater recharge section). Additional water quality volume provided in duplex infiltration systems and rain garden above and beyond the water quality volume required.

6.04 RIP-RAP OUTLET PROTECTION SIZING

OUTLET PROTECTION SIZING

Arlington, MA

Location



Calc By CRT Date 8/18/2021 Checked by DRR
 Project No.
 23407.00

 Subject
 Outlet Protection Sizing Calcs
 Date 8/18/2021



OUTLET PROTECTION SIZING



Project No.	23407.00		_		Calc	By CRT						
Subject	Outlet Protection Sizing Calcs					Date 8/18/2021						
Location	Arlington, MA					Checked	by DRR					
						Da	ate 8/18/2021					
Roof Drain	Q=Design Discharge, (i	ft^3/s)		=	3.3	cfs						
	D=Culvert Diameter, (ft)		=	1.00	ft						
	TW=Tailwater Depth, (f	it)		=	0.4	ft, (0.4xD for a	unknow tailwater, o	or enter known tailwater)				
						(Tailwater der	oth is to be limited	to between 0.4D and 1.0D)				
	Riprap Rock Sizing											
		Г	0 74	/3 E D	_ g	=32.2 fps						
	D50=	0.2D -	(dD ^{2.5}	TW	D50	= median roc	k size, ft					
			vgo									
	D50= 0.28 3.30			(4/3)	$\frac{4}{3}$ = 0.34 ft							
			5.67	l	0.40	ا 	09 inches					
		Table 1 - D	inran Classe	a and Anro	n Dimonoio	- 4	.uo inches					
				Aprop	Aprop	15						
		Class	(in)	Length	Depth							
		1	5	4D	3.5D50							
		2	6	4D	3.5D50	Use Class 2						
		3	10	5D	3.3D50							
		4	14	6D	2.2D50							
		5	20	7D	2.0D50							
		6	22	8D	2.0D50			Riprap Rock Sizing Gradation				
	Apron Dimensions					-		Given Size	Size	of Stone,	inches	
	Length, L=5D	=	5	ft				100	9	to	12	
	Depth=3.3D50	=	19.80	Inches				85	8	to	11	
	Width=3D+(2/3)L	=	6.33	ft	(at apron e	nd)		50	6	to	9	
								15	3	to	8	1

6.05 GROUNDWATER MOUNDING ANALYSIS

Time	Inflo	w	Storage	Elevation	Outflow	Discarded	Primary	
(hours)	(cfs)		(cubic-feet)	(feet)	(cfs)	(cfs)	(cfs)	Infiltration System 1P
	12.12	0.2	103	6.02	0	0	0	
	12.13	0.2	107	6.02	0.1	0.1	0	51555 Impervious Surface (sft)
	12.14	0.2	111	6.02	0.1	0.1	0	
	12.15	0.1	115	6.02	0.1	0.1	0	0.025 Required recharge volume (acre-ft)
	12.16	0.1	118	6.02	0.1	0.1	0	
	12.17	0.1	121	6.02	0.1	0.1	0	0.100 Average infiltration rate (cfs)
	12.18	0.1	123	6.02	0.1	0.1	0	
								8640.00 Average infiltration rate (cft/day)
	12.4	0.1	152	6.02	0.1	0.1	0	
	12.41	0.1	152	6.02	0.1	0.1	0	7556 System bottom area (sft)
	12.42	0.1	152	6.02	0.1	0.1	0	(use 183'L x 41.3'W)
	12.43	0.1	153	6.02	0.1	0.1	0	
	12.44	0.1	153	6.02	0.1	0.1	0	1.143 Percoloation/application rate (ft/day)
	12.45	0.1	153	6.02	0.1	0.1	0	
	12.46	0.1	153	6.02	0.1	0.1	0	12.13 Infiltration start time
	12.47	0.1	153	6.02	0.1	0.1	0	
	12.48	0.1	153	6.02	0.1	0.1	0	13.35 Infiltration end time
	12.49	0.1	153	6.02	0.1	0.1	0	
	12.5	0.1	153	6.02	0.1	0.1	0	1.22 Time (hrs)
	13.26	0	111	. 6.02	0.1	0.1	0	0.051 Time (days)
	13.27	0	111	6.02	0.1	0.1	0	
	13.28	0	110	6.02	0.1	0.1	0	1.04 Hydraulic conductivity (ft/day)
	13.29	0	110	6.02	0.1	0.1	0	
	13.3	0	110	6.02	0.1	0.1	0	0.138 Specific yield
	13.31	0	109	6.02	0.1	0.1	0	
	13.32	0	109	6.02	0.1	0.1	0	5 Initial saturated thickness (ft)
	13.33	0	108	6.02	0.1	0.1	0	
	13.34	0	108	6.02	0.1	0.1	0	0.422 Increase in hydraulic head (ft)
	13.35	0	107	6.02	0.1	0.1	0	
	13.36	0	107	6.02	0	0	0	Note that full tabular hydrograph not printed for brevity

Pond 1P Mounding - Results

5.422

0.422

h(max)

∆h(max)

Input Values			inch/ho	ur	feet/da	y .
1.1430	R	Recharge (infiltration) rate (feet/day)		0.67		1.33
0.138	Sy	Specific yield, Sy (dimensionless, between 0 and 1)				
1.04	к	Horizontal hydraulic conductivity, Kh (feet/day)*		2.00		4.00
91.500	x	1/2 length of basin (x direction, in feet)				(USGS SIR 2010-5102), vertical soil permeability
20.650	У	1/2 width of basin (y direction, in feet)	hours		days	(ft/d) is assumed to be one-tenth horizontal
0.051	t	duration of infiltration period (days)		36		1.50 hydraulic conductivity (ft/d).
5.000	hi(0)	initial thickness of saturated zone (feet)				

maximum thickness of saturated zone (beneath center of basin at end of infiltration period) maximum groundwater mounding (beneath center of basin at end of infiltration period)



Disclaimer

This spreadsheet solving the Hantush (1967) equation for ground-water mounding beneath an infiltration basin is made available to the general public as a convenience for those wishing to replicate values documented in the USGS Scientific Investigations Report 2010-5102 "Groundwater mounding beneath hypothetical stormwater infiltration basins" or to calculate values based on user-specified site conditions. Any changes made to the spreadsheet (other than values identified as user-specified) after transmission from the USGS could have unintended, undesirable consequences. These consequences could include, but may not be limited to: erroneous output, numerical instabilities, and violations of underlying assumptions that are inherent in results presented in the accompanying USGS published report. The USGS assumes no responsibility for the consequences of any changes made to the spreadsheet. If changes are made to the spreadsheet, the user is responsible for documenting the changes and justifying the results and conclusions.

Time	Ir	nflow	Storage	Elevation	Outfl	w	Discarded	Primary	
(hours)	(0	cfs)	(cubic-feet)	(feet)	(cfs)		(cfs)	(cfs)	Infiltration System TD5
	5.8	0.00001		0	5	0.00000	0.00000	0.00000	
	5.81	0.00001		0	5	0.00001	0.00001	0.00000	1076 Impervious Surface (sft)
	5.82	0.00001		0	5	0.00001	0.00001	0.00000	
	5.83	0.00001		0	5	0.00001	0.00001	0.00000	0.001 Required recharge volume (acre-ft)
	5.84	0.00001		0	5	0.00001	0.00001	0.00000	
	5.85	0.00001		0	5	0.00001	0.00001	0.00000	0.001 Average infiltration rate (cfs)
	5.86	0.00001		0	5	0.00001	0.00001	0.00000	
									53.03 Average infiltration rate (cft/day)
	15.62	0.00050		1	5.01	0.00060	0.00060	0.00000	
	15.63	0.00049		1	5.01	0.00060	0.00060	0.00000	278 System bottom area (sft)
	15.64	0.00049		1	5.01	0.00059	0.00059	0.00000	(use 16.4'L x 17'W)
	15.65	0.00049		1	5.01	0.00059	0.00059	0.00000	
	15.66	0.00049		1	5.01	0.00059	0.00059	0.00000	0.191 Percoloation/application rate (ft/day)
	15.67	0.00049		1	5.01	0.00059	0.00059	0.00000	
	15.68	0.00049		1	5.01	0.00058	0.00058	0.00000	5.81 Infiltration start time
	15.69	0.00048		1	5.01	0.00058	0.00058	0.00000	
	15.7	0.00048		1	5.01	0.00058	0.00058	0.00000	25.58 Infiltration end time
	15.71	0.00048		1	5.01	0.00058	0.00058	0.00000	
	15.72	0.00048		1	5.01	0.00058	0.00058	0.00000	19.77 Time (hrs)
	25.49	0.00000		0	5	0.00001	0.00001	0.00000	0.824 Time (davs)
	25.5	0.00000		0	5	0.00001	0.00001	0.00000	
	25.51	0.00000		0	5	0.00001	0.00001	0.00000	1.04 Hydraulic conductivity (ft/day)
	25.52	0.00000		0	5	0.00001	0.00001	0.00000	
	25.53	0.00000		0	5	0.00001	0.00001	0.00000	0.138 Specific yield
	25.54	0.00000		0	5	0.00001	0.00001	0.00000	
	25.55	0.00000		0	5	0.00001	0.00001	0.00000	5 Initial saturated thickness (ft)
	25.56	0.00000		0	5	0.00001	0.00001	0.00000	
	25.57	0.00000		0	5	0.00001	0.00001	0.00000	0.846 Increase in hydraulic head (ft)
	25.58	0.00000		0	5	0.00001	0.00001	0.00000	
	25.59	0.00000		0	5	0.00000	0.00000	0.00000	Note that full tabular hydrograph not printed for brevity

TD5 representative of duplex systems with least separation to groundwater

Pond 1P Mounding - Results

5.846

0.846

Ground-

h(max)

∆h(max)

Distance from

In

put Values			inch/hou	r f	feet/day	
0.1910	R	Recharge (infiltration) rate (feet/day)	0	.67		1.33
0.138	Sy	Specific yield, Sy (dimensionless, between 0 and 1)				
1.04	к	Horizontal hydraulic conductivity, Kh (feet/day)*	2	.00		4.00
8.200	x	1/2 length of basin (x direction, in feet)				(USGS SIR 2010-5102), vertical soil permeability
8.500	У	1/2 width of basin (y direction, in feet)	hours	C	days	(ft/d) is assumed to be one-tenth horizontal
0.824	t	duration of infiltration period (days)		36		1.50 hydraulic conductivity (ft/d).
5.000	hi(0)	initial thickness of saturated zone (feet)				

maximum thickness of saturated zone (beneath center of basin at end of infiltration period) maximum groundwater mounding (beneath center of basin at end of infiltration period)

water Mounding in	center of basin	
feet	feet	
0.846	0	De Celeviete New
0.021	20	Re-Calculate Now
0.000	40	
0.000	50	Croundwater Mounding in fact
0.000	60	Groundwater Mounding, in leet
0.000	70	0.900
0.000	80	0.800
0.000	90	0.700
0.000	100	0.600
0.000	120	0.500
		0.400
		0.300
		0.200
		0.100

Disclaimer

This spreadsheet solving the Hantush (1967) equation for ground-water mounding beneath an infiltration basin is made available to the general public as a convenience for those wishing to replicate values documented in the USGS Scientific Investigations Report 2010-5102 "Groundwater mounding beneath hypothetical stormwater infiltration basins" or to calculate values based on user-specified site conditions. Any changes made to the spreadsheet (other than values identified as user-specified) after transmission from the USGS could have unintended, undesirable consequences. These consequences could include, but may not be limited to: erroneous output, numerical instabilities, and violations of underlying assumptions that are inherent in results presented in the accompanying USGS published report. The USGS assumes no responsibility for the consequences of any changes made to the spreadsheet. If changes are made to the spreadsheet, the user is responsible for documenting the changes and justifying the results and conclusions.

20

40

60

80

100

120

140

-0.100

Ć

6.06 ILLICIT DISCHARGE COMPLIANCE STATEMENT

Illicit Discharge Compliance Statement

This statement is to document that, to the best of my knowledge and belief, there are no and will be no illicit discharges to the stormwater management systems or protected wetland resource areas for the Thorndike Place residential development on Dorothy Road in Arlington, Massachusetts.

Authorized Signature/Title

Date

APPENDIX A

USGS LOCUS MAP



File: 2340700\C\Drainage\2340700-EX WATERSHED

APPENDIX B

FEMA MAP

National Flood Hazard Layer FIRMette



Legend



APPENDIX C

WEB SOIL SURVEY



United States Department of Agriculture

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 Middlesex County, Massachusetts



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.

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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.

Custom Soil Resource Report Soil Map



MAF	P LEGEND	MAP INFORMATION
Area of Interest (AOI) Area of Interest (AOI)	Spoil AreaStony Spot	The soil surveys that comprise your AOI were mapped at 1:25,000.
Soil Map Unit Polygo Soil Map Unit Lines Soil Map Unit Lines Soil Map Unit Points Special Point Features Blowout Soli Map Unit Points Special Point Features Clay Spot	NS Very Stony Spot Very Stony Spot Very Stony Spot Very Stony Spot Other Special Line Features Vater Features Streams and Canals Transportation +++ Rails	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.
 Closed Depression Gravel Pit Gravelly Spot Landfill Lava Flow Marsh or swamp 	 Interstate Highways US Routes Major Roads Local Roads Background Aerial Photography	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
 Mine or Quarry Miscellaneous Water Perennial Water Rock Outcrop Saline Spot 		accurate calculations of distance or area are required. This product is generated from the USDA-NRCS certified data as of the version date(s) listed below. Soil Survey Area: Middlesex County, Massachusetts Survey Area Data: Version 20, Jun 9, 2020
 Sandy Spot Severely Eroded Spot Sinkhole Slide or Slip Sodic Spot 	t	Soil map units are labeled (as space allows) for map scales 1:50,000 or larger. Date(s) aerial images were photographed: Sep 11, 2019—Oct 5, 2019 The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
51A	Swansea muck, 0 to 1 percent slopes	4.3	4.6%
52A	Freetown muck, 0 to 1 percent slopes	10.4	11.2%
603	Urban land, wet substratum	32.1	34.5%
626B	Merrimac-Urban land complex, 0 to 8 percent slopes	14.3	15.4%
655	Udorthents, wet substratum	31.9	34.3%
Totals for Area of Interest	·	92.9	100.0%

Map Unit Legend

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.

Middlesex County, Massachusetts

51A—Swansea muck, 0 to 1 percent slopes

Map Unit Setting

National map unit symbol: 2trl2 Elevation: 0 to 1,140 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

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

Description of Swansea

Setting

Landform: Swamps, bogs Landform position (three-dimensional): Dip Down-slope shape: Concave Across-slope shape: Concave Parent material: Highly decomposed organic material over loose sandy and gravelly glaciofluvial deposits

Typical profile

Oa1 - 0 to 24 inches: muck Oa2 - 24 to 34 inches: muck Cg - 34 to 79 inches: coarse sand

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Very poorly drained
Runoff class: Negligible
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: About 0 to 6 inches
Frequency of flooding: Rare
Frequency of ponding: Frequent
Available water capacity: Very high (about 16.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified Land capability classification (nonirrigated): 8w Hydrologic Soil Group: B/D Ecological site: F144AY043MA - Acidic Organic Wetlands Hydric soil rating: Yes

Minor Components

Freetown

Percent of map unit: 10 percent *Landform:* Bogs, swamps

Landform position (three-dimensional): Dip Down-slope shape: Concave Across-slope shape: Concave Hydric soil rating: Yes

Whitman

Percent of map unit: 5 percent Landform: Depressions, drainageways Landform position (two-dimensional): Toeslope Landform position (three-dimensional): Base slope Down-slope shape: Concave Across-slope shape: Concave Hydric soil rating: Yes

Scarboro

Percent of map unit: 5 percent Landform: Drainageways, depressions Landform position (two-dimensional): Toeslope Landform position (three-dimensional): Base slope, tread, dip Down-slope shape: Concave Across-slope shape: Concave Hydric soil rating: Yes

52A—Freetown muck, 0 to 1 percent slopes

Map Unit Setting

National map unit symbol: 2t2q9 Elevation: 0 to 1,110 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

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

Description of Freetown

Setting

Landform: Depressions, depressions, bogs, marshes, kettles, swamps Landform position (two-dimensional): Toeslope Landform position (three-dimensional): Tread, dip Down-slope shape: Concave Across-slope shape: Concave Parent material: Highly decomposed organic material

Typical profile

Oe - 0 to 2 inches: mucky peat Oa - 2 to 79 inches: muck

Properties and qualities

Slope: 0 to 1 percent
Surface area covered with cobbles, stones or boulders: 0.0 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Very poorly drained
Runoff class: Negligible
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: About 0 to 6 inches
Frequency of flooding: Rare
Frequency of ponding: Frequent
Available water capacity: Very high (about 19.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified Land capability classification (nonirrigated): 5w Hydrologic Soil Group: B/D Ecological site: F144AY043MA - Acidic Organic Wetlands Hydric soil rating: Yes

Minor Components

Swansea

Percent of map unit: 5 percent Landform: Kettles, depressions, depressions, marshes, swamps, bogs Landform position (two-dimensional): Toeslope Landform position (three-dimensional): Tread, dip Down-slope shape: Concave Across-slope shape: Concave Hydric soil rating: Yes

Scarboro

Percent of map unit: 5 percent Landform: Depressions, drainageways Landform position (two-dimensional): Toeslope Landform position (three-dimensional): Base slope, tread, dip Down-slope shape: Concave Across-slope shape: Concave Hydric soil rating: Yes

Whitman

Percent of map unit: 5 percent Landform: Depressions, drainageways Landform position (two-dimensional): Toeslope Landform position (three-dimensional): Base slope Down-slope shape: Concave Across-slope shape: Concave Hydric soil rating: Yes

603—Urban land, wet substratum

Map Unit Setting

National map unit symbol: 9951 Mean annual precipitation: 32 to 50 inches Mean annual air temperature: 45 to 50 degrees F Frost-free period: 110 to 200 days Farmland classification: Not prime farmland

Map Unit Composition

Urban land: 85 percent *Minor components:* 15 percent *Estimates are based on observations, descriptions, and transects of the mapunit.*

Description of Urban Land

Setting

Landform position (two-dimensional): Footslope Landform position (three-dimensional): Base slope Down-slope shape: Linear Across-slope shape: Linear Parent material: Excavated and filled land over alluvium and/or marine deposits

Minor Components

Udorthents, loamy

Percent of map unit: 10 percent Hydric soil rating: No

Rock outcrop

Percent of map unit: 5 percent Landform: Ledges Landform position (two-dimensional): Summit Landform position (three-dimensional): Head slope Down-slope shape: Concave Across-slope shape: Concave

626B—Merrimac-Urban land complex, 0 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2tyr9 Elevation: 0 to 820 feet Mean annual precipitation: 36 to 71 inches Mean annual air temperature: 39 to 55 degrees F *Frost-free period:* 140 to 250 days *Farmland classification:* Not prime farmland

Map Unit Composition

Merrimac and similar soils: 45 percent *Urban land:* 40 percent *Minor components:* 15 percent *Estimates are based on observations, descriptions, and transects of the mapunit.*

Description of Merrimac

Setting

Landform: Eskers, moraines, outwash terraces, outwash plains, kames Landform position (two-dimensional): Backslope, footslope, summit, shoulder Landform position (three-dimensional): Side slope, crest, riser, tread Down-slope shape: Convex

Across-slope shape: Convex

Parent material: Loamy glaciofluvial deposits derived from granite, schist, and gneiss over sandy and gravelly glaciofluvial deposits derived from granite, schist, and gneiss

Typical profile

Ap - 0 to 10 inches: fine sandy loam *Bw1 - 10 to 22 inches:* fine sandy loam

- Bw2 22 to 26 inches: stratified gravel to gravelly loamy sand
- 2C 26 to 65 inches: stratified gravel to very gravelly sand

Properties and qualities

Slope: 0 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 99.90 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 2 percent
Maximum salinity: Nonsaline (0.0 to 1.4 mmhos/cm)
Sodium adsorption ratio, maximum: 1.0
Available water capacity: Low (about 4.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified Land capability classification (nonirrigated): 2e Hydrologic Soil Group: A Ecological site: F144AY022MA - Dry Outwash Hydric soil rating: No

Description of Urban Land

Typical profile *M - 0 to 10 inches:* cemented material

Properties and qualities

Slope: 0 to 8 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 capacity: 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

Windsor

Percent of map unit: 5 percent Landform: Dunes, outwash terraces, deltas, outwash plains Landform position (three-dimensional): Tread, riser Down-slope shape: Convex, linear Across-slope shape: Convex, linear Hydric soil rating: No

Sudbury

Percent of map unit: 5 percent Landform: Outwash plains, terraces, deltas Landform position (two-dimensional): Footslope Landform position (three-dimensional): Tread, dip Down-slope shape: Concave Across-slope shape: Linear Hydric soil rating: No

Hinckley

Percent of map unit: 5 percent Landform: Eskers, kames, deltas, outwash plains Landform position (two-dimensional): Summit, shoulder, backslope Landform position (three-dimensional): Nose slope, side slope, crest, head slope, rise Down-slope shape: Convex Across-slope shape: Convex, linear Hydric soil rating: No

655—Udorthents, wet substratum

Map Unit Setting

National map unit symbol: vr1n Elevation: 0 to 3,000 feet Mean annual precipitation: 32 to 54 inches Mean annual air temperature: 43 to 54 degrees F Frost-free period: 110 to 240 days Farmland classification: Not prime farmland

Map Unit Composition

Udorthents, wet substratum, and similar soils: 85 percent *Minor components:* 15 percent *Estimates are based on observations, descriptions, and transects of the mapunit.*

Description of Udorthents, Wet Substratum

Setting

Parent material: Loamy alluvium and/or sandy glaciofluvial deposits and/or loamy glaciolacustrine deposits and/or loamy marine deposits and/or loamy basal till and/or loamy lodgment till

Properties and qualities

Slope: 0 to 8 percent Depth to restrictive feature: More than 80 inches Depth to water table: More than 80 inches Frequency of flooding: None Frequency of ponding: None

Minor Components

Urban land

Percent of map unit: 8 percent Landform position (two-dimensional): Footslope Landform position (three-dimensional): Base slope Down-slope shape: Linear Across-slope shape: Linear

Freetown

Percent of map unit: 4 percent Landform: Depressions, bogs Landform position (two-dimensional): Toeslope Landform position (three-dimensional): Dip Down-slope shape: Concave Across-slope shape: Concave Hydric soil rating: Yes

Swansea

Percent of map unit: 3 percent Landform: Bogs, depressions Landform position (two-dimensional): Toeslope Landform position (three-dimensional): Dip Down-slope shape: Concave Across-slope shape: Concave Hydric soil rating: Yes

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APPENDIX D

TEST PIT LOGS



City/Town of Arlington

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

A. Facility Information

	Arlington Land Realty, LLC						
	Owner Name						
	Dorothy Road		16-8-2, 16-8-3, 16	6-8-4, 16-8-5,	16-8-6, 16-8	3-7A	
	Street Address		Map/Lot #				
	Arlington	MA	02474				
	City	State	Zip Code				
В.	Site Information						
1.	(Check one) 🛛 New Construction 🗌 Upg	rade 🗌 Repair					
2.	Soil Survey Available? 🛛 Yes 🗌 No	If yes:		Web Soil S Source	urvey <u>6</u> s	55, 51A coil Map Unit	
	Udorthents, Swansea Muck	Fill throughout site; clay base la	ayer in one test pit				
	Soil Name	Soil Limitations	•				-
	Glaciofluvial deposit	Depression					
	Soil Parent material	Landform					-
3.	Surficial Geological Report Available? 🛛 Yes 🗍 No	If ves: 2018/USGS		Glaciomarine	e fine depos	its, stagnant ice deposit	s
		Year Published	/Source	Map Unit	I	, 0	
	fine/very fine sand down to very fine sand, silt, silty cl	ay, and clay					
	Description of Geologic Map Unit:	· · ·					
4.	Flood Rate Insurance Map Within a regulatory	floodway? 🗌 Yes 🛛 No	D				
5.	Within a velocity zone? 🗌 Yes 🛛 No						
6.	Within a Mapped Wetland Area? 🛛 🕅 Yes	No If yes, Mass	GIS Wetland Data	Layer:	Shallow ma Wetland Type	arsh meadow e	
7.	Current Water Resource Conditions (USGS):	11/25/2020 Month/Day/ Year	Range: 🛛 Abo	ve Normal	Normal	Below Normal	
8.	Other references reviewed: Not in Zor	ne I, II, or IWPA (OLIVER)					
		, <i>t</i>					



City/Town of Arlington

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

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

Deep Observation Hole Number: TP-1					11/25/2020		5 AM Cloudy		<u>, 30deg</u> <u>42.40 N</u> Latitude		<u>71.15 W</u>
1 Land	Woodl	and adjacent	to residential/hig	jhway	Forest	Time		Some large	boulders	Lande	<u>0-2%</u>
	(e.g., wo	odland, agriculti	ural field, vacant lot, o	etc.)	Vegetation			Surface Stone	s (e.g., cobbles,	stones, boulder	s, etc.) Slope (%)
Des	scription of Lo	cation:									
2. Soil Parent Material: Glaciofluvial deposits Depression SU											
Landform Position on Landscape (SU, SH, BS, FS, TS)											rs, 15)
J. DISIAI	ices ironi.	Oper		>100 feet		Drinkin		ay <u>≥100</u> te	el	vve	Other for $\frac{>100}{>100}$ leet
4 Unsuita	hle Material	s Present [.] 🕅		<u>ZIUU</u> teet If Ves∘ Γ		Drinking Soil 🕅 I	j vvaler vv Fill Material	/eli <u>≥100</u> te	ei Neathered/Fra	ctured Rock	
4. Onsult				II 103. L							
5. Groundwater Observed: Yes No If yes: <u>108"</u> Depth Weeping from Pit <u>108"</u> Depth Standing Water in Hole											
Soil Log											
Donth (in)	Soil Horizon	Soil Texture	Soil Matrix: Color-	Redo	oximorphic Fea	tures	Coarse F % by	Fragments Volume	Soil Structure	Soil	Other
Deptil (III)	/Layer	(USDA	Moist (Munsell)	Depth	Color	Percent	Gravel	Cobbles & Stones	Son Structure	(Moist)	Other
0"-10	А	SL	7.5YR 2.5/1				0	0	massive	friable	
10"-36"	B (fill)	gravelly sandy loam	10YR 3/3				10	2-4	massive	very friable	
36"-48"											
48"-108"	C1 (fill)	gravelly sandy loam	10YR 2/1				15-20	4-6	massive	very friable	
36"-78"	C2 (fill)	loamy sand	10YR 5/4				0	0	single grain	loose	sandy layer (only on E side of test pit)
78"-108"	2C2 (fill)	gravelly sandy loam	10YR 2/1				15-20	4-6	massive	very friable	gravelly layer below sandy layer on E side of test pit

Additional Notes:

Elevation of TP-1 = 12.0. Groundwater at bottom of test pit (9' - elevation 3.0). Test pit mostly fill



City/Town of Arlington

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

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

0	Deep (Observatio	n Hole Numl	ber: <u>TP-2</u>	11	/25/20	8:45AM	<u> </u>	loudy, 35deg	42.40 N		<u>71.15 W</u>
		W _o	odland adiaa	+ solid ar	20 hticl/bigby		nme	V	eather Some lore		und	Longitude:
1. L	and U	lse: <u>(e.q</u>	, woodland, agr	icultural field, va	cant lot, etc.		getation		Surface Stor	les (e.g., cobbles,	stones, boulders,	etc.) Slope (%)
					,	,	0				, ,	, , ,
Description of Location:												
2 5	Soil Pa	rent Materi	Glaciof	luvial deposit	S			Depressio	on		SU	
2. 0								Landform			Position on Lands	scape (SU, SH, BS, FS, TS)
3. E	Distand	ces from:	Open Wate	r Body <u>>100</u>	<u>)</u> feet		Drain	age Way	<u>>100</u> feet	Wetla	nds <u>>100</u> fee	t
			Proper	ty Line <u>>100</u>	<u>)</u> feet		Drinking W	ater Well	<u>>100</u> feet	Ot	her fe	et
4. Ur												
	atenais	s Present:		NO ITYES:		bed Soll		eriai				
5. 0	Found	awater Obse	ervea: 📋 Ye	s 🖾 No			If yes: Depth Weeping from Pit Depth S				Standing Water in Hole	
							So	il Log				
Dent	Depth (in) Soil Horizon Soil Texture Soil Matrix: Redoximorph					imorphic F	c Features Coarse Fragments % by Volume			Soil Structure	Soil Consistence	Other
Dehi	un (ini)	/Layer	(USDA)	Color-Moist (Munsell)	Depth	Color	Percent	Gravel	Cobbles & Stones	Son Structure	(Moist)	Other
0	-7	А	sandy loam	10YR 2.5/1				0	0	massive	friable	
7-′	132	C (fill)	gravelly sandy loam	10YR 3/2				15-20	4-6	massive	friable	

Additional Notes:

Elevation of TP-2 = 11.2. Estimated groundwater elevation (to bottom of test pit) = 0.2. Fill throughout test pit. No groundwater observed



City/Town of Arlington

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

D. Determination of High Groundwater Elevation

1.	Method Used:		Obs. Hole # <u>TP-1</u>	Obs.	Hole # <u>TP-2</u>		
	Depth observed standing water in observation	n hole	<u>108</u> inches		inches		
	Depth weeping from side of observation hole		inches		inches		
	Depth to soil redoximorphic features (mottles	5)	inches		inches		
	 Depth to adjusted seasonal high groundwater (USGS methodology) 	· (S _h) inches			_inches		
	Index Well Number	Reading Date					
	$S_h = S_c - [S_r \times (OW_c - OW_{max})/OW_r]$						
	Obs. Hole/Well# S _c	Sr	OWc	OW _{max}	OWr	S _h	
2. E	stimated Depth to High Groundwater: 108 inches	;					

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material

a.	Does at least four feet of naturally occurring pervious material exist in all areas observed throughout the area proposed for the soil	absorption
sy	stem?	

🗌 Yes 🛛 🖾 No

b.	If yes, at what depth was it observed (exclude A and O	Upper boundary:		Lower boundary:	
Ho	rizons)?		inches		inches
C.	If no, at what depth was impervious material observed?	Upper boundary:	108	Lower boundary:	>108 (fill material)
			inches		inches



City/Town of Arlington

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

F. Certification

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

	11/25/2020	
Signature of Soil Evaluator	Date	
Emily Derrig SE14158	12/1/2020	
Typed or Printed Name of Soil Evaluator / License #	Expiration Date of License	
Name of Approving Authority Witness	Approving Authority	

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

Field Diagrams: Use this area for field diagrams:



City/Town of Arlington

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A. Facility Information

	Arlington Land Realty, LLC						
	Owner Name						
	Dorothy Road		16-8-2, 16-8-3, 16	5-8-4, 16-8-5,	16-8-6, 16-	8-7A	
	Street Address		Map/Lot #				
	Arlington	MA	02474				
	City	State	Zip Code				
В.	. Site Information						
1.	(Check one) 🛛 New Construction 🗌 Upg	jrade 🗌 Repair					
2.	Soil Survey Available? 🛛 Yes 🗌 No	If yes:		Web Soil S Source	urvey <u>6</u>	655, 51A Soil Map Unit	
	Udorthents, Swansea Muck	Fill throughout site; clay base I	ayer in one test pit				
	Soil Name	Soil Limitations					
	Glaciofluvial deposit	Depression					
	Soil Parent material	Landform					
3.	Surficial Geological Report Available? 🛛 Yes 🗌 No	If ves: 2018/USGS		Glaciomarine	e fine depos	sits. stagnant ice de	posits
-		Year Published	I/Source	Map Unit	I	, J	<u>.</u>
	fine/very fine sand down to very fine sand, silt, silty c	lay, and clay					
	Description of Geologic Map Unit:						
4.	Flood Rate Insurance Map Within a regulatory	/ floodway? 🗌 Yes 🛛 N	0				
5.	Within a velocity zone? 🗌 Yes 🛛 No						
6.	Within a Mapped Wetland Area? 🛛 Yes	No If yes, Mass	GIS Wetland Data	Layer:	Shallow m Wetland Typ	narsh meadow ^{Je}	
7.	Current Water Resource Conditions (USGS):	11/25/2020 Month/Day/ Year	Range: 🔀 Abo	ve Normal	Norma	I 🗌 Below Norr	nal
8.	Other references reviewed: Not in Zor	ne I. II. or IWPA (OLIVER)					



City/Town of Arlington

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

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

Deep	Observatior	n Hole Numb	er: <u>TP-3</u> Hole #	11/25/	2020	9:45 A	M	Cloudy	, 40deg	42.40 N		<u>71.15 W</u>
1. Land	Use Woodl	and adjacent	to residential/hig ural field, vacant lot, o	ighway Forest , etc.) Vegetation			Some large boulders Surface Stones (e.g., cobbles, stones, boulders, e			s, etc.)	0-2% Slope (%)	
Des	scription of Lo	ocation:										
2. Soil Parent Material: Glaciofluvial deposits Depression FS Landform Position on Landscape (SU, SH, BS, FS, TS)												
3. Distances from: Open Water Body >100 feet Drainage Way >100 feet Wetlands >100 feet											<u>>100</u> feet	
4. Unsuita	Property Line >100 feet Drinking Water Well >100 feet Other feet 4. Unsuitable Materials Present: Yes No If Yes: Disturbed Soil Fill Material Weathered/Fractured Rock Bedrock											
5. Grour	J. Groundwater Observed: Yes No If yes: <u>84" Depth Weeping from Pit</u> <u>144" Depth Standing Water in Hole</u> Soil Log											
Dopth (in)	Soil Horizon	Soil Texture	Soil Matrix: Color-	Rede	oximorphic Fea	tures	Coarse F % by	Fragments Volume	Soil Structure	Soil		Other
Deptil (III)	/Layer	(USDA	Moist (Munsell)	Depth	Color	Percent	Gravel	Cobbles & Stones	Soli Structure	(Moist)		Other
0"-8"	А	SL	10YR 2/1				0	0	massive	very friable		
8"-84"	В	SL	7.5YR 2.5/2	36"	7.5YR 5/8	2-4%	2-4	0	massive	friable		
84"-108"	C1	Sandy Clay Loam	10YR 2/1				0	0	massive	firm		
108"- 144"	C2	Clay	GLEY 2 4/5B				0	0	massive	very firm		

Additional Notes:

TP-3 Elevation = 6.5. Groundwater observed at bottom of test pit (12') and weeping from sides at 7' - estimated groundwater elevation = -0.5



City/Town of Arlington

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

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

[Deep (Observatior	n Hole Numb	ber:									
	•			Hole #	Da	te	Time	Wea	ather	Latitude		Longitude:	
1. l	_and U	lse: (e.g.	, woodland, agri	icultural field, va	cant lot, etc	.) Veg	getation		Surface Stor	nes (e.g., cobbles,	stones, boulders,	etc.) Slope (%)	
Ι	Descrip	otion of Loca	ation:										
2. 3	. Soil Parent Material: Landform Position on Landscape (SU, SH, BS, FS, TS)												
3. Distances from: Open Water Body feet Drainage Way feet Wetlands feet										eet			
			Propert	ty Line	feet	C	Drinking W	ater Well	feet	Ot	her fe	et	
4. Ur M	. Unsuitable Materials Present: Ves No If Yes: Disturbed Soil Fill Material Weathered/Fractured Rock Bedrock												
5. (5. Groundwater Observed: Yes No If yes: Depth Weeping from Pit Depth Standing Water in Hole												
							So	il Log					
Don	th (in)	Soil Horizon	n Soil Texture So	zon Soil Texture S	Soil Matrix:	Redox	kimorphic Fe	atures	Coarse I % by	Fragments Volume	Soil Structure	Soil Consistence	Other
Deb		/Layer	(USDA)	Color-Moist (Munsell)	Depth	Color	Percent	Gravel	Cobbles & Stones	Son Structure	(Moist)	Oulei	

Additional Notes:



City/Town of Arlington

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

D. Determination of High Groundwater Elevation

1.	Method Used:		Obs. Hole # <u>TP-3</u>	Obs.	Hole #		
	Depth observed standing water in observatio	n hole	<u>132</u> inches		_inches		
	\boxtimes Depth weeping from side of observation hole		<u>84</u> inches		_ inches		
	Depth to soil redoximorphic features (mottles	Depth to soil redoximorphic features (mottles)		inches			
	Depth to adjusted seasonal high groundwater (S _h) (USGS methodology)		inches		inches		
	Index Well Number	Reading Date					
	$S_h = S_c - [S_r \times (OW_c - OW_{max})/OW_r]$						
	Obs. Hole/Well# S _c	Sr	OWc	OW _{max}	OWr	S _h	
2. E	stimated Depth to High Groundwater: <u>84</u> inches						

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material

a.	Does at least four feet of naturally occurring pervious material exist in all areas observed throughout the area proposed for the soil	absorption
sy	rstem?	

🗌 Yes 🛛 No

b.	If yes, at what depth was it observed (exclude A and O	Upper boundary:		Lower boundary:	
Ho	rizons)?		inches		inches
C.	If no, at what depth was impervious material observed?	Upper boundary:	84	Lower boundary:	132
			inches		inches



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Emily Derrig SE14158	12/1/2020	
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