STONEFIELD

STORMWATER MANAGEMENT REPORT
PRIMROSE SCHOOL FRANCHISING COMPANY

PROPOSED CHILDCARE FACILITY
PARCEL ID: 28-113
885 MAIN STREET
TOWN OF READING
MIDDLESEX COUNTY, MASSACHUSETTS

PREPARED FOR:
PRIMROSE SCHOOLS FRANCHISING COMPANY
21 CONKLIN AVENUE
WARREN, NEW JERSEY 07059

PREPARED BY:
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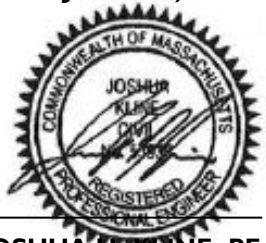

JOSHUA H. KLINE, PE
MA PE LICENSE #53936

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APPENDICES

1.0 PROJECT DESCRIPTION

Primrose School Franchising Company is proposing to develop Parcel 28-113, commonly known as 885 Main Street, Reading, MA, (herein referred to as the "project site") to accommodate the construction of a 14,058 square foot Childcare Facility (7,029 SF Floor Plate). Additional improvements include children's playground areas with associated play equipment, lighting, landscaping, off-street parking facilities, utility connections, and stormwater infrastructure.

The property is located within the Single Family 15 (S-15) zoning district in the Town of Reading. The proposed development fronts Main Street (Route 28) and is surrounded by single family residential lots. The site will be accessed via one (1) full movement driveway from Main Street (MA Route 28). Refer to **APPENDIX A** for project maps of the subject site.

The project site is 84,280 SF (1.94 acres), the extent of land disturbance is 58,951 SF (1.35 acres), and 19,481 SF (0.45 acres) of impervious surface will be added to the project site. The overall drainage area was modeled as 84,280 SF (1.94 acres).

This Report has been prepared to analyze the potential stormwater runoff impacts of the proposed project site and outline proposed measures to conform to the stormwater management regulations set forth by the Town of Reading and the Massachusetts Department of Environmental Protection.

2.0 EXISTING CONDITIONS

EXISTING SITE DEVELOPMENT

The project site fronts Main Street (MA Route 28) to the West. Under existing conditions, the project site is developed with an approximately 3,070 ± SF house with associated accessory structures, parking facilities, pool and utility connections. The site is accessed via one (1) full movement driveway off Main Street. There is an existing bordering vegetated wetland on the northeast corner of the project site that captures all runoff within the existing developed area. The entirety of the existing structures, associated parking area, and utility connections will be removed to accommodate the proposed development. An Aerial Map depicting the existing site conditions can be found in **APPENDIX A**.

EXISTING TOPOGRAPHY

The high point of the project site is 125.0' along the southern property line near Francis Drive. Runoff will sheet flow north from the high point near Francis drive, across site, and discharge to the onsite wetlands. Another high point of 112.5' exists at the western edge of the project site along Main Street, runoff from this point, similarly, will

sheet flow across site and discharge to the wetlands. No runoff from the project site enters the State Highway Layout. Grades onsite generally range from 2-7% within the previously developed area and increases to 30-35% as it approaches the onsite wetlands to the Northeast.

PROJECT SITE SOILS

Soil mapping was obtained from the National Resource Conservation Service (NRCS) for the project site and immediate area. Generally, the project site is underlain with one major soil group: Sandy Loam (SL). Overall, the soils are well drained and runoff flows overland northeast to the on-site wetlands. The table below provides a summary of soils for the project site:

TABLE 1: NRCS SOIL MAPPING RESULTS

Soil Unit Code	Soil Description	Approximate Project Coverage	Drainage Class	Hydrologic Soil Group
73B	Whitman Fine Sandy Loam	61.3%	Very Poorly Drained	D
631C	Charlton-Urban Land-Hollis Complex	28.5%	Well Drained	A
655	Udorthents	5.9%	NS	D*
305C	Paxton Fine Sandy Loam	3.8%	Well Drained	C
629C	Canton-Charlton-Urban Land Complex	0.5%	Well Drained	A

*629C does not have a pre-determined hydraulic soil group. As such, these soils are analyzed as HSG D for a conservative analysis.

Additional information regarding the NRCS soil mapping can be found in **APPENDIX B**.

A "Preliminary Stormwater Management Area Evaluation" was performed by Whitestone Associates (report dated March 14, 2025), which included 4 Test Pits, 3 of which included infiltration testing. The soil conditions encountered within the subsurface tests conducted by Whitestone consisted of the following generalized strata in order of increasing depth. *Records of Subsurface Exploration* are provided in Appendix A.

Surface Cover Materials: The test pits encountered 3.0 inches to 5.0 inches of topsoil at the ground surface. In test pits TP-2 and TP-4, the topsoil was underlain by 10 inches and 19 inches, respectively, of subsoil with roots.

Existing Fill: Beneath the surface cover materials, test pits TP-1 and TP-3 encountered existing fill, consisting of gray to brown, silty sand with gravel to poorly graded sand with silt and gravel, cobbles, boulders. The existing fill extended to depths of 6.5 fbgs and 3.5 fbgs in test pits TP-1 and TP-3, respectively. In test pit TP-1, the existing fill was underlain by 6.0 inches of former topsoil and 6.0 inches of former subsoil with roots. In test pit TP-3, the existing fill was underlain by 6.0 inches of former topsoil.

Glacial Till: Beneath the surface cover materials or former topsoil/subsoil, the test pits encountered glacial till, consisting of brown, silty sand with gravel (USCS: SM) or silty gravel with sand (USCS: GM), cobbles, boulders. The test pits were terminated in the glacial till at a depth of 10 fbgs.

Groundwater: Groundwater was encountered in only test pit TP-2 during the exploration at a depth of 10 fbgs. As noted above, no indications of ESGWH were observed in the test pits. Groundwater levels should be expected to fluctuate seasonally and following periods of precipitation.

WATERSHED / RECEIVING WATERS – TMDL DESIGNATION

Under existing conditions, the site drains to the onsite bordering vegetated wetlands to the northeast of the project site that ultimately discharges to Saugus River (State Waterbody ID: MA93-94). The watershed for the development is part of the Headwaters Saugus River Watershed (State Watershed ID Designation: 010900010401) as defined by the United States Environmental Protection Agency for Community Waterway Mapping. Per the Massachusetts Year 2022 Integrated List of Waters prepared by the Massachusetts Department of Environmental Protection, Saugus River is identified as an impaired water for algae, bacteria and other microbes, degraded habitat, low oxygen, murky water, and nitrogen and/or phosphorus.

EXISTING ENVIRONMENTAL INVENTORY

Based on the effective FEMA flood insurance rate mapping (FEMA Map #25017C311E issued June 4th, 2010), the entirety of the site lies within flood zone x, an area with minimal flood hazard. The FEMA Map can be found in **APPENDIX A** of this Report.

There are state (MassDEP) regulated freshwater wetlands within the project site that are subject to the Wetlands Protection Act Regulations (310 CMR). As there are regulated wetlands within the project site, the limits of the areas and associated Buffer Zones are shown on the Site Plans prepared by Stonefield in conjunction with this Report. Per the records of natural communities maintained in the National Heritage & Endangered Species Program (NHESP) database, there are no records of endangered or threatened species sightings or suitable habitats located within the vicinity of the proposed improvements.

3.0 PROPOSED CONDITIONS

PROPOSED SITE DEVELOPMENT

The proposed development will consist of a 14,058 square foot child daycare facility. Additional improvements include an off-street parking facility, lighting, landscaping, child play area, utility services and stormwater management infrastructure. The site will be accessed via one (1) full movement driveway off of Main Street. Refer to **APPENDIX A** for a half-size Overall Site Plan depicting the proposed project improvements.

PROPOSED TOPOGRAPHY

Project site topography and drainage patterns will generally remain similar to existing conditions; however, due to the need for more commercially friendly, ADA compliant grades, the previously developed area has been widened and flattened. A combination of extended curbing and retaining/landscape walls will be implemented through the project to make up for the change in grades.

ANTICIPATED ENVIRONMENTAL INVENTORY IMPACTS

The proposed development will not disturb land within the 25' wetland buffer. The Township will remain apprised of the MassDEP permitting status as the project moves forward.

4.0 STORMWATER MANAGEMENT METHODOLOGY & PARAMETERS

HYDROLOGIC METHODOLOGY

The analysis program "HydroCAD" Version 10.0 by HydroCAD Software Solutions was utilized to calculate and plot the runoff hydrographs. The program incorporates the time of concentration, C values, rainfall data, and project drainage areas to calculate the runoff characteristics. The existing and proposed drainage areas have been analyzed utilizing Intensity-Duration-Frequency data obtained from NOAA for the project area; specifics of the rainfall distribution can be found in **APPENDIX C.** Additional key variables utilized in the analysis include:

TABLE 2: HYDROCAD DESIGN VARIABLES

Variable	Input	Variable	Input
Runoff Calculation Method	SCS TR-20	NRCS Rainfall Frequency Data Set	Middlesex
Pervious/Impervious CN Calculations	Separate	Storm Intervals (Year Events)	2, 10, 25, 100
Stage-Storage Relationship	Dynamic	Storm Duration	24 Hours
Minimum time of concentration	6 minutes	Storm Curve	NOAA D

Additional information regarding the hydrologic calculations can be found in **APPENDIX C**.

5.0 STORMWATER ANALYSIS

EXISTING DRAINAGE AREAS

Under current conditions, the project site is comprised of three (3) drainage areas discharging to three (3) Points of Interest (POI-1, POI-2, POI-3). The existing bordering vegetated wetlands located in the northeast corner of the project site are designated as POI-1 and comprised of drainage area EX-1. EX-1 receives runoff via sheet flow from the majority of the site, east of the existing driveway. The abutting properties to the south have been designated

as POI-2 and is comprised of drainage area EX-2. EX-2 receives runoff from portions of the existing driveway as well as all grass and wooded areas south of the driveway. The abutting properties to the north have been designated as POI-3 and is comprised EX-3. EX-3 is comprised of portions of the existing driveway as well as all grassed and wooded areas North of the existing driveway. See below for a short summary of the drainage areas:

TABLE 3: SUMMARY OF EXISTING DRAINAGE AREA

Drainage Area	Description	Area Extents	Impervious Area	Time of Concentration
EX-1 (POI-1)	Existing Runoff to Wetlands	60,862 SF	5,544 SF	11.2 Minutes
EX-2 (POI-2)	Existing Runoff to 881 Main Street	15,893 SF	3,525 SF	6.0 Minutes*
EX-3 (POI-3)	Existing Runoff to 891 Main Street	7,525 SF	2,478 SF	6.0 Minutes*
Total	--	84,280 SF	11,547 SF	--

***The minimum time of concentration was utilized due to the high level of impervious coverage / land disturbance and proximity to existing and proposed stormwater pipe conveyance systems**

Existing drainage areas were delineated based on field surveying data. Hydrologic calculations and parameters for each drainage area can be found in **APPENDIX C**; specific drainage area delineations and land cover can be found in **APPENDIX E.**

PROPOSED DRAINAGE AREAS

Under proposed conditions, the general drainage patterns and ultimate point of interest will be maintained. The intent behind the proposed delineations is to reduce the amount of direct runoff to the onsite bordering vegetated wetlands. The diverted land from drainage area P-1B is sent to various stormwater management features to meet the Massachusetts Department of Environmental Protection Stormwater Management Standards as outlined in the next Report section. See below for a short summary of each area:

TABLE 5: SUMMARY OF PROPOSED DRAINAGE AREAS

Drainage Area	Description	Area Extents	Impervious Area	Time of Concentration
P-1A	Proposed Drainage Direct to POI-1	46,041 SF	596 SF	6.6 Minutes
P-1B	Proposed Drainage to B-1	30,470 SF	29,878 SF	6.0 Minutes*
POI-1	Ultimate Point of Interest: Onsite Bordering Vegetated Wetlands	76,511 SF	30,474 SF	--
P-2 (POI-2)	Ultimate Point of Interest: 881 Main Street	5,274 SF	554 SF	6.0 Minutes*
P-3 (POI-3)	Ultimate Point of Interest: 891 Main Street	2,495 SF	0 SF	6.0 Minutes*
Total	--	84,280 SF	31,028 SF	--

***The minimum time of concentration was utilized due to the high level of impervious coverage / land disturbance and proximity to existing and proposed stormwater pipe conveyance systems**

All proposed drainage areas were delineated based on the proposed grading design overlain on field survey data data. Hydrologic calculations and parameters for each drainage area can be found in **APPENDIX C**; specific drainage area delineations and land cover can be found in **APPENDIX E.**

STORMWATER MANAGEMENT DESIGN PARAMETERS

The extent of development proposes to disturb over one (1) acre of the existing site; as such, it is subject to all Stormwater Standards as defined in the Town Ordinances and the Massachusetts Stormwater Handbook Volume 1. See below for a summary of each design parameter and compliance requirements:

TABLE 6: STORMWATER DESIGN STANDARDS SUMMARY

Design Parameter	Design Target for Compliance
Standard 1: *Stormwater Discharge*	Demonstrate that no new stormwater conveyances will discharge untreated stormwater directly to or cause erosion in wetlands or waters.
Standard 2: *Stormwater Quantity*	Demonstrate through hydrologic and hydraulic analysis that for stormwater leaving the site, post-construction runoff hydrographs for the 2-, 10-, and 100-year storm events do not exceed, at any point in time, the pre-construction runoff hydrographs for the same storm events.
Standard 3: *Groundwater Recharge*	Demonstrate through hydrologic and hydraulic analysis that the site and its stormwater management measure shall approximate average annual pre-construction groundwater recharge volume for the site.
Standard 4: *Stormwater Quality*	Stormwater management measures shall be designed to reduce the post-construction load of total suspended solids (TSS) in stormwater runoff generated from the water quality design storm by 80 percent of the anticipated load from existing and proposed impervious coverage onsite. In accordance with Town Stormwater Regulations section 4.1.3.4., all new development sites shall be designed to meet an average annual pollutant removal equivalent to 90% of the average annual load of Total Suspended Solids (TSS) related to the total post-construction impervious area on the site And 60% of the average annual load of Total Phosphorus (TP) related to the total post-construction impervious surface area on the site.
Standard 5: *High Pollutant Loads*	Demonstrate that the discharge of stormwater runoff from land uses with higher potential pollutant loads will be eliminated or reduced through complete protection from potential runoff or use of a specific structural BMP.
Standard 6: *Critical Areas*	The project does not lie within Zone II Areas, Interim Wellhead Protection Areas, Outstanding Resource Waters, Special Resources, Zone I, or Zone A and therefore is **exempt** from meeting Standard 6 as it is not applicable to the development.

STANDARD 1 – STORMWATER DISCHARGE

The proposed stormwater conveyance system for POI-1 discharges directly to the onsite bordering vegetated wetlands and is therefore subject to water treatment standards. The level of treatment is outlined under the Standard 4 section in this Report as the development impacts a critical area.

STANDARD 2 – STORMWATER QUANTITY

A series of SC-800 StormTech chambers in conjunction with an outlet control structure are used to attenuate peak stormwater runoff rates to the mandated regulatory levels. The tables below summarize the various drainage areas in relation to flow rates and runoff volume during regulatory storm events:

TABLE 7: SUMMARY OF EXISTING DRAINAGE AREA FLOW RATES

Drainage Area	2-Year Flow Rate	10-Year Flow Rate	25-Year Flow Rate	100-Year Flow Rate
POI-1 (E-1)	1.50 CFS	3.44 CFS	4.76 CFS	6.86 CFS
POI-2 (E-2)	0.31 CFS	0.77 CFS	1.12 CFS	1.69 CFS
POI-3 (E-3)	0.25 CFS	0.52 CFS	0.71 CFS	1.01 CFS

TABLE 8: SUMMARY OF PROPOSED DRAINAGE AREA FLOW RATES

Drainage Area	2-Year Flow Rate	10-Year Flow Rate	25-Year Flow Rate	100-Year Flow Rate
P-1A (Undetained to POI)	1.43 CFS	3.24 CFS	4.45 CFS	6.35 CFS
P-1B (To Infiltration System)	2.16 CFS	3.45 CFS	4.25 CFS	5.48 CFS
POI-1 (P-1)	1.43 CFS	3.24 CFS	4.45 CFS	6.37 CFS
POI-2 (P-2)	0.04 CFS	0.09 CFS	0.17 CFS	0.31 CFS
POI-3 (P-3)	0.04 CFS	0.13 CFS	0.19 CFS	0.28 CFS

Under post-development conditions the runoff flow rates and volumes are reduced to all of the ultimate points of interest. Runoff is diverted from the majority of the developed area (P-1B) to the on-site stormwater management system for runoff attenuation and water quality treatment. The table below outlines the regulatory compliance parameters for runoff quantity on the project site:

TABLE 9: STORMWATER RUNOFF QUANTITY COMPLIANCE SUMMARY (POI-1)

Rainfall Event	Existing Flow Rate	Proposed Flow Rate	Proposed % Reduction
2-Year Storm	1.50 CFS	1.43 CFS	4.67%
10-Year Storm	3.44 CFS	3.24 CFS	5.81%
25-Year Storm	4.76 CFS	4.45 CFS	6.51%
100-Year Storm	6.86 CFS	6.37 CFS	7.14%

TABLE 10: STORMWATER RUNOFF QUANTITY COMPLIANCE SUMMARY (POI-2)

Rainfall Event	Existing Flow Rate	Proposed Flow Rate	Proposed % Reduction
2-Year Storm	0.31 CFS	0.04 CFS	87.10%
10-Year Storm	0.77 CFS	0.09 CFS	88.31%
25-Year Storm	1.12 CFS	0.17 CFS	84.82%
100-Year Storm	1.69 CFS	0.31 CFS	81.66%

TABLE 9: STORMWATER RUNOFF QUANTITY COMPLIANCE SUMMARY (POI-3)

Rainfall Event	Existing Flow Rate	Proposed Flow Rate	Proposed % Reduction
2-Year Storm	0.25 CFS	0.04 CFS	84.00%
10-Year Storm	0.52 CFS	0.13 CFS	75.00%
25-Year Storm	0.71 CFS	0.19 CFS	73.24%
100-Year Storm	1.01 CFS	0.28 CFS	72.28%

The proposed SC-800 StormTech chambers in conjunction with an outlet control structure provide sufficient flow rate attenuation to ensure that no adverse impacts are anticipated downstream of the project site. Detailed hydrologic calculations for each drainage area can be found in **APPENDIX C**.

STANDARD 3 – GROUNDWATER RECHARGE

Groundwater recharge is required as the infiltration rates of the soils were found to be greater than 0.17 in/hour and there are no contaminated soils on or within the vicinity of the site. Groundwater recharge is met through the implementation of the aforementioned subsurface infiltration system which provides a total recharge volume of 5,168 CF. There is a separation of ±4.0 feet between the bottom of the infiltration structure and the seasonal high groundwater table, therefore a groundwater mounding analysis was not required.

The required recharge volume was calculated by multiplying the total impervious area, 31,028 SF, by 0.60 inches due to the hydrologic rating of A which yields a required recharge volume of 1,551.4 CF. The proposed BMP exceeds this requirement by 3,617 CF and therefore meets Standard 3 requirements. The dynamic method was utilized and can be found in **APPENDIX C.**

STANDARD 4 – STORMWATER QUALITY CONTROL

For all developments, a removal of 80% of the average annual post-construction load of Total Suspended Solids (TSS) is required.

Compliance with stormwater design standard 4, runoff quality requirements, will be accomplished through the implementation of deep sump and hooded catch basins (25% TSS removal rate), ADS isolator Row (25% TSS removal rate), and Infiltration Basin (80% TSS removal rate), which when utilized in series provide a combined 89% TSS removal rate.

The proposed treatment design will exceed the regulatory requirements for stormwater runoff quality set in Volume 1, Chapter 1 of the Massachusetts Stormwater Handbook and ensure that runoff discharged into the unnamed tributary will not have any adverse effects on downstream waterways and environs. The MassDEP TSS removal spreadsheet can be found in **APPENDIX C.**

Per the Town of Reading Stormwater Regulations, all new development sites shall be designed to meet an average annual pollutant removal equivalent to 90% of the average annual load of Total Suspended Solids (TSS) related to the total post-construction impervious area on the site AND 60% of the average annual load of Total Phosphorus (TP) related to the total post-construction impervious surface area on the site.

Compliance with the Towns stormwater runoff quality requirements will be demonstrated through the method outlined in section 4.1.4.4.2 of the Town or Reading Stormwater Regulations: "Retaining the volume of runoff equivalent to, or greater than, one (1.0) inch multiplied by the total post-construction impervious surface area on the new development site".

The required volume to be retained onsite was calculated by multiplying the total area of impervious surface, 31,028 SF, by one (1) inch which yields a volume of 2,586 CF. The proposed BMP exceeds this requirement by 2,582 CF and therefore meets the local pollutant removal requirements.

STANDARD 5 – HIGH POLLUTANT LOADS

The proposed use for the development is a child day care facility which is not considered a Land Use with Higher Potential Pollutant Loads (LUHPPL) by the MassDEP and therefore is exempt from Standard 5 requirements.

STANDARD 6 – CRITICAL AREAS

The proposed redevelopment area does not lie in or discharge to a Zone II Interim Wellhead Protection Area, Outstanding Resources Waters, Special Resource Waters or other critical area as defined by the Massachusetts Stormwater Handbook Volume 1, and therefore is exempt from Standard 6 requirements.

STANDARD 7 – REDEVELOPMENT PROJECT

Since the site has a net increase of impervious cover by 19,481 SF (0.45 AC), the site is not determined to be a redevelopment project and must comply with all Standards as defined in the Massachusetts Department of Environmental Protection Stormwater Management Standards.

STANDARD 8 – EROSION, SEDIMENTATION, AND POLLUTION PREVENTION PLAN

A Soil Erosion & Sediment Control Plan has been prepared in accordance with the latest edition of Volume 2 of the Massachusetts Stormwater Handbook and the Erosion and Sedimentation Control Guidelines. This plan can be found within the Land Development Plans prepared by Stonefield Engineering & Design in conjunction with this Report. Proposed temporary measures during construction include but are not limited to silt fencing, stabilized construction entrance, inlet filters, silt sock, street sweeping, and temporary seeding for soil stabilization. No land disturbance will occur until certification and permits have been obtained. Details for all proposed control measures have also been provided.

STANDARD 9 – STORMWATER FACILITY OPERATIONS AND MAINTENANCE

A Stormwater Operations & Maintenance Manual has been included in this Pollution Prevention Plan. Any necessary easements or covenants associated with the stormwater improvements will be recorded prior to the start of construction.

STANDARD 10 – ILLICIT DISCHARGES

The proposed stormwater management system discharges are entirely comprised of stormwater. Firefighting, water line flushing, landscape irrigation, uncontaminated groundwater, potable water sources, foundation drains, air conditioning condensation, footing drains, and water for street washing are prohibited to discharge onsite and will therefore not result in an illicit discharge.

6.0 EROSION, SEDIMENTATION, AND POLLUTION PREVENTION

TEMPORARY EROSION AND SEDIMENT CONTROL MEASURES

Under proposed conditions, erosion and sediment controls will be utilized to limit the potential effects due to construction of the proposed development. Refer to the Soil Erosion and Sediment Control Plans in **APPENDIX A** of this report. The following includes the temporary sediment controls proposed for this project:

Construction Entrance – To provide a stable entrance and exit from a construction site and keep mud and sediment off public roads, a temporary stone-stabilized pad located at points of vehicular ingress and egress on a construction site. If the action of the vehicle traveling over the gravel pad is not sufficient to remove the majority

of the mud, then the tires must be washed before the vehicle enters a public road. If washing is used, provisions must be made to intercept the wash water and trap sediment before it is carried off-site.

Dust Control – To reduce surface and air movement of dust from exposed soil surfaces during land disturbing, demolition, and construction activities, preventative measures must be taken. Sprinkling or other approved methods must be used to reduce dust generated on the site. Dust control shall be provided by the general contractor to a degree acceptable to the owner/operator, and in compliance with the applicable local and state dust control requirements.

Inlet Protection – A sediment filter or an excavated impounding area around a storm drain, drop inlet, or curb inlet must be used to prevent sediment from entering storm drainage systems prior to permanent stabilization of the disturbed area. During construction, the inlet protection measures shall be replaced as needed to ensure proper function of the structure.

Preserving Natural Vegetation – Natural vegetation should be preserved whenever possible, but especially on steep slopes, near perennial and intermittent watercourses or swales, and on building sites in wooded areas. Clearly flag or mark areas around trees that are to be saved. It is preferable to keep ground disturbance away from the trees at least as far out as the dripline. If possible, place a barrier/fencing around the trees. Inspect flagged areas regularly to make sure flagging has not been removed. If tree roots have been exposed or injured, re-cover and/or seal them.

Sediment Fence – A temporary sediment barrier consisting of a filter fabric stretched across and attached to supporting posts and entrenched must be established along the perimeter of areas to be disturbed before initiation of and during construction. The sediment fence is constructed of stakes and synthetic filter fabric with a rigid wire fence backing where necessary for support. Sediment fence can be purchased with pockets presewn to accept use of steel fence posts. Silt fences should be inspected immediately after each rainfall and at least daily during prolonged rainfall. Repair as necessary. If the fabric tears, decomposes, or in any way becomes ineffective, replace it immediately. Replace burlap used in sediment fences after no more than 60 days.

Compost Filter Sock – A temporary tubular mesh sleeve that contains compost of a well-shredded organic material for a linear treatment that provides stormwater pollutant removal through filtration of pollutants from overland flow. The compost filter sock is placed at the bottom of the silt fence and should be repaired as necessary. Filter socks shall be inspected immediately after each rainfall and at least daily during prolonged rainfall as well as at least once weekly. If the fabric tears, decomposes, or in any way becomes ineffective, replace it immediately. Filter socks shall be replaced after 6 months. Upon completion of temporary control, the sock may be cut open and the mulch spread as a soil supplement.

Temporary Soil Stockpile – Locate the topsoil stockpile so that it does not interfere with work on the site. Side slopes of the stockpile should not exceed 2:1. Surround all topsoil stockpiles with an interceptor dike with gravel outlet and silt fence. Either seed or cover stockpiles with clear plastic or other mulching materials within 7 days of the formation of the stockpile. Topsoil should not be placed while in a frozen or muddy condition, when the subgrade is excessively wet, or when conditions exist that may otherwise be detrimental to proper grading or proposed sodding or seeding. Do not place topsoil on slopes steeper than 2:1. Maintain protective cover on stockpiles until needed.

PERMANENT EROSION AND SEDIMENT CONTROL MEASURES

Permanent Seeding – Permanent seeding of grass and planting trees and shrubs shall be established on any graded or cleared area where long-lived plant cover is needed to stabilize the soil in accordance with the accompanying plans. Areas which will not be brought to final grade for a year or more shall also be seeded permanently. Inspect seeded areas for failure and make necessary repairs and reseed immediately. Conduct or follow-up survey after one year and replace failed plants where necessary.

Riprap – A permanent, erosion-resistant ground cover of large, loose, angular stone must be installed in accordance with the accompanying plans to protect slopes, streambanks, channels, or areas subject to erosion by wave action. Riprap should be checked at least annually and after every major storm for displaced stones, slumping, and erosion at edges, especially downstream or downslope. If the riprap has been damaged, it should be repaired immediately before further damage can take place.

CONSTRUCTION PHASING PLAN AND SEQUENCE OF OPERATIONS

The Soil Erosion & Sediment Control Plans have been phased in order to effectively control erosion and sedimentation and minimize impacts due to seasonal changes. Please refer to **APPENDIX A** for half size Soil Erosion & Sediment Control Plans for detailed construction sequencing.

FINAL SITE STABILIZATION

Recommended practices for final surface stabilization include surface roughening, terrace, topsoiling, permanent seeding, sodding, trees and shrub planting, mulching, and riprap. The stabilization measures shall be in conformance with the *Massachusetts Erosion and Sediment Control Guidelines for Urban and Suburban Areas*, latest edition.

7.0 CONCLUSIONS

As demonstrated in this Report, the increase in runoff flow rate and volume generated by the proposed development will be satisfactorily mitigated by the introduction of an on-site stormwater conveyance system, a subsurface infiltration system, and an outlet control structure and on-site stormwater conveyance system. Runoff

water quality will be impacted by the increase in impervious surfaces and a series of street sweeping, deep sump hooded catch basins, ADS isolator row and a subsurface infiltration system will provide treatment to remove total suspended solids to a satisfactory regulatory level. Groundwater recharge also will be impacted due to the loss of pervious surfaces and a subsurface infiltration system will provide groundwater recharge equal to or greater than recharge under existing conditions.

The proposed project complies with all applicable stormwater management regulations and standards. As such, the project is not anticipated to have any adverse drainage impacts on neighboring properties, downstream watercourses, or adjoining conveyance systems.

8.0 REFERENCES

1. Massachusetts Stormwater Handbook and Stormwater Standards, last amended January 2, 2008

   https://www.mass.gov/guides/massachusetts-stormwater-handbook-and-stormwater-standards

2. Massachusetts Complete Erosion and Sedimentation Control Guidelines for Urban and Suburban Areas: A Guide for Planners, Designers, and Municipal Officials, last amended May 2003

   https://www.mass.gov/doc/complete-erosion-and-sedimentation-control-guidelines-a-guide-for-planners-designers-and/download

3. Town of Reading Zoning Bylaw, last amended April, 2022

   https://www.readingma.gov/DocumentCenter/View/2242/Zoning-Bylaw-PDF

4. Town of Reading Stormwater Management and Erosion Control Regulations, last amended December 6, 2021

   https://www.readingma.gov/DocumentCenter/View/2280/Stormwater-Regulations-PDF

APPENDIX A
PROJECT FIGURES

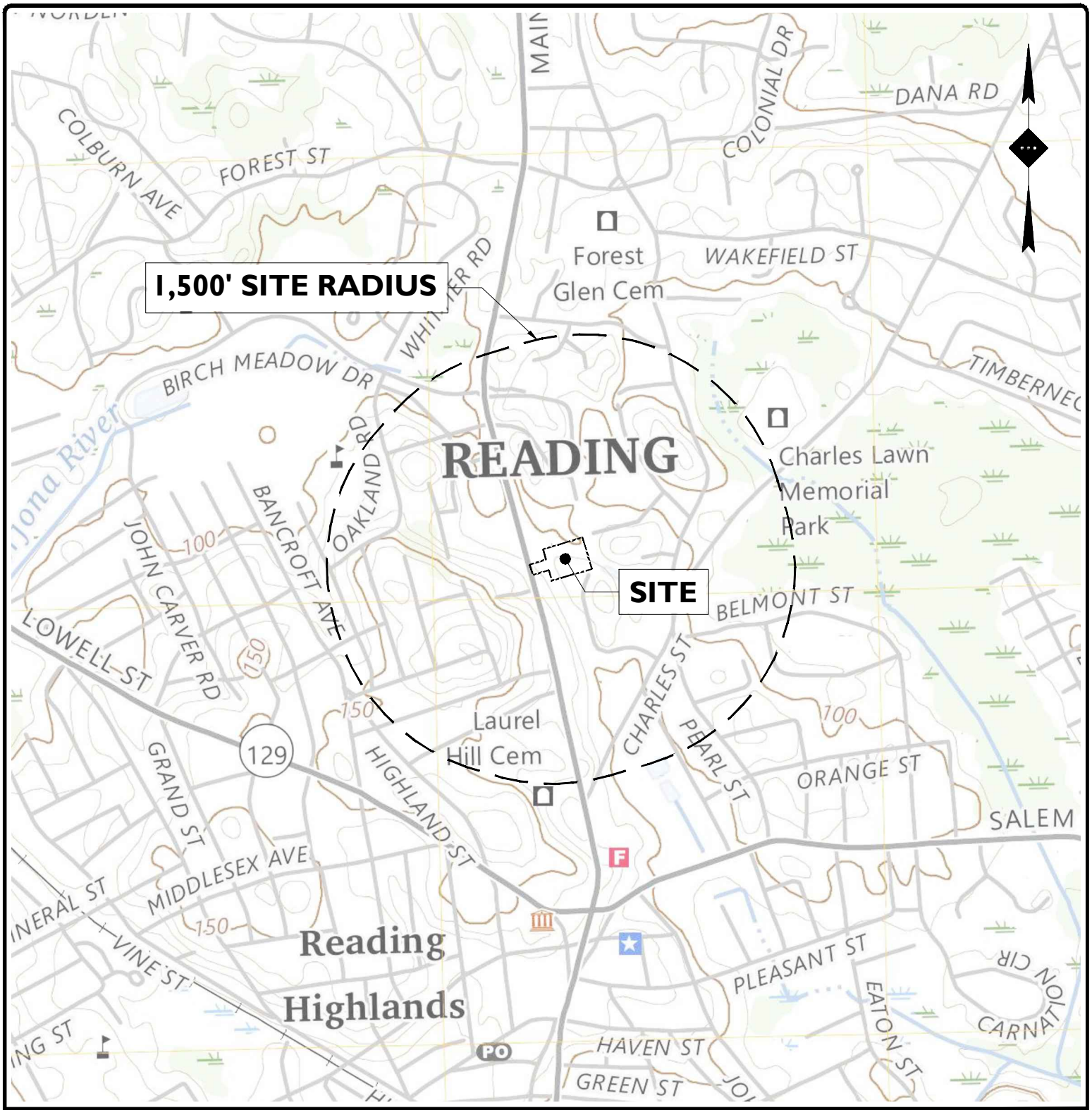
INVENTORY

FIGURE 1: USGS LOCATION MAP

FIGURE 2: AERIAL MAP

FIGURE 3: TAX & ZONING MAP

FIGURE 4: FEMA MAP



USGS QUAD MAP

1000' 0' 1000' 2000'

GRAPHIC SCALE IN FEET

1" = 1000'

SOURCE: USGS READING QUADRANGLE MASSACHUSETTS 7.5-MINUTE SERIES

PRIMROSE SCHOOLS FRANCHISING COMPANY

PROPOSED CHILD DAY CARE FACILITY

PARCEL ID: 28-113
885 MAIN STREET, TOWN OF READING
MIDDLESEX COUNTY, MASSACHUSETTS

DRAWN BY:	SCL
CHECKED BY:	JHK
DATE:	02/27/2025
SCALE:	1" = 1000'
PROJECT ID:	BOS-240115

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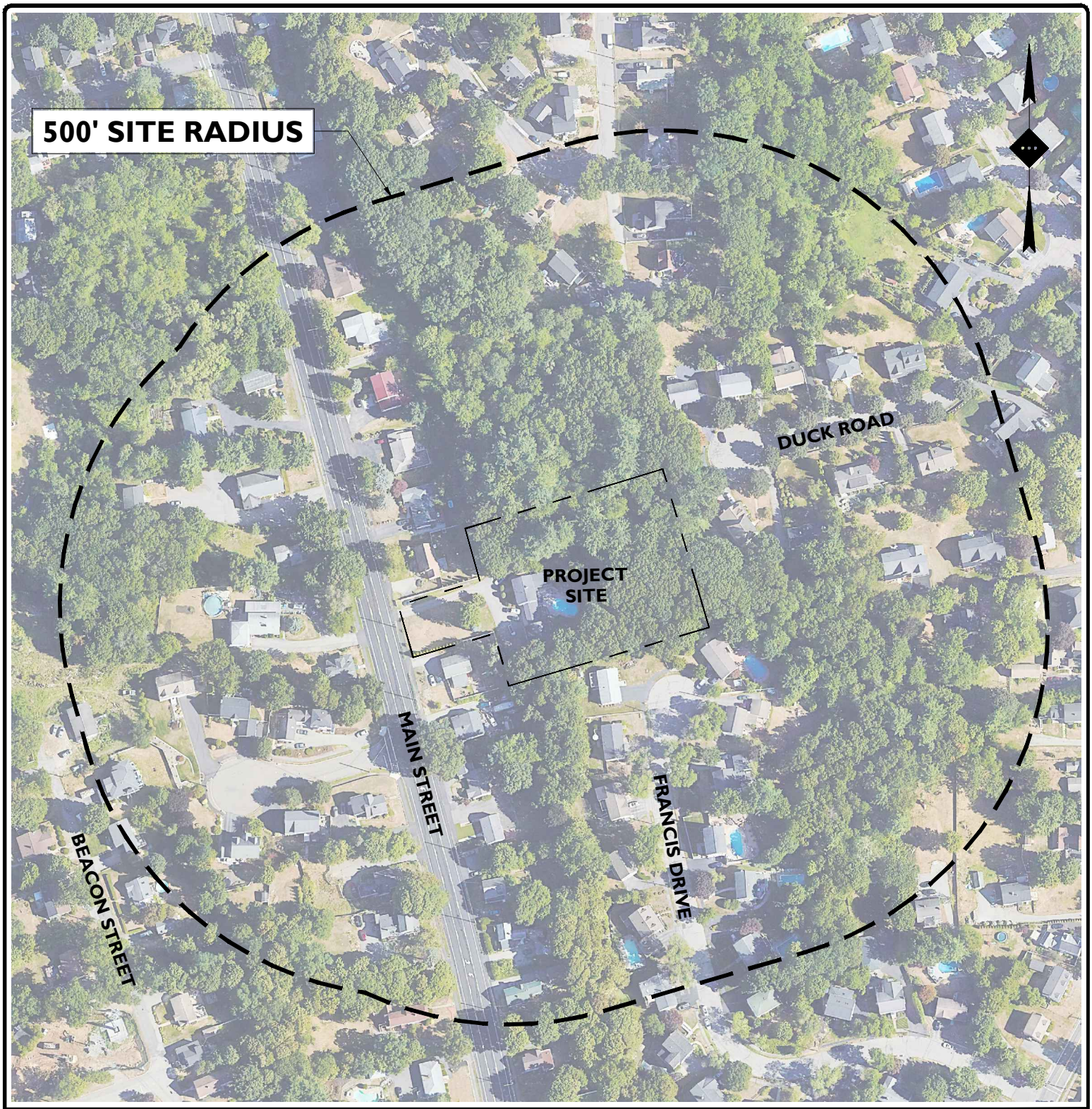

AERIAL MAP

200' 0' 200' 400'

GRAPHIC SCALE IN FEET

1" = 200'

SOURCE: GOOGLE EARTH IMAGE, DATED 06/13/2024

DRAWN BY:	SCL
CHECKED BY:	JHK
DATE:	02/27/2025
SCALE:	1" = 200'
PROJECT ID:	BOS-240115

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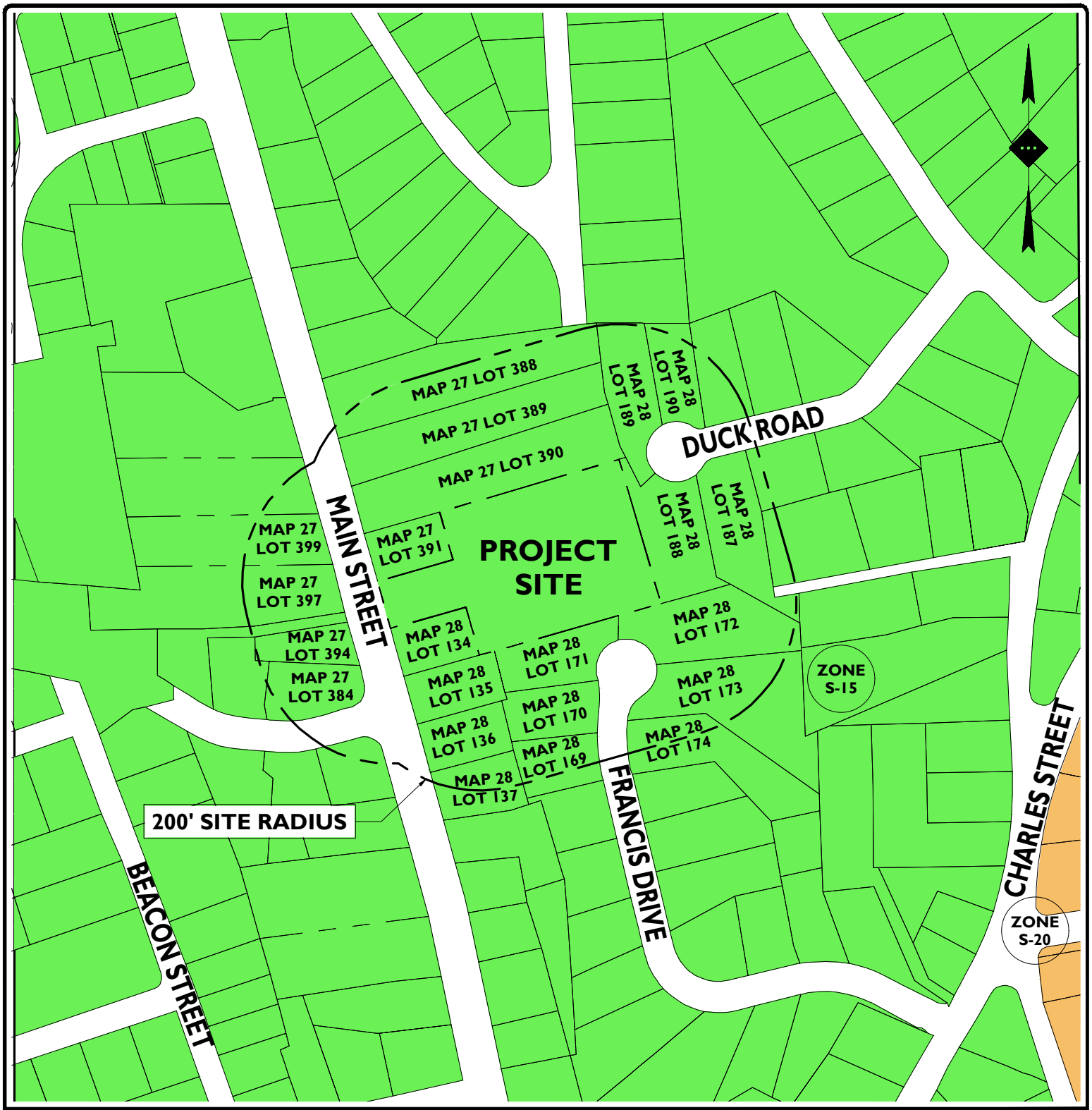

TAX & ZONING MAP

200' 0' 200' 400'

GRAPHIC SCALE IN FEET

1" = 200'

SOURCE: TOWN OF READING ZONING MAP DATED 04/27/2025 & TOWN OF READING MAPGEO

PRIMROSE SCHOOLS FRANCHISING COMPANY

PROPOSED CHILD DAY CARE FACILITY

PARCEL ID: 28-113
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MIDDLESEX COUNTY, MASSACHUSETTS

DRAWN BY:	SCL
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DATE:	02/27/2025
SCALE:	1" = 200'
PROJECT ID:	BOS-240115

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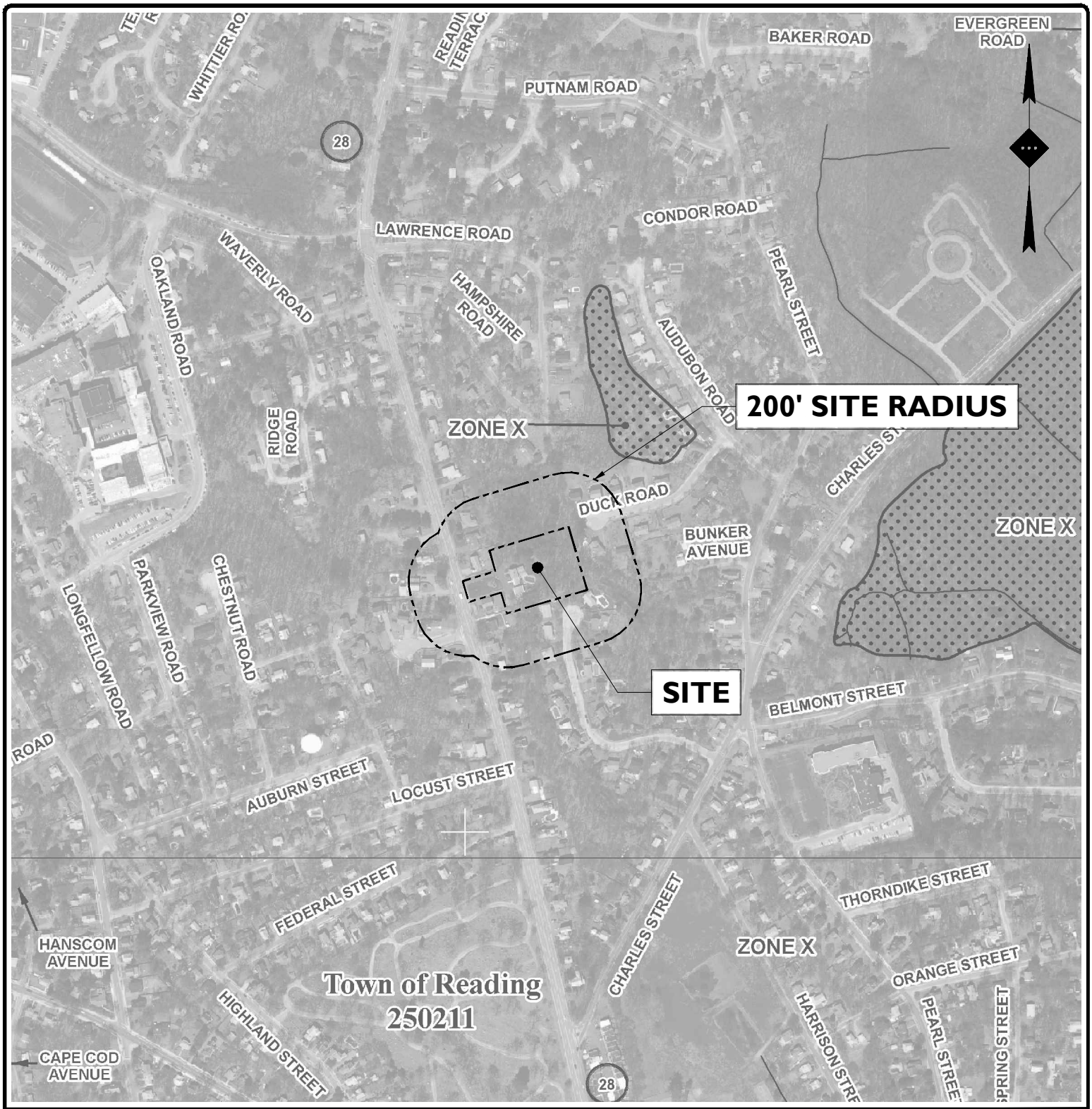

FEMA FLOOD MAP

500' 0' 500' 1000'

GRAPHIC SCALE IN FEET

1" = 500'

SOURCE: FEMA FLOOD MAP NUMBER 25017C0311E & 25017C0313E

PRIMROSE SCHOOLS FRANCHISING COMPANY

PROPOSED CHILD DAY CARE FACILITY

PARCEL ID: 28-113
885 MAIN STREET, TOWN OF READING
MIDDLESEX COUNTY, MASSACHUSETTS

DRAWN BY:	SCL
CHECKED BY:	JHK
DATE:	02/27/2025
SCALE:	1" = 500'
PROJECT ID:	BOS-240115

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APPENDIX B
PROJECT SOILS

INVENTORY

B-1: NRCS SOILS REPORT

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

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

Custom Soil Resource Report for Middlesex County, Massachusetts

February 25, 2025

Custom Soil Resource Report
Soil Map

Map Scale: 1:934 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 10 20 40 60

Feet
0 45 90 180 270

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

MAP LEGEND

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

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

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

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

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

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

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

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

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

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

Soil Survey Area: Middlesex County, Massachusetts
Survey Area Data: Version 24, Aug 27, 2024

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

Date(s) aerial images were photographed: Mar 1, 2023—Sep 1, 2023

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
73B	Whitman fine sandy loam, 0 to 3 percent slopes, extremely stony	1.3	53.0%
305C	Paxton fine sandy loam, 8 to 15 percent slopes	0.1	3.8%
629C	Canton-Charlton-Urban land complex, 3 to 15 percent slopes	0.0	0.5%
631C	Charlton-Urban land-Hollis complex, 3 to 15 percent slopes, rocky	0.9	37.5%
655	Udorthents, wet substratum	0.1	5.2%
Totals for Area of Interest		**2.4**	**100.0%**

Map Unit Descriptions

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

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

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

was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

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

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

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

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

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

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

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

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

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

Middlesex County, Massachusetts

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

Map Unit Setting

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

Map Unit Composition

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

Description of Whitman, Extremely Stony

Setting

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

Typical profile

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

Properties and qualities

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

Interpretive groups

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

Minor Components

Ridgebury, extremely stony

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

Scarboro

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

Swansea

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

Woodbridge, extremely stony

Percent of map unit: 1 percent
Landform: Ground moraines, hills, drumlins
Landform position (two-dimensional): Summit, backslope, footslope
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

305C—Paxton fine sandy loam, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: 2w66y
Elevation: 0 to 1,320 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

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

Description of Paxton

Setting

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

Typical profile

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

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: 20 to 39 inches to densic material
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)
Depth to water table: About 18 to 37 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 4.1 inches)

Interpretive groups

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

Minor Components

Charlton

Percent of map unit: 7 percent
Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Woodbridge

Percent of map unit: 6 percent
Landform: Hills, drumlins, ground moraines
Landform position (two-dimensional): Summit, backslope, footslope
Landform position (three-dimensional): Side slope
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

Ridgebury

Percent of map unit: 2 percent
Landform: Drumlins, drainageways, depressions, ground moraines, hills
Landform position (two-dimensional): Footslope, toeslope
Landform position (three-dimensional): Head slope, base slope
Down-slope shape: Concave, linear
Across-slope shape: Concave, linear
Hydric soil rating: Yes

629C—Canton-Charlton-Urban land complex, 3 to 15 percent slopes

Map Unit Setting

National map unit symbol: 9959
Elevation: 0 to 1,000 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

Canton and similar soils: 40 percent
Charlton and similar soils: 30 percent
Urban land: 25 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Canton

Setting

Landform: Hills
Landform position (two-dimensional): Backslope, footslope
Landform position (three-dimensional): Side slope, base slope
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Friable loamy eolian deposits over friable sandy basal till derived from granite and gneiss

Typical profile

H1 - 0 to 8 inches: fine sandy loam
H2 - 8 to 21 inches: fine sandy loam
H3 - 21 to 65 inches: gravelly loamy sand

Properties and qualities

Slope: 3 to 15 percent
Depth to restrictive feature: 18 to 30 inches to strongly contrasting textural stratification
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches

Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 2.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: A
Ecological site: F144AY034CT - Well Drained Till Uplands
Hydric soil rating: No

Description of Charlton

Setting

Landform: Ground moraines, drumlins
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Friable loamy eolian deposits over friable loamy basal till derived from granite and gneiss

Typical profile

H1 - 0 to 5 inches: fine sandy loam
H2 - 5 to 22 inches: sandy loam
H3 - 22 to 65 inches: gravelly sandy loam

Properties and qualities

Slope: 3 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 7.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: A
Ecological site: F144AY034CT - Well Drained Till Uplands
Hydric soil rating: No

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

Minor Components

Scituate

Percent of map unit: 2 percent

Landform: Hillslopes, depressions
Landform position (two-dimensional): Summit, toeslope
Landform position (three-dimensional): Head slope, base slope
Down-slope shape: Linear
Across-slope shape: Concave
Hydric soil rating: No

Montauk

Percent of map unit: 2 percent
Landform: Hillslopes
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Head slope, nose slope
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Udorthents, loamy

Percent of map unit: 1 percent
Hydric soil rating: No

631C—Charlton-Urban land-Hollis complex, 3 to 15 percent slopes, rocky

Map Unit Setting

National map unit symbol: vr1g
Elevation: 0 to 1,000 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

Charlton and similar soils: 45 percent
Urban land: 35 percent
Hollis and similar soils: 10 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Charlton

Setting

Landform: Ground moraines, drumlins
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Friable loamy eolian deposits over friable loamy basal till derived from granite and gneiss

Typical profile

H1 - 0 to 5 inches: fine sandy loam
H2 - 5 to 22 inches: sandy loam
H3 - 22 to 65 inches: gravelly sandy loam

Properties and qualities

Slope: 3 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 7.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: A
Ecological site: F144AY034CT - Well Drained Till Uplands
Hydric soil rating: No

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

Description of Hollis

Setting

Landform: Hillslopes, ridges
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Friable, shallow loamy basal till over granite and gneiss

Typical profile

H1 - 0 to 2 inches: fine sandy loam
H2 - 2 to 14 inches: fine sandy loam
H3 - 14 to 18 inches: unweathered bedrock

Properties and qualities

Slope: 3 to 15 percent
Surface area covered with cobbles, stones or boulders: 9.0 percent
Depth to restrictive feature: 8 to 20 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None

Available water supply, 0 to 60 inches: Very low (about 2.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: D
Ecological site: F144AY033MA - Shallow Dry Till Uplands
Hydric soil rating: No

Minor Components

Canton

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

Udorthents, loamy

Percent of map unit: 2 percent
Hydric soil rating: No

Rock outcrop

Percent of map unit: 2 percent
Landform: Ledges
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Head slope
Down-slope shape: Concave
Across-slope shape: Concave

Scituate

Percent of map unit: 1 percent
Landform: Hillslopes, depressions
Landform position (two-dimensional): Summit, toeslope
Landform position (three-dimensional): Head slope, base slope
Down-slope shape: Linear
Across-slope shape: Concave
Hydric soil rating: No

Montauk

Percent of map unit: 1 percent
Landform: Hillslopes
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Head slope, nose slope
Down-slope shape: Convex
Across-slope shape: Convex
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: Depressions, bogs
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 C
HYDROLOGIC & HYDRAULIC CALCULATIONS

INVENTORY

APPENDIX C-1
TSS REMOVAL CALCULATIONS

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

Version 1, Automated: Mar. 4, 2008

Location: Basin B-1

TSS Removal Calculation Worksheet

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Deep Sump and Hooded Catch Basin	0.25	1.00	0.25	0.75
Isolator Row PLUS	0.25	0.75	0.19	0.56
Infiltration Basin	0.80	0.56	0.45	0.11
	0.00	0.11	0.00	0.11
	0.00	0.11	0.00	0.11

Total TSS Removal = 89%

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

Project: BOS-240115
Prepared By: AJD
Date: 6/26/2025

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

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

BMP Accounting and Tracking Tool (BATT) version

State	MASSACHUSETTS
Municipality	READING
Permit Type	Local
Permit Number	
Major Watershed	NORTH COAST
TP Load Reduction Target	60%
TN Load Reduction Target	N/A
TSS Load Reduction Target	90%

Table 1. Project Summary Credit for READING, MASSACHUSETTS

Project Type	Removed Phosphorus Load (lb/yr)	Removed Nitrogen Load (lb/yr)	Removed Sediment Load (lb/yr)
Structural	1.2	10.38	260.4
Non-Structural	0	0	0
Land Use Conversion	0	0	0
Total	1.2	10.38	260.4

Table 2. Structural Project Summary for READING, MASSACHUSETTS

Project ID	BMP Type	BMP Storage Capacity (ft^3)/ Filter Depth (in.)	Phosphorus BMP Efficiency (%)	Nitrogen BMP Efficiency (%)	Sediment BMP Efficiency (%)	Removed Phosphorus Load (lb/yr)	Removed Nitrogen Load (lb/yr)	Removed Sediment Load (lb/yr)	Impervious Area Treated (ac)	Runoff Depth (in.)
BOS-240115	INFILTRATION BASIN	5168	98.01	99.75	100	1.2	10.38	260.4	0.69	2.06

Developed by:

TETRA TECH
10306 Eaton Place, Suite 340
Fairfax, VA 22030

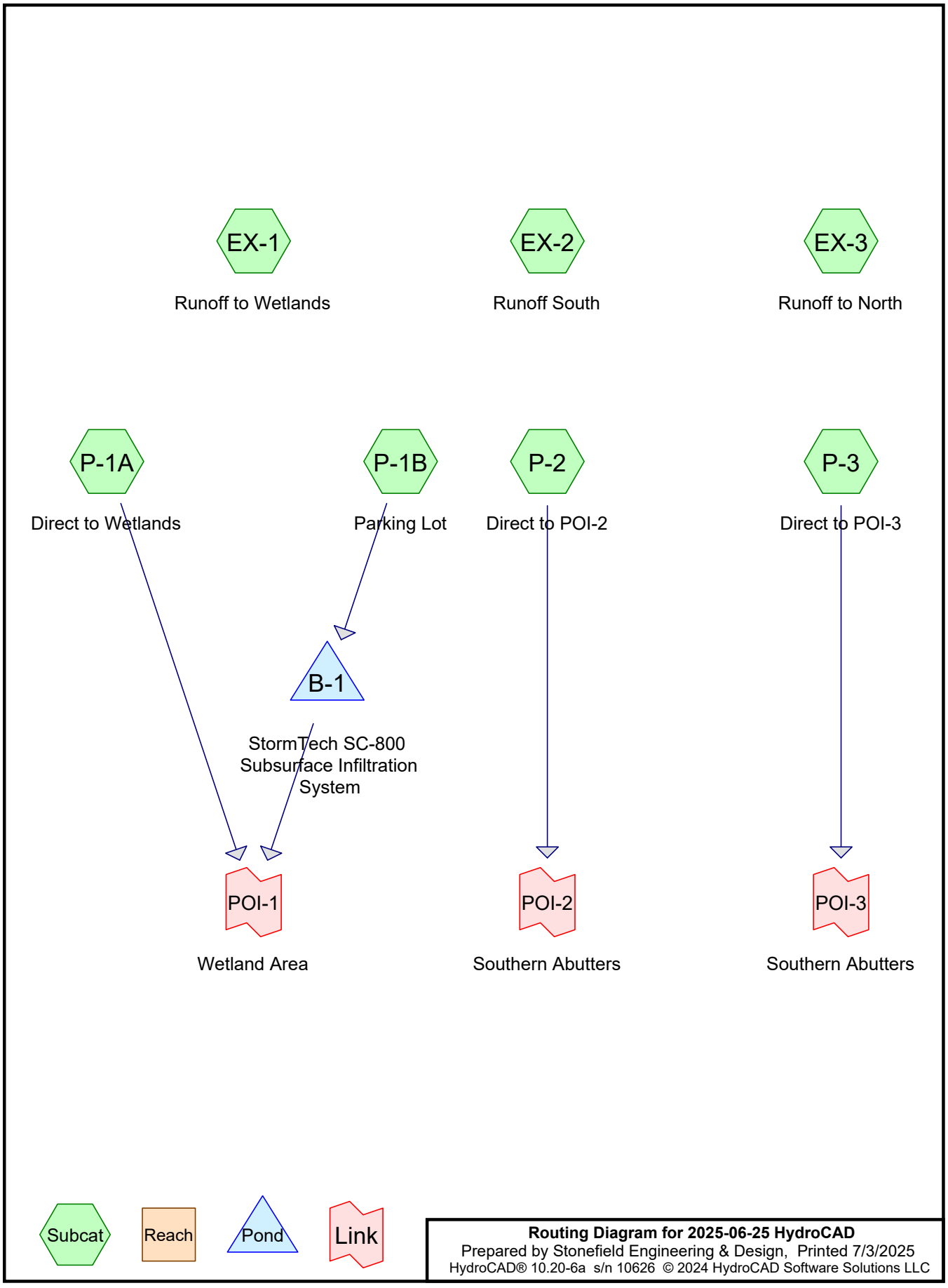
Updated by:

PARADIGM ENVIRONMENTAL
3911 Old Lee Highway, Suite 41-E

Developed for:

EPA
USEPA Region 1 - New England
5 Post Office Square, Boston, MA

APPENDIX C-2
HydroCAD Node Schematic Diagram



Routing Diagram for 2025-06-25 HydroCAD
Prepared by Stonefield Engineering & Design, Printed 7/3/2025

APPENDIX C-3
HydroCAD Hydrologic Calculations

Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment EX-1: Runoff to Wetlands Runoff Area=60,862 sf 9.11% Impervious Runoff Depth=1.19"
Flow Length=204' Tc=11.2 min CN=72/98 Runoff=1.50 cfs 6,025 cf

Subcatchment EX-2: Runoff South Runoff Area=15,893 sf 22.18% Impervious Runoff Depth=0.95"
Tc=6.0 min CN=57/98 Runoff=0.31 cfs 1,262 cf

Subcatchment EX-3: Runoff to North Runoff Area=7,525 sf 32.93% Impervious Runoff Depth=1.45"
Tc=6.0 min CN=65/98 Runoff=0.25 cfs 911 cf

Subcatchment P-1A: Direct to Wetlands Runoff Area=46,041 sf 1.29% Impervious Runoff Depth=1.19"
Flow Length=238' Tc=6.6 min CN=75/98 Runoff=1.43 cfs 4,580 cf

Subcatchment P-1B: Parking Lot Runoff Area=30,470 sf 98.06% Impervious Runoff Depth=3.03"
Tc=6.0 min CN=66/98 Runoff=2.16 cfs 7,696 cf

Subcatchment P-2: Direct to POI-2 Runoff Area=5,274 sf 10.50% Impervious Runoff Depth=0.37"
Tc=6.0 min CN=45/98 Runoff=0.04 cfs 165 cf

Subcatchment P-3: Direct to POI-3 Runoff Area=2,495 sf 0.00% Impervious Runoff Depth=0.70"
Tc=6.0 min CN=66/0 Runoff=0.04 cfs 145 cf

Pond B-1: StormTech SC-800 Subsurface Peak Elev=106.05' Storage=2,293 cf Inflow=2.16 cfs 7,696 cf
Discarded=0.28 cfs 7,696 cf Primary=0.00 cfs 0 cf Outflow=0.28 cfs 7,696 cf

Link POI-1: Wetland Area Inflow=1.43 cfs 4,580 cf
Primary=1.43 cfs 4,580 cf

Link POI-2: Southern Abutters Inflow=0.04 cfs 165 cf
Primary=0.04 cfs 165 cf

Link POI-3: Southern Abutters Inflow=0.04 cfs 145 cf
Primary=0.04 cfs 145 cf

Total Runoff Area = 168,560 sf Runoff Volume = 20,784 cf Average Runoff Depth = 1.48"
74.74% Pervious = 125,985 sf 25.26% Impervious = 42,575 sf

Summary for Subcatchment EX-1: Runoff to Wetlands

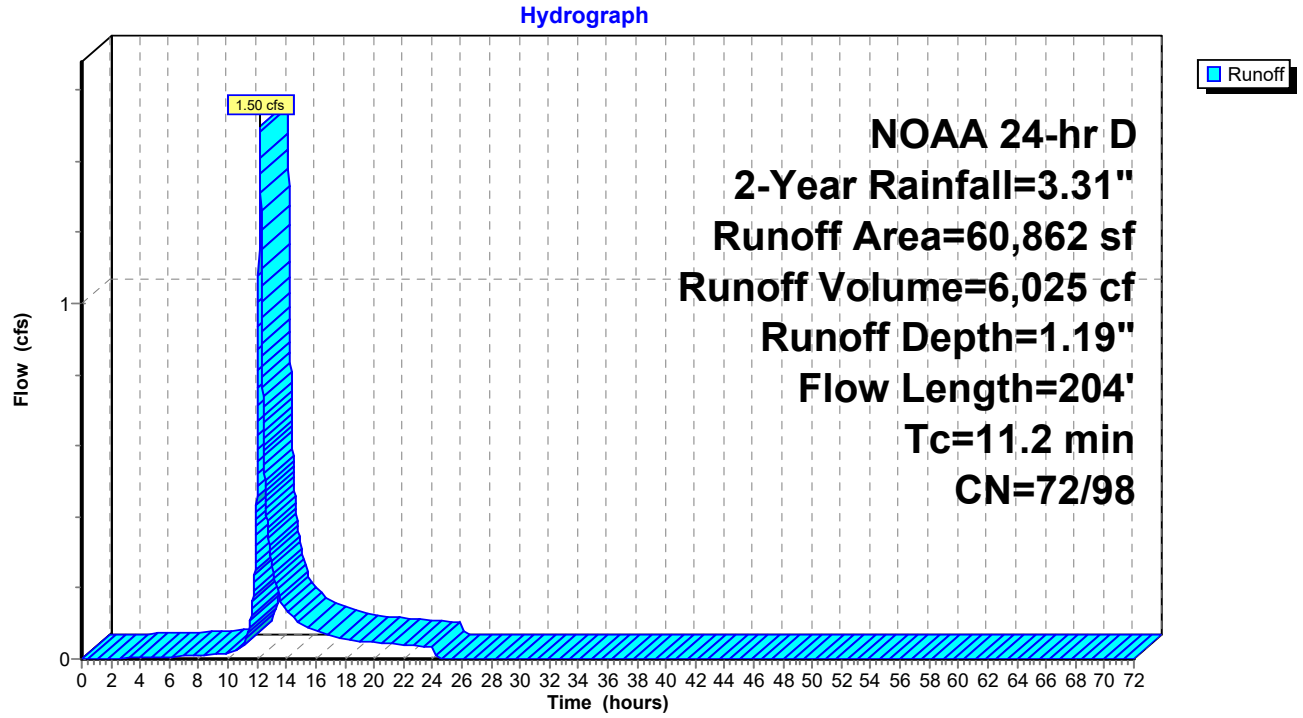
Runoff = 1.50 cfs @ 12.19 hrs, Volume= 6,025 cf, Depth= 1.19"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 2-Year Rainfall=3.31"

Area (sf)	CN	Description
5,544	98	Unconnected pavement, HSG D
5,696	30	Woods, Good, HSG A
43,615	77	Woods, Good, HSG D
4,717	80	>75% Grass cover, Good, HSG D
1,290	39	>75% Grass cover, Good, HSG A
60,862	74	Weighted Average
55,318	72	90.89% Pervious Area
5,544	98	9.11% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.3	96	0.1200	0.15		**Sheet Flow, 1A-1B** Woods: Light underbrush n= 0.400 P2= 3.09"
0.6	63	0.0670	1.81		**Shallow Concentrated Flow, 1B-1C** Short Grass Pasture Kv= 7.0 fps
0.3	45	0.2000	2.24		**Shallow Concentrated Flow, 1C-1D** Woodland Kv= 5.0 fps
11.2	204	Total			

Subcatchment EX-1: Runoff to Wetlands



Summary for Subcatchment EX-2: Runoff South

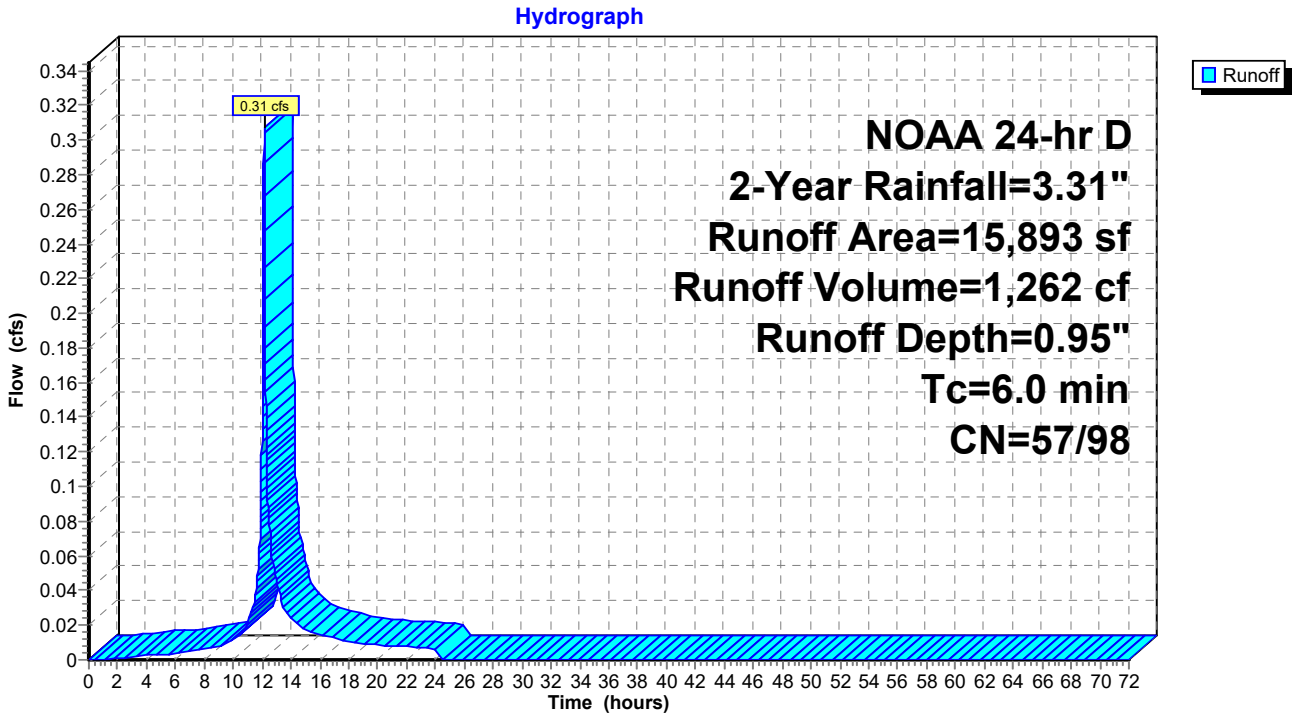
Runoff = 0.31 cfs @ 12.14 hrs, Volume= 1,262 cf, Depth= 0.95"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 2-Year Rainfall=3.31"

Area (sf)	CN	Description
3,525	98	Unconnected pavement, HSG D
2,282	30	Woods, Good, HSG A
4,016	80	>75% Grass cover, Good, HSG D
2,104	74	>75% Grass cover, Good, HSG C
3,966	39	>75% Grass cover, Good, HSG A
15,893	66	Weighted Average
12,368	57	77.82% Pervious Area
3,525	98	22.18% Impervious Area

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

Subcatchment EX-2: Runoff South



Summary for Subcatchment EX-3: Runoff to North

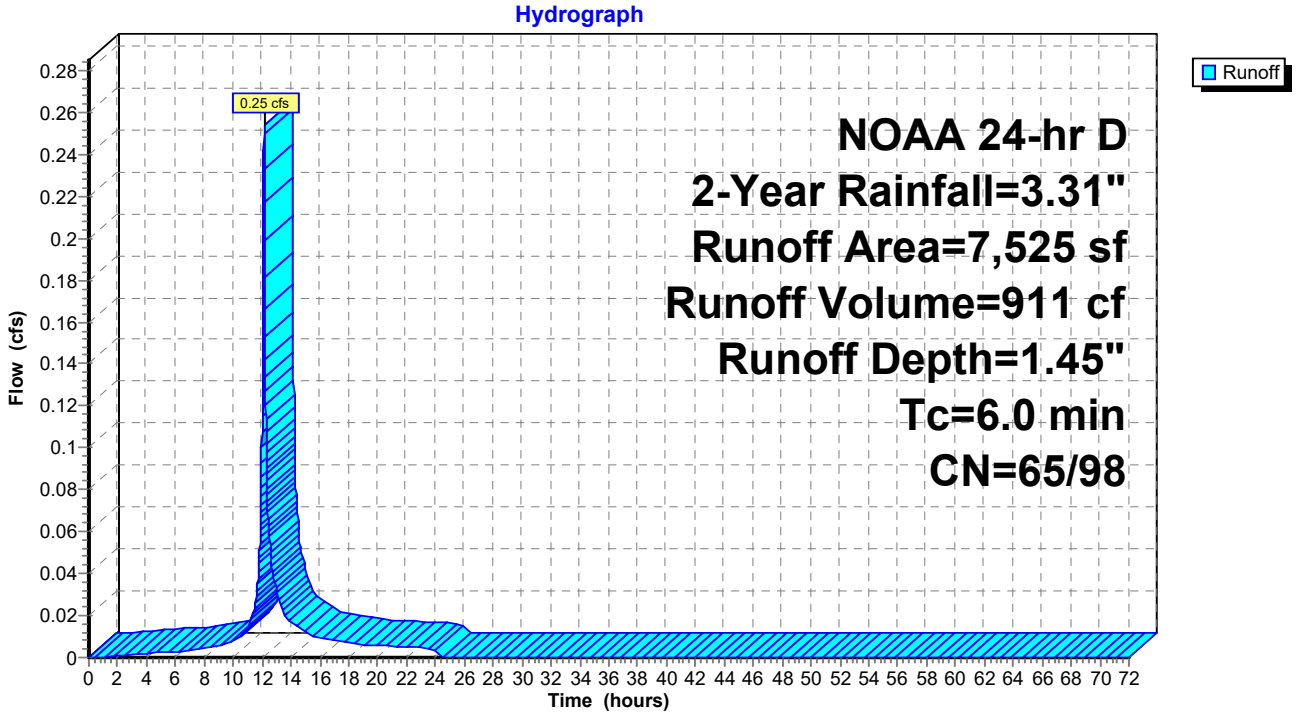
Runoff = 0.25 cfs @ 12.13 hrs, Volume= 911 cf, Depth= 1.45"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 2-Year Rainfall=3.31"

Area (sf)	CN	Description
2,478	98	Unconnected pavement, HSG D
11	30	Woods, Good, HSG A
1,328	77	Woods, Good, HSG D
1,476	80	>75% Grass cover, Good, HSG D
614	74	>75% Grass cover, Good, HSG C
1,618	39	>75% Grass cover, Good, HSG A
7,525	76	Weighted Average
5,047	65	67.07% Pervious Area
2,478	98	32.93% Impervious Area

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

Subcatchment EX-3: Runoff to North



Summary for Subcatchment P-1A: Direct to Wetlands

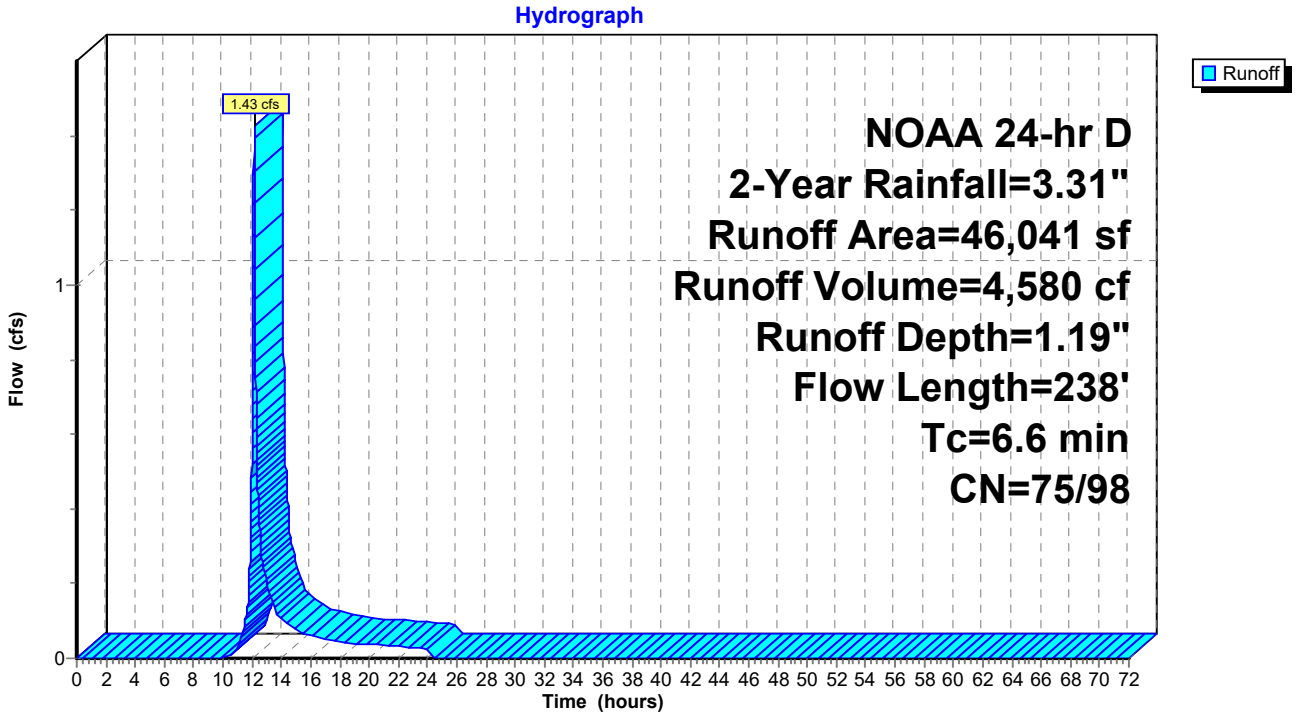
Runoff = 1.43 cfs @ 12.14 hrs, Volume= 4,580 cf, Depth= 1.19"
Routed to Link POI-1 : Wetland Area

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 2-Year Rainfall=3.31"

	Area (sf)	CN	Description
*	596	98	Impervious
*	589	39	Turf Area, HSG A
*	8,791	80	Turf Area, HSG D
	1,088	30	Woods, Good, HSG A
	21,266	77	Woods, Good, HSG D
	1,685	39	>75% Grass cover, Good, HSG A
	12,026	80	>75% Grass cover, Good, HSG D
	46,041	76	Weighted Average
	45,445	75	98.71% Pervious Area
	596	98	1.29% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	100	0.0850	0.30		**Sheet Flow, 1A-1B** Grass: Short n= 0.150 P2= 3.09"
0.9	105	0.0140	1.90		**Shallow Concentrated Flow, 1B-1C** Unpaved Kv= 16.1 fps
0.1	33	0.0600	3.94		**Shallow Concentrated Flow, 1C-1D** Unpaved Kv= 16.1 fps
6.6	238	Total			

Subcatchment P-1A: Direct to Wetlands



Summary for Subcatchment P-1B: Parking Lot

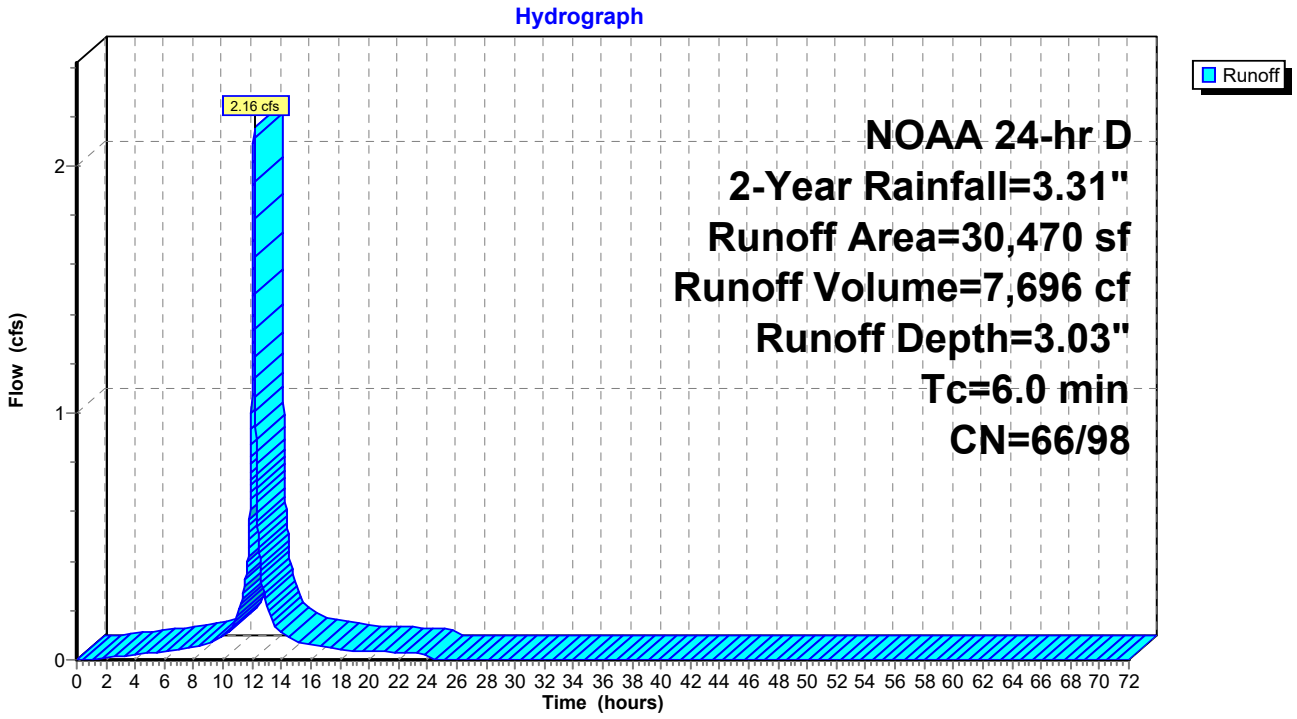
Runoff = 2.16 cfs @ 12.13 hrs, Volume= 7,696 cf, Depth= 3.03"
Routed to Pond B-1 : StormTech SC-800 Subsurface Infiltration System

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 2-Year Rainfall=3.31"

	Area (sf)	CN	Description
*	29,878	98	Impervious
	238	80	>75% Grass cover, Good, HSG D
	181	74	>75% Grass cover, Good, HSG C
	173	39	>75% Grass cover, Good, HSG A
	30,470	97	Weighted Average
	592	66	1.94% Pervious Area
	29,878	98	98.06% Impervious Area

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

Subcatchment P-1B: Parking Lot



Summary for Subcatchment P-2: Direct to POI-2

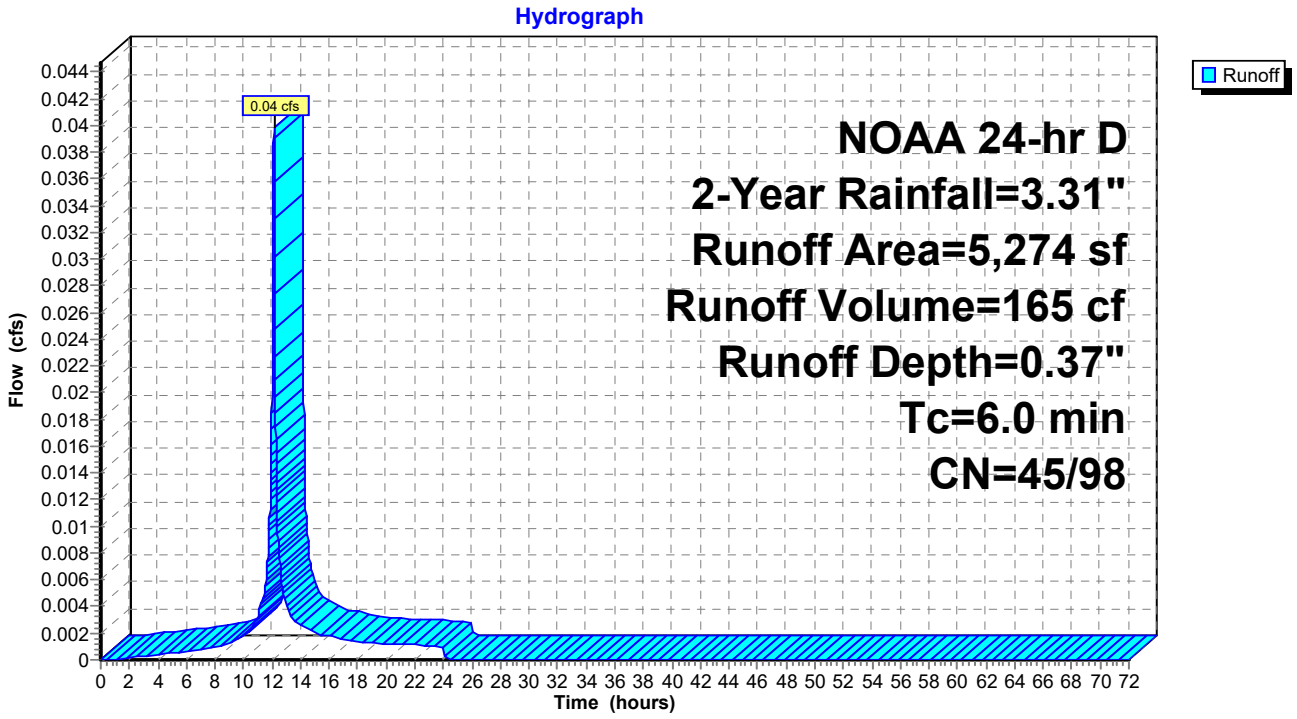
Runoff = 0.04 cfs @ 12.13 hrs, Volume= 165 cf, Depth= 0.37"
Routed to Link POI-2 : Southern Abutters

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 2-Year Rainfall=3.31"

Area (sf)	CN	Description
554	98	Unconnected pavement, HSG D
3,951	39	>75% Grass cover, Good, HSG A
250	74	>75% Grass cover, Good, HSG C
519	80	>75% Grass cover, Good, HSG D
5,274	51	Weighted Average
4,720	45	89.50% Pervious Area
554	98	10.50% Impervious Area

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

Subcatchment P-2: Direct to POI-2



Summary for Subcatchment P-3: Direct to POI-3

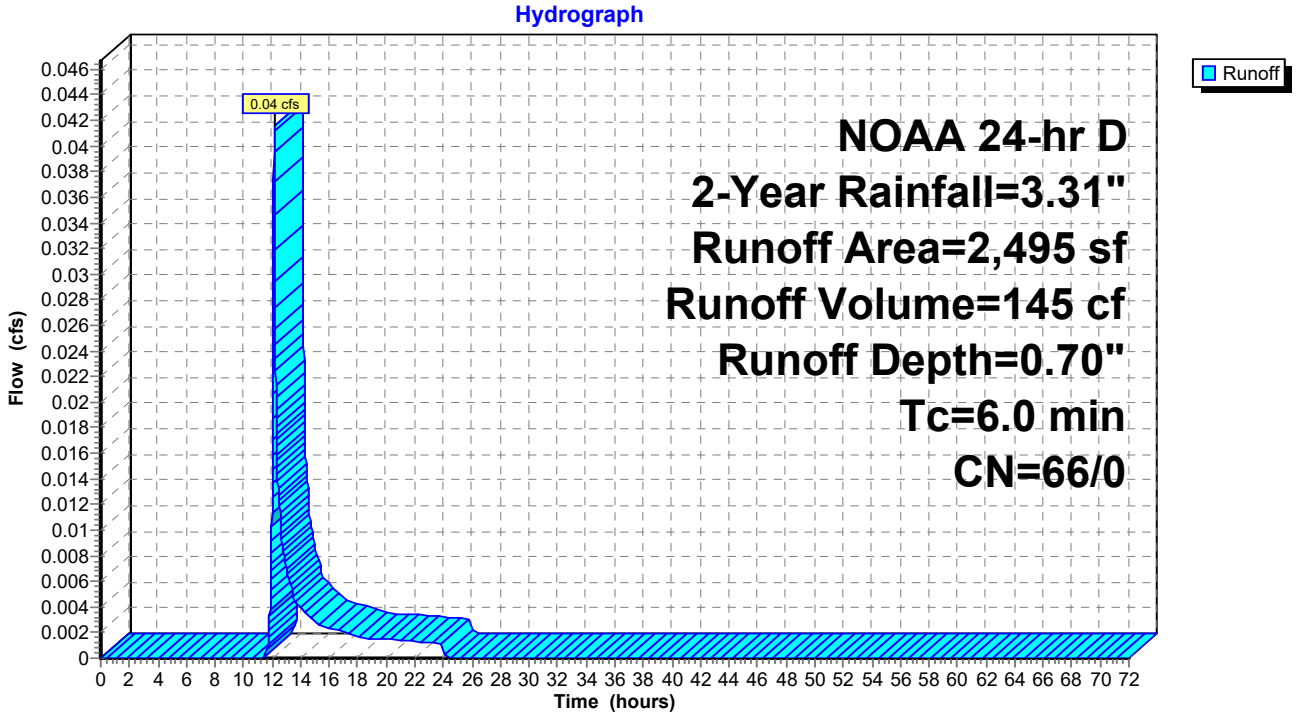
Runoff = 0.04 cfs @ 12.14 hrs, Volume= 145 cf, Depth= 0.70"
Routed to Link POI-3 : Southern Abutters

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 2-Year Rainfall=3.31"

Area (sf)	CN	Description
1,299	80	>75% Grass cover, Good, HSG D
424	74	>75% Grass cover, Good, HSG C
772	39	>75% Grass cover, Good, HSG A
2,495	66	Weighted Average
2,495	66	100.00% Pervious Area

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

Subcatchment P-3: Direct to POI-3



Summary for Pond B-1: StormTech SC-800 Subsurface Infiltration System

Inflow Area = 30,470 sf, 98.06% Impervious, Inflow Depth = 3.03" for 2-Year event
Inflow = 2.16 cfs @ 12.13 hrs, Volume= 7,696 cf
Outflow = 0.28 cfs @ 12.76 hrs, Volume= 7,696 cf, Atten= 87%, Lag= 37.8 min
Discarded = 0.28 cfs @ 12.76 hrs, Volume= 7,696 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Link POI-1 : Wetland Area

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 106.05' @ 12.76 hrs Surf.Area= 2,679 sf Storage= 2,293 cf

Plug-Flow detention time= 57.8 min calculated for 7,695 cf (100% of inflow)
Center-of-Mass det. time= 57.8 min (816.0 - 758.2)

Volume	Invert	Avail.Storage	Storage Description
#1A	104.50'	3,075 cf	**39.50'W x 67.82'L x 4.25'H Field A** 11,385 cf Overall - 3,697 cf Embedded = 7,687 cf x 40.0% Voids
#2A	105.50'	3,697 cf	**ADS_StormTech SC-800 +Cap** x 72 Inside #1 Effective Size= 45.0"W x 33.0"H => 7.11 sf x 7.12'L = 50.6 cf Overall Size= 51.0"W x 33.0"H x 7.55'L with 0.43' Overlap 72 Chambers in 8 Rows Cap Storage= 3.4 cf x 2 x 8 rows = 54.7 cf
		6,772 cf	Total Available Storage

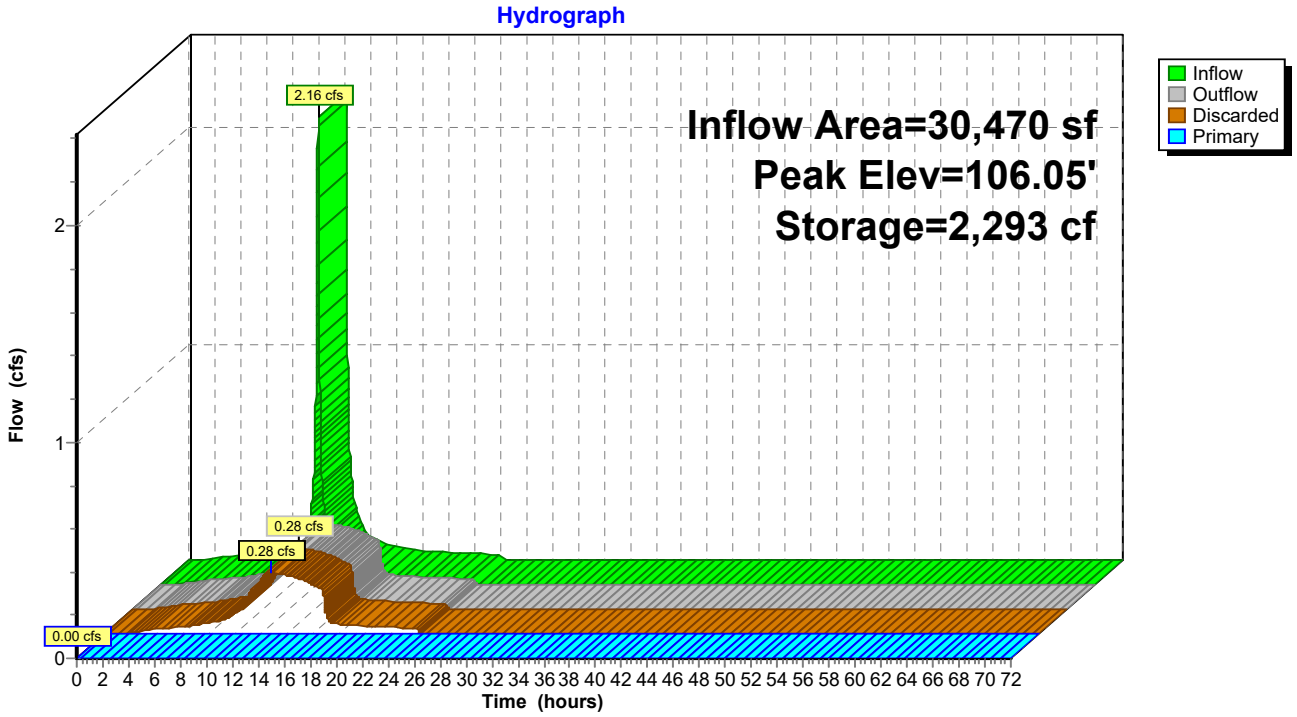
Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	104.00'	**12.0" Round Culvert** L= 45.0' Ke= 0.500 Inlet / Outlet Invert= 104.00' / 103.50' S= 0.0111 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#2	Device 1	107.50'	**7.0" W x 3.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	108.20'	**6.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#4	Discarded	104.50'	**3.150 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 101.00' Phase-In= 0.10'

Discarded OutFlow Max=0.28 cfs @ 12.76 hrs HW=106.05' (Free Discharge)
└**4=Exfiltration** (Controls 0.28 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=104.50' TW=0.00' (Dynamic Tailwater)
└**1=Culvert** (Passes 0.00 cfs of 0.93 cfs potential flow)
  ├**2=Orifice/Grate** (Controls 0.00 cfs)
  └**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond B-1: StormTech SC-800 Subsurface Infiltration System

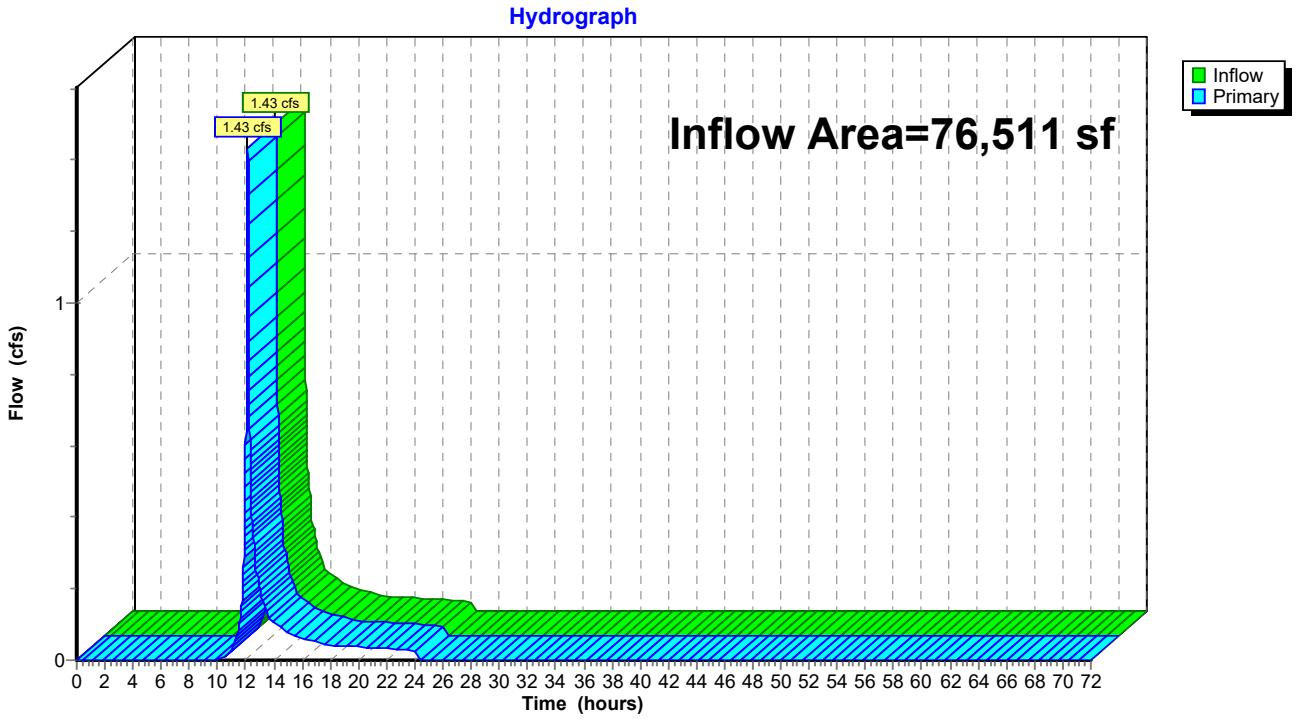


Summary for Link POI-1: Wetland Area

Inflow Area = 76,511 sf, 39.83% Impervious, Inflow Depth = 0.72" for 2-Year event
Inflow = 1.43 cfs @ 12.14 hrs, Volume= 4,580 cf
Primary = 1.43 cfs @ 12.14 hrs, Volume= 4,580 cf, Atten= 0%, Lag= 0.0 min

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

Link POI-1: Wetland Area

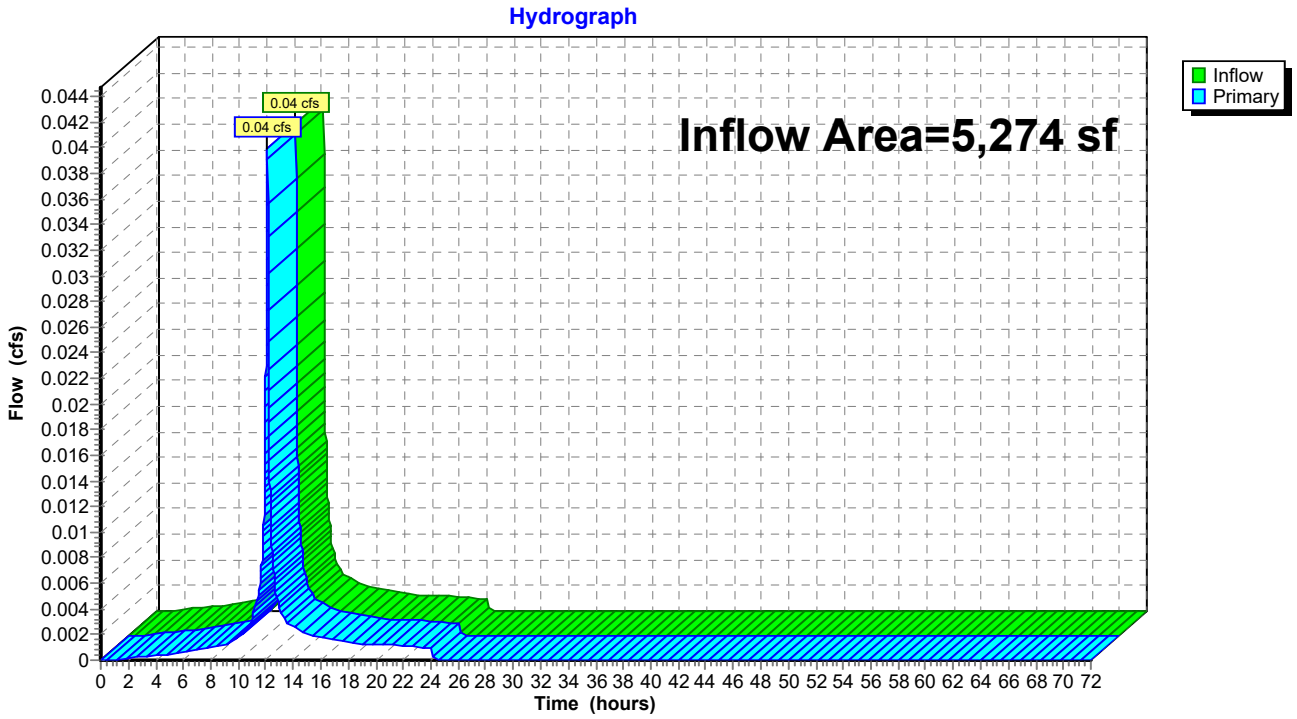


Summary for Link POI-2: Southern Abutters

Inflow Area = 5,274 sf, 10.50% Impervious, Inflow Depth = 0.37" for 2-Year event
Inflow = 0.04 cfs @ 12.13 hrs, Volume= 165 cf
Primary = 0.04 cfs @ 12.13 hrs, Volume= 165 cf, Atten= 0%, Lag= 0.0 min

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

Link POI-2: Southern Abutters

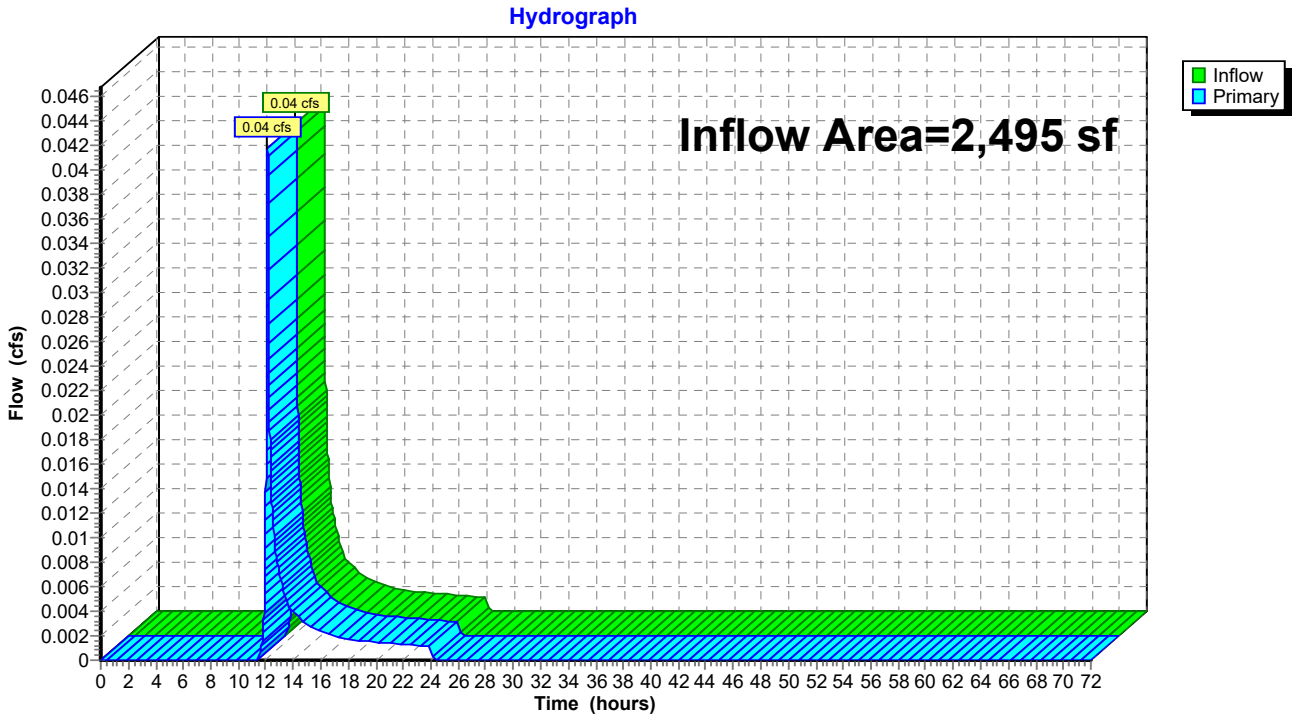


Summary for Link POI-3: Southern Abutters

Inflow Area = 2,495 sf, 0.00% Impervious, Inflow Depth = 0.70" for 2-Year event
Inflow = 0.04 cfs @ 12.14 hrs, Volume= 145 cf
Primary = 0.04 cfs @ 12.14 hrs, Volume= 145 cf, Atten= 0%, Lag= 0.0 min

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

Link POI-3: Southern Abutters



Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment EX-1: Runoff to Wetlands Runoff Area=60,862 sf 9.11% Impervious Runoff Depth=2.61"
Flow Length=204' Tc=11.2 min CN=72/98 Runoff=3.44 cfs 13,221 cf

Subcatchment EX-2: Runoff South Runoff Area=15,893 sf 22.18% Impervious Runoff Depth=2.06"
Tc=6.0 min CN=57/98 Runoff=0.77 cfs 2,725 cf

Subcatchment EX-3: Runoff to North Runoff Area=7,525 sf 32.93% Impervious Runoff Depth=2.85"
Tc=6.0 min CN=65/98 Runoff=0.52 cfs 1,787 cf

Subcatchment P-1A: Direct to Wetlands Runoff Area=46,041 sf 1.29% Impervious Runoff Depth=2.66"
Flow Length=238' Tc=6.6 min CN=75/98 Runoff=3.24 cfs 10,203 cf

Subcatchment P-1B: Parking Lot Runoff Area=30,470 sf 98.06% Impervious Runoff Depth=4.92"
Tc=6.0 min CN=66/98 Runoff=3.45 cfs 12,499 cf

Subcatchment P-2: Direct to POI-2 Runoff Area=5,274 sf 10.50% Impervious Runoff Depth=0.98"
Tc=6.0 min CN=45/98 Runoff=0.09 cfs 432 cf

Subcatchment P-3: Direct to POI-3 Runoff Area=2,495 sf 0.00% Impervious Runoff Depth=1.88"
Tc=6.0 min CN=66/0 Runoff=0.13 cfs 391 cf

Pond B-1: StormTech SC-800 Subsurface Peak Elev=107.09' Storage=4,424 cf Inflow=3.45 cfs 12,499 cf
Discarded=0.34 cfs 12,499 cf Primary=0.00 cfs 0 cf Outflow=0.34 cfs 12,499 cf

Link POI-1: Wetland Area Inflow=3.24 cfs 10,203 cf
Primary=3.24 cfs 10,203 cf

Link POI-2: Southern Abutters Inflow=0.09 cfs 432 cf
Primary=0.09 cfs 432 cf

Link POI-3: Southern Abutters Inflow=0.13 cfs 391 cf
Primary=0.13 cfs 391 cf

Total Runoff Area = 168,560 sf Runoff Volume = 41,258 cf Average Runoff Depth = 2.94"
74.74% Pervious = 125,985 sf 25.26% Impervious = 42,575 sf

Summary for Subcatchment EX-1: Runoff to Wetlands

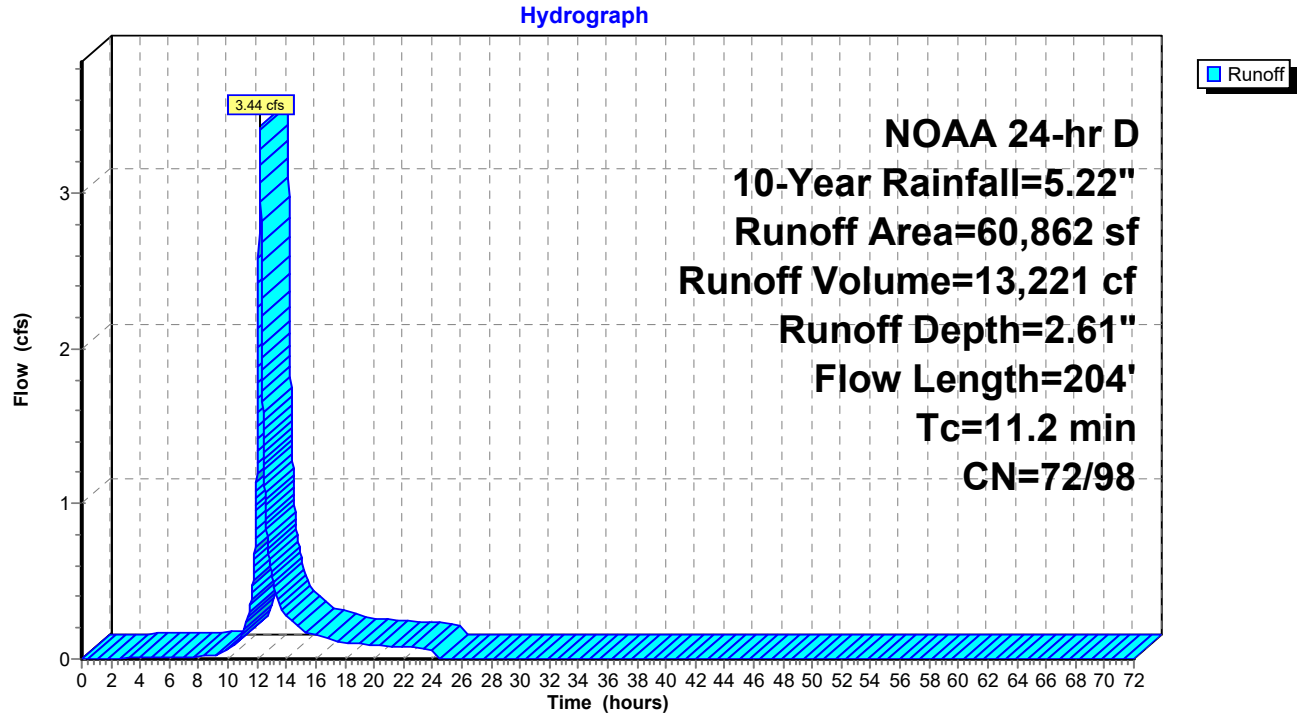
Runoff = 3.44 cfs @ 12.19 hrs, Volume= 13,221 cf, Depth= 2.61"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 10-Year Rainfall=5.22"

Area (sf)	CN	Description
5,544	98	Unconnected pavement, HSG D
5,696	30	Woods, Good, HSG A
43,615	77	Woods, Good, HSG D
4,717	80	>75% Grass cover, Good, HSG D
1,290	39	>75% Grass cover, Good, HSG A
60,862	74	Weighted Average
55,318	72	90.89% Pervious Area
5,544	98	9.11% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.3	96	0.1200	0.15		**Sheet Flow, 1A-1B** Woods: Light underbrush n= 0.400 P2= 3.09"
0.6	63	0.0670	1.81		**Shallow Concentrated Flow, 1B-1C** Short Grass Pasture Kv= 7.0 fps
0.3	45	0.2000	2.24		**Shallow Concentrated Flow, 1C-1D** Woodland Kv= 5.0 fps
11.2	204	Total			

Subcatchment EX-1: Runoff to Wetlands



Summary for Subcatchment EX-2: Runoff South

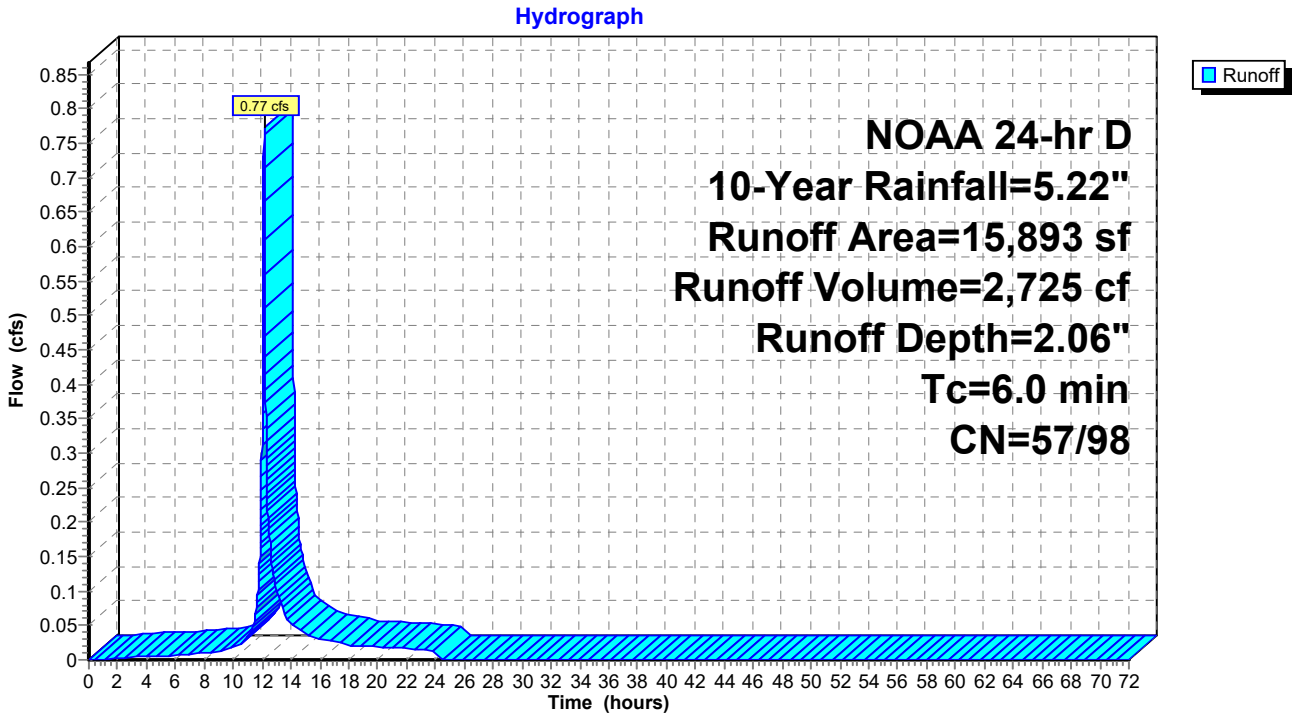
Runoff = 0.77 cfs @ 12.13 hrs, Volume= 2,725 cf, Depth= 2.06"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 10-Year Rainfall=5.22"

Area (sf)	CN	Description
3,525	98	Unconnected pavement, HSG D
2,282	30	Woods, Good, HSG A
4,016	80	>75% Grass cover, Good, HSG D
2,104	74	>75% Grass cover, Good, HSG C
3,966	39	>75% Grass cover, Good, HSG A
15,893	66	Weighted Average
12,368	57	77.82% Pervious Area
3,525	98	22.18% Impervious Area

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

Subcatchment EX-2: Runoff South



Summary for Subcatchment EX-3: Runoff to North

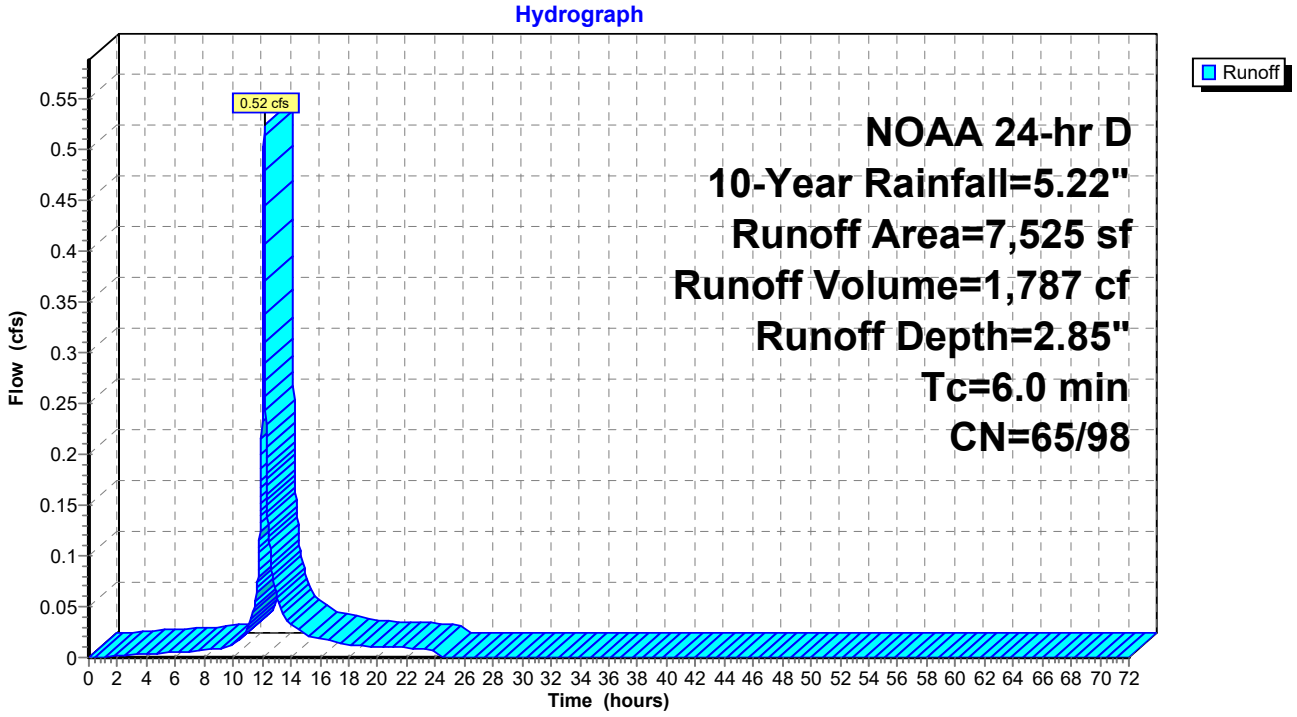
Runoff = 0.52 cfs @ 12.13 hrs, Volume= 1,787 cf, Depth= 2.85"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 10-Year Rainfall=5.22"

Area (sf)	CN	Description
2,478	98	Unconnected pavement, HSG D
11	30	Woods, Good, HSG A
1,328	77	Woods, Good, HSG D
1,476	80	>75% Grass cover, Good, HSG D
614	74	>75% Grass cover, Good, HSG C
1,618	39	>75% Grass cover, Good, HSG A
7,525	76	Weighted Average
5,047	65	67.07% Pervious Area
2,478	98	32.93% Impervious Area

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

Subcatchment EX-3: Runoff to North



Summary for Subcatchment P-1A: Direct to Wetlands

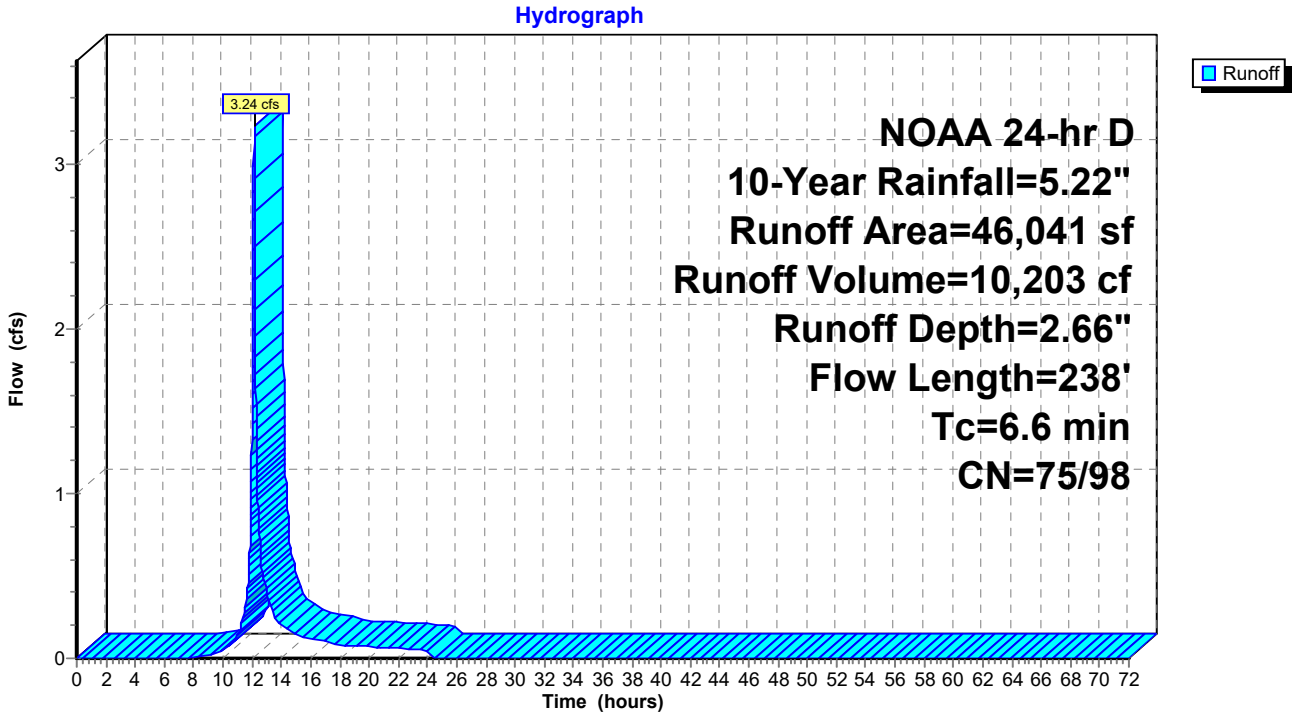
Runoff = 3.24 cfs @ 12.14 hrs, Volume= 10,203 cf, Depth= 2.66"
Routed to Link POI-1 : Wetland Area

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 10-Year Rainfall=5.22"

	Area (sf)	CN	Description
*	596	98	Impervious
*	589	39	Turf Area, HSG A
*	8,791	80	Turf Area, HSG D
	1,088	30	Woods, Good, HSG A
	21,266	77	Woods, Good, HSG D
	1,685	39	>75% Grass cover, Good, HSG A
	12,026	80	>75% Grass cover, Good, HSG D
	46,041	76	Weighted Average
	45,445	75	98.71% Pervious Area
	596	98	1.29% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	100	0.0850	0.30		**Sheet Flow, 1A-1B** Grass: Short n= 0.150 P2= 3.09"
0.9	105	0.0140	1.90		**Shallow Concentrated Flow, 1B-1C** Unpaved Kv= 16.1 fps
0.1	33	0.0600	3.94		**Shallow Concentrated Flow, 1C-1D** Unpaved Kv= 16.1 fps
6.6	238	Total			

Subcatchment P-1A: Direct to Wetlands



Summary for Subcatchment P-1B: Parking Lot

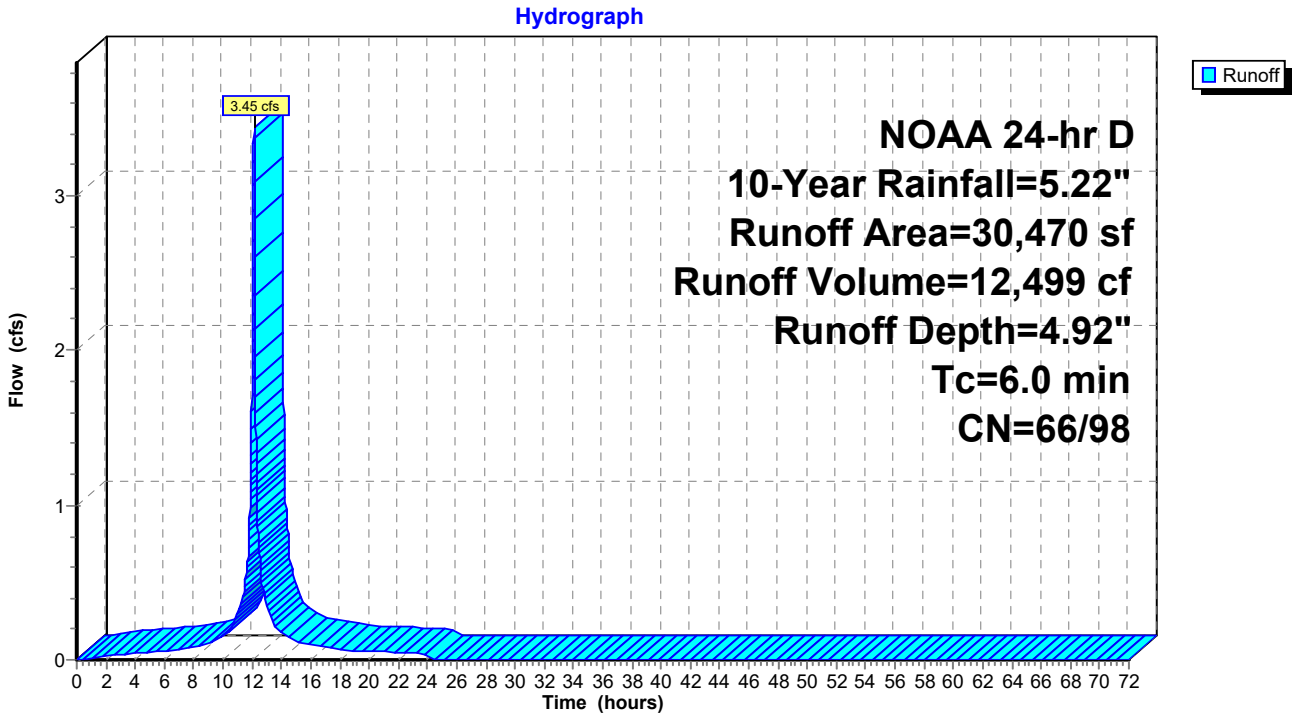
Runoff = 3.45 cfs @ 12.13 hrs, Volume= 12,499 cf, Depth= 4.92"
Routed to Pond B-1 : StormTech SC-800 Subsurface Infiltration System

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 10-Year Rainfall=5.22"

	Area (sf)	CN	Description
*	29,878	98	Impervious
	238	80	>75% Grass cover, Good, HSG D
	181	74	>75% Grass cover, Good, HSG C
	173	39	>75% Grass cover, Good, HSG A
	30,470	97	Weighted Average
	592	66	1.94% Pervious Area
	29,878	98	98.06% Impervious Area

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

Subcatchment P-1B: Parking Lot



Summary for Subcatchment P-2: Direct to POI-2

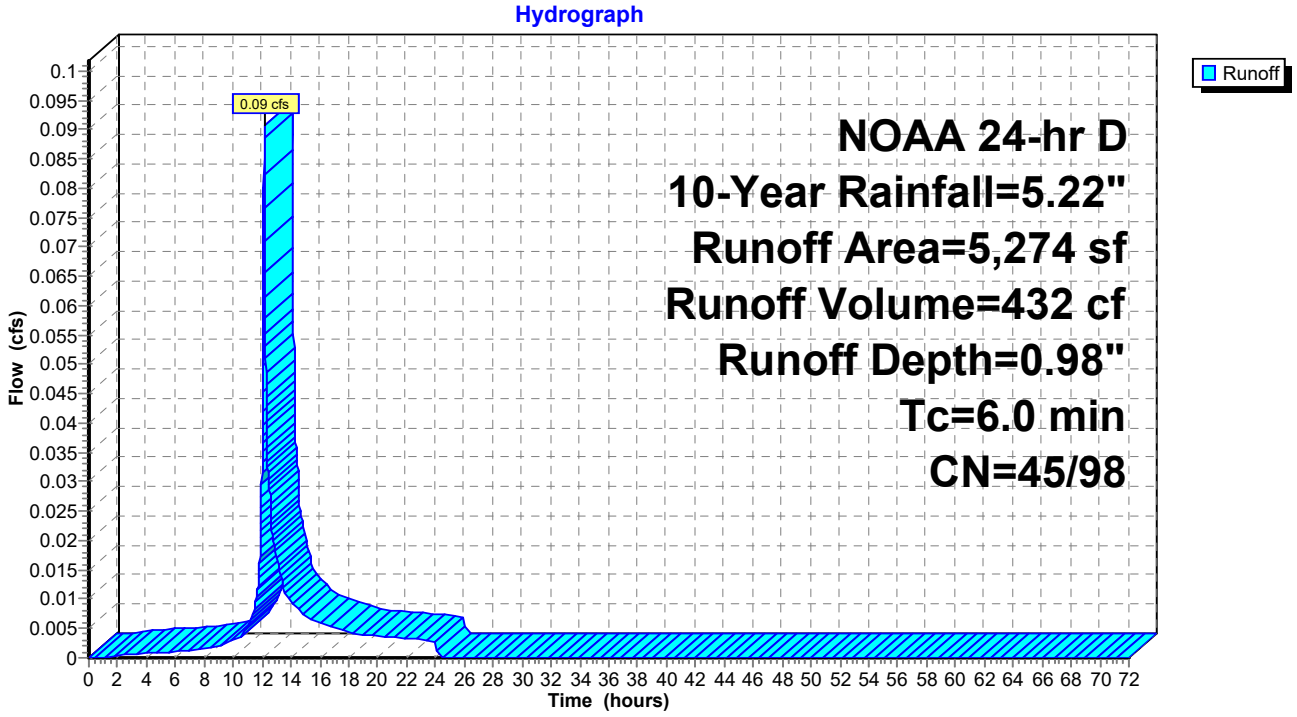
Runoff = 0.09 cfs @ 12.14 hrs, Volume= 432 cf, Depth= 0.98"
Routed to Link POI-2 : Southern Abutters

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 10-Year Rainfall=5.22"

Area (sf)	CN	Description
554	98	Unconnected pavement, HSG D
3,951	39	>75% Grass cover, Good, HSG A
250	74	>75% Grass cover, Good, HSG C
519	80	>75% Grass cover, Good, HSG D
5,274	51	Weighted Average
4,720	45	89.50% Pervious Area
554	98	10.50% Impervious Area

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

Subcatchment P-2: Direct to POI-2



Summary for Subcatchment P-3: Direct to POI-3

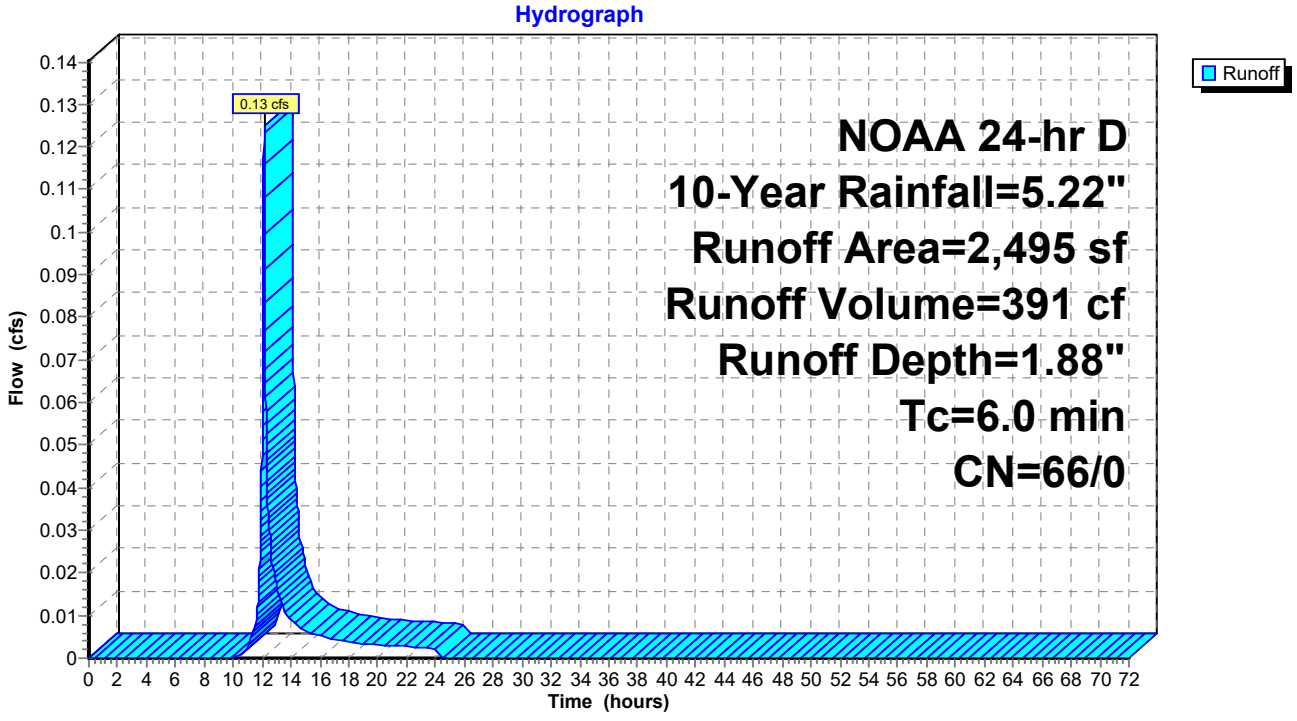
Runoff = 0.13 cfs @ 12.14 hrs, Volume= 391 cf, Depth= 1.88"
Routed to Link POI-3 : Southern Abutters

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 10-Year Rainfall=5.22"

Area (sf)	CN	Description
1,299	80	>75% Grass cover, Good, HSG D
424	74	>75% Grass cover, Good, HSG C
772	39	>75% Grass cover, Good, HSG A
2,495	66	Weighted Average
2,495	66	100.00% Pervious Area

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

Subcatchment P-3: Direct to POI-3



Summary for Pond B-1: StormTech SC-800 Subsurface Infiltration System

Inflow Area = 30,470 sf, 98.06% Impervious, Inflow Depth = 4.92" for 10-Year event
Inflow = 3.45 cfs @ 12.13 hrs, Volume= 12,499 cf
Outflow = 0.34 cfs @ 13.05 hrs, Volume= 12,499 cf, Atten= 90%, Lag= 55.4 min
Discarded = 0.34 cfs @ 13.05 hrs, Volume= 12,499 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Link POI-1 : Wetland Area

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 107.09' @ 13.05 hrs Surf.Area= 2,679 sf Storage= 4,424 cf

Plug-Flow detention time= 103.9 min calculated for 12,497 cf (100% of inflow)
Center-of-Mass det. time= 103.9 min (853.3 - 749.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	104.50'	3,075 cf	**39.50'W x 67.82'L x 4.25'H Field A** 11,385 cf Overall - 3,697 cf Embedded = 7,687 cf x 40.0% Voids
#2A	105.50'	3,697 cf	**ADS_StormTech SC-800 +Cap** x 72 Inside #1 Effective Size= 45.0"W x 33.0"H => 7.11 sf x 7.12'L = 50.6 cf Overall Size= 51.0"W x 33.0"H x 7.55'L with 0.43' Overlap 72 Chambers in 8 Rows Cap Storage= 3.4 cf x 2 x 8 rows = 54.7 cf
		6,772 cf	Total Available Storage

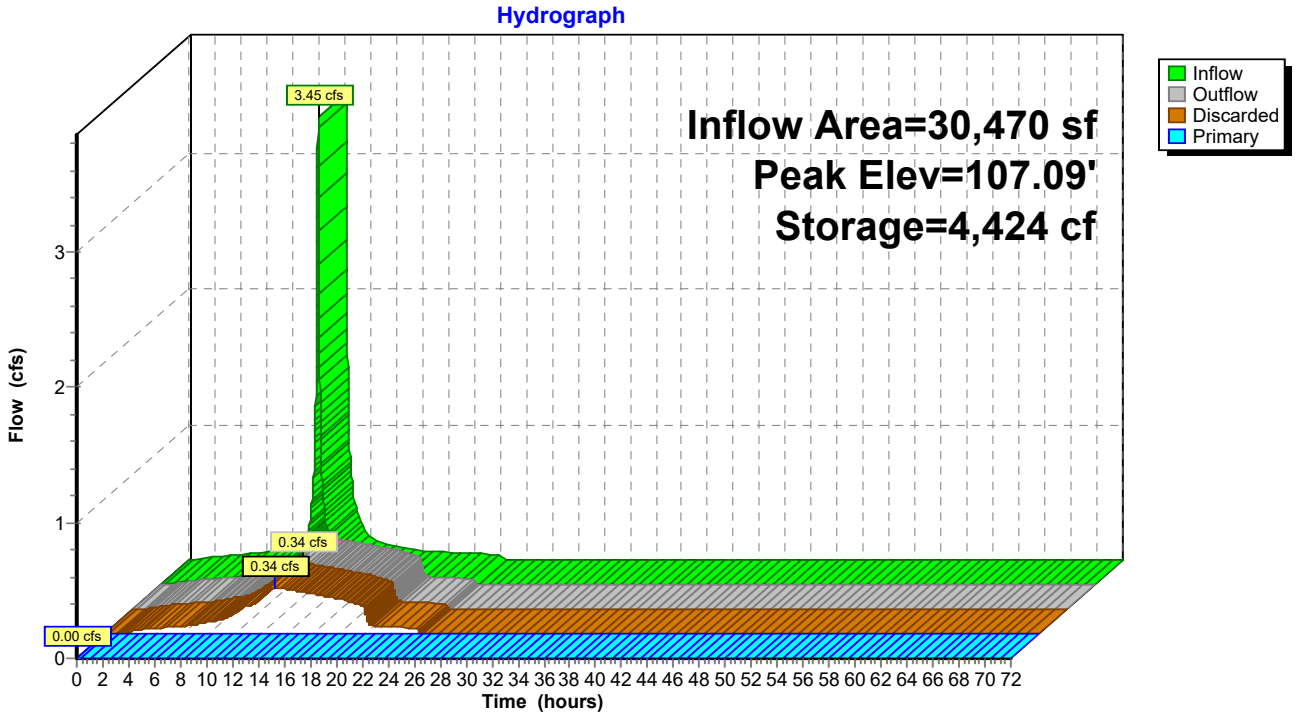
Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	104.00'	**12.0" Round Culvert** L= 45.0' Ke= 0.500 Inlet / Outlet Invert= 104.00' / 103.50' S= 0.0111 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#2	Device 1	107.50'	**7.0" W x 3.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	108.20'	**6.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#4	Discarded	104.50'	**3.150 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 101.00' Phase-In= 0.10'

Discarded OutFlow Max=0.34 cfs @ 13.05 hrs HW=107.09' (Free Discharge)
└**4=Exfiltration** (Controls 0.34 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=104.50' TW=0.00' (Dynamic Tailwater)
└**1=Culvert** (Passes 0.00 cfs of 0.93 cfs potential flow)
  ├**2=Orifice/Grate** (Controls 0.00 cfs)
  └**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond B-1: StormTech SC-800 Subsurface Infiltration System

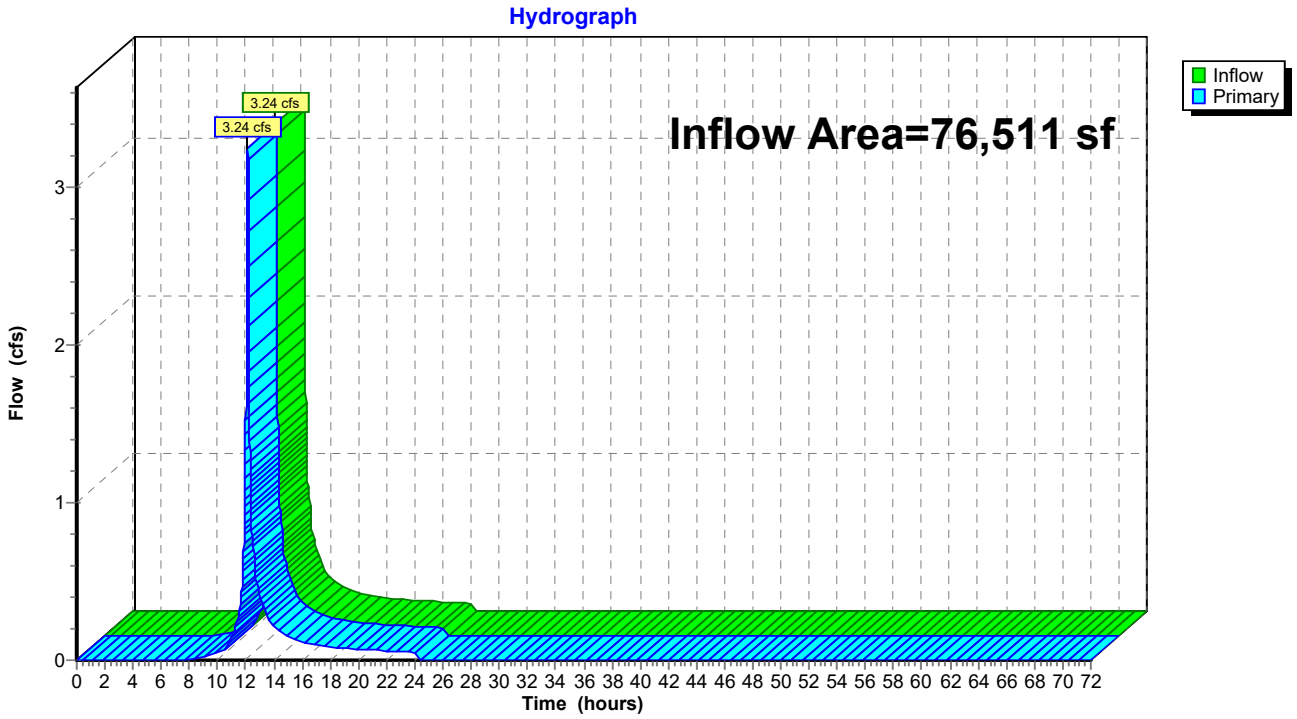


Summary for Link POI-1: Wetland Area

Inflow Area = 76,511 sf, 39.83% Impervious, Inflow Depth = 1.60" for 10-Year event
Inflow = 3.24 cfs @ 12.14 hrs, Volume= 10,203 cf
Primary = 3.24 cfs @ 12.14 hrs, Volume= 10,203 cf, Atten= 0%, Lag= 0.0 min

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

Link POI-1: Wetland Area

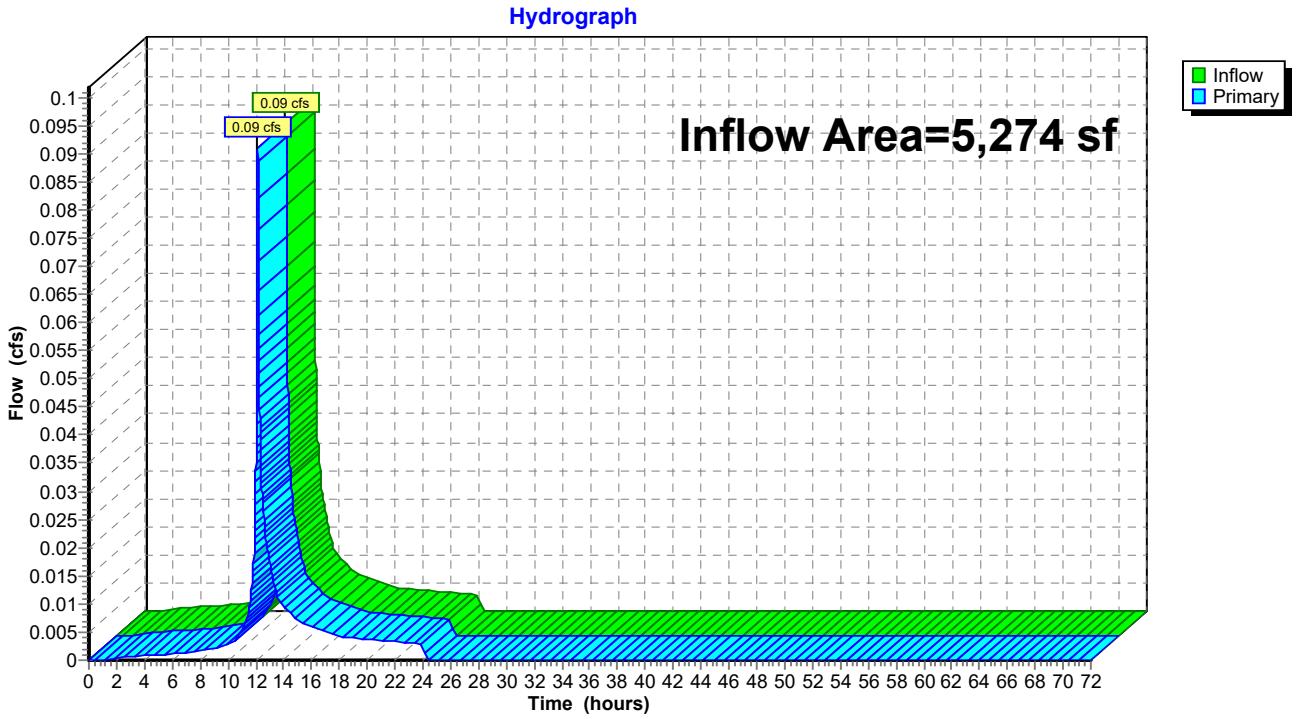


Summary for Link POI-2: Southern Abutters

Inflow Area = 5,274 sf, 10.50% Impervious, Inflow Depth = 0.98" for 10-Year event
Inflow = 0.09 cfs @ 12.14 hrs, Volume= 432 cf
Primary = 0.09 cfs @ 12.14 hrs, Volume= 432 cf, Atten= 0%, Lag= 0.0 min

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

Link POI-2: Southern Abutters

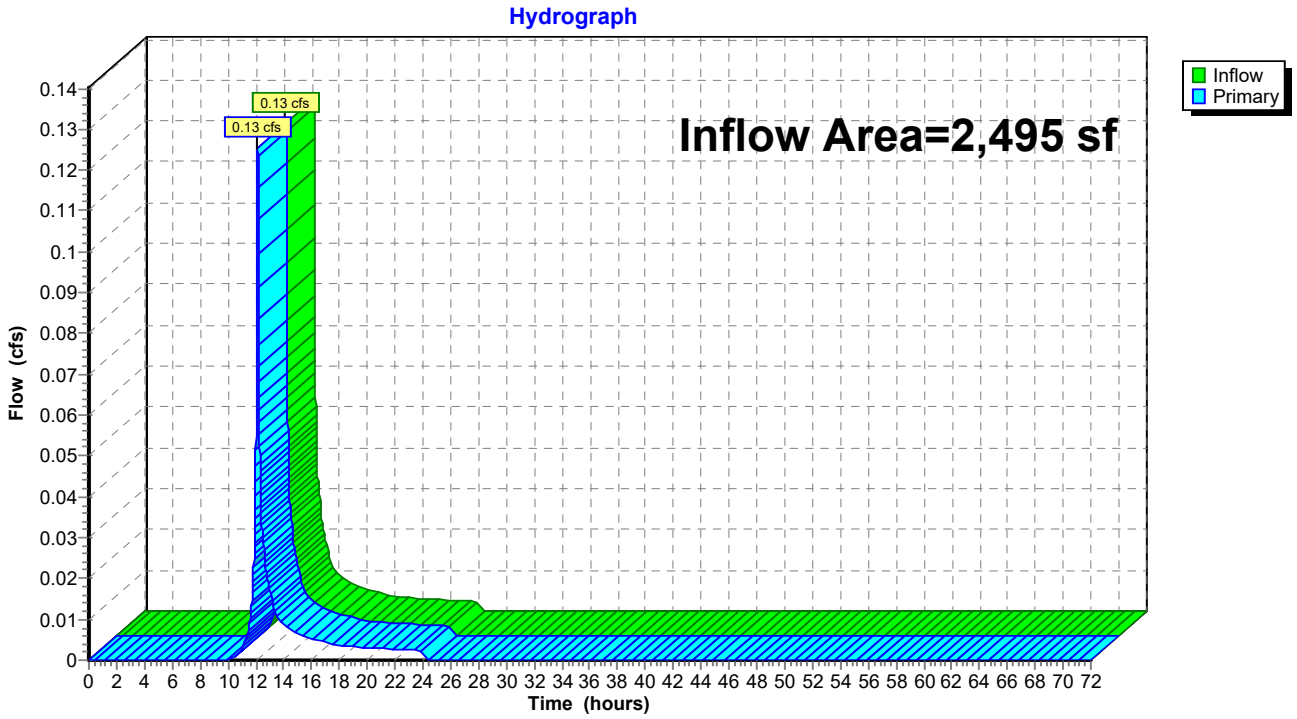


Summary for Link POI-3: Southern Abutters

Inflow Area = 2,495 sf, 0.00% Impervious, Inflow Depth = 1.88" for 10-Year event
Inflow = 0.13 cfs @ 12.14 hrs, Volume= 391 cf
Primary = 0.13 cfs @ 12.14 hrs, Volume= 391 cf, Atten= 0%, Lag= 0.0 min

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

Link POI-3: Southern Abutters



Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment EX-1: Runoff to Wetlands Runoff Area=60,862 sf 9.11% Impervious Runoff Depth=3.59"
Flow Length=204' Tc=11.2 min CN=72/98 Runoff=4.76 cfs 18,210 cf

Subcatchment EX-2: Runoff South Runoff Area=15,893 sf 22.18% Impervious Runoff Depth=2.87"
Tc=6.0 min CN=57/98 Runoff=1.12 cfs 3,802 cf

Subcatchment EX-3: Runoff to North Runoff Area=7,525 sf 32.93% Impervious Runoff Depth=3.81"
Tc=6.0 min CN=65/98 Runoff=0.71 cfs 2,391 cf

Subcatchment P-1A: Direct to Wetlands Runoff Area=46,041 sf 1.29% Impervious Runoff Depth=3.67"
Flow Length=238' Tc=6.6 min CN=75/98 Runoff=4.45 cfs 14,069 cf

Subcatchment P-1B: Parking Lot Runoff Area=30,470 sf 98.06% Impervious Runoff Depth=6.10"
Tc=6.0 min CN=66/98 Runoff=4.25 cfs 15,501 cf

Subcatchment P-2: Direct to POI-2 Runoff Area=5,274 sf 10.50% Impervious Runoff Depth=1.52"
Tc=6.0 min CN=45/98 Runoff=0.17 cfs 667 cf

Subcatchment P-3: Direct to POI-3 Runoff Area=2,495 sf 0.00% Impervious Runoff Depth=2.75"
Tc=6.0 min CN=66/0 Runoff=0.19 cfs 571 cf

Pond B-1: StormTech SC-800 Subsurface Peak Elev=107.72' Storage=5,539 cf Inflow=4.25 cfs 15,501 cf
Discarded=0.38 cfs 14,977 cf Primary=0.20 cfs 524 cf Outflow=0.57 cfs 15,501 cf

Link POI-1: Wetland Area Inflow=4.45 cfs 14,593 cf
Primary=4.45 cfs 14,593 cf

Link POI-2: Southern Abutters Inflow=0.17 cfs 667 cf
Primary=0.17 cfs 667 cf

Link POI-3: Southern Abutters Inflow=0.19 cfs 571 cf
Primary=0.19 cfs 571 cf

Total Runoff Area = 168,560 sf Runoff Volume = 55,212 cf Average Runoff Depth = 3.93"
74.74% Pervious = 125,985 sf 25.26% Impervious = 42,575 sf

Summary for Subcatchment EX-1: Runoff to Wetlands

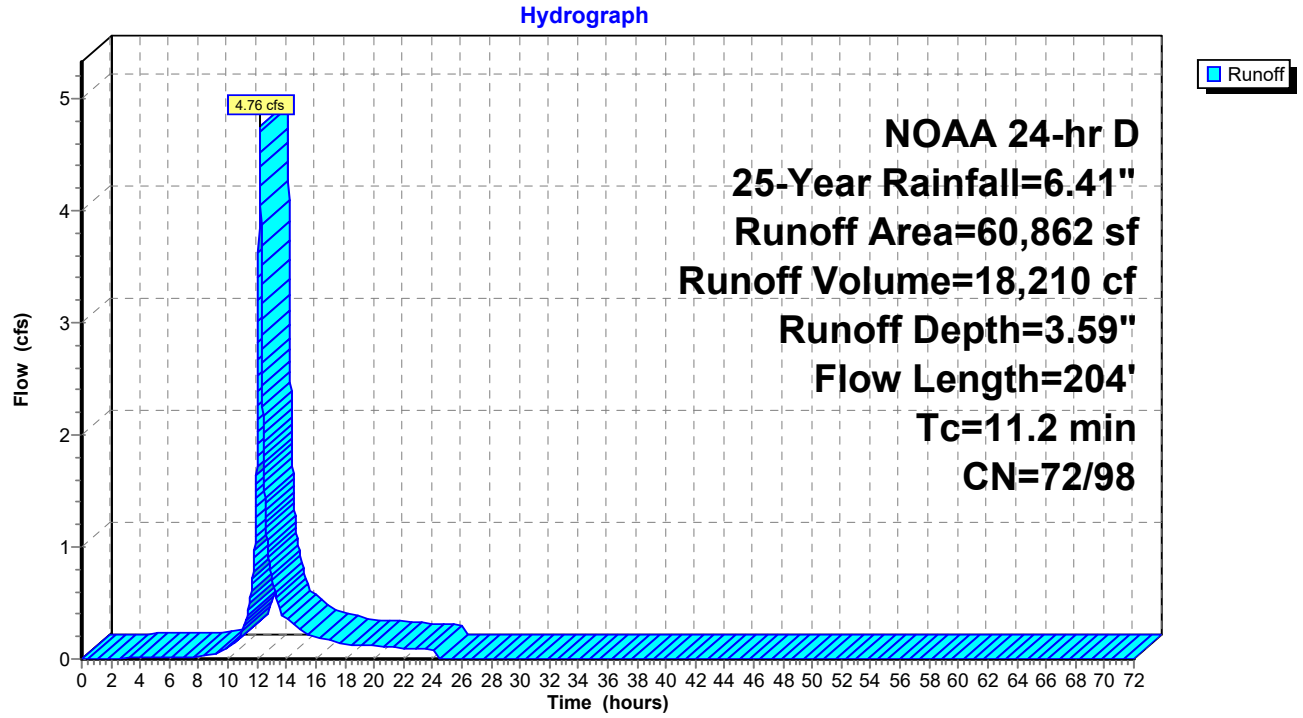
Runoff = 4.76 cfs @ 12.19 hrs, Volume= 18,210 cf, Depth= 3.59"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 25-Year Rainfall=6.41"

Area (sf)	CN	Description
5,544	98	Unconnected pavement, HSG D
5,696	30	Woods, Good, HSG A
43,615	77	Woods, Good, HSG D
4,717	80	>75% Grass cover, Good, HSG D
1,290	39	>75% Grass cover, Good, HSG A
60,862	74	Weighted Average
55,318	72	90.89% Pervious Area
5,544	98	9.11% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.3	96	0.1200	0.15		**Sheet Flow, 1A-1B** Woods: Light underbrush n= 0.400 P2= 3.09"
0.6	63	0.0670	1.81		**Shallow Concentrated Flow, 1B-1C** Short Grass Pasture Kv= 7.0 fps
0.3	45	0.2000	2.24		**Shallow Concentrated Flow, 1C-1D** Woodland Kv= 5.0 fps
11.2	204	Total			

Subcatchment EX-1: Runoff to Wetlands



Summary for Subcatchment EX-2: Runoff South

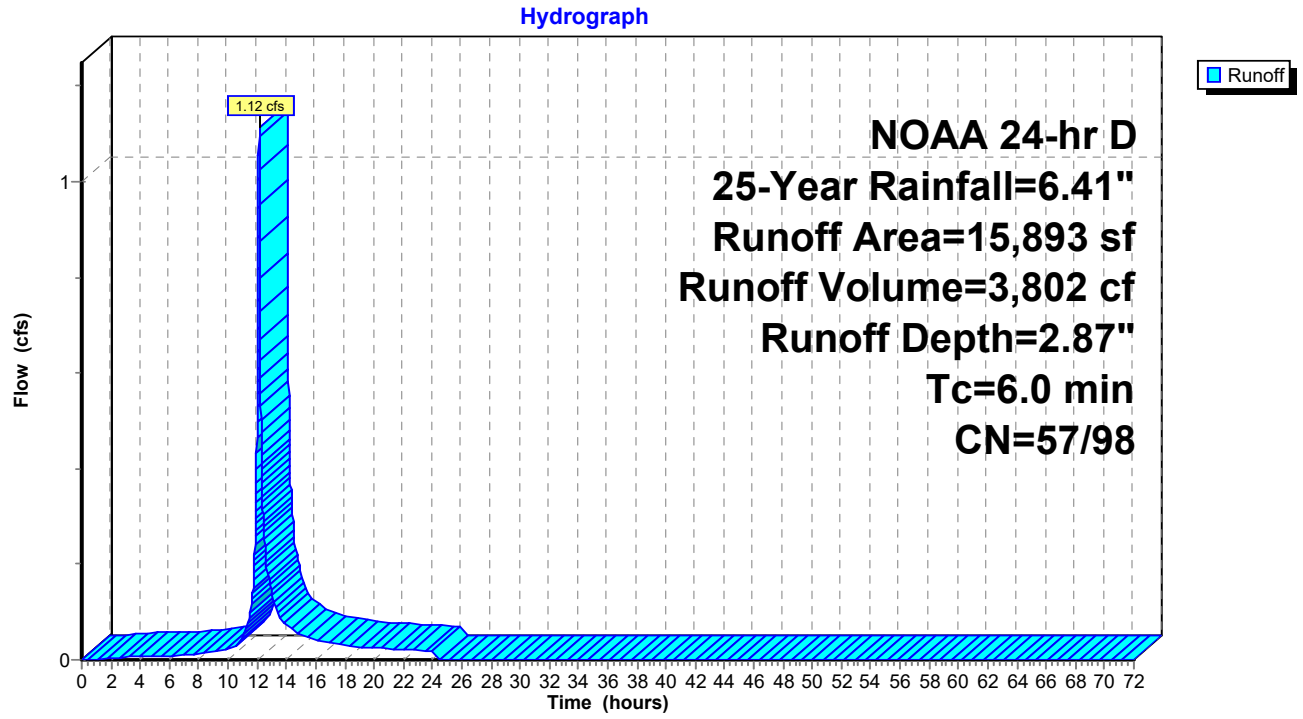
Runoff = 1.12 cfs @ 12.13 hrs, Volume= 3,802 cf, Depth= 2.87"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 25-Year Rainfall=6.41"

Area (sf)	CN	Description
3,525	98	Unconnected pavement, HSG D
2,282	30	Woods, Good, HSG A
4,016	80	>75% Grass cover, Good, HSG D
2,104	74	>75% Grass cover, Good, HSG C
3,966	39	>75% Grass cover, Good, HSG A
15,893	66	Weighted Average
12,368	57	77.82% Pervious Area
3,525	98	22.18% Impervious Area

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

Subcatchment EX-2: Runoff South



Summary for Subcatchment EX-3: Runoff to North

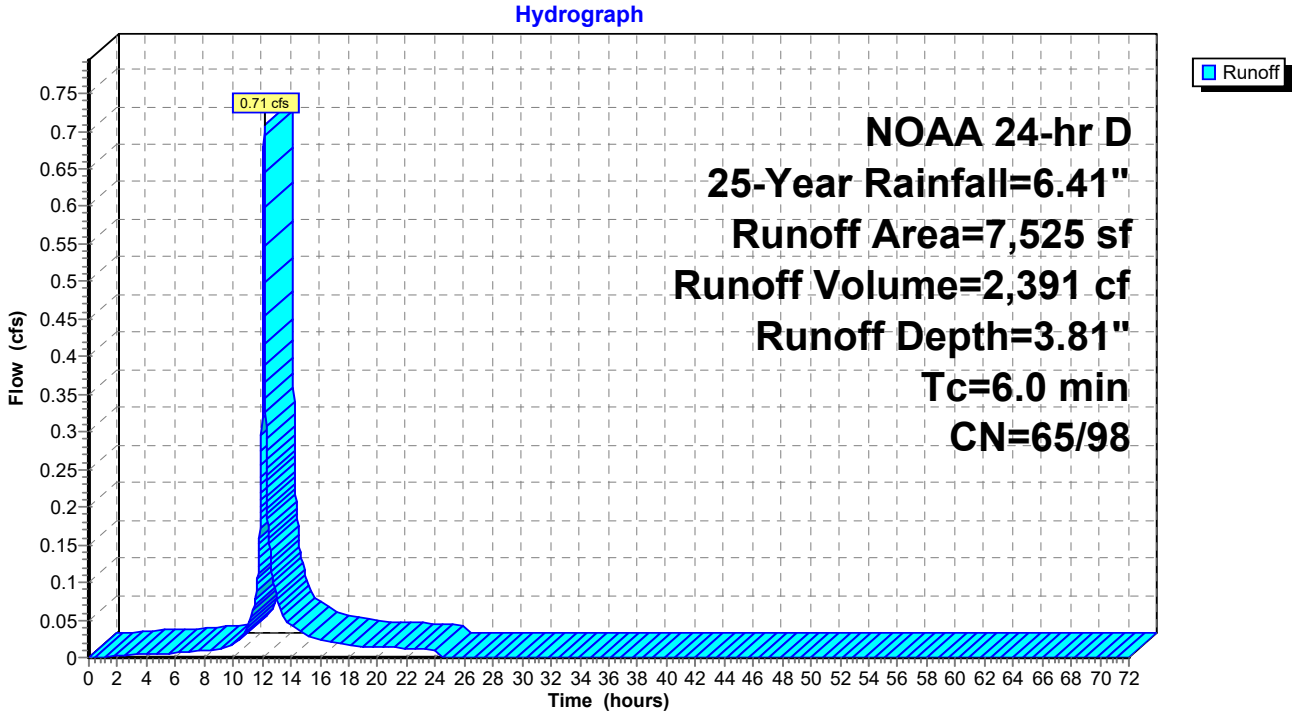
Runoff = 0.71 cfs @ 12.13 hrs, Volume= 2,391 cf, Depth= 3.81"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 25-Year Rainfall=6.41"

Area (sf)	CN	Description
2,478	98	Unconnected pavement, HSG D
11	30	Woods, Good, HSG A
1,328	77	Woods, Good, HSG D
1,476	80	>75% Grass cover, Good, HSG D
614	74	>75% Grass cover, Good, HSG C
1,618	39	>75% Grass cover, Good, HSG A
7,525	76	Weighted Average
5,047	65	67.07% Pervious Area
2,478	98	32.93% Impervious Area

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

Subcatchment EX-3: Runoff to North



Summary for Subcatchment P-1A: Direct to Wetlands

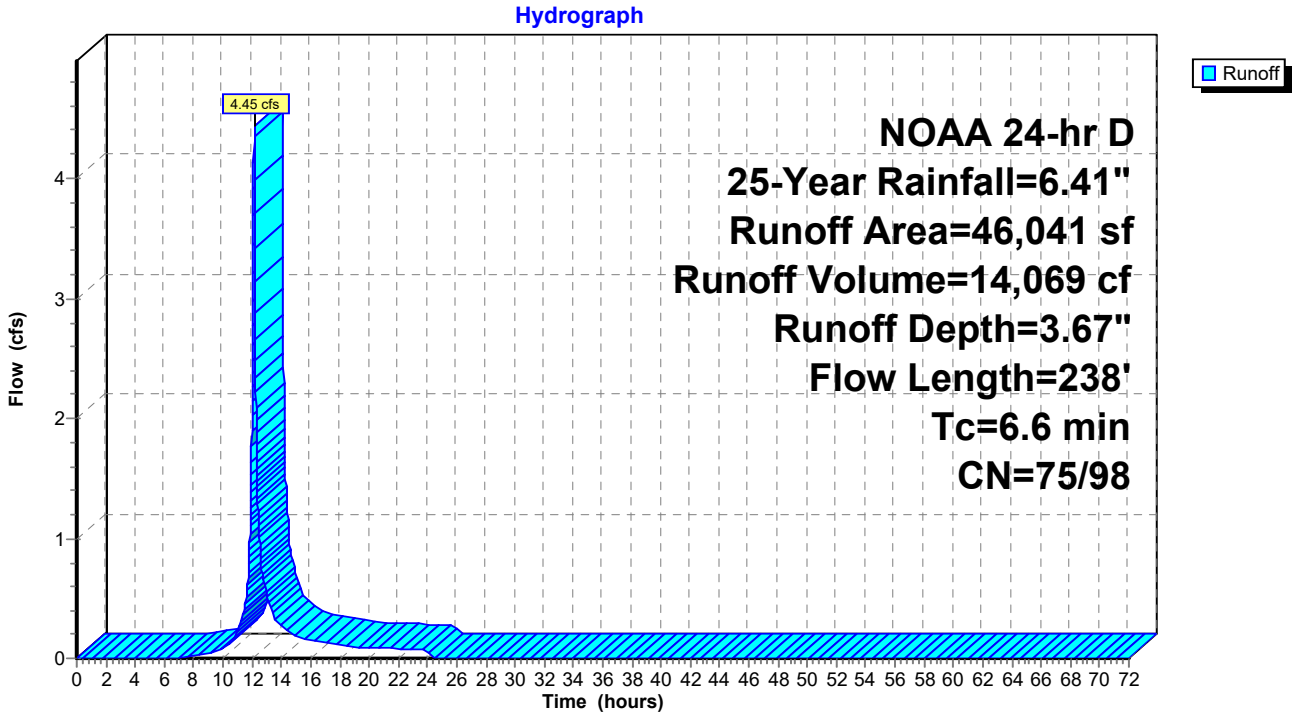
Runoff = 4.45 cfs @ 12.14 hrs, Volume= 14,069 cf, Depth= 3.67"
Routed to Link POI-1 : Wetland Area

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 25-Year Rainfall=6.41"

	Area (sf)	CN	Description
*	596	98	Impervious
*	589	39	Turf Area, HSG A
*	8,791	80	Turf Area, HSG D
	1,088	30	Woods, Good, HSG A
	21,266	77	Woods, Good, HSG D
	1,685	39	>75% Grass cover, Good, HSG A
	12,026	80	>75% Grass cover, Good, HSG D
	46,041	76	Weighted Average
	45,445	75	98.71% Pervious Area
	596	98	1.29% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	100	0.0850	0.30		**Sheet Flow, 1A-1B** Grass: Short n= 0.150 P2= 3.09"
0.9	105	0.0140	1.90		**Shallow Concentrated Flow, 1B-1C** Unpaved Kv= 16.1 fps
0.1	33	0.0600	3.94		**Shallow Concentrated Flow, 1C-1D** Unpaved Kv= 16.1 fps
6.6	238	Total			

Subcatchment P-1A: Direct to Wetlands



Summary for Subcatchment P-1B: Parking Lot

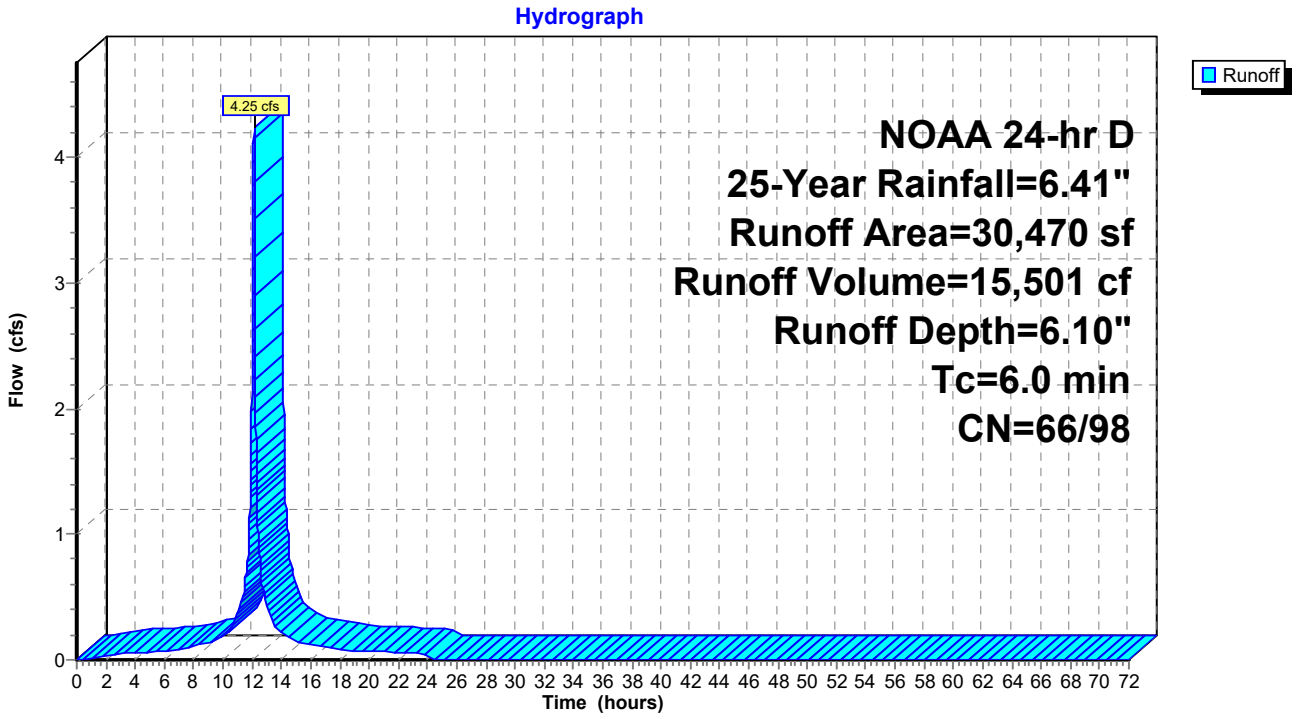
Runoff = 4.25 cfs @ 12.13 hrs, Volume= 15,501 cf, Depth= 6.10"
Routed to Pond B-1 : StormTech SC-800 Subsurface Infiltration System

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 25-Year Rainfall=6.41"

	Area (sf)	CN	Description
*	29,878	98	Impervious
	238	80	>75% Grass cover, Good, HSG D
	181	74	>75% Grass cover, Good, HSG C
	173	39	>75% Grass cover, Good, HSG A
	30,470	97	Weighted Average
	592	66	1.94% Pervious Area
	29,878	98	98.06% Impervious Area

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

Subcatchment P-1B: Parking Lot



Summary for Subcatchment P-2: Direct to POI-2

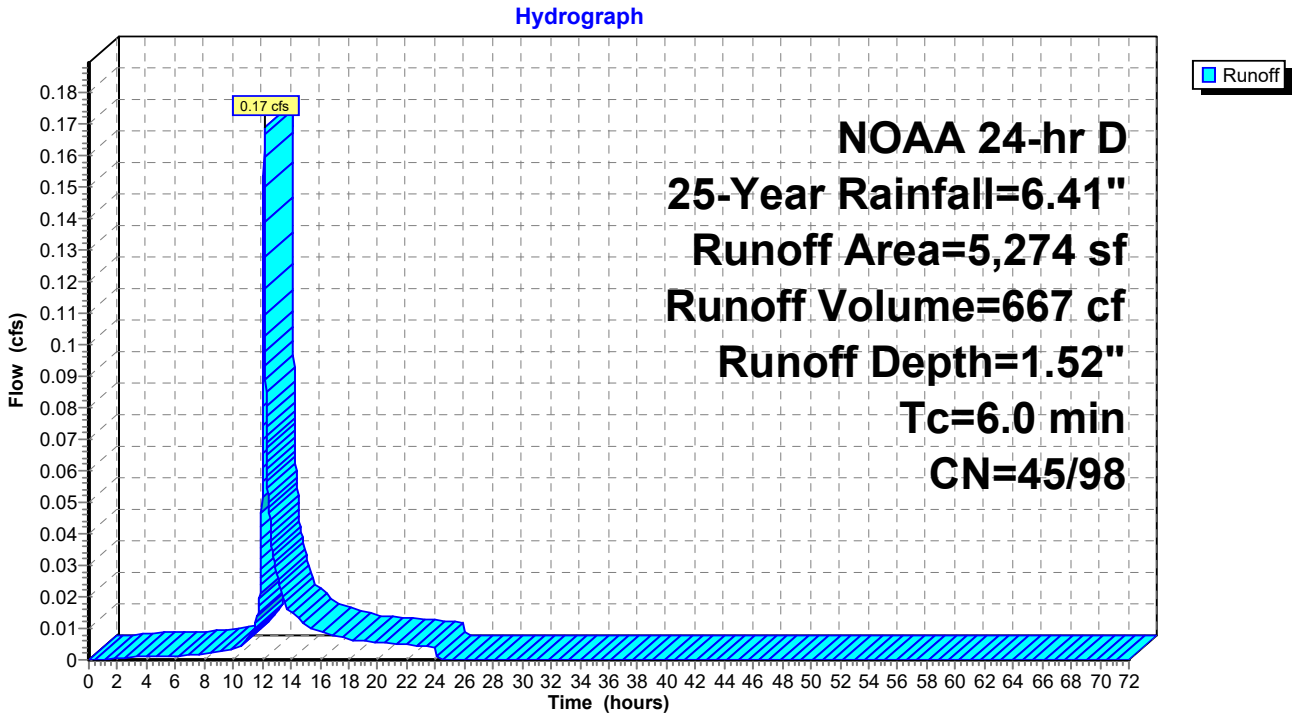
Runoff = 0.17 cfs @ 12.14 hrs, Volume= 667 cf, Depth= 1.52"
Routed to Link POI-2 : Southern Abutters

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 25-Year Rainfall=6.41"

Area (sf)	CN	Description
554	98	Unconnected pavement, HSG D
3,951	39	>75% Grass cover, Good, HSG A
250	74	>75% Grass cover, Good, HSG C
519	80	>75% Grass cover, Good, HSG D
5,274	51	Weighted Average
4,720	45	89.50% Pervious Area
554	98	10.50% Impervious Area

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

Subcatchment P-2: Direct to POI-2



Summary for Subcatchment P-3: Direct to POI-3

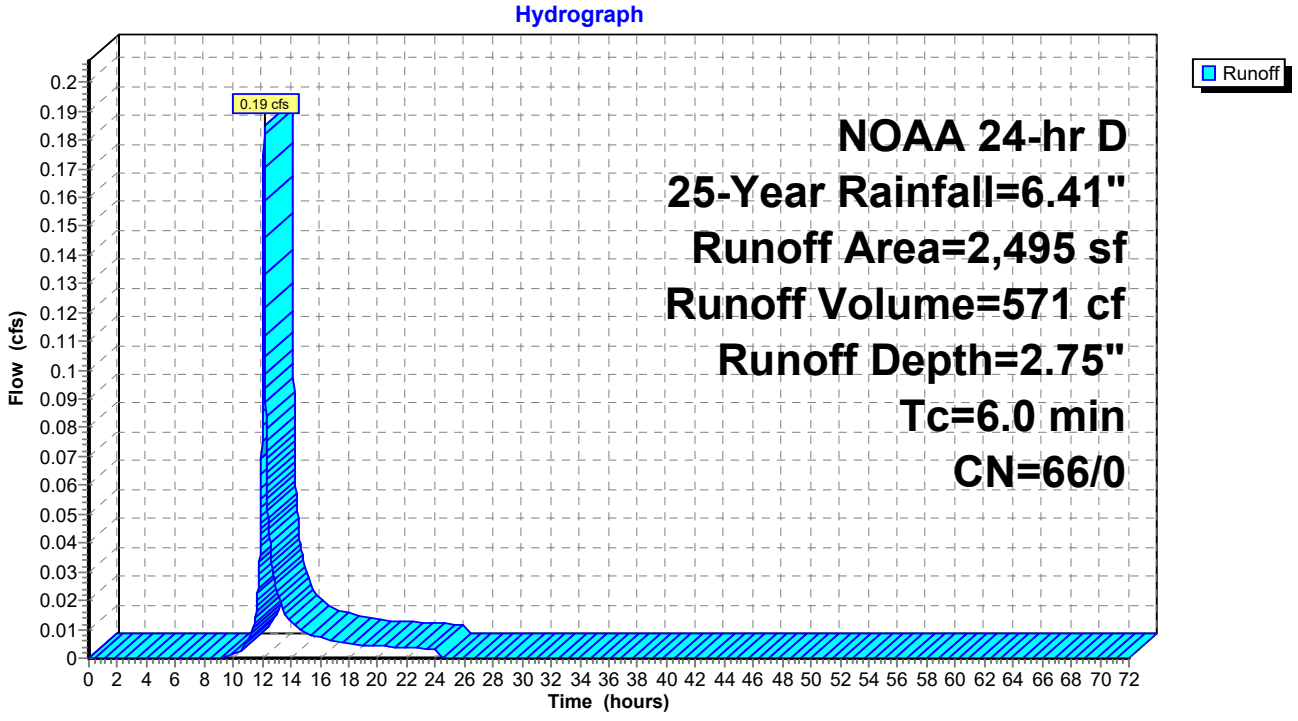
Runoff = 0.19 cfs @ 12.13 hrs, Volume= 571 cf, Depth= 2.75"
Routed to Link POI-3 : Southern Abutters

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 25-Year Rainfall=6.41"

Area (sf)	CN	Description
1,299	80	>75% Grass cover, Good, HSG D
424	74	>75% Grass cover, Good, HSG C
772	39	>75% Grass cover, Good, HSG A
2,495	66	Weighted Average
2,495	66	100.00% Pervious Area

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

Subcatchment P-3: Direct to POI-3



Summary for Pond B-1: StormTech SC-800 Subsurface Infiltration System

Inflow Area = 30,470 sf, 98.06% Impervious, Inflow Depth = 6.10" for 25-Year event
Inflow = 4.25 cfs @ 12.13 hrs, Volume= 15,501 cf
Outflow = 0.57 cfs @ 12.72 hrs, Volume= 15,501 cf, Atten= 87%, Lag= 35.3 min
Discarded = 0.38 cfs @ 12.72 hrs, Volume= 14,977 cf
Primary = 0.20 cfs @ 12.72 hrs, Volume= 524 cf
Routed to Link POI-1 : Wetland Area

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 107.72' @ 12.72 hrs Surf.Area= 2,679 sf Storage= 5,539 cf

Plug-Flow detention time= 118.4 min calculated for 15,499 cf (100% of inflow)
Center-of-Mass det. time= 118.4 min (864.5 - 746.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	104.50'	3,075 cf	**39.50'W x 67.82'L x 4.25'H Field A** 11,385 cf Overall - 3,697 cf Embedded = 7,687 cf x 40.0% Voids
#2A	105.50'	3,697 cf	**ADS_StormTech SC-800 +Cap** x 72 Inside #1 Effective Size= 45.0"W x 33.0"H => 7.11 sf x 7.12'L = 50.6 cf Overall Size= 51.0"W x 33.0"H x 7.55'L with 0.43' Overlap 72 Chambers in 8 Rows Cap Storage= 3.4 cf x 2 x 8 rows = 54.7 cf
		6,772 cf	Total Available Storage

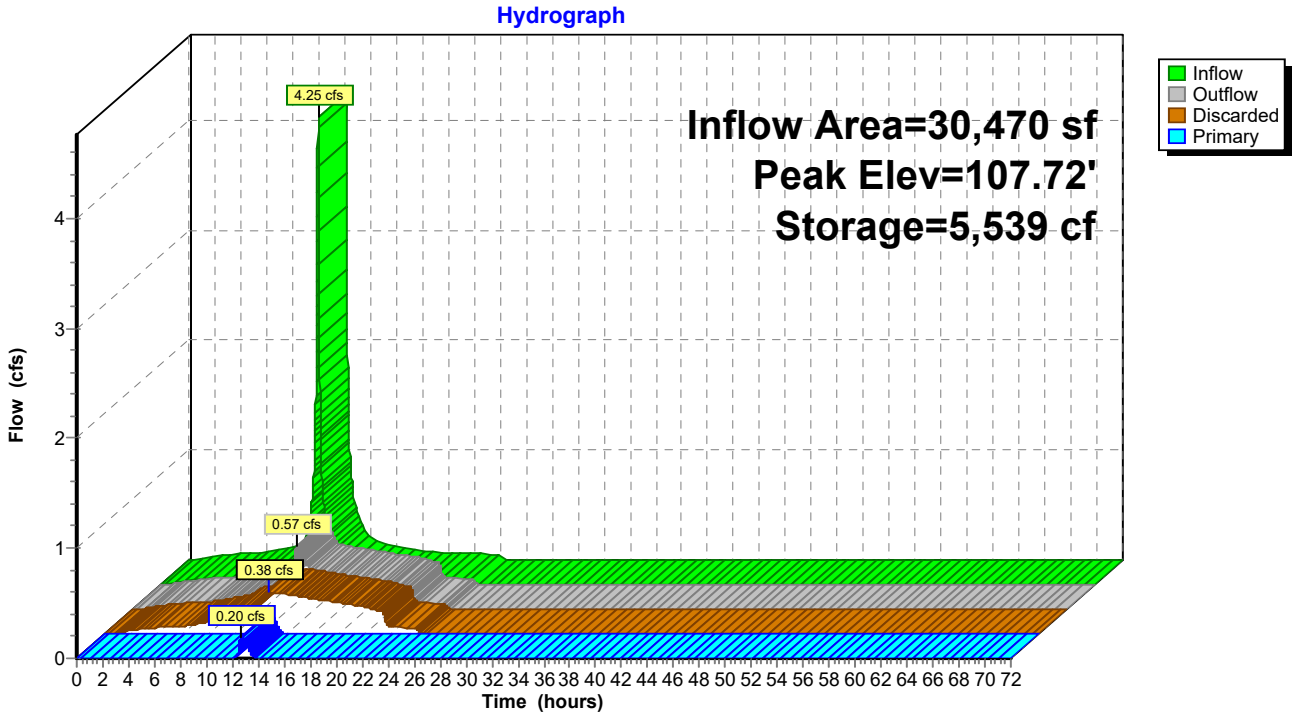
Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	104.00'	**12.0" Round Culvert** L= 45.0' Ke= 0.500 Inlet / Outlet Invert= 104.00' / 103.50' S= 0.0111 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#2	Device 1	107.50'	**7.0" W x 3.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	108.20'	**6.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#4	Discarded	104.50'	**3.150 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 101.00' Phase-In= 0.10'

Discarded OutFlow Max=0.38 cfs @ 12.72 hrs HW=107.72' (Free Discharge)
└**4=Exfiltration** (Controls 0.38 cfs)

Primary OutFlow Max=0.20 cfs @ 12.72 hrs HW=107.72' TW=0.00' (Dynamic Tailwater)
└**1=Culvert** (Passes 0.20 cfs of 6.63 cfs potential flow)
  ├**2=Orifice/Grate** (Orifice Controls 0.20 cfs @ 1.51 fps)
  └**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond B-1: StormTech SC-800 Subsurface Infiltration System

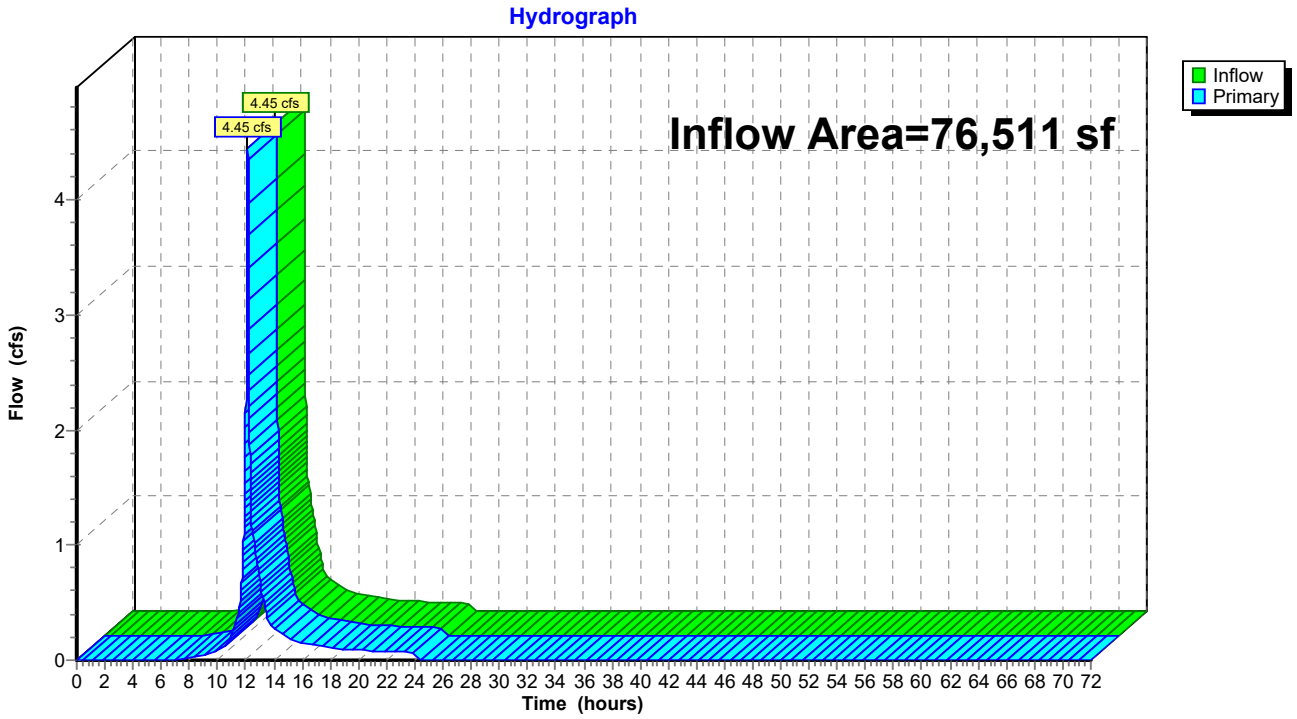


Summary for Link POI-1: Wetland Area

Inflow Area = 76,511 sf, 39.83% Impervious, Inflow Depth = 2.29" for 25-Year event
Inflow = 4.45 cfs @ 12.14 hrs, Volume= 14,593 cf
Primary = 4.45 cfs @ 12.14 hrs, Volume= 14,593 cf, Atten= 0%, Lag= 0.0 min

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

Link POI-1: Wetland Area

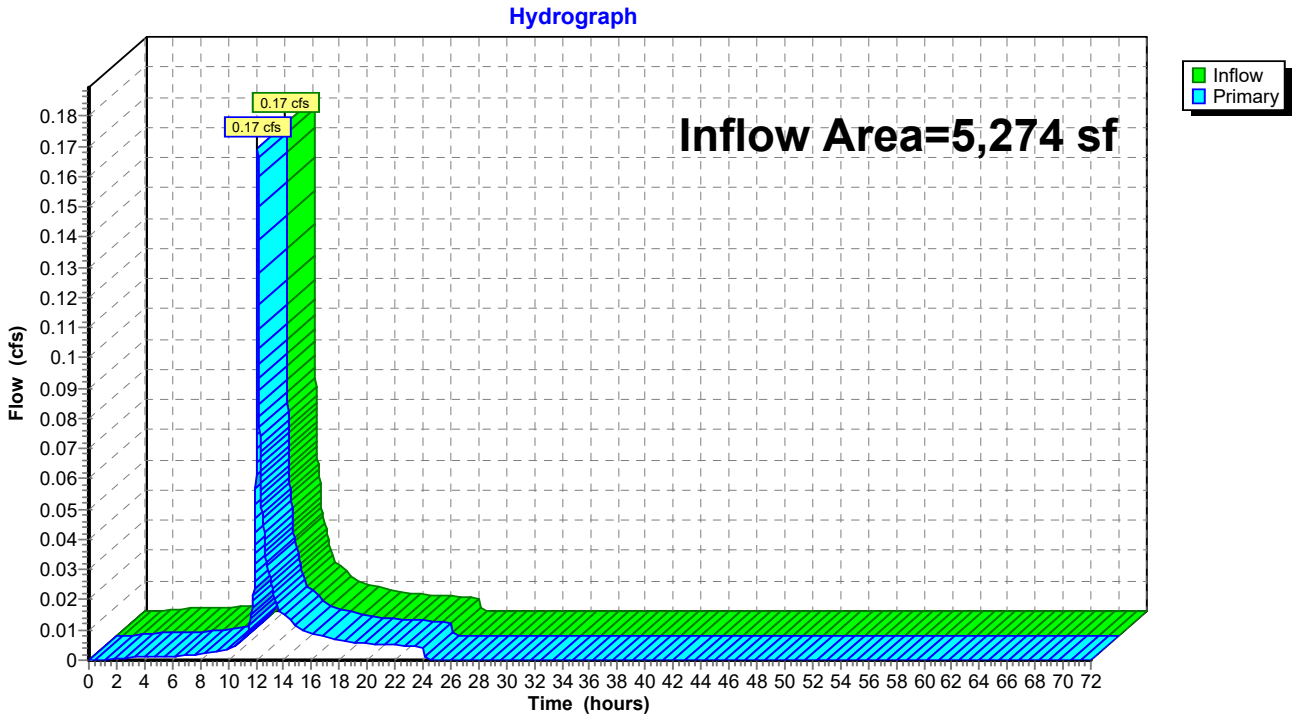


Summary for Link POI-2: Southern Abutters

Inflow Area = 5,274 sf, 10.50% Impervious, Inflow Depth = 1.52" for 25-Year event
Inflow = 0.17 cfs @ 12.14 hrs, Volume= 667 cf
Primary = 0.17 cfs @ 12.14 hrs, Volume= 667 cf, Atten= 0%, Lag= 0.0 min

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

Link POI-2: Southern Abutters

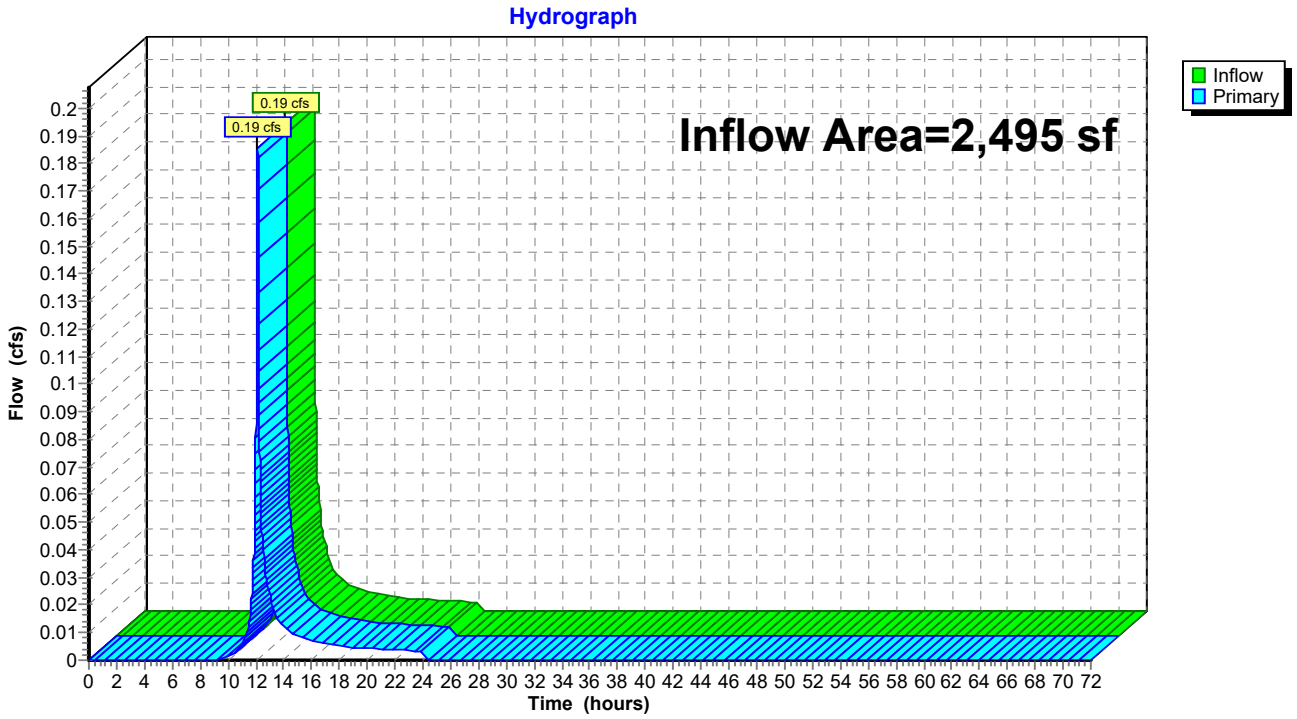


Summary for Link POI-3: Southern Abutters

Inflow Area = 2,495 sf, 0.00% Impervious, Inflow Depth = 2.75" for 25-Year event
Inflow = 0.19 cfs @ 12.13 hrs, Volume= 571 cf
Primary = 0.19 cfs @ 12.13 hrs, Volume= 571 cf, Atten= 0%, Lag= 0.0 min

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

Link POI-3: Southern Abutters



Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment EX-1: Runoff to Wetlands Runoff Area=60,862 sf 9.11% Impervious Runoff Depth=5.19"
Flow Length=204' Tc=11.2 min CN=72/98 Runoff=6.86 cfs 26,310 cf

Subcatchment EX-2: Runoff South Runoff Area=15,893 sf 22.18% Impervious Runoff Depth=4.24"
Tc=6.0 min CN=57/98 Runoff=1.69 cfs 5,621 cf

Subcatchment EX-3: Runoff to North Runoff Area=7,525 sf 32.93% Impervious Runoff Depth=5.38"
Tc=6.0 min CN=65/98 Runoff=1.01 cfs 3,372 cf

Subcatchment P-1A: Direct to Wetlands Runoff Area=46,041 sf 1.29% Impervious Runoff Depth=5.29"
Flow Length=238' Tc=6.6 min CN=75/98 Runoff=6.35 cfs 20,313 cf

Subcatchment P-1B: Parking Lot Runoff Area=30,470 sf 98.06% Impervious Runoff Depth=7.93"
Tc=6.0 min CN=66/98 Runoff=5.48 cfs 20,126 cf

Subcatchment P-2: Direct to POI-2 Runoff Area=5,274 sf 10.50% Impervious Runoff Depth=2.51"
Tc=6.0 min CN=45/98 Runoff=0.31 cfs 1,103 cf

Subcatchment P-3: Direct to POI-3 Runoff Area=2,495 sf 0.00% Impervious Runoff Depth=4.21"
Tc=6.0 min CN=66/0 Runoff=0.28 cfs 874 cf

Pond B-1: StormTech SC-800 Subsurface Peak Elev=108.36' Storage=6,355 cf Inflow=5.48 cfs 20,126 cf
Discarded=0.41 cfs 17,180 cf Primary=1.68 cfs 2,946 cf Outflow=2.09 cfs 20,126 cf

Link POI-1: Wetland Area Inflow=6.37 cfs 23,258 cf
Primary=6.37 cfs 23,258 cf

Link POI-2: Southern Abutters Inflow=0.31 cfs 1,103 cf
Primary=0.31 cfs 1,103 cf

Link POI-3: Southern Abutters Inflow=0.28 cfs 874 cf
Primary=0.28 cfs 874 cf

Total Runoff Area = 168,560 sf Runoff Volume = 77,719 cf Average Runoff Depth = 5.53"
74.74% Pervious = 125,985 sf 25.26% Impervious = 42,575 sf

Summary for Subcatchment EX-1: Runoff to Wetlands

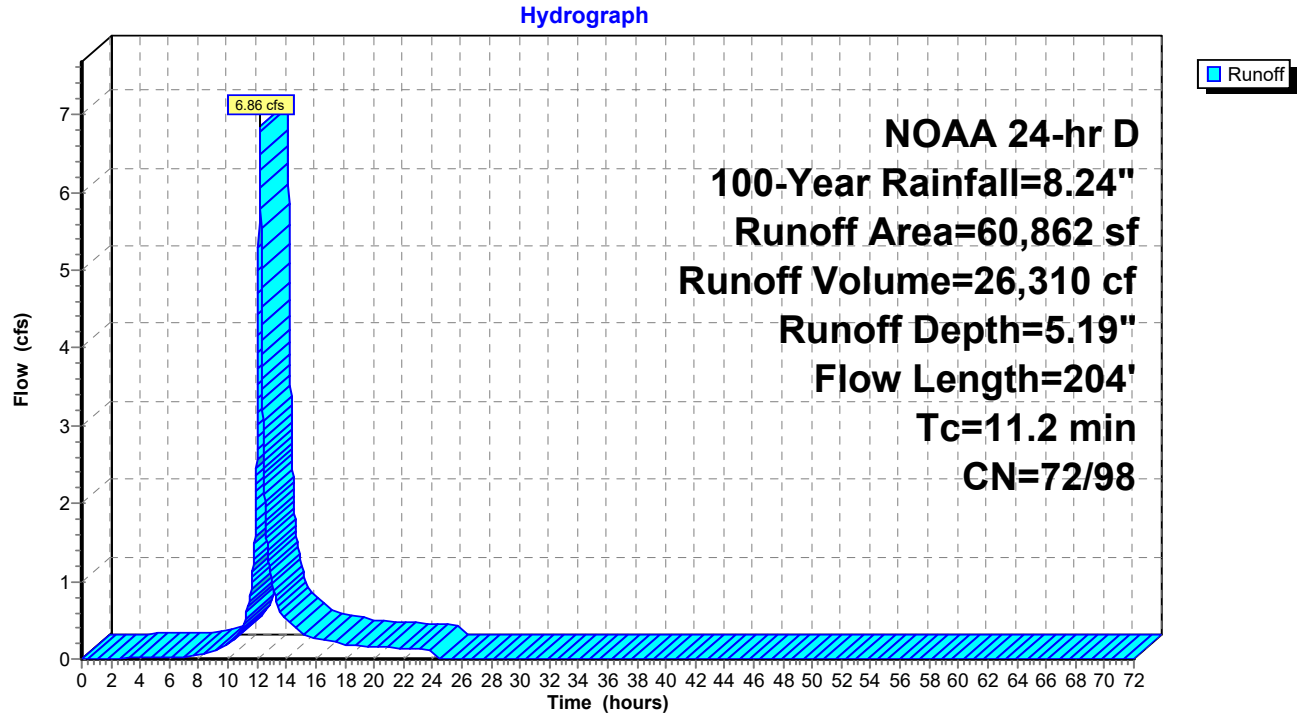
Runoff = 6.86 cfs @ 12.19 hrs, Volume= 26,310 cf, Depth= 5.19"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 100-Year Rainfall=8.24"

Area (sf)	CN	Description
5,544	98	Unconnected pavement, HSG D
5,696	30	Woods, Good, HSG A
43,615	77	Woods, Good, HSG D
4,717	80	>75% Grass cover, Good, HSG D
1,290	39	>75% Grass cover, Good, HSG A
60,862	74	Weighted Average
55,318	72	90.89% Pervious Area
5,544	98	9.11% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.3	96	0.1200	0.15		**Sheet Flow, 1A-1B** Woods: Light underbrush n= 0.400 P2= 3.09"
0.6	63	0.0670	1.81		**Shallow Concentrated Flow, 1B-1C** Short Grass Pasture Kv= 7.0 fps
0.3	45	0.2000	2.24		**Shallow Concentrated Flow, 1C-1D** Woodland Kv= 5.0 fps
11.2	204	Total			

Subcatchment EX-1: Runoff to Wetlands



Summary for Subcatchment EX-2: Runoff South

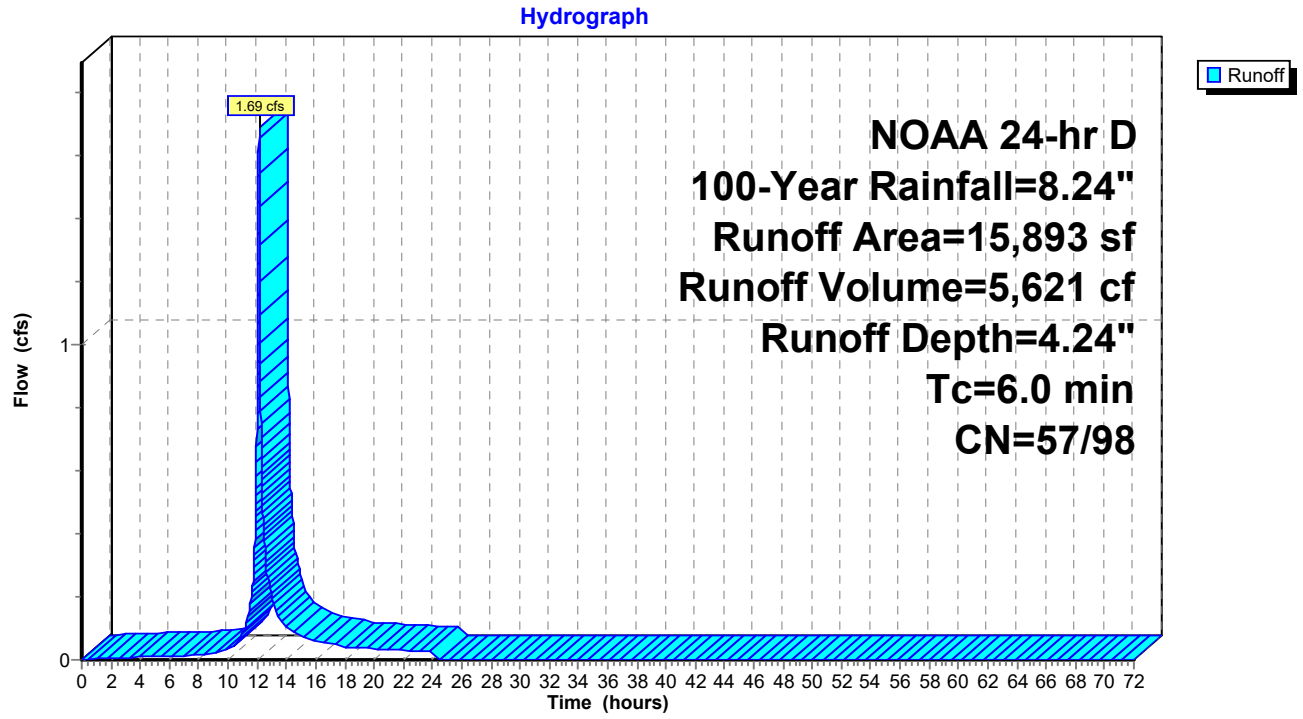
Runoff = 1.69 cfs @ 12.13 hrs, Volume= 5,621 cf, Depth= 4.24"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 100-Year Rainfall=8.24"

Area (sf)	CN	Description
3,525	98	Unconnected pavement, HSG D
2,282	30	Woods, Good, HSG A
4,016	80	>75% Grass cover, Good, HSG D
2,104	74	>75% Grass cover, Good, HSG C
3,966	39	>75% Grass cover, Good, HSG A
15,893	66	Weighted Average
12,368	57	77.82% Pervious Area
3,525	98	22.18% Impervious Area

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

Subcatchment EX-2: Runoff South



Summary for Subcatchment EX-3: Runoff to North

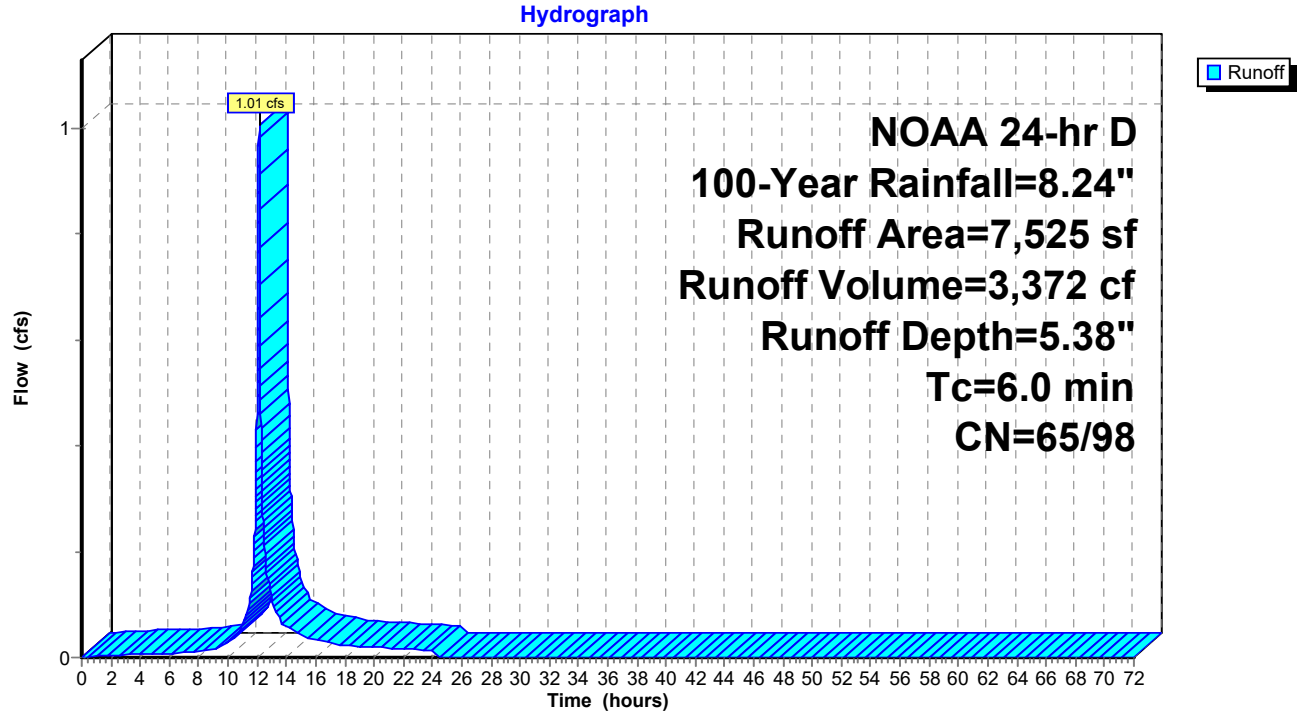
Runoff = 1.01 cfs @ 12.13 hrs, Volume= 3,372 cf, Depth= 5.38"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 100-Year Rainfall=8.24"

Area (sf)	CN	Description
2,478	98	Unconnected pavement, HSG D
11	30	Woods, Good, HSG A
1,328	77	Woods, Good, HSG D
1,476	80	>75% Grass cover, Good, HSG D
614	74	>75% Grass cover, Good, HSG C
1,618	39	>75% Grass cover, Good, HSG A
7,525	76	Weighted Average
5,047	65	67.07% Pervious Area
2,478	98	32.93% Impervious Area

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

Subcatchment EX-3: Runoff to North



Summary for Subcatchment P-1A: Direct to Wetlands

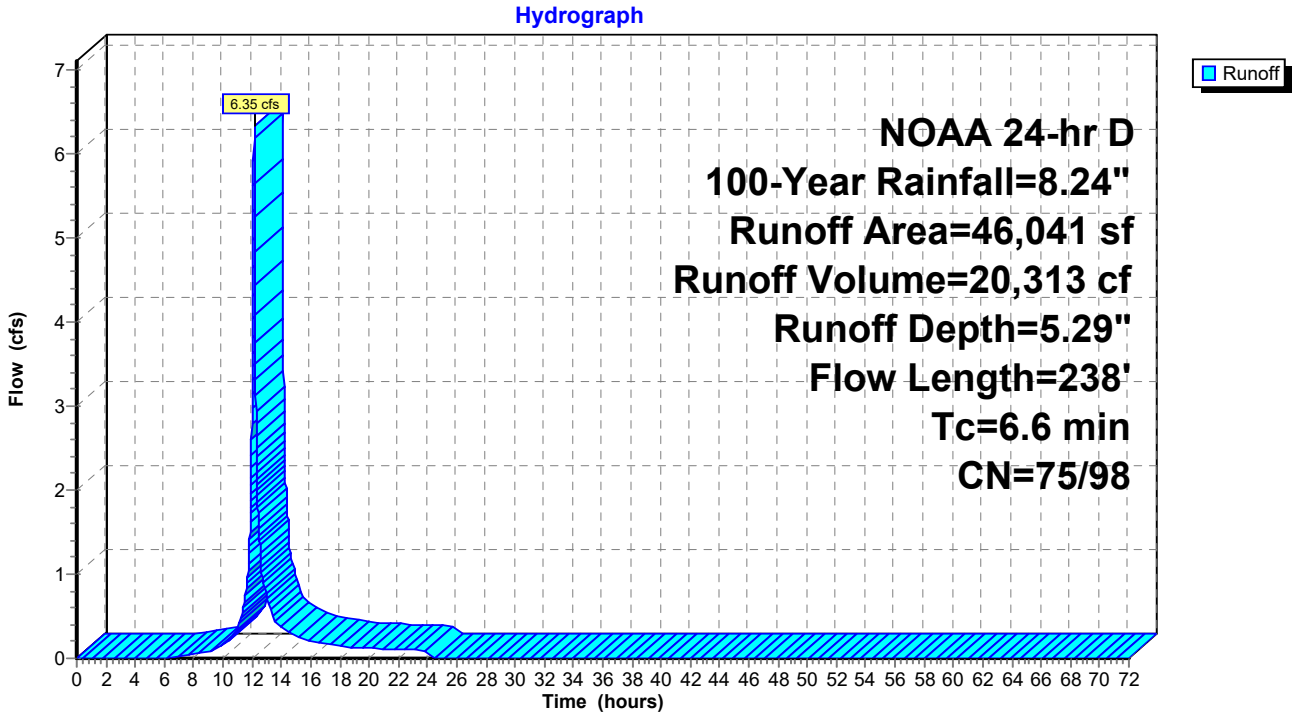
Runoff = 6.35 cfs @ 12.14 hrs, Volume= 20,313 cf, Depth= 5.29"
Routed to Link POI-1 : Wetland Area

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 100-Year Rainfall=8.24"

	Area (sf)	CN	Description
*	596	98	Impervious
*	589	39	Turf Area, HSG A
*	8,791	80	Turf Area, HSG D
	1,088	30	Woods, Good, HSG A
	21,266	77	Woods, Good, HSG D
	1,685	39	>75% Grass cover, Good, HSG A
	12,026	80	>75% Grass cover, Good, HSG D
	46,041	76	Weighted Average
	45,445	75	98.71% Pervious Area
	596	98	1.29% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	100	0.0850	0.30		**Sheet Flow, 1A-1B** Grass: Short n= 0.150 P2= 3.09"
0.9	105	0.0140	1.90		**Shallow Concentrated Flow, 1B-1C** Unpaved Kv= 16.1 fps
0.1	33	0.0600	3.94		**Shallow Concentrated Flow, 1C-1D** Unpaved Kv= 16.1 fps
6.6	238	Total			

Subcatchment P-1A: Direct to Wetlands



Summary for Subcatchment P-1B: Parking Lot

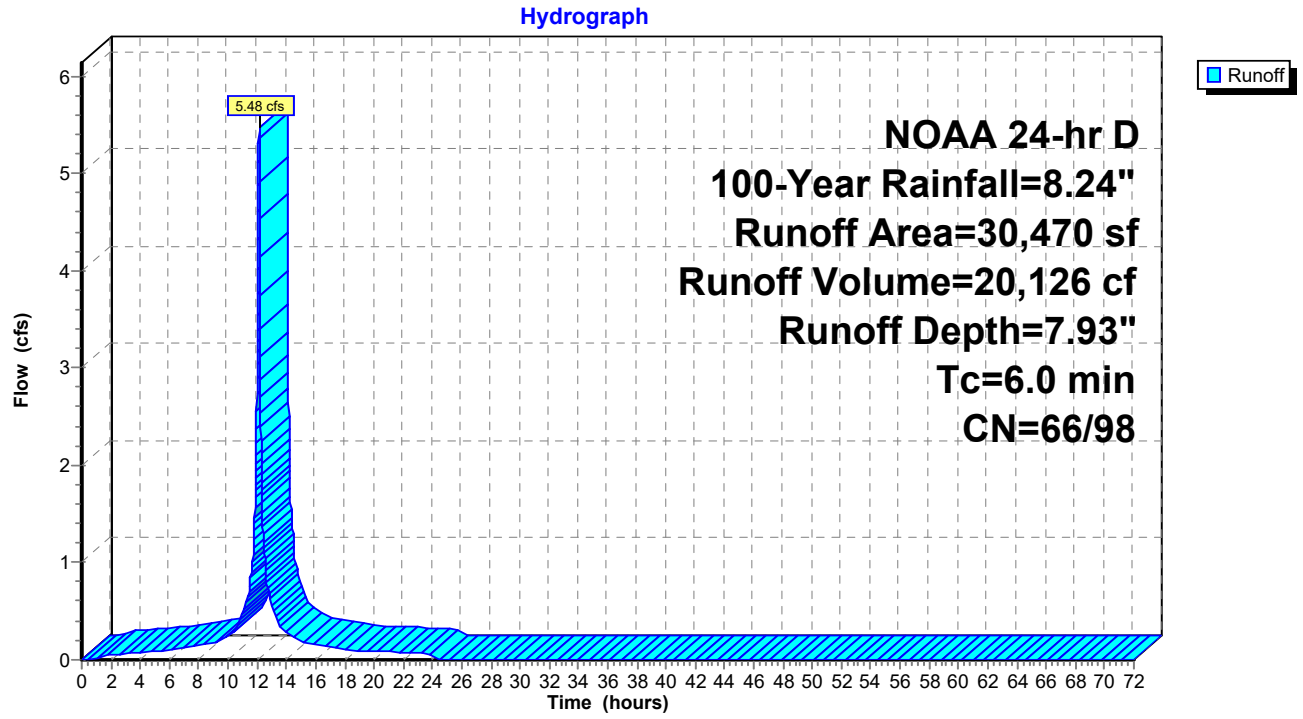
Runoff = 5.48 cfs @ 12.13 hrs, Volume= 20,126 cf, Depth= 7.93"
Routed to Pond B-1 : StormTech SC-800 Subsurface Infiltration System

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 100-Year Rainfall=8.24"

	Area (sf)	CN	Description
*	29,878	98	Impervious
	238	80	>75% Grass cover, Good, HSG D
	181	74	>75% Grass cover, Good, HSG C
	173	39	>75% Grass cover, Good, HSG A
	30,470	97	Weighted Average
	592	66	1.94% Pervious Area
	29,878	98	98.06% Impervious Area

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

Subcatchment P-1B: Parking Lot



Summary for Subcatchment P-2: Direct to POI-2

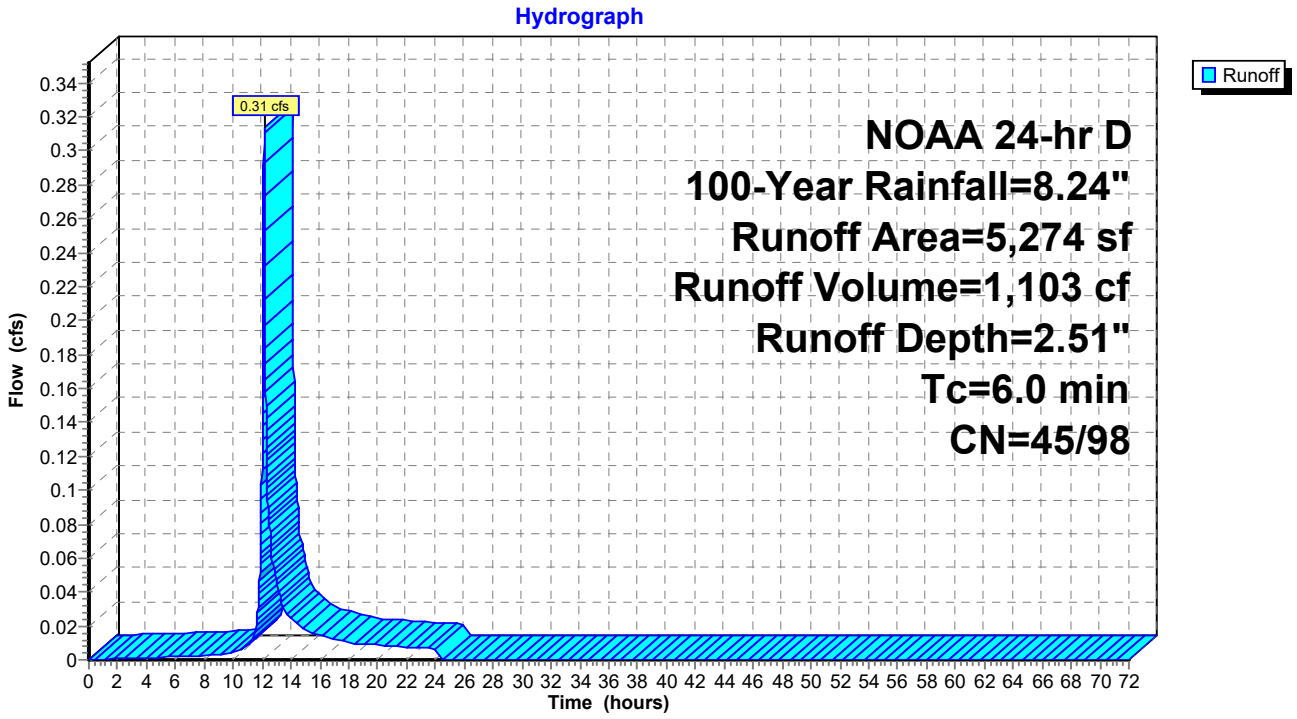
Runoff = 0.31 cfs @ 12.14 hrs, Volume= 1,103 cf, Depth= 2.51"
Routed to Link POI-2 : Southern Abutters

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 100-Year Rainfall=8.24"

Area (sf)	CN	Description
554	98	Unconnected pavement, HSG D
3,951	39	>75% Grass cover, Good, HSG A
250	74	>75% Grass cover, Good, HSG C
519	80	>75% Grass cover, Good, HSG D
5,274	51	Weighted Average
4,720	45	89.50% Pervious Area
554	98	10.50% Impervious Area

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

Subcatchment P-2: Direct to POI-2



Summary for Subcatchment P-3: Direct to POI-3

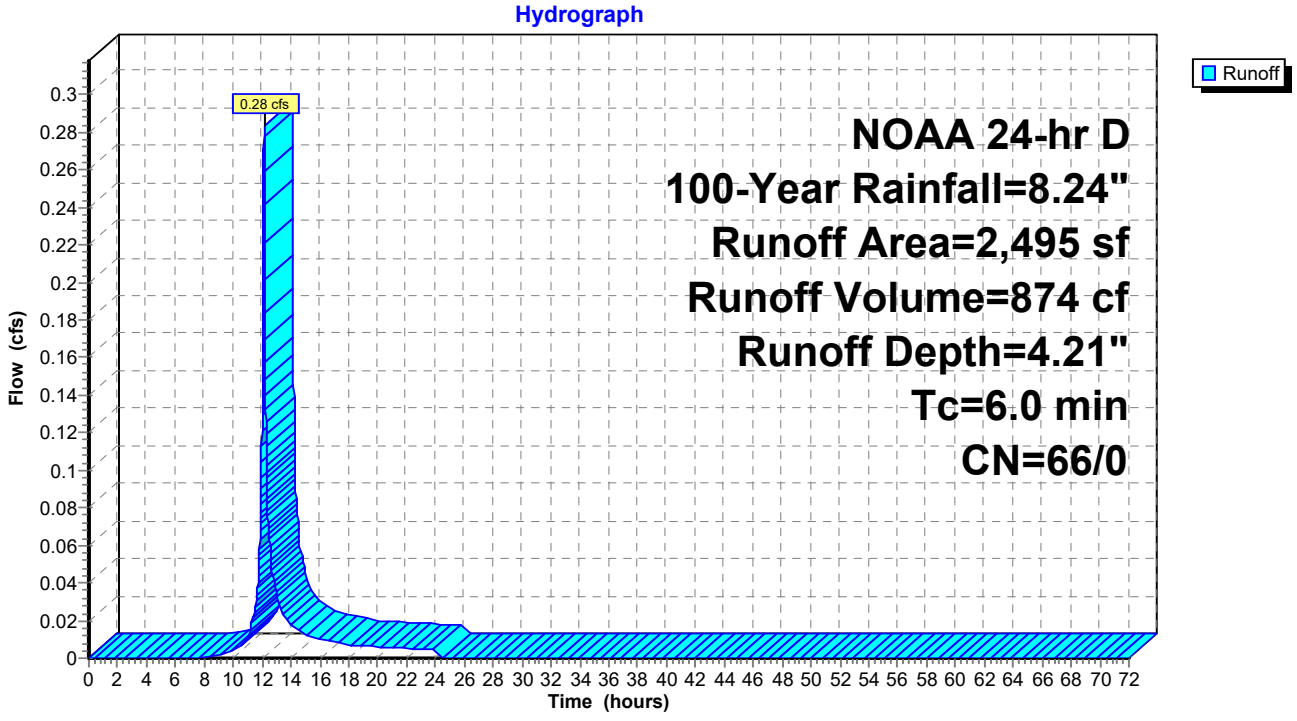
Runoff = 0.28 cfs @ 12.13 hrs, Volume= 874 cf, Depth= 4.21"
Routed to Link POI-3 : Southern Abutters

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 100-Year Rainfall=8.24"

Area (sf)	CN	Description
1,299	80	>75% Grass cover, Good, HSG D
424	74	>75% Grass cover, Good, HSG C
772	39	>75% Grass cover, Good, HSG A
2,495	66	Weighted Average
2,495	66	100.00% Pervious Area

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

Subcatchment P-3: Direct to POI-3



Summary for Pond B-1: StormTech SC-800 Subsurface Infiltration System

Inflow Area = 30,470 sf, 98.06% Impervious, Inflow Depth = 7.93" for 100-Year event
Inflow = 5.48 cfs @ 12.13 hrs, Volume= 20,126 cf
Outflow = 2.09 cfs @ 12.27 hrs, Volume= 20,126 cf, Atten= 62%, Lag= 8.7 min
Discarded = 0.41 cfs @ 12.27 hrs, Volume= 17,180 cf
Primary = 1.68 cfs @ 12.27 hrs, Volume= 2,946 cf
Routed to Link POI-1 : Wetland Area

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 108.36' @ 12.27 hrs Surf.Area= 2,679 sf Storage= 6,355 cf

Plug-Flow detention time= 109.6 min calculated for 20,123 cf (100% of inflow)
Center-of-Mass det. time= 109.6 min (852.3 - 742.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	104.50'	3,075 cf	**39.50'W x 67.82'L x 4.25'H Field A** 11,385 cf Overall - 3,697 cf Embedded = 7,687 cf x 40.0% Voids
#2A	105.50'	3,697 cf	**ADS_StormTech SC-800 +Cap** x 72 Inside #1 Effective Size= 45.0"W x 33.0"H => 7.11 sf x 7.12'L = 50.6 cf Overall Size= 51.0"W x 33.0"H x 7.55'L with 0.43' Overlap 72 Chambers in 8 Rows Cap Storage= 3.4 cf x 2 x 8 rows = 54.7 cf
		6,772 cf	Total Available Storage

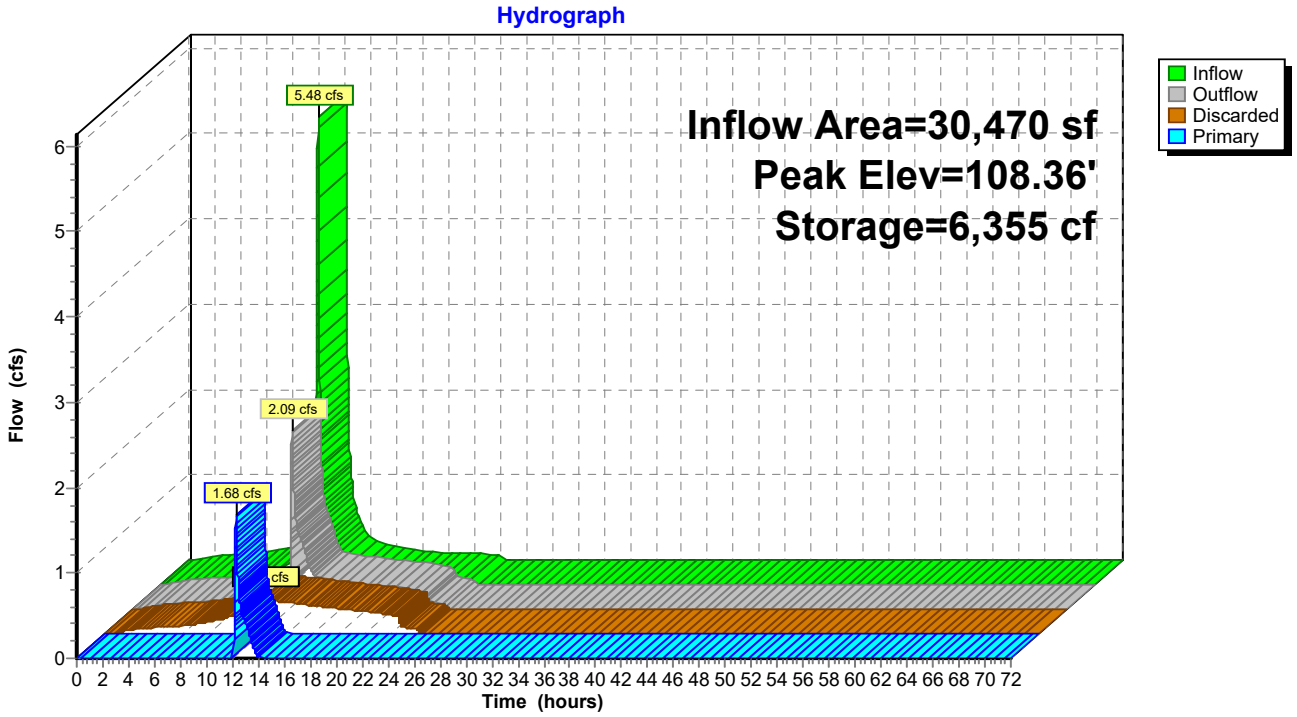
Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	104.00'	**12.0" Round Culvert** L= 45.0' Ke= 0.500 Inlet / Outlet Invert= 104.00' / 103.50' S= 0.0111 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#2	Device 1	107.50'	**7.0" W x 3.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	108.20'	**6.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#4	Discarded	104.50'	**3.150 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 101.00' Phase-In= 0.10'

Discarded OutFlow Max=0.41 cfs @ 12.27 hrs HW=108.36' (Free Discharge)
└**4=Exfiltration** (Controls 0.41 cfs)

Primary OutFlow Max=1.67 cfs @ 12.27 hrs HW=108.36' TW=0.00' (Dynamic Tailwater)
└**1=Culvert** (Passes 1.67 cfs of 7.26 cfs potential flow)
  ├**2=Orifice/Grate** (Orifice Controls 0.60 cfs @ 4.12 fps)
  └**3=Broad-Crested Rectangular Weir** (Weir Controls 1.07 cfs @ 1.12 fps)

Pond B-1: StormTech SC-800 Subsurface Infiltration System

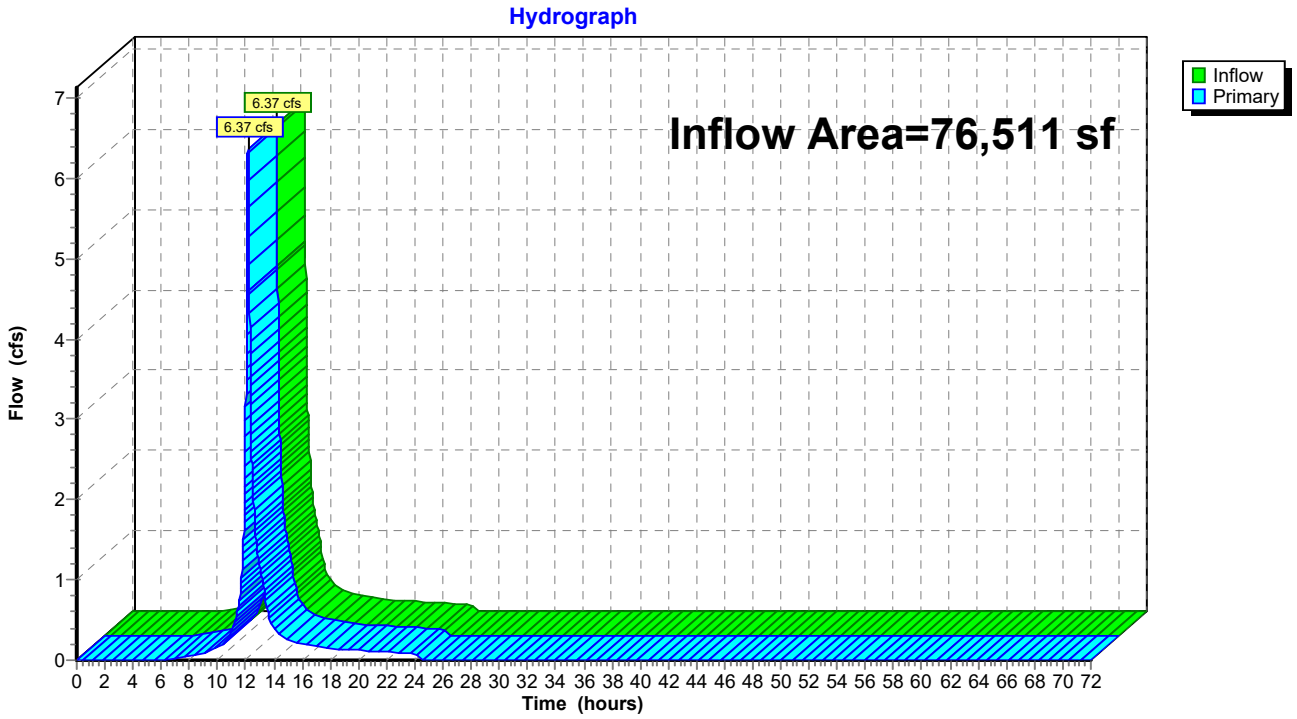


Summary for Link POI-1: Wetland Area

Inflow Area = 76,511 sf, 39.83% Impervious, Inflow Depth = 3.65" for 100-Year event
Inflow = 6.37 cfs @ 12.14 hrs, Volume= 23,258 cf
Primary = 6.37 cfs @ 12.14 hrs, Volume= 23,258 cf, Atten= 0%, Lag= 0.0 min

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

Link POI-1: Wetland Area

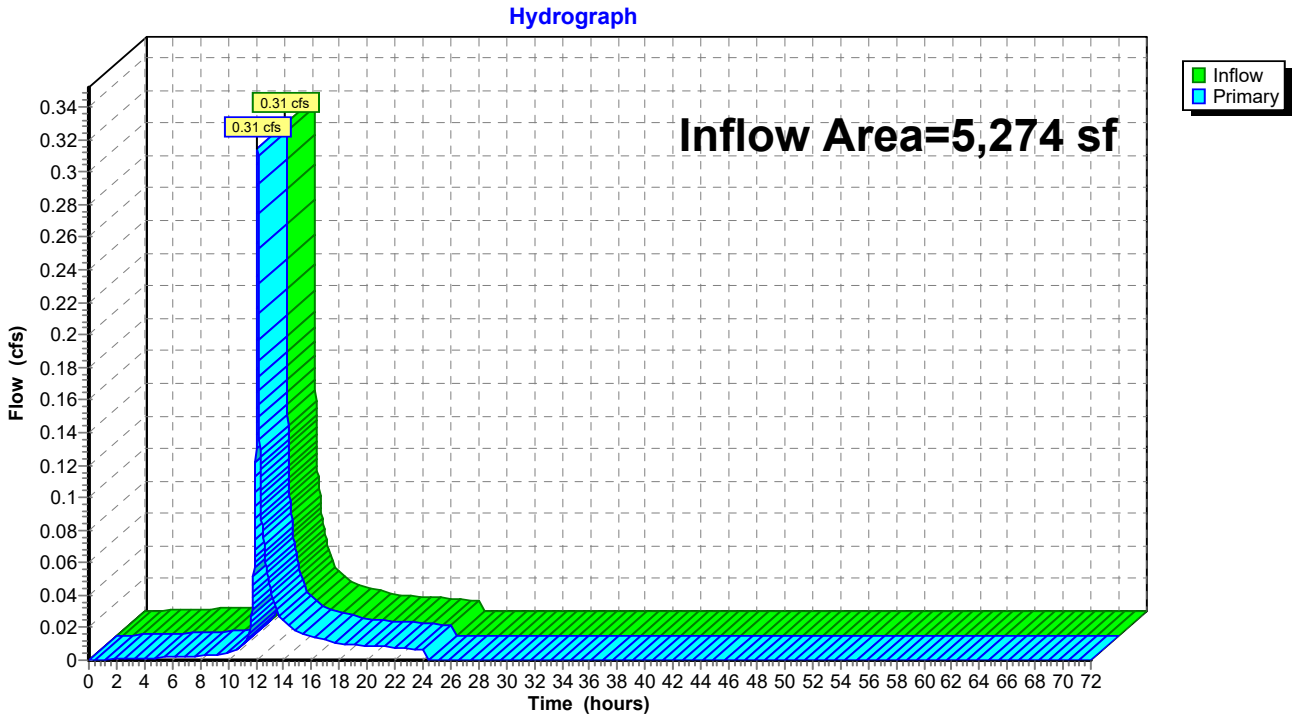


Summary for Link POI-2: Southern Abutters

Inflow Area = 5,274 sf, 10.50% Impervious, Inflow Depth = 2.51" for 100-Year event
Inflow = 0.31 cfs @ 12.14 hrs, Volume= 1,103 cf
Primary = 0.31 cfs @ 12.14 hrs, Volume= 1,103 cf, Atten= 0%, Lag= 0.0 min

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

Link POI-2: Southern Abutters

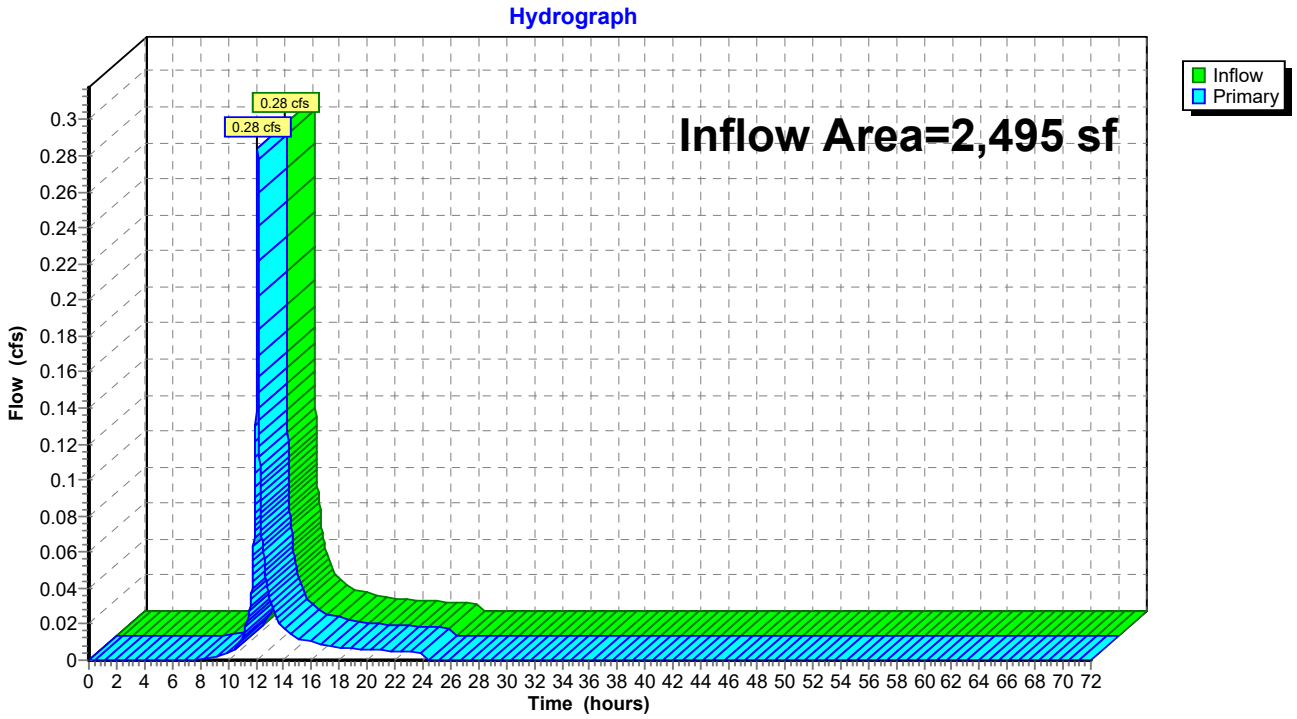


Summary for Link POI-3: Southern Abutters

Inflow Area = 2,495 sf, 0.00% Impervious, Inflow Depth = 4.21" for 100-Year event
Inflow = 0.28 cfs @ 12.13 hrs, Volume= 874 cf
Primary = 0.28 cfs @ 12.13 hrs, Volume= 874 cf, Atten= 0%, Lag= 0.0 min

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

Link POI-3: Southern Abutters



APPENDIX C-4
INFILTRATION BASIN STAGE-STORAGE AND STAGE DISCHARGE TABLES

Stage-Area-Storage for Pond B-1: StormTech SC-800 Subsurface Infiltration System

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
104.50	**2,679**	0
104.60	2,679	107
104.70	2,679	214
104.80	2,679	321
104.90	2,679	429
105.00	2,679	536
105.10	2,679	643
105.20	2,679	750
105.30	2,679	857
105.40	2,679	964
105.50	2,679	1,072
105.60	2,679	1,295
105.70	2,679	1,518
105.80	2,679	1,739
105.90	2,679	1,959
106.00	2,679	2,177
106.10	2,679	2,394
106.20	2,679	2,609
106.30	2,679	2,822
106.40	2,679	3,033
106.50	2,679	3,241
106.60	2,679	3,448
106.70	2,679	3,652
106.80	2,679	3,853
106.90	2,679	4,052
107.00	2,679	4,247
107.10	2,679	4,439
107.20	2,679	4,628
107.30	2,679	4,812
107.40	2,679	4,993
107.50	2,679	5,168
107.60	2,679	5,339
107.70	2,679	5,503
107.80	2,679	5,660
107.90	2,679	5,808
108.00	2,679	5,943
108.10	2,679	6,066
108.20	2,679	6,182
108.30	2,679	6,290
108.40	2,679	6,397
108.50	2,679	6,504
108.60	2,679	6,612
108.70	2,679	**6,719**

Stage-Discharge for Pond B-1: StormTech SC-800 Subsurface Infiltration System

Elevation (feet)	Discharge (cfs)	Discarded (cfs)	Primary (cfs)
104.50	0.00	0.00	0.00
104.60	0.20	0.20	0.00
104.70	0.21	0.21	0.00
104.80	0.21	0.21	0.00
104.90	0.22	0.22	0.00
105.00	0.22	0.22	0.00
105.10	0.23	0.23	0.00
105.20	0.23	0.23	0.00
105.30	0.24	0.24	0.00
105.40	0.25	0.25	0.00
105.50	0.25	0.25	0.00
105.60	0.26	0.26	0.00
105.70	0.26	0.26	0.00
105.80	0.27	0.27	0.00
105.90	0.27	0.27	0.00
106.00	0.28	0.28	0.00
106.10	0.28	0.28	0.00
106.20	0.29	0.29	0.00
106.30	0.30	0.30	0.00
106.40	0.30	0.30	0.00
106.50	0.31	0.31	0.00
106.60	0.31	0.31	0.00
106.70	0.32	0.32	0.00
106.80	0.32	0.32	0.00
106.90	0.33	0.33	0.00
107.00	0.33	0.33	0.00
107.10	0.34	0.34	0.00
107.20	0.35	0.35	0.00
107.30	0.35	0.35	0.00
107.40	0.36	0.36	0.00
107.50	0.36	0.36	0.00
107.60	0.43	0.37	0.06
107.70	0.54	0.37	0.17
107.80	0.67	0.38	0.29
107.90	0.75	0.39	0.36
108.00	0.82	0.39	0.43
108.10	0.88	0.40	0.48
108.20	0.93	0.40	0.53
108.30	1.51	0.41	1.11
108.40	2.53	0.41	2.12
108.50	3.89	0.42	3.48
108.60	5.55	0.42	5.13
108.70	**7.52**	**0.43**	**7.09**

APPENDIX C-5
STONE LINED SCOUR HOLE SIZING CALCULATIONS

CONDUIT OUTLET PROTECTION CALCULATION

PREFORMED SCOUR HOLE (SC-1)

OUTLET PARAMETERS

OPENING SPAN (S_P):	1.00	FT	OPENING RISE (R_P):	1.00	FT
FLOW AT OUTLET ($Q_{25\ yr}$):	0.20	CFS	UNIT DISCHARGE (q):	0.20	CFS/FT
TAILWATER DEPTH (TW):	0.00	FT			
SCOUR HOLE TYPE:	Type 1		SCOUR HOLE DEPTH (F):	F = 0.5Rp	

SCOUR HOLE DIMENSIONS

LENGTH (C):	6.00	FT	RIPRAP SIZE (d_{50}):	0.09	IN* (6-inch minimum)
WIDTH (B):	5.00	FT	SCOUR HOLE DEPTH (F):	0.50	FT

SCOUR HOLE SIZING CHART

ID#	C (FT)	B (FT)	F (FT)	$3S_P$ (FT)	$2S_P$ (FT)	D_{50} (IN)
SC-1	6.00	5.00	0.50	3.00	2.00	6.00

CONDUIT OUTLET PROTECTION CALCULATION

PREFORMED SCOUR HOLE (SC-2)

OUTLET PARAMETERS

OPENING SPAN (S_P):	0.50	FT	OPENING RISE (R_P):	0.50	FT
FLOW AT OUTLET ($Q_{25\ yr}$):	0.95	CFS	UNIT DISCHARGE (q):	1.90	CFS/FT
TAILWATER DEPTH (TW):	0.00	FT			
SCOUR HOLE TYPE:	Type 1		SCOUR HOLE DEPTH (F):	F = 0.5Rp	

SCOUR HOLE DIMENSIONS

LENGTH (C):	4.50	FT	RIPRAP SIZE (d_{50}):	3.53	IN* (6-inch minimum)
WIDTH (B):	4.00	FT	SCOUR HOLE DEPTH (F):	0.50	FT* (6-inch minimum)

SCOUR HOLE SIZING CHART

ID#	C (FT)	B (FT)	F (FT)	$3S_P$ (FT)	$2S_P$ (FT)	D_{50} (IN)
SC-1	4.50	4.00	0.50	1.50	1.00	6.00

APPENDIX D
SITE PLAN SHEETS

INVENTORY

FIGURE 1: SITE PLAN

FIGURE 2: STORMWATER MANAGEMENT PLAN

FIGURE 3: LANDSCAPING PLAN

FIGURE 4: SOIL EROSION & SEDIMENT CONTROL PLAN

LAND USE AND ZONING

PARCEL ID: 028.0-0000-0133.0

SINGLE FAMILY 15 DISTRICT (S-15)

PROPOSED USE

CHILD CARE FACILITY — PERMITTED USE

ZONING REQUIREMENT	REQUIRED	EXISTING	PROPOSED
MINIMUM LOT AREA	15,000 SF (0.34 AC)	84,280 SF (1.94 AC)	NO CHANGE
MINIMUM LOT AREA OUTSIDE OF WETLAND RESOURCE AREA	12,000 SF	71,063 SF	NO CHANGE
MINIMUM LOT FRONTAGE	100 FT	80 FT (EN)	NO CHANGE
MINIMUM FRONT YARD	20 FT	169.5 FT	150.1 FT
MINIMUM SIDE YARD	15 FT	42.2 FT	25.0 FT
MINIMUM REAR YARD	20 FT	208.2 FT	171.0 FT
MAXIMUM LOT COVERAGE	25% (21,070 SF)	3.9% (3,320 SF)	8.4% (7,064 SF)
MAXIMUM BUILDING HEIGHT	35 FT	<35 FT	<35 FT

(EN) EXISTING NON-CONFORMITY

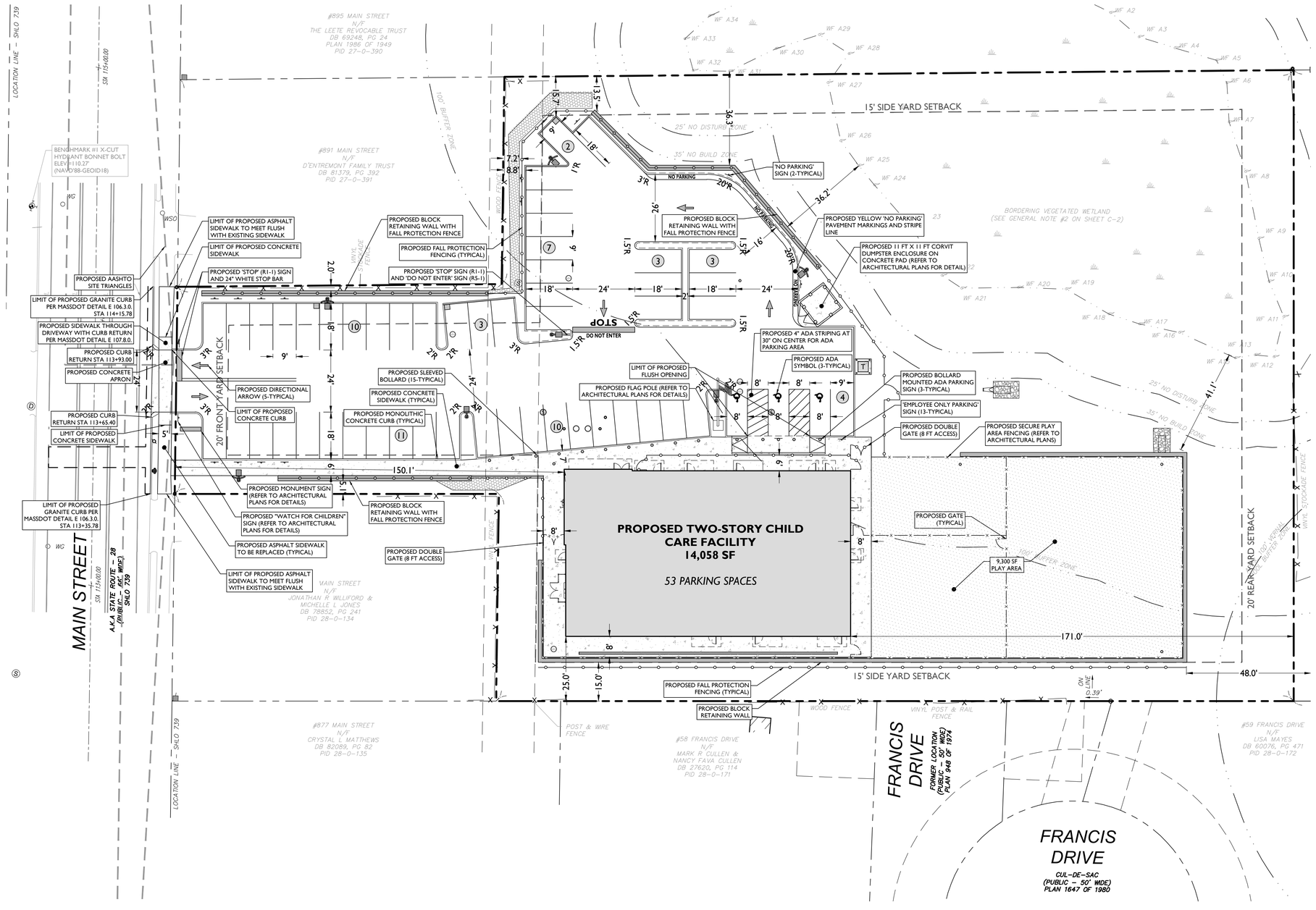
OFF-STREET PARKING REQUIREMENTS

CODE SECTION	REQUIRED	PROPOSED
§ 9.1.1.7	REQUIRED PARKING FOR NURSERY/ KINDERGARTEN / ELEMENTARY: 1 SPACE / EMPLOYEE + 1 SPACE / 7 STUDENTS EMPLOYEE = 28 EMPLOYEES = 28 SPACES STUDENTS = 177 STUDENTS = 25 SPACES **REQUIRED = 53 SPACES**	53 SPACES
§ 9.1.2.2	PARKING SPACE DIMENSIONS: 9 FT X 18 FT	9 FT X 18 FT

SIGNAGE REQUIREMENTS

CODE SECTION	REQUIRED	PROPOSED
§ 8.5.6	WALL MOUNTED SIGN REQUIREMENTS: MAXIMUM AREA: 2 SF PER LF OF FACADE 2 SF X 110 LF = 220 SF	24 SF
§ 8.5.6	FREESTANDING SIGN REQUIREMENTS: MAXIMUM NUMBER OF SIGNS: 1/LOT	1 SIGN (*)
	MAXIMUM AREA: 35 SF	25 FT
	MAXIMUM HEIGHT: 10.5 FT	8 FT
	MINIMUM SIDE SETBACK: 20 FT	24.3 FT

(*) ONE (1) FREESTANDING SIGN ALLOWED BY SPECIAL PERMIT



SYMBOL / DESCRIPTION

- PROPERTY LINE
- SETBACK LINE
- SAWCUT LINE
- PROPOSED CURB
- PROPOSED MOUNTABLE CURB
- PROPOSED EXTENDED CURB
- PROPOSED SIGNS / BOLLARDS
- PROPOSED BUILDING
- PROPOSED CONCRETE
- PROPOSED TURF
- PROPOSED STABILIZED SLOPE
- PROPOSED GRAVEL
- PROPOSED AREA LIGHT
- PROPOSED RETAINING WALL
- PROPOSED FALL PROTECTION FENCE
- PROPOSED PLAY AREA FENCING
- PROPOSED SCREENED FENCE
- PROPOSED BUILDING DOORS
- WF AXX — WETLAND LIMITS
- WETLAND BUFFER

GENERAL NOTES

1. THE CONTRACTOR SHALL VERIFY AND FAMILIARIZE THEMSELVES WITH THE EXISTING SITE CONDITIONS AND THE PROPOSED SCOPE OF WORK (INCLUDING DIMENSIONS, LAYOUT, ETC.) PRIOR TO INITIATING THE IMPROVEMENTS IDENTIFIED WITHIN THESE DOCUMENTS. SHOULD ANY DISCREPANCY BE FOUND BETWEEN THE EXISTING SITE CONDITIONS AND THE PROPOSED WORK THE CONTRACTOR SHALL NOTIFY STONEFIELD ENGINEERING & DESIGN, LLC. PRIOR TO THE START OF CONSTRUCTION.
2. THE CONTRACTOR SHALL OBTAIN ALL NECESSARY PERMITS AND ENSURE THAT ALL REQUIRED APPROVALS HAVE BEEN OBTAINED PRIOR TO THE START OF CONSTRUCTION. COPIES OF ALL REQUIRED PERMITS AND APPROVALS SHALL BE KEPT ON SITE AT ALL TIMES DURING CONSTRUCTION.
3. ALL CONTRACTORS WILL, TO THE FULLEST EXTENT PERMITTED BY LAW, INDEMNIFY AND HOLD HARMLESS STONEFIELD ENGINEERING & DESIGN, LLC. AND IT'S SUB-CONSULTANTS FROM AND AGAINST ANY DAMAGES AND LIABILITIES INCLUDING ATTORNEY'S FEES ARISING OUT OF CLAIMS BY EMPLOYEES OF THE CONTRACTOR IN ADDITION TO CLAIMS CONNECTED TO THE PROJECT AS A RESULT OF NOT CARRYING THE PROPER INSURANCE FOR WORKERS COMPENSATION, LIABILITY INSURANCE, AND LIMITS OF COMMERCIAL GENERAL LIABILITY INSURANCE.
4. THE CONTRACTOR SHALL NOT DEVIATE FROM THE PROPOSED IMPROVEMENTS IDENTIFIED WITHIN THIS PLAN SET UNLESS APPROVAL IS PROVIDED IN WRITING BY STONEFIELD ENGINEERING & DESIGN, LLC.
5. THE CONTRACTOR IS RESPONSIBLE TO DETERMINE THE MEANS AND METHODS OF CONSTRUCTION.
6. THE CONTRACTOR SHALL NOT PERFORM ANY WORK OR CAUSE DISTURBANCE ON A PRIVATE PROPERTY NOT CONTROLLED BY THE PERSON OR ENTITY WHO HAS AUTHORIZED THE WORK WITHOUT PRIOR WRITTEN CONSENT FROM THE OWNER OF THE PRIVATE PROPERTY.
7. THE CONTRACTOR IS RESPONSIBLE TO RESTORE ANY DAMAGED OR UNDERMINED STRUCTURE OR SITE FEATURE THAT IS IDENTIFIED TO REMAIN ON THE PLAN SET. ALL REPAIRS SHALL USE NEW MATERIALS TO RESTORE THE FEATURE TO ITS EXISTING CONDITION AT THE CONTRACTORS EXPENSE.
8. CONTRACTOR IS RESPONSIBLE TO PROVIDE THE APPROPRIATE SHOP DRAWINGS, PRODUCT DATA, AND OTHER REQUIRED SUBMITTALS FOR REVIEW. STONEFIELD ENGINEERING & DESIGN, LLC. WILL REVIEW THE SUBMITTALS IN ACCORDANCE WITH THE DESIGN INTENT AS REFLECTED WITHIN THE PLAN SET.
9. THE CONTRACTOR IS RESPONSIBLE FOR TRAFFIC CONTROL IN ACCORDANCE WITH MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES, LATEST EDITION.
10. THE CONTRACTOR IS REQUIRED TO PERFORM ALL WORK IN THE PUBLIC RIGHT-OF-WAY IN ACCORDANCE WITH THE APPROPRIATE GOVERNING AUTHORITY AND SHALL BE RESPONSIBLE FOR THE PROCUREMENT OF STREET OPENING PERMITS.
11. THE CONTRACTOR IS REQUIRED TO RETAIN AN OSHA CERTIFIED SAFETY INSPECTOR TO BE PRESENT ON SITE AT ALL TIMES DURING CONSTRUCTION & DEMOLITION ACTIVITIES.
12. SHOULD AN EMPLOYEE OF STONEFIELD ENGINEERING & DESIGN, LLC. BE PRESENT ON SITE AT ANY TIME DURING CONSTRUCTION, IT DOES NOT RELIEVE THE CONTRACTOR OF ANY OF THE RESPONSIBILITIES AND REQUIREMENTS LISTED IN THE NOTES WITHIN THIS PLAN SET.

20' 0' 20' 40'

GRAPHIC SCALE IN FEET
1" = 20'

ISSUE	DATE	BY	DESCRIPTION
02	04/26/2025	AJD	ISSUED FOR PEER REVIEW COMMENTS
01	05/06/2025	SCL	ISSUED FOR TOWN COMMENTS
00	03/07/2025	AJD	ISSUED FOR MUNICIPAL SUBMISSION

NOT APPROVED FOR CONSTRUCTION

STONEFIELD engineering & design
Rutherford, NJ · New York, NY · Salem, MA · Providence, RI
Princeton, NJ · Tampa, FL · Birmingham, MI
www.stonefieldeng.com
120 Washington Street, Suite 201, Salem, MA 01970
Phone 617.203.2076

LAND DEVELOPMENT PLANS

PRIMROSE SCHOOLS FRANCHISING COMPANY

PROPOSED CHILD DAY CARE FACILITY

PARCEL ID: 28/113
885 MAIN STREET
TOWN OF READING
MIDDLESEX COUNTY, MASSACHUSETTS

JOSHUA H. KLINE, P.E.
MASSACHUSETTS LICENSE No. 53936
LICENSED PROFESSIONAL ENGINEER

STONEFIELD engineering & design

SCALE: 1" = 20' | PROJECT ID: BOS-240115

TITLE: SITE PLAN

DRAWING: C-4

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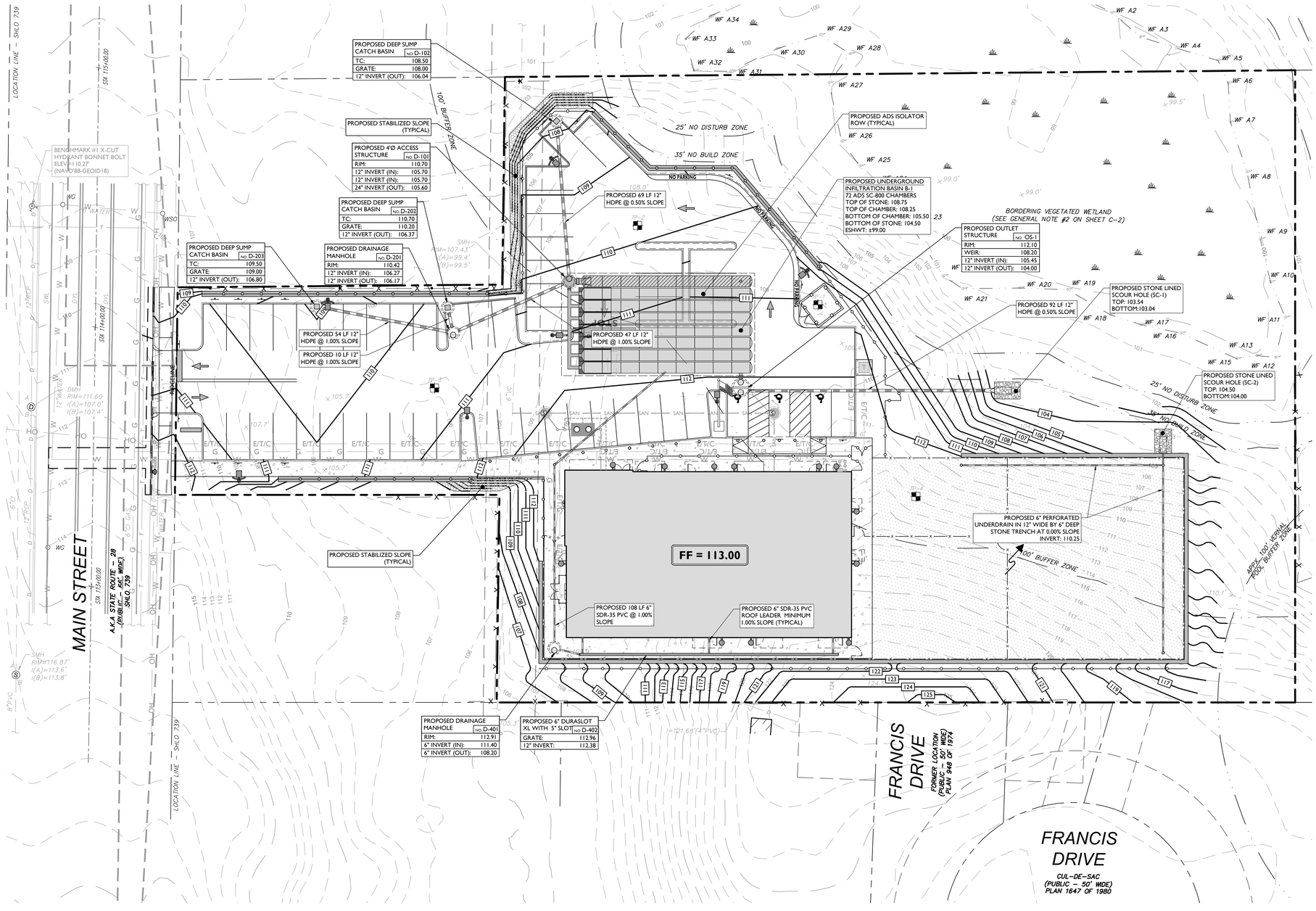

SYMBOL / DESCRIPTION

- PROPERTY LINE
- PROPOSED GRADING CONTOUR
- PROPOSED GRADING RIDGELINE
- PROPOSED STORMWATER STRUCTURES
- PROPOSED TRENCH DRAIN
- PROPOSED STORMWATER PIPING
- PROPOSED UNDERGROUND OUTLET STRUCTURE

DRAINAGE AND UTILITY NOTES

1. THE CONTRACTOR TO PERFORM A TEST PIT PRIOR TO CONSTRUCTION (RECOMMEND 30 DAYS PRIOR) AT LOCATIONS OF EXISTING UTILITY CROSSINGS FOR STORMWATER IMPROVEMENTS. SHOULD A CONFLICT EXIST, THE CONTRACTOR SHALL IMMEDIATELY NOTIFY STONEFIELD ENGINEERING & DESIGN, LLC. IN WRITING.
2. CONTRACTOR SHALL START CONSTRUCTION OF STORM LINES AT THE LOWEST INVERT AND WORK UP-GRADIENT.
3. THE CONTRACTOR IS REQUIRED TO CALL THE APPROPRIATE AUTHORITY FOR NOTICE OF CONSTRUCTION/EXCAVATION AND UTILITY MARK OUT PRIOR TO THE START OF CONSTRUCTION IN ACCORDANCE WITH STATE LAW. CONTRACTOR IS REQUIRED TO CONFIRM THE HORIZONTAL AND VERTICAL LOCATION OF UTILITIES IN THE FIELD. SHOULD A DISCREPANCY EXIST BETWEEN THE FIELD LOCATION OF A UTILITY AND THE LOCATION SHOWN ON THE PLAN SET OR SURVEY, THE CONTRACTOR SHALL NOTIFY STONEFIELD ENGINEERING & DESIGN, LLC. IMMEDIATELY IN WRITING.
4. THE CONTRACTOR IS RESPONSIBLE TO MAINTAIN A RECORD OF THE AS-BUILT LOCATIONS OF ALL PROPOSED UNDERGROUND INFRASTRUCTURE. THE CONTRACTOR SHALL NOTE ANY DISCREPANCIES BETWEEN THE AS-BUILT LOCATIONS AND THE LOCATIONS DEPICTED WITHIN THE PLAN SET. THIS RECORD SHALL BE PROVIDED TO THE OWNER FOLLOWING COMPLETION OF WORK.

EXCAVATION, SOIL PREPARATION, AND DEWATERING NOTES

1. THE CONTRACTOR IS REQUIRED TO REVIEW THE REFERENCED GEOTECHNICAL DOCUMENTS PRIOR TO CONSTRUCTION. THESE DOCUMENTS SHALL BE CONSIDERED A PART OF THE PLAN SET.
2. THE CONTRACTOR IS REQUIRED TO PREPARE SUBGRADE SOILS BENEATH ALL PROPOSED IMPROVEMENTS AND BACKFILL ALL EXCAVATIONS IN ACCORDANCE WITH RECOMMENDATIONS BY THE GEOTECHNICAL ENGINEER OF RECORD.
3. THE CONTRACTOR IS RESPONSIBLE FOR PROVIDING SHORING FOR ALL EXCAVATIONS AS REQUIRED. CONTRACTOR SHALL HAVE THE SHORING DESIGN PREPARED BY A QUALIFIED PROFESSIONAL. SHORING DESIGNS SHALL BE SUBMITTED TO STONEFIELD ENGINEERING & DESIGN, LLC. AND THE OWNER PRIOR TO THE START OF CONSTRUCTION.
4. THE CONTRACTOR IS RESPONSIBLE FOR ENSURING THAT ALL OPEN EXCAVATIONS ARE PERFORMED AND PROTECTED IN ACCORDANCE WITH THE LATEST OSHA REGULATIONS.
5. THE CONTRACTOR IS RESPONSIBLE FOR ANY DEWATERING DESIGN AND OPERATIONS, AS REQUIRED, TO CONSTRUCT THE PROPOSED IMPROVEMENTS. THE CONTRACTOR SHALL OBTAIN ANY REQUIRED PERMITS FOR DEWATERING OPERATIONS AND GROUNDWATER DISPOSAL.

STORMWATER INFILTRATION BMP CONSTRUCTION NOTES

1. PRIOR TO THE START OF CONSTRUCTION, ANY AREA DESIGNATED TO BE USED FOR AN INFILTRATION BMP (E.G. BASIN, BIORETENTION AREA, ETC.) SHALL BE FENCED OFF AND SHALL NOT BE UTILIZED AS STORAGE FOR CONSTRUCTION EQUIPMENT OR AS A STOCKPILE AREA FOR CONSTRUCTION MATERIALS. NO ACTIVITY SHALL BE PERMITTED WITHIN THE INFILTRATION BASIN AREA UNLESS RELATED TO THE CONSTRUCTION OF THE INFILTRATION BASIN. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO NOTIFY ALL SUBCONTRACTORS OF BASIN AREA RESTRICTIONS.
2. THE CONTRACTOR SHALL MAKE EVERY EFFORT, WHERE PRACTICAL, TO AVOID SUBGRADE SOIL COMPACTION IN THE AREAS DESIGNATED TO BE USED FOR AN INFILTRATION BMP.
3. ALL EXCAVATION WITHIN THE LIMITS OF ANY INFILTRATION BMP SHALL BE PERFORMED WITH THE LIGHTEST PRACTICAL EXCAVATION EQUIPMENT. ALL EXCAVATION EQUIPMENT SHALL BE PLACED OUTSIDE THE LIMITS OF THE BASIN WHERE FEASIBLE. THE USE OF LIGHT-WEIGHT, RUBBER-TIRED EQUIPMENT (LESS THAN 8 PSI APPLIED TO THE GROUND SURFACE) IS RECOMMENDED WITHIN THE BASIN LIMITS.
4. THE SEQUENCE OF SITE CONSTRUCTION SHALL BE COORDINATED WITH BASIN CONSTRUCTION TO ADHERE TO SEQUENCING LIMITATIONS.
5. DURING THE FINAL GRADING OF AN INFILTRATION BASIN, THE BOTTOM OF THE BASIN SHALL BE DEEPLY TILLED WITH A ROTARY TILLER OR DISC HARROW AND THEN SMOOTHED OUT WITH A LEVELING DRAW OR EQUIVALENT GRADING EQUIPMENT. ALL GRADING EQUIPMENT SHALL BE LOCATED OUTSIDE OF THE BASIN BOTTOM WHERE FEASIBLE.
6. THE CONTRACTOR SHALL NOTIFY THE MUNICIPALITY TO DETERMINE IF WITNESS TESTING IS REQUIRED DURING INFILTRATION BASIN EXCAVATION AND/OR SOIL INFILTRATION TESTING.

STORMWATER UNDERGROUND BMP CONSTRUCTION NOTES

1. THE CONTRACTOR SHALL INSTALL AND BACKFILL THE UNDERGROUND BMP IN ACCORDANCE WITH THE MANUFACTURER'S SPECIFICATIONS.
2. THE CONTRACTOR SHALL REMOVE ANY FILL, TOPSOIL, AND SUBSOIL ENCOUNTERED UP TO 4 FEET BENEATH THE PROPOSED UNDERGROUND BMP AND REPLACE WITH CLEAN FILL THAT HAS A MINIMUM INFILTRATION RATE OF 3.15 INCHES PER HOUR.
3. UNDERGROUND BASINS SHALL UTILIZE A STONE BACKFILL WITH A MINIMUM VOID RATIO OF 40%.
4. NO CONSTRUCTION LOADING OVER UNDERGROUND BASINS IS PERMITTED UNTIL BACKFILL IS COMPLETE PER THE MANUFACTURER'S SPECIFICATIONS. NO VEHICLES SHALL BE STAGED OR OPERATE FROM A FIXED POSITION OVER THE BASIN.

20' 0' 20' 40'
GRAPHIC SCALE IN FEET
1" = 20'

ISSUE	DATE	BY	DESCRIPTION
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NOT APPROVED FOR CONSTRUCTION

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LAND DEVELOPMENT PLANS

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MASSACHUSETTS LICENSE No. 53936
LICENSED PROFESSIONAL ENGINEER

STONEFIELD engineering & design

SCALE: 1" = 20' | PROJECT ID: BOS-240115

TITLE: STORMWATER MANAGEMENT PLAN

DRAWING: C-6

Z:\BOSTON\BOS2024\BOS-240115 PRIMROSE SCHOOLS - 885 MAIN STREET, READING, MA\CAD\PLOT\XXX-04-STMT.DWG

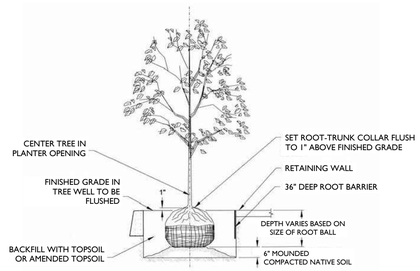
PLANT SCHEDULE

SYMBOL	CODE	QTY	BOTANICAL NAME	COMMON NAME	SIZE	CONTAINER	REMARKS
DECIDUOUS TREES							
	LIQ	2	LIQUIDAMBAR STYRACIFLUA	SWEET GUM	3" - 3.5" CAL	B&B	RECOMMENDED NATIVE PLANT
	MAG	2	MAGNOLIA VIRGINANA	SWEETBAY MAGNOLIA	3" - 3.5" CAL	B&B	RECOMMENDED NATIVE PLANT
	NYS	3	NYSSA SYLVATICA	TUPELO	3" - 3.5" CAL	B&B	RECOMMENDED NATIVE PLANT
	PAL	3	QUERCUS PALUSTRIS	PIN OAK	3" - 3.5" CAL	B&B	RECOMMENDED NATIVE PLANT
	TIL	1	TILIA AMERICANA	AMERICAN LINDEN	3" - 3.5" CAL	B&B	RECOMMENDED NATIVE PLANT
EVERGREEN TREES							
	VIR	41	JUNIPERUS VIRGINIANA	EASTERN REDCEDAR	6' - 8' HT	B&B	RECOMMENDED NATIVE PLANT
	JUN	4	JUNIPERUS VIRGINIANA 'J.N. SELECT GREEN'	EMERALD FEATHER EASTERN REDCEDAR	6' - 8' HT	B&B	RECOMMENDED NATIVE PLANT
	PIC	8	PICEA GLAUCA	WHITE SPRUCE	6' - 8' HT	B&B	RECOMMENDED NATIVE PLANT
SHRUBS							
	VIB	8	VIBURNUM DENTATUM	VIBURNUM	18" - 24"	POT	RECOMMENDED NATIVE PLANT
EVERGREEN SHRUBS							
	GLA	28	ILEX GLABRA 'COMPACTA'	COMPACT INKBERRY	18" - 24"	POT	RECOMMENDED NATIVE PLANT
GROUND COVERS							
	CAR	79	CAREX PENSYLVANICA	PENNSYLVANIA SEDGE	1 GAL.	POT, 24" O.C.	RECOMMENDED NATIVE PLANT
	RHU	32	RHUS AROMATICA 'GRO-LOW'	GRO-LOW FRAGRANT SUMAC	1 GAL.	POT, 36" O.C.	RECOMMENDED NATIVE PLANT
PERENNIALS AND GRASSES							
	ROS	45	COREOPSIS ROSEA	ROSE COREOPSIS	1 GAL.	POT, 24" O.C.	RECOMMENDED NATIVE PLANT
	PAN	6	PANICUM VIRGATUM 'SHENANDOAH'	SHENANDOAH SWITCH GRASS	1 GAL.	POT, 24" O.C.	RECOMMENDED NATIVE PLANT

NOTE: IF ANY DISCREPANCIES OCCUR BETWEEN AMOUNTS SHOWN ON THE LANDSCAPE PLAN AND WITHIN THE PLANT LIST, THE PLAN SHALL DICTATE.

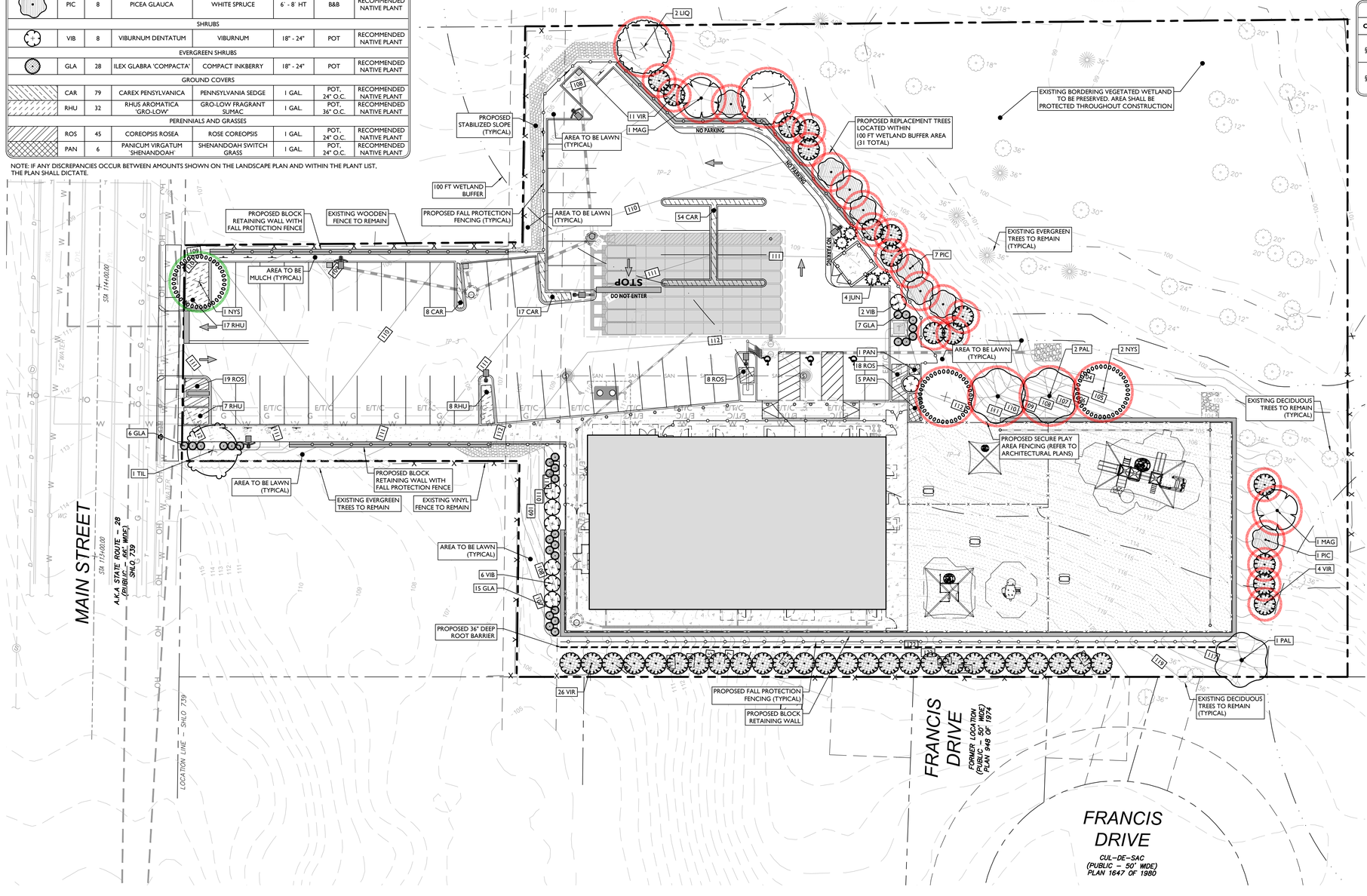
LANDSCAPE MAINTENANCE SCHEDULE

MAINTENANCE TASK	WINTER			SPRING				SUMMER				FALL			
	DEC	JAN	FEB	MAR	APR	MAY	FREQUENCY	JUN	JUL	AUG	FREQUENCY	SEP	OCT	NOV	FREQUENCY
SITE INSPECTION				X			ONCE PER SEASON		X		ONCE PER SEASON			X	ONCE PER SEASON
DEBRIS & WEED CONTROL				X	X	X	BI-WEEKLY	X	X	X	BI-WEEKLY	X	X		BI-WEEKLY
IRRIGATION MAINTENANCE					X		ONCE PER SEASON				N/A		X		ONCE PER SEASON
MULCHING					X		ONCE PER SEASON				N/A				N/A
MOWING OF TURF				X	X	X	WEEKLY	X	X	X	WEEKLY	X	X	X	WEEKLY
PRUNING				X	X		MONTHLY				N/A			X	ONCE PER SEASON
FERTILIZER & AMENDMENTS				X	X	X	MONTHLY	X	X	X	BI-WEEKLY	X	X	X	BI-WEEKLY
INSECT & DISEASE CONTROL						X	ONCE PER SEASON	X	X	X	BI-WEEKLY	X	X		N/A
PLANTING RENOVATION				X			ONCE PER SEASON				N/A		X		ONCE PER SEASON
LANDSCAPE STRUCTURES INSPECTION					X		ONCE PER SEASON				N/A				N/A
LIGHTING MAINTENANCE				X			ONCE PER SEASON				N/A		X		ONCE PER SEASON
PAVED SURFACE MAINTENANCE					X		ONCE PER SEASON				N/A				N/A



RHIZOME BARRIER SUPPLY - 36" x 24" ROOT BARRIER PANELS

NOT TO SCALE



SYMBOL	DESCRIPTION
	PROPOSED ROOT BARRIER
	PROPOSED STREET TREES
	PROPOSED REPLACEMENT TREES

LANDSCAPING REQUIREMENTS

CODE SECTION	REQUIRED	PROPOSED
§ 6.5.2	LANDSCAPE STANDARDS SIDE YARD SETBACKS SHALL BE PLANTED WITH GRASS, SHRUBS AND SHADE TREES	COMPLIES
§ 6.5.7	STREET TREES 1 TREE FOR EVERY 50 LF OF FRONTAGE (55 FT) * (1 TREE / 50 FT FRONTAGE) = 1 TREE	1 TREE

811 Know what's **below** **Call** before you dig.

IRRIGATION NOTE:

IRRIGATION CONTRACTOR TO PROVIDE A DESIGN FOR AN IRRIGATION SYSTEM SEPARATING PLANTING BEDS FROM LAWN AREA. PRIOR TO CONSTRUCTION, DESIGN IS TO BE SUBMITTED TO THE PROJECT LANDSCAPE DESIGNER FOR REVIEW AND APPROVAL. WHERE POSSIBLE, DRIP IRRIGATION AND OTHER WATER CONSERVATION TECHNIQUES SUCH AS RAIN SENSORS SHALL BE IMPLEMENTED. CONTRACTOR TO VERIFY MAXIMUM ON SITE DYNAMIC WATER PRESSURE AVAILABLE MEASURED IN PSI. PRESSURE REDUCING DEVICES OR BOOSTER PUMPS SHALL BE PROVIDED TO MEET SYSTEM PRESSURE REQUIREMENTS. DESIGN TO SHOW ALL VALVES, PIPING, HEADS, BACKFLOW PREVENTION, METERS, CONTROLLERS, AND SLEEVES WITHIN HARDSCAPE AREAS.

LANDSCAPING NOTES

1. THE CONTRACTOR SHALL RESTORE ALL DISTURBED GRASS AND LANDSCAPED AREAS TO MATCH EXISTING CONDITIONS UNLESS INDICATED OTHERWISE WITHIN THE PLAN SET.
2. THE CONTRACTOR SHALL RESTORE ALL DISTURBED LAWN AREAS WITH A MINIMUM 4 INCH LAYER OF TOPSOIL AND SEED.
3. THE CONTRACTOR SHALL RESTORE MULCH AREAS WITH A MINIMUM 3 INCH LAYER OF MULCH .
4. THE MAXIMUM SLOPE ALLOWABLE IN LANDSCAPE RESTORATION AREAS SHALL BE 3 FEET HORIZONTAL TO 1 FOOT VERTICAL (3:1 SLOPE) UNLESS INDICATED OTHERWISE WITHIN THE PLAN SET.
5. THE CONTRACTOR IS REQUIRED TO LOCATE ALL SPRINKLER HEADS IN AREA OF LANDSCAPING DISTURBANCE PRIOR TO CONSTRUCTION. THE CONTRACTOR SHALL RELOCATE SPRINKLER HEADS AND LINES IN ACCORDANCE WITH OWNER'S DIRECTION WITHIN AREAS OF DISTURBANCE.
6. THE CONTRACTOR SHALL ENSURE THAT ALL DISTURBED LANDSCAPED AREAS ARE GRADED TO MEET FLUSH AT THE ELEVATION OF WALKWAYS AND TOP OF CURB ELEVATIONS EXCEPT UNLESS INDICATED OTHERWISE WITHIN THE PLAN SET. NO ABRUPT CHANGES IN GRADE ARE PERMITTED IN DISTURBED LANDSCAPING AREAS.

20' 0' 20' 40'

GRAPHIC SCALE IN FEET

1" = 20'

ISSUE	DATE	BY	DESCRIPTION
02	04/26/2025	AJD	ISSUED FOR PEER REVIEW COMMENTS
01	05/06/2025	SCL	ISSUED FOR TOWN COMMENTS
00	03/07/2025	AJD	ISSUED FOR MUNICIPAL SUBMISSION

NOT APPROVED FOR CONSTRUCTION

STONEFIELD engineering & design
Rutherford, NJ · New York, NY · Salem, MA · Providence, RI
Princeton, NJ · Tampa, FL · Birmingham, MI
www.stonefieldeng.com
120 Washington Street, Suite 201, Salem, MA 01970
Phone 617.203.2076

LAND DEVELOPMENT PLANS

PRIMROSE SCHOOLS FRANCHISING COMPANY

PROPOSED CHILD DAY CARE FACILITY

PARCEL ID: 28-113
885 MAIN STREET
TOWN OF READING
MIDDLESEX COUNTY, MASSACHUSETTS

JOSHUA H. KLINE, P.E.
MASSACHUSETTS LICENSE No. 53936
LICENSED PROFESSIONAL ENGINEER

STONEFIELD engineering & design

SCALE: 1" = 20' | PROJECT ID: BOS-240115

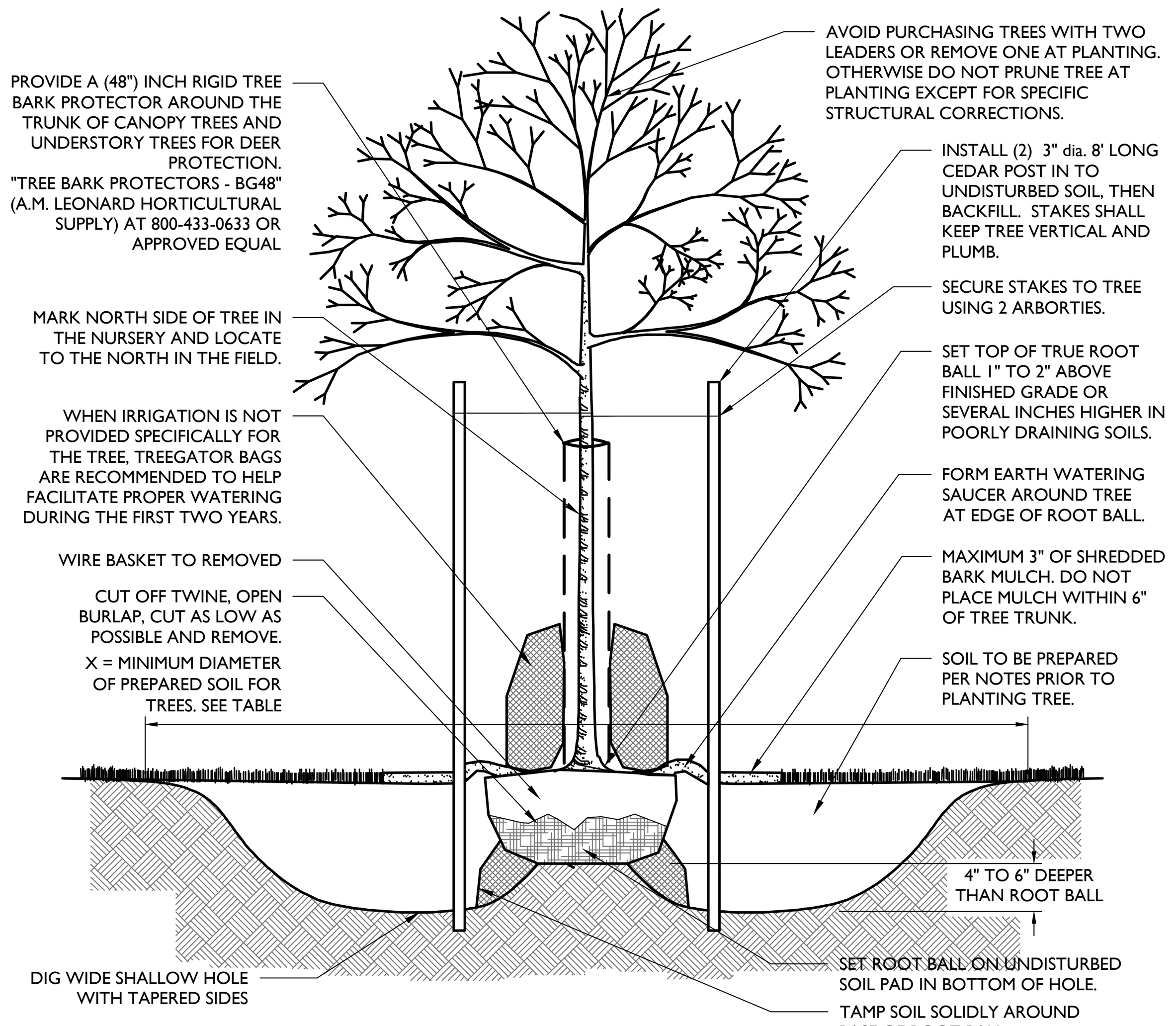
TITLE: LANDSCAPING PLAN

DRAWING: C-10

Z:\BOSTON\BOS\2024\BOS-240115 PRIMROSE SCHOOLS - 885 MAIN STREET, READING, MA\CAD\PLOT\XXX-LYLANDSCAPE

NOTES:

1. FOR CONTAINER-GROWN TREES, USE FINGERS OR SMALL HAND TOOLS TO PULL THE ROOTS OUT OF THE OUTER LAYER OF POTTING SOIL; THEN CUT OR PULL APART ANY ROOTS CIRCLING THE PERIMETER OF THE CONTAINER
2. THOROUGHLY SOAK THE TREE ROOT BALL AND ADJACENT PREPARED SOIL SEVERAL TIMES DURING THE FIRST MONTH AFTER PLANTING AND REGULARLY THROUGHOUT THE FOLLOWING TWO SUMMERS.
3. SOIL AMENDMENTS:
   - MODIFY HEAVY CLAY OR SILT SOILS (MORE THAN 40% CLAY OR SILT) BY ADDING COMPOSTED PINE BARK (UP TO 30% BY VOLUME) OR GYPSUM
   - MODIFY EXTREMELY SANDY SOILDS (MORE THAN 85% SAND) BY ADDING ORGANIC MATTER AND/OR DRY, SHREDDED CLAY LOAM UP TO 30% OF THE TOTAL MIX



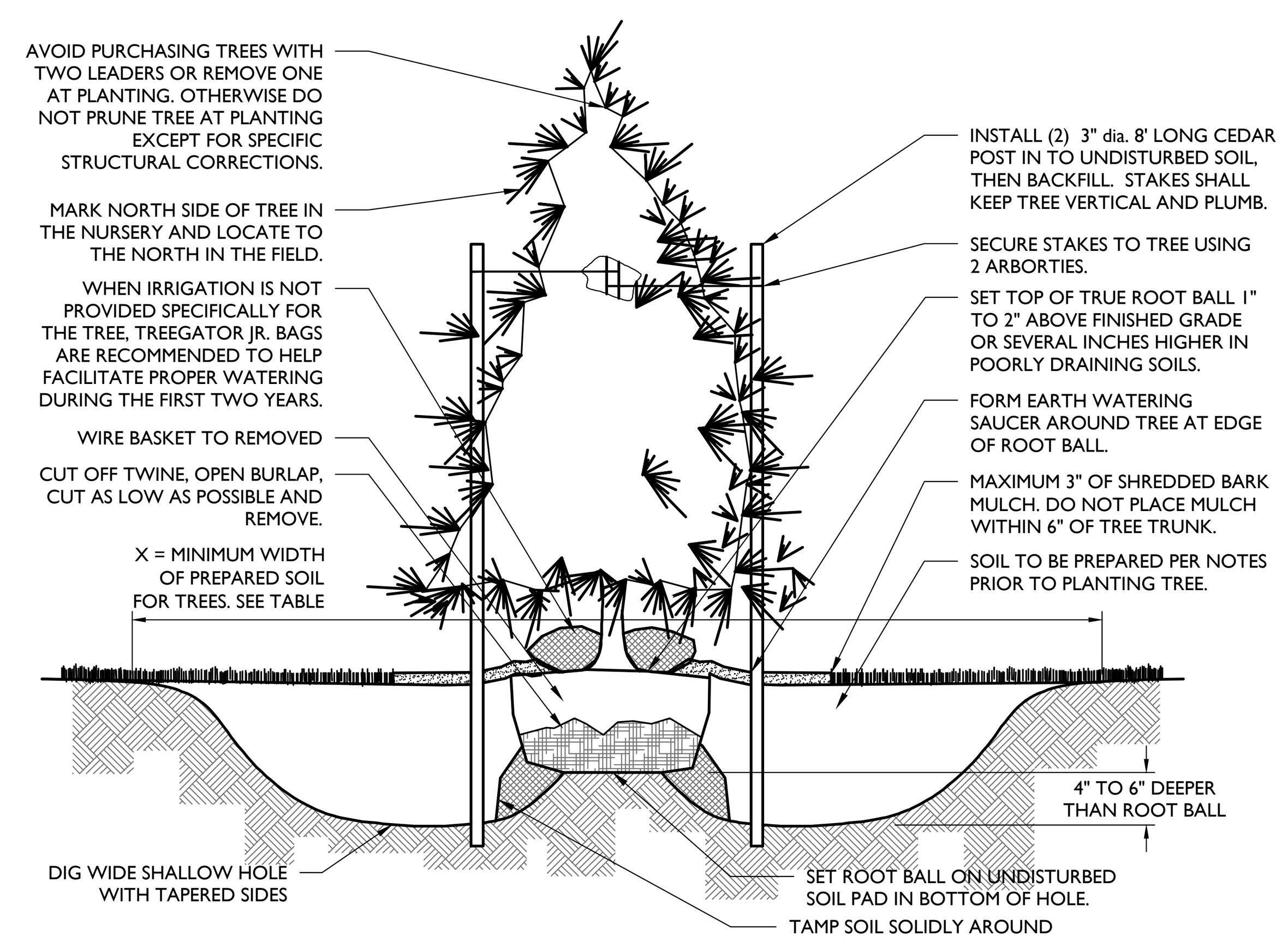
DECIDUOUS TREE PLANTING DETAIL

NOT TO SCALE

1

NOTES:

1. FOR CONTAINER-GROWN TREES, USE FINGERS OR SMALL HAND TOOLS TO PULL THE ROOTS OUT OF THE OUTER LAYER OF POTTING SOIL; THEN CUT OR PULL APART ANY ROOTS CIRCLING THE PERIMETER OF THE CONTAINER.
2. THOROUGHLY SOAK THE TREE ROOT BALL AND ADJACENT PREPARED SOIL SEVERAL TIMES DURING THE FIRST MONTH AFTER PLANTING AND REGULARLY THROUGHOUT THE FOLLOWING TWO SUMMERS.
3. SOIL AMENDMENTS:
   - MODIFY HEAVY CLAY OR SILT SOILS (MORE THAN 40% CLAY OR SILT) BY ADDING COMPOSTED PINE BARK (UP TO 30% BY VOLUME) OR GYPSUM
   - MODIFY EXTREMELY SANDY SOILS (MORE THAN 85% SAND) BY ADDING ORGANIC MATTER AND/OR DRY, SHREDDED CLAY LOAM UP TO 30% OF THE TOTAL MIX

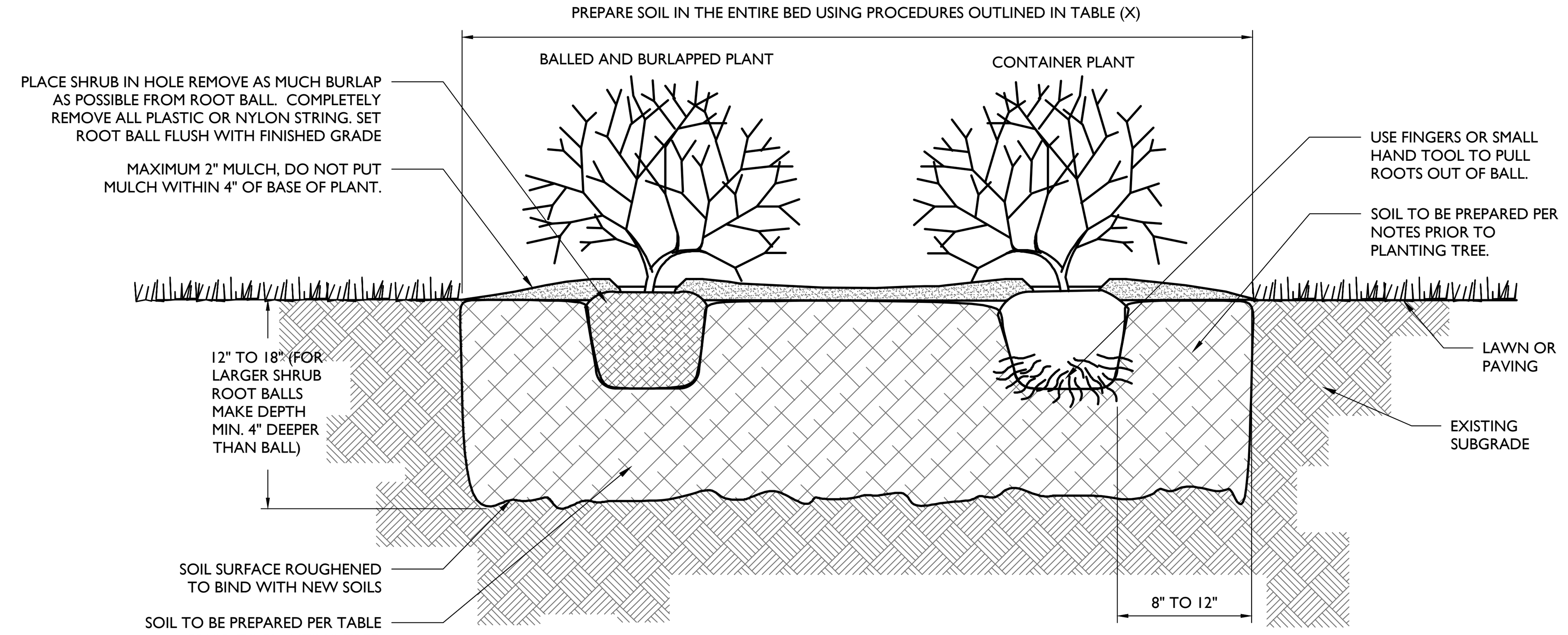


CONIFEROUS TREE PLANTING DETAIL

NOT TO SCALE

2

PREPARE SOIL IN THE ENTIRE BED USING PROCEDURES OUTLINED IN TABLE (X)



NOTES:

1. FOR THE CONTAINER-GROWN SHRUBS, USE FINGERS OR SMALL HAND TOOL TO PULL THE ROOTS OUT OF THE OUTER LAYER OF POTTING SOIL; THEN CUT OR PULL APART ANY ROOTS CIRCLING THE PERIMETER OF THE CONTAINER.
2. THOROUGHLY SOAK THE SHRUB ROOT BALL AND ADJACENT PREPARED SOIL SEVERAL TIMES DURING THE FIRST MONTH AFTER PLANTING AND REGULARLY THROUGHOUT THE FOLLOWING TWO SUMMERS.
   - MODIFY HEAVY CLAY OR SILT SOILS (MORE THAN 40% CLAY OR SILT) BY ADDING COMPOSTED PINE BARK (UP TO 30% BY VOLUME) OR GYPSUM
   - MODIFY EXTREMELY SANDY SOILS (MORE THAN 85% SAND) BY ADDING ORGANIC MATTER AND/OR DRY, SHREDDED CLAY LOAM UP TO 30% OF THE TOTAL

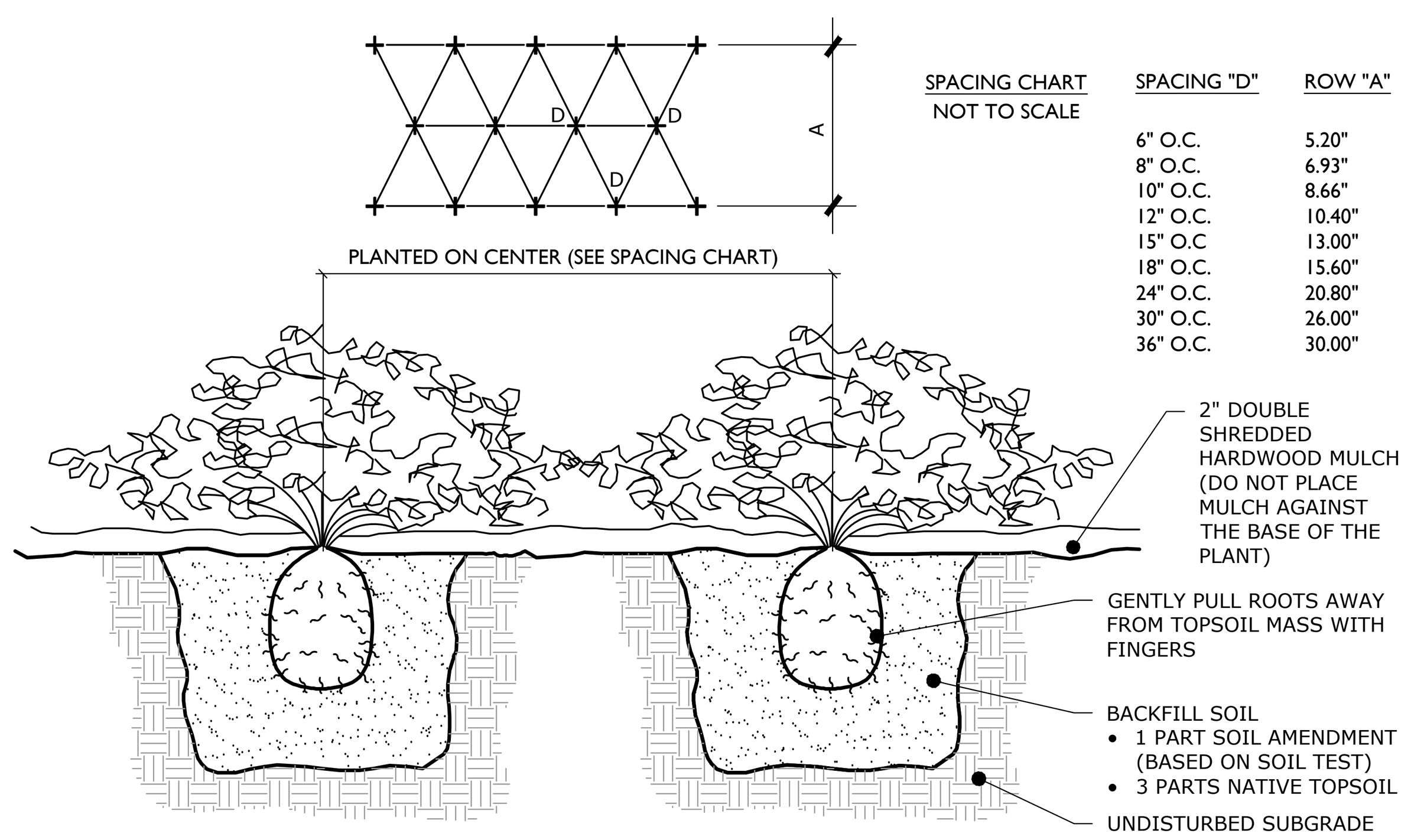
DECIDUOUS AND EVERGREEN SHRUB PLANTING DETAIL

NOT TO SCALE

3

NOTES:

1. THOROUGHLY SOAK THE GROUND COVER ROOT BALL AND ADJACENT PREPARED SOIL SEVERAL TIMES DURING THE FIRST MONTH AFTER PLANTING AND REGULARLY THROUGHOUT THE FOLLOWING TWO SUMMERS.
2. SOIL AMENDMENTS:
   - MODIFY HEAVY CLAY OR SILT SOILDS (MORE THAN 40% CLAY OR SILT) BY ADDING COMPOSTED PINE BARK (UP TO 30% BY VOLUME) OR GYPSUM
   - MODIFY EXTREMELY SANDY SOILDS (MORE THAN 85% SAND) BY ADDING ORGANIC MATTER AND/OR DRY, SHREDDED CLAY LOAM UP TO 30% OF THE TOTAL MIX
3. ALL GROUND COVER AREAS SHALL BE TREATED WITH A PRE-EMERGENT PER MANUFACTURER'S SPECIFICATIONS



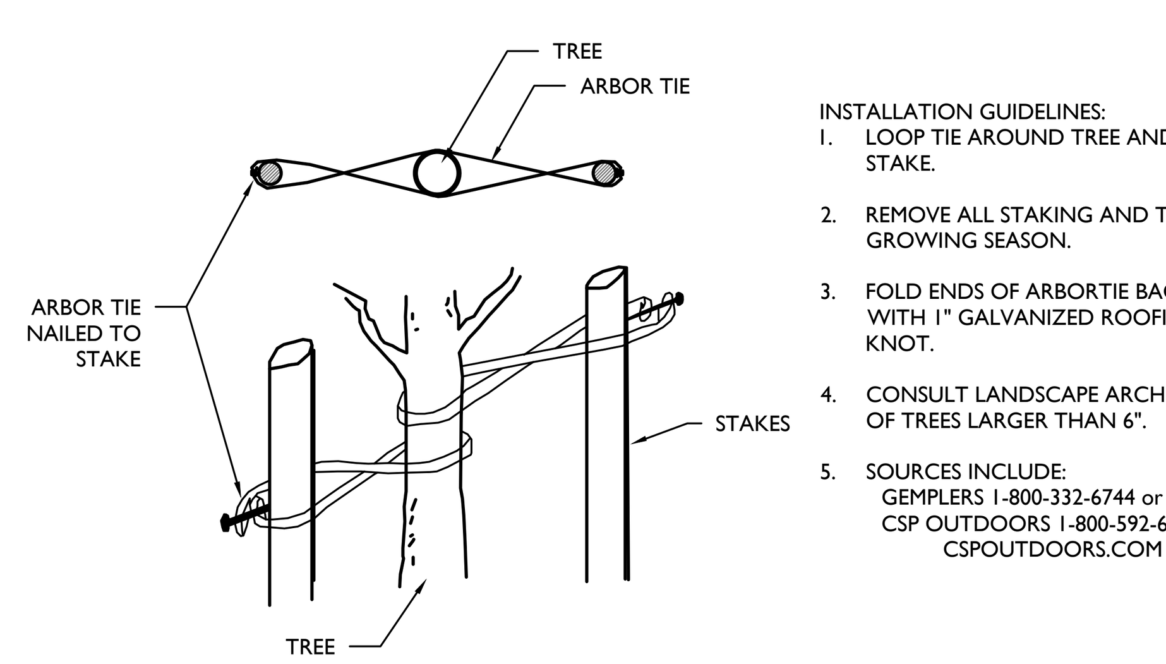
SPACING CHART
NOT TO SCALE

SPACING "D"	ROW "A"
6" O.C.	5.20"
8" O.C.	6.93"
10" O.C.	8.66"
12" O.C.	10.40"
15" O.C.	13.00"
18" O.C.	15.60"
24" O.C.	20.80"
30" O.C.	26.00"
36" O.C.	30.00"

GROUND COVER/PERENNIAL/ANNUAL PLANTING DETAIL

NOT TO SCALE

4



INSTALLATION GUIDELINES:

1. LOOP TIE AROUND TREE AND NAIL TO CEDAR STAKE.
2. REMOVE ALL STAKING AND TIES AT END OF FIRST GROWING SEASON.
3. FOLD ENDS OF ARBORTIE BACK. SECURE TO STAKES WITH 1" GALVANIZED ROOFING NAIL OR USE A KNOT.
4. CONSULT LANDSCAPE ARCHITECT FOR STAKING OF TREES LARGER THAN 6".
5. SOURCES INCLUDE:
   GEMPLERS 1-800-332-6744 or GEMPLERS.COM
   CSP OUTDOORS 1-800-592-6940 or CSPOUTDOORS.COM

ARBORTIE DETAIL

NOT TO SCALE

5

GENERAL LANDSCAPING NOTES:

1. THE LANDSCAPE CONTRACTOR SHALL FURNISH ALL MATERIALS AND PERFORM ALL WORK IN ACCORDANCE WITH THESE SPECIFICATIONS, APPROVED OR FINAL DRAWINGS, AND INSTRUCTIONS PROVIDED BY THE PROJECT LANDSCAPE DESIGNER, MUNICIPAL OFFICIALS, OR OWNER/OWNER'S REPRESENTATIVE. ALL WORK COMPLETED AND MATERIALS FURNISHED AND INSTALLED SHALL BE IN STRICT ACCORDANCE WITH THE INTENTION OF THE SPECIFICATIONS, DRAWINGS, AND INSTRUCTIONS AND EXECUTED WITH THE STANDARD LEVEL OF CARE FOR THE LANDSCAPE INDUSTRY.
2. WORK MUST BE CARRIED OUT ONLY DURING WEATHER CONDITIONS FAVORABLE TO LANDSCAPE CONSTRUCTION AND TO THE HEALTH AND WELFARE OF PLANTS. THE SUITABILITY OF SUCH WEATHER CONDITIONS SHALL BE DETERMINED BY THE PROJECT LANDSCAPE DESIGNER OR GOVERNING MUNICIPAL OFFICIAL.
3. IT IS THE RESPONSIBILITY OF THE LANDSCAPE CONTRACTOR, BEFORE ORDERING OR PURCHASING MATERIALS, TO PROVIDE SAMPLES OF THOSE MATERIALS TO THE PROJECT LANDSCAPE DESIGNER OR GOVERNING MUNICIPAL OFFICIAL FOR APPROVAL, IF SO REQUESTED.
4. IF SAMPLES ARE REQUESTED, THE LANDSCAPE CONTRACTOR IS TO SUBMIT CERTIFICATION TAGS FROM TREES, SHRUBS AND SEED VERIFYING TYPE AND PURITY.
5. UNLESS OTHERWISE AUTHORIZED BY THE PROJECT LANDSCAPE DESIGNER OR GOVERNING MUNICIPAL OFFICIAL, THE LANDSCAPE CONTRACTOR SHALL PROVIDE NOTICE AT LEAST FORTY-EIGHT HOURS (48 HRS.) IN ADVANCE OF THE ANTICIPATED DELIVERY DATE OF ANY PLANT MATERIALS TO THE PROJECT SITE. A LEGIBLE COPY OF THE INVOICE, SHOWING VARIETIES AND SIZES OF MATERIALS INCLUDED FOR EACH SHIPMENT SHALL BE FURNISHED TO THE PROJECT LANDSCAPE DESIGNER, OR GOVERNING MUNICIPAL OFFICIAL.
6. THE PROJECT LANDSCAPE DESIGNER OR GOVERNING MUNICIPAL OFFICIAL RESERVES THE RIGHT TO INSPECT AND REJECT PLANTS AT ANY TIME AND AT ANY PLACE.

PROTECTION OF EXISTING VEGETATION NOTES:

1. BEFORE COMMENCING WORK, ALL EXISTING VEGETATION WHICH COULD BE IMPACTED AS A RESULT OF THE PROPOSED CONSTRUCTION ACTIVITIES MUST BE PROTECTED FROM DAMAGE BY THE INSTALLATION OF TREE PROTECTION FENCING. FENCING SHALL BE LOCATED AT THE DRIP-LINE OR LIMIT OF DISTURBANCE AS DEPICTED WITHIN THE APPROVED OR FINAL PLAN SET, ESTABLISHING THE TREE PROTECTION ZONE. FENCE INSTALLATION SHALL BE IN ACCORDANCE WITH THE PROVIDED "TREE PROTECTION FENCE DETAIL." NO WORK MAY BEGIN UNTIL THIS REQUIREMENT IS FULFILLED. THE FENCING SHALL BE INSPECTED REGULARLY BY THE LANDSCAPE CONTRACTOR AND MAINTAINED UNTIL ALL CONSTRUCTION ACTIVITIES HAVE BEEN COMPLETED.
2. IN ORDER TO AVOID DAMAGE TO ROOTS, BARK OR LOWER BRANCHES, NO VEHICLE, EQUIPMENT, DEBRIS, OR OTHER MATERIALS SHALL BE DRIVEN, PARKED OR PLACED WITHIN THE TREE PROTECTION ZONE. ALL ON-SITE CONTRACTORS SHALL USE ANY AND ALL PRECAUTIONARY MEASURES WHEN PERFORMING WORK AROUND TREES, WALKS, PAVEMENTS, UTILITIES, AND ANY OTHER FEATURES EITHER EXISTING OR PREVIOUSLY INSTALLED UNDER THIS CONTRACT.
3. IN RARE INSTANCES WHERE EXCAVATING, FILL, OR GRADING IS REQUIRED WITHIN THE DRIP-LINE OF TREES TO REMAIN, THE WORK SHALL BE PERFORMED AS FOLLOWS:
   - TRENCHING: WHEN TRENCHING OCCURS AROUND TREES TO REMAIN, THE TREE ROOTS SHALL NOT BE CUT, BUT THE TRENCH SHALL BE TUNNELED UNDER OR AROUND THE ROOTS BY CAREFUL HAND DIGGING AND WITHOUT INJURY TO THE ROOTS. NO ROOTS, LIMBS, OR WOODS ARE TO HAVE ANY PAINT OR MATERIAL APPLIED TO ANY SURFACE.
   - RAISING GRADES: WHEN THE GRADE AT AN EXISTING TREE IS BELOW THE NEW FINISHED GRADE, AND FILL NOT EXCEEDING 6 INCHES (6") IS REQUIRED, CLEAN, WASHED GRAVEL FROM ONE TO TWO INCHES (1" - 2") IN SIZE SHALL BE PLACED DIRECTLY AROUND THE TREE TRUNK. THE GRAVEL SHALL EXTEND OUT FROM THE TRUNK ON ALL SIDES A MINIMUM OF 18 INCHES (18") AND FINISH APPROXIMATELY TWO INCHES (2") ABOVE THE FINISH GRADE AT TREE. INSTALL GRAVEL BEFORE ANY EARTH FILL IS PLACED. NEW EARTH FILL SHALL NOT BE LEFT IN CONTACT WITH THE TRUNK OF ANY TREE REQUIRING FILL. WHERE FILL EXCEEDING 6 INCHES (6") IS REQUIRED, A DRY LAID TREE WELL SHALL BE CONSTRUCTED. IF APPLICABLE, TREE WELL INSTALLATION SHALL BE IN ACCORDANCE WITH THE PROVIDED "TREE WELL DETAIL."
   - LOWERING GRADES: EXISTING TREES LOCATED IN AREAS WHERE THE NEW FINISHED GRADE IS TO BE LOWERED, SHALL HAVE RE-GRADING WORK DONE BY HAND TO THE INDICATED ELEVATION, NO GREATER THAN SIX INCHES (6"). ROOTS SHALL BE CUT CLEANLY THREE INCHES (3") BELOW FINISHED GRADE UNDER THE DIRECTION OF A LICENSED ARBORIST. WHERE CUT EXCEEDING 6 INCHES (6") IS REQUIRED, A DRY LAID RETAINING WALL SHALL BE CONSTRUCTED. IF APPLICABLE, THE RETAINING WALL INSTALLATION SHALL BE IN ACCORDANCE WITH THE PROVIDED "TREE RETAINING WALL DETAIL."

SOIL PREPARATION AND MULCH NOTES:

1. LANDSCAPE CONTRACTOR SHALL OBTAIN A SOIL TEST OF THE IN-SITU TOPSOIL BY A CERTIFIED SOIL LABORATORY PRIOR TO PLANTING. LANDSCAPE CONTRACTOR SHALL ALLOW FOR A TWO WEEK TURNAROUND TIME FROM SUBMITTAL OF SAMPLE TO NOTIFICATION OF RESULTS.
2. BASED ON SOIL TEST RESULTS, ADJUST THE RATES OF LIME AND FERTILIZER THAT SHALL BE MIXED INTO THE TOP SIX INCHES (6") OF TOPSOIL. THE LIME AND FERTILIZER RATES PROVIDED WITHIN THE "SEED SPECIFICATION" OR "SOD SPECIFICATION" IS APPROXIMATE AND FOR BIDDING PURPOSES ONLY. IF ADDITIONAL AMENDMENTS ARE NECESSARY, ADJUST THE TOPSOIL AS FOLLOWS:
   - MODIFY HEAVY CLAY OR SILT SOILS (MORE THAN 40% CLAY OR SILT) BY ADDING COMPOSTED PINE BARK (UP TO 30% BY VOLUME) OR GYPSUM.
   - MODIFY EXTREMELY SANDY SOILS (MORE THAN 85%) BY ADDING ORGANIC MATTER AND/OR DRY, SHREDDED CLAY LOAM UP TO 30% OF THE TOTAL MIX.
3. TOPSOIL SHALL BE FERTILE, FRIABLE, NATURAL TOPSOIL OF LOAMING CHARACTER, WITHOUT ADMIXTURE OF SUBSOIL MATERIAL OBTAINED FROM A WELL-DRAINED ARABLE SITE, FREE FROM ALL CLAY, LUMPS, COARSE SANDS, STONES, PLANTS, ROOTS, STICKS, AND OTHER FOREIGN MATERIAL GREATER THAN ONE INCH (1").
4. TOPSOIL SHALL HAVE A PH RANGE OF 5.0-7.0 AND SHALL NOT CONTAIN LESS THAN 6% ORGANIC MATTER BY WEIGHT.
5. OBTAIN TOPSOIL ONLY FROM LOCAL SOURCES OR FROM AREAS HAVING SIMILAR SOIL CHARACTERISTICS TO THAT FOUND AT THE PROJECT SITE.
6. CONTRACTOR SHALL PROVIDE A SIX INCH (6") DEEP LAYER OF TOPSOIL IN ALL PLANTING AREAS. TOPSOIL SHALL BE SPREAD OVER A PREPARED SURFACE IN A UNIFORM LAYER TO ACHIEVE THE DESIRED COMPACTED THICKNESS. THE SPREADING OF TOPSOIL SHALL NOT BE CONDUCTED UNDER MUDDY OR FROZEN SOIL CONDITIONS.
7. UNLESS OTHERWISE NOTED IN THE CONTRACT, THE LANDSCAPE CONTRACTOR SHALL BE RESPONSIBLE FOR THE INSTALLATION OF TOPSOIL AND THE ESTABLISHMENT OF FINE-GRADING WITHIN THE DISTURBED AREA OF THE SITE.
8. LANDSCAPE CONTRACTOR SHALL VERIFY THAT THE SUB-GRADE ELEVATION MEETS THE FINISHED GRADE ELEVATION (LESS THE REQUIRED TOPSOIL), IN ACCORDANCE WITH THE APPROVED OR FINAL GRADING PLAN.
9. ALL LAWN AND PLANTING AREAS SHALL BE GRADED TO A SMOOTH, EVEN AND UNIFORM PLANE WITH NO ABRUPT CHANGE OF SURFACE AS DEPICTED WITHIN THE APPROVED OR FINAL CONSTRUCTION SET UNLESS OTHERWISE DIRECTED BY THE PROJECT LANDSCAPE DESIGNER OR MUNICIPAL OFFICIAL.
10. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROPER SURFACE AND SUBSURFACE PLANT BED DRAINAGE PRIOR TO THE INSTALLATION OF PLANTINGS. IF POOR DRAINAGE CONDITIONS EXIST, CORRECTIVE ACTION SHALL BE TAKEN PRIOR TO INSTALLATION. ALL PLANTING AND LAWN AREAS SHALL BE GRADED AND MAINTAINED TO ALLOW A FREE FLOW OF SURFACE WATER.
11. DOUBLE SHREDDED HARDWOOD MULCH OR APPROVED EQUAL SHALL BE USED AS A THREE INCH (3") TOP DRESSING IN ALL SHRUB PLANTING BEDS AND AROUND ALL TREES PLANTED BY LANDSCAPE CONTRACTOR. GROUND COVER, PERENNIAL, AND ANNUAL PLANTING BEDS SHALL BE MULCHED WITH A TWO INCH (2") TOP DRESSING. SINGLE TREES OR SHRUBS SHALL BE MULCHED TO AVOID CONTACT WITH TRUNK OR PLANT STEM. MULCH SHALL BE OF SUFFICIENT CHARACTER AS NOT TO BE EASILY DISPLACED BY WIND OR WATER RUNOFF.
12. WHENEVER POSSIBLE, THE SOIL PREPARATION AREA SHALL BE CONNECTED FROM PLANTING TO PLANTING.
13. SOIL SHALL BE LOOSENED WITH A BACKHOE OR OTHER LARGE COARSE-TILING EQUIPMENT UNLESS THE SOIL IS FROZEN OR EXCESSIVELY WET. TILING THAT PRODUCES LARGE, COARSE CHUNKS OF SOIL IS PREFERABLE TO TILING THAT RESULTS IN FINE GRAINS UNIFORM IN TEXTURE. AFTER THE AREA IS LOOSENED IT SHALL NOT BE DRIVEN OVER BY ANY VEHICLE.
14. APPLY PRE-EMERGENT WEED CONTROL TO ALL PLANT BEDS PRIOR TO MULCHING. ENSURE COMPATIBILITY BETWEEN PRODUCT AND PLANT MATERIAL.
15. ALL PLANTING SOIL SHALL BE AMENDED WITH THE FOLLOWING:

MYCRO® TREE SAVER - A DRY GRANULAR MYCORRHIZAL FUNGI INOCULANT THAT IS MIXED IN THE BACKFILL WHEN PLANTING TREES AND SHRUBS. IT CONTAINS SPORES OF BOTH ECTOMYCORRHIZAL AND VA MYCORRHIZAL FUNGI (VAM), BENEFICIAL RHIZOSPHERE BACTERIA, TERRA-SORB SUPERABSORBENT HYDROGEL TO REDUCE WATER LEACHING, AND SELECTED ORGANIC MICROBIAL NUTRIENTS.

- DIRECTIONS FOR USE: USE 3-OZ PER EACH FOOT DIAMETER OF THE ROOT BALL, OR 3-OZ PER INCH CALIPER. MIX INTO THE BACKFILL WHEN TRANSPLANTING TREES AND SHRUBS. MIX PRODUCT IN A RING-SHAPED VOLUME OF SOIL AROUND THE UPPER PORTION OF THE ROOT BALL, EXTENDING FROM THE SOIL SURFACE TO A DEPTH OF ABOUT 8 INCHES, AND EXTENDING OUT FROM THE ROOT BALL ABOUT 8 INCHES INTO THE BACKFILL. APPLY WATER TO SOIL SATURATION.
- MYCOR® TREE SAVER® IS EFFECTIVE FOR ALL TREE AND SHRUB SPECIES EXCEPT RHODODENDRONS, AZALEAS, AND MOUNTAIN LAUREL, WHICH REQUIRE ERICOID MYCORRHIZAE.
- SOIL PH: THE FUNGI IN THIS PRODUCT WERE CHOSEN BASED ON THEIR ABILITY TO SURVIVE AND COLONIZE PLANT ROOTS IN A PH RANGE OF 3 TO 9.
- FUNGICIDES: THE USE OF CERTAIN FUNGICIDES CAN HAVE A DETRIMENTAL EFFECT ON THE INOCULATION PROGRAM. SOIL APPLICATION OF ANY FUNGICIDE IS NOT RECOMMENDED FOR TWO WEEKS AFTER APPLICATION.
- OTHER PESTICIDES: HERBICIDES AND INSECTICIDES DO NOT NORMALLY INTERFERE WITH MYCORRHIZAL FUNGAL DEVELOPMENT, BUT MAY INHIBIT THE GROWTH OF SOME TREE AND SHRUB SPECIES IF NOT USED PROPERLY.

HEALTHY START MACRO TABS 12-8-8

- FERTILIZER TABLETS ARE PLACED IN THE UPPER 4 INCHES OF BACKFILL SOIL WHEN PLANTING TREES AND SHRUBS.
- TABLETS ARE FORMULATED FOR LONG-TERM RELEASE BY SLOW BIODEGRADATION, AND LAST UP TO 2 YEARS AFTER PLANTING. TABLETS CONTAIN 12-8-8 NPK FERTILIZER, AS WELL AS A MINIMUM OF SEVEN PERCENT (7%) HUMIC ACID BY WEIGHT, MICROBIAL NUTRIENTS DERIVED FROM SEA KELP, PROTEIN BYPRODUCTS, AND YUCCA SCHIDIGERA, AND A COMPLEMENT OF BENEFICIAL RHIZOSPHERE BACTERIA. THE STANDARD 21 GRAM TABLET IS SPECIFIED HERE. DIRECTIONS FOR USE: FOR PLANTING BALLED & BURLAPPED (B&B) TREES AND SHRUBS, MEASURE THE THICKNESS OF THE TRUNK, AND USE ABOUT 1 TABLET (21-G) PER HALF-INCH. PLACE THE TABLETS DIRECTLY NEXT TO THE ROOT BALL, EVENLY DISTRIBUTED AROUND ITS PERIMETER, AT A DEPTH OF ABOUT 4 INCHES.

IRRIGATION DURING ESTABLISHMENT

SIZE AT PLANTING	IRRIGATION FOR VITALITY	IRRIGATION FOR SURVIVAL
< 2" CALIPER	DAILY FOR TWO WEEKS, EVERY OTHER DAY FOR TWO MONTHS, WEEKLY UNTIL ESTABLISHED	TWO TO THREE TIMES WEEKLY FOR TWO TO THREE MONTHS
2"-4 CALIPER	DAILY FOR ONE MONTH, EVERY OTHER DAY FOR THREE MONTHS, WEEKLY UNTIL ESTABLISHED	TWO TO THREE TIMES WEEKLY FOR THREE TO FOUR MONTHS
4 >" CALIPER	DAILY FOR SIX WEEKS, EVERY OTHER DAY FOR FIVE MONTHS, WEEKLY UNTIL ESTABLISHED	TWICE WEEKLY FOR FOUR TO FIVE MONTHS

TABLE NOTES:

1. AT EACH IRRIGATION, APPLY TWO TO THREE GALLONS PER INCH TRUNK CALIPER TO THE ROOT BALL SURFACE. APPLY IT IN A MANNER SO ALL WATER SOAKS THE ENTIRE ROOT BALL. DO NOT WATER IF ROOT BALL IS WET/SATURATED ON THE IRRIGATION DAY.

2. WHEN IRRIGATING FOR VITALITY, DELETE DAILY IRRIGATION WHEN PLANTING IN WINTER OR WHEN PLANTING IN COOL CLIMATES. ESTABLISHMENT TAKES THREE TO FOUR MONTHS PER INCH TRUNK CALIPER. NEVER APPLY IRRIGATION IF THE SOIL IS SATURATED.

3. WHEN IRRIGATION FOR SURVIVAL, TREES TAKE MUCH LONGER TO ESTABLISH THAN REGULARLY IRRIGATED TREES. IRRIGATION MAY BE REQUIRED IN THE NORMAL HOT, DRY PORTIONS OF THE FOLLOWING YEAR.

PLANT QUALITY AND HANDLING NOTES:

1. ALL PLANT MATERIAL SHALL CONFORM TO THE AMERICAN STANDARD FOR NURSERY STOCK (ANSI Z60.1-2004) OR LATEST REVISION AS PUBLISHED BY THE AMERICAN NURSERY AND LANDSCAPE ASSOCIATION.
2. IN ALL CASES, BOTANICAL NAMES LISTED WITHIN THE APPROVED OR FINAL PLANT LIST SHALL TAKE PRECEDENCE OVER COMMON NAMES.
3. ALL PLANTS SHALL BE OF SELECTED SPECIMEN QUALITY, EXCEPTIONALLY HEAVY, TIGHTLY KNIT, SO TRAINED OR FAVORED IN THEIR DEVELOPMENT AND APPEARANCE AS TO BE SUPERIOR IN FORM, NUMBER OF BRANCHES, COMPACTNESS AND SYMMETRY. ALL PLANTS SHALL HAVE A NORMAL HABIT OR SOUND, HEALTHY, VIGOROUS PLANTS WITH WELL DEVELOPED ROOT SYSTEM. PLANTS SHALL BE FREE OF DISEASE, INSECT PESTS, EGGS OR LARVAE.
4. PLANTS SHALL NOT BE PRUNED BEFORE DELIVERY. TREES WITH ABRASION OF THE BARK, SUNSCALDS, DISFIGURING KNOTS OR FRESH CUTS OF LIMBS OVER ONE AND ONE-FOURTH INCHES (1-1/4") WHICH HAVE NOT COMPLETELY CALLOUSED SHALL BE REJECTED.
5. ALL PLANTS SHALL BE TYPICAL OF THEIR SPECIES OR VARIETY AND SHALL HAVE A NORMAL HABIT OF GROWTH AND BE LEGIBLY TAGGED WITH THE PROPER NAME AND SIZE.
6. THE ROOT SYSTEM OF EACH PLANT SHALL BE WELL PROVIDED WITH FIBROUS ROOTS. ALL PARTS SHALL BE SOUND, HEALTHY, VIGOROUS, WELL-BRANCHED AND DENSELY FOLIATED WHEN IN LEAF.
7. ALL PLANTS DESIGNATED BALL AND BURLAP (B&B) MUST BE MOVED WITH THE ROOT SYSTEM AS SOLID UNITS WITH BALLS OF EARTH FIRMLY WRAPPED WITH BURLAP. THE DIAMETER AND DEPTH OF THE BALLS OF EARTH MUST BE SUFFICIENT TO ENCOMPASS THE FIBROUS ROOT FEEDING SYSTEMS NECESSARY FOR THE HEALTHY DEVELOPMENT OF THE PLANT. NO PLANT SHALL BE ACCEPTED WHEN THE BALL OF EARTH SURROUNDING ITS ROOTS HAS BEEN BADLY CRACKED OR BROKEN PREPARATORY TO OR DURING THE PROCESS OF PLANTING. THE BALLS SHALL REMAIN INTACT DURING ALL OPERATIONS. ALL PLANTS THAT CANNOT BE PLANTED AT ONCE MUST BE HEELED-IN BY SETTING IN THE GROUND AND COVERING THE BALLS WITH SOIL OR MULCH AND THEN WATERING. HEMP BURLAP AND TWINE IS PREFERABLE TO TREATED. IF TREATED BURLAP IS USED, ALL TWINE IS TO BE CUT FROM AROUND THE TRUNK AND ALL BURLAP IS TO BE REMOVED.
8. PLANTS TRANSPORTED TO THE PROJECT IN OPEN VEHICLES SHALL BE COVERED WITH TARPS OR OTHER SUITABLE COVERS SECURELY FASTENED TO THE BODY OF THE VEHICLE TO PREVENT INJURY TO THE PLANTS. CLOSED VEHICLES SHALL BE ADEQUATELY VENTILATED TO PREVENT OVERHEATING OF THE PLANTS. EVIDENCE OF INADEQUATE PROTECTION FOLLOWING DIGGING, CARELESSNESS WHILE IN TRANSIT, OR IMPROPER HANDLING OR STORAGE SHALL BE CAUSE FOR REJECTION OF PLANT MATERIAL. ALL PLANTS SHALL BE KEPT MOIST, FRESH, AND PROTECTED. SUCH PROTECTION SHALL ENCOMPASS THE ENTIRE PERIOD DURING WHICH THE PLANTS ARE IN TRANSIT, BEING HANDLED, OR ARE IN TEMPORARY STORAGE.
9. ALL PLANT MATERIAL SHALL BE INSTALLED IN ACCORDANCE WITH THE CORRESPONDING LANDSCAPE PLAN AND PLANTING DETAILS.
10. LANDSCAPE CONTRACTOR SHALL MAKE BEST EFFORT TO INSTALL PLANTINGS ON THE SAME DAY AS DELIVERY. IF PLANTS ARE NOT PLANTED IMMEDIATELY ON SITE, PROPER CARE SHALL BE TAKEN TO PLACE THE PLANTINGS IN PARTIAL SHADE WHEN POSSIBLE. THE ROOT BALL SHALL BE KEPT MOIST AT ALL TIME AND COVERED WITH MOISTENED MULCH OR AGED WOODCHIPS. PROPER IRRIGATION SHALL BE SUPPLIED SO AS TO NOT ALLOW THE ROOT BALL TO DRY OUT. PLANTINGS SHALL BE UNTIED AND PROPER SPACING SHALL BE ALLOTTED FOR AIR CIRCULATION AND TO PREVENT DISEASE, WILTING, AND LEAF LOSS. PLANTS THAT REMAIN UNPLANTED FOR A PERIOD OF TIME GREATER THAN THREE (3) DAYS SHALL BE HEALED IN WITH TOPSOIL OR MULCH AND WATERED AS REQUIRED TO PRESERVE ROOT MOISTURE.
11. NO PLANT MATERIAL SHALL BE PLANTED IN MUDDY OR FROZEN SOIL.
12. PLANTS WITH INJURED ROOTS OR BRANCHES SHALL BE PRUNED PRIOR TO PLANTING UTILIZING CLEAN, SHARP TOOLS. ONLY DISEASED OR INJURED PLANTS SHALL BE REMOVED.
13. IF ROCK OR OTHER UNDERGROUND OBSTRUCTION IS ENCOUNTERED, THE LANDSCAPE DESIGNER RESERVES THE RIGHT TO RELOCATE OR ENLARGE PLANTING PITS OR DELETE PLANT MATERIAL FROM THE CONTRACT.
14. IF PLANTS ARE PROPOSED WITHIN SIGHT TRIANGLES, TREES SHALL BE LIMBED AND MAINTAINED TO A HEIGHT OF EIGHT FEET (8') ABOVE GRADE, AND SHRUBS, GROUND COVER, PERENNIALS, AND ANNUALS SHALL BE MAINTAINED TO A HEIGHT NOT TO EXCEED TWO FEET (2') ABOVE GRADE UNLESS OTHERWISE NOTED OR SPECIFIED BY THE GOVERNING MUNICIPALITY OR AGENCY.
15. INSTALLATION SHALL OCCUR DURING THE FOLLOWING SEASONS:
    PLANTS (APRIL 15 - SEPTEMBER 30)
    LAWNS (MARCH 15 - JUNE 15 OR SEPTEMBER 1 - DECEMBER 1)
16. THE FOLLOWING TREES ARE SUSCEPTIBLE TO TRANSPLANT SHOCK AND SHALL NOT BE PLANTED DURING THE FALL SEASON (STARTING SEPTEMBER 15):

ABIES CONCOLOR	CORNUS VARIETIES	OSTRYA VIRGINIANA
ACER BUERGERIANUM	CRATAEGUS VARIETIES	PINUS NIGRA
ACER FREEMANII	CUPRESSOCYPARIS LEYLANDII	PLATANUS VARIETIES
ACER RUBRUM	FAGUS VARIETIES	POPULUS VARIETIES
ACER SACCHARINUM	HALESIA VARIETIES	PRUNUS VARIETIES
BETULA VARIETIES	ILEX X FOSTERII	PYRUS VARIETIES
CARPINUS VARIETIES	ILEX NELLIE STEVENS	QUERCUS VARIETIES (NOT Q. PALUSTRIS)
CEDRUS DEODARA	ILEX OPACA	SALIX WEEPING VARIETIES
CELTIS VARIETIES	JUNIPERUS VIRGINIANA	SORBUS VARIETIES
CERCIDIPHYLLUM VARIETIES	KOELREUTERIA PANICULATA	TAXODIUM VARIETIES
CERCIS CANADENSIS	LIQUIDAMBAR VARIETIES	TAXUX B REPANDENS
CORNUS VARIETIES	LIRIODENDRON VARIETIES	TILIA TOMENTOSA VARIETIES
CRATAEGUS VARIETIES	MALUS IN LEAF	ULMUS PARVIFOLIA VARIETIES
	NYSSA SYLVATICA	ZELKOVA VARIETIES

17. IF A PROPOSED PLANT IS UNATTAINABLE OR ON THE FALL DIGGING HAZARD LIST, AN EQUIVALENT SPECIES OF THE SAME SIZE MAY BE REQUESTED FOR SUBSTITUTION OF THE ORIGINAL PLANT. ALL SUBSTITUTIONS SHALL BE APPROVED BY THE PROJECT LANDSCAPE DESIGNER OR MUNICIPAL OFFICIAL PRIOR TO ORDERING AND INSTALLATION.
18. DURING THE COURSE OF CONSTRUCTION/PLANT INSTALLATION, EXCESS AND WASTE MATERIALS SHALL BE CONTINUOUSLY AND PROMPTLY REMOVED AT THE END OF EACH WORK DAY. ALL DEBRIS, MATERIALS, AND TOOLS SHALL BE PROPERLY STORED, STOCKPILED OR DISPOSED OF AND ALL PAVED AREAS SHALL BE CLEANED.
19. THE LANDSCAPE CONTRACTOR SHALL DISPOSE OF ALL RUBBISH AND EXCESS SOIL AT HIS EXPENSE TO AN OFF-SITE LOCATION AS APPROVED BY THE LOCAL MUNICIPALITY.
20. A 90-DAY MAINTENANCE PERIOD SHALL BEGIN IMMEDIATELY AFTER ALL PLANTS HAVE BEEN SATISFACTORILY INSTALLED.
21. MAINTENANCE SHALL INCLUDE, BUT NOT BE LIMITED TO, REPLACING MULCH THAT HAS BEEN DISPLACED BY EROSION OR OTHER MEANS, REPAIRING AND RESHAPING WATER RINGS OR SAUCERS, MAINTAINING STAKES AND GUYS IF ORIGINALLY REQUIRED, WATERING WHEN NEEDED OR DIRECTED, WEEDING, PRUNING, SPRAYING, FERTILIZING, MOWING THE LAWN, AND PERFORMING ANY OTHER WORK REQUIRED TO KEEP THE PLANTS IN A HEALTHY CONDITION.
22. MOW ALL GRASS AREAS AT REGULAR INTERVALS TO KEEP THE GRASS HEIGHT FROM EXCEEDING THREE INCHES (3"). MOWING SHALL BE PERFORMED ONLY WHEN GRASS IS DRY. MOWER BLADE SHALL BE SET TO REMOVE NO MORE THAN ONE THIRD (1/3) OF THE GRASS LENGTH. WHEN THE AMOUNT OF GRASS IS HEAVY, IT SHALL BE REMOVED TO PREVENT DESTRUCTION OF THE UNDERLYING TURF. MOW GRASS AREAS IN SUCH A MANNER AS TO PREVENT CLIPPINGS FROM BLOWING ON PAVED AREAS, AND SIDEWALKS. CLEANUP AFTER MOWING SHALL INCLUDE SWEEPING OR BLOWING OF PAVED AREAS AND SIDEWALKS TO CLEAR THEM FROM MOWING DEBRIS.
23. GRASSED AREAS DAMAGED DURING THE PROCESS OF THE WORK SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR, WHO SHALL RESTORE THE DISTURBED AREAS TO A CONDITION SATISFACTORY TO THE PROJECT LANDSCAPE DESIGNER, MUNICIPAL OFFICIAL, OR OWNER/OWNER'S REPRESENTATIVE. THIS MAY INCLUDE FILLING TO GRADE, FERTILIZING, SEEDING, AND MULCHING.
24. SHOULD THE OWNER REQUIRE MAINTENANCE BEYOND THE STANDARD 90-DAY MAINTENANCE PERIOD, A SEPARATE CONTRACT SHALL BE ESTABLISHED.
25. LANDSCAPE CONTRACTOR SHALL WATER NEW PLANTINGS FROM TIME OF INSTALL AND THROUGHOUT REQUIRED 90-DAY MAINTENANCE PERIOD UNTIL PLANTS ARE ESTABLISHED. IF ON-SITE WATER IS NOT AVAILABLE AT THE PROJECT LOCATION, THE LANDSCAPE CONTRACTOR SHALL FURNISH IT BY MEANS OR A WATERING TRUCK OR OTHER ACCEPTABLE MANNER.
26. THE QUANTITY OF WATER APPLIED AT ONE TIME SHALL BE SUFFICIENT TO PENETRATE THE SOIL TO A MINIMUM OF EIGHT INCHES (8") IN SHRUB BEDS AND SIX INCHES (6") IN TURF AREAS AT A RATE WHICH WILL PREVENT SATURATION OF THE SOIL.
27. IF AN AUTOMATIC IRRIGATION SYSTEM HAS BEEN INSTALLED, IT CAN BE USED FOR WATERING PLANT MATERIAL. HOWEVER, FAILURE OF THE SYSTEM DOES NOT ELIMINATE THE LANDSCAPE CONTRACTOR'S RESPONSIBILITY OF PLANT HEALTH AND ESTABLISHMENT.

PLANT MATERIAL GUARANTEE NOTES:

1. THE LANDSCAPE CONTRACTOR SHALL GUARANTEE ALL PLANT MATERIAL FOR A PERIOD OF ONE YEAR (1 YR.) FROM APPROVAL OF LANDSCAPE INSTALLATION BY THE PROJECT LANDSCAPE DESIGNER, MUNICIPAL OFFICIAL, OR OWNER/OWNER'S REPRESENTATIVE.
2. THE LANDSCAPE CONTRACTOR SHALL REMOVE AND REPLACE DYING, DEAD, OR DEFECTIVE PLANT MATERIAL AT HIS EXPENSE. THE LANDSCAPE CONTRACTOR SHALL ALSO BE RESPONSIBLE FOR ANY DAMAGES CAUSED BY HIS COMPANY'S OPERATIONS.
3. ALL REPLACEMENT PLANTS SHALL BE OF THE SAME SPECIES AND SIZE AS SPECIFIED ON THE APPROVED OR FINAL PLANT LIST. REPLACEMENTS RESULTING FROM REMOVAL, LOSS, OR DAMAGE DUE TO OCCUPANCY OF THE PROJECT IN ANY PART, VANDALISM, PHYSICAL DAMAGE BY ANIMALS, VEHICLES, ETC., AND LOSSES DUE TO CURTAILMENT OF WATER BY LOCAL AUTHORITIES SHALL BE APPROVED AND PAID FOR BY THE OWNER.
4. THE CONTRACTOR SHALL INSTRUCT THE OWNER AS TO THE PROPER CARE AND MAINTENANCE OF ALL PLANTINGS.

LAWN (SEED OR SOD) NOTES:

1. SEED MIXTURE SHALL BE FRESH, CLEAN, NEW CROP SEED. SOD SHALL BE STRONGLY ROOTED, UNIFORM IN THICKNESS, AND FREE OF WEEDS, DISEASE, AND PESTS.
2. SEED OR SOD SHALL BE PURCHASED FROM A RECOGNIZED DISTRIBUTOR AND SHALL BE COMPOSED OF THE MIX OR BLEND WITHIN THE PROVIDED "SEED SPECIFICATION" OR "SOD SPECIFICATION."
3. REFERENCE LANDSCAPE PLAN FOR AREAS TO BE SEEDED OR LAID WITH SOD.
4. SEEDING SHALL NOT BE PERFORMED IN WINDY WEATHER. IF THE SEASON OF THE PROJECT COMPLETION PROHIBITS PERMANENT STABILIZATION, TEMPORARY STABILIZATION SHALL BE PROVIDED IN ACCORDANCE WITH THE "TEMPORARY SEEDING SPECIFICATION."
5. PROTECT NEW LAWN AREAS AGAINST TRESPASSING WHILE THE SEED IS GERMINATING. FURNISH AND INSTALL FENCES, SIGNS, BARRIERS OR ANY OTHER NECESSARY TEMPORARY PROTECTIVE DEVICES. DAMAGE RESULTING FROM TRESPASS, EROSION, WASHOUT, SETTLEMENT OR OTHER CAUSES SHALL BE REPAIRED BY THE LANDSCAPE CONTRACTOR AT HIS EXPENSE. REMOVE ALL FENCES, SIGNS, BARRIERS OR OTHER TEMPORARY PROTECTIVE DEVICES ONCE LAWN HAS BEEN ESTABLISHED.

ISSUE	DATE	BY	DESCRIPTION
02	06/26/2025	AJD	ISSUED FOR PEER REVIEW COMMENTS
01	05/06/2025	SCL	ISSUED FOR TOWN COMMENTS
00	03/07/2025	AJD	ISSUED FOR MUNICIPAL SUBMISSION

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LAND DEVELOPMENT PLANS

PRIMROSE SCHOOLS FRANCHISING COMPANY

PROPOSED CHILD DAY CARE FACILITY

PARCEL ID: 28-113
885 MAIN STREET
TOWN OF READING
MIDDLESEX COUNTY, MASSACHUSETTS

JOSHUA H. KLINE, P.E.
MASSACHUSETTS LICENSE No. 53936
LICENSED PROFESSIONAL ENGINEER

STONEFIELD engineering & design

SCALE: AS SHOWN | PROJECT ID: BOS-240115

TITLE: LANDSCAPING DETAILS

DRAWING: C-11

STABILIZATION SPECIFICATIONS:

I.A. TEMPORARY SEEDING AND MULCHING:
GROUND LIMESTONE - APPLIED UNIFORMLY ACCORDING TO SOIL TEST RECOMMENDATIONS.
FERTILIZER - APPLY 11LBS./1,000 SF OF 10-20-10 OR EQUIVALENT WITH 50% WATER INSOLUBLE NITROGEN (UNLESS A SOIL TEST INDICATES OTHERWISE) WORKED INTO THE SOIL A MINIMUM OF 4".
SEED - PERENNIAL RYEGRASS 100 LBS/ACRE (2.3 LBS./1,000 SF) OR OTHER APPROVED SEEDS; PLANT BETWEEN MARCH 1 AND MAY 15 OR BETWEEN AUGUST 15 AND OCTOBER 1.
MULCH - UNROTTED STRAW OR HAY AT A RATE OF 70 TO 90 LBS./1,000 SF APPLIED TO ACHIEVE 95% SOIL SURFACE COVERAGE. MULCH SHALL BE ANCHORED BY APPROVED METHODS (I.E. PEG AND TWINE, MULCH NETTING, OR LIQUID MULCH BINDER).

I.B. PERMANENT SEEDING AND MULCHING:
TOPSOIL - UNIFORM APPLICATION TO A DEPTH OF 5" (UNSETTLED).
GROUND LIMESTONE - APPLIED UNIFORMLY ACCORDING TO SOIL TEST RECOMMENDATIONS.
FERTILIZER - APPLY 11 LBS./1,000 SF OF 10-10-10 OR EQUIVALENT WITH 50% WATER INSOLUBLE NITROGEN (UNLESS A SOIL TEST INDICATES OTHERWISE) WORKED INTO THE SOIL A MINIMUM OF 4".
SEED - TURF TYPE TALL FESCUE (BLEND OF 3 CULTIVARS) 350 LBS./ACRE (8 LBS./1,000 SF) OR OTHER APPROVED SEEDS; PLANT BETWEEN MARCH 1 AND OCTOBER 1 (SUMMER SEEDINGS REQUIRE IRRIGATION)
MULCH - UNROTTED STRAW OR HAY AT A RATE OF 70 TO 90 LBS./1,000 SF APPLIED TO ACHIEVE 95% SOIL SURFACE COVERAGE. MULCH SHALL BE ANCHORED BY APPROVED METHODS (I.E. PEG AND TWINE, MULCH NETTING, OR LIQUID MULCH BINDER).

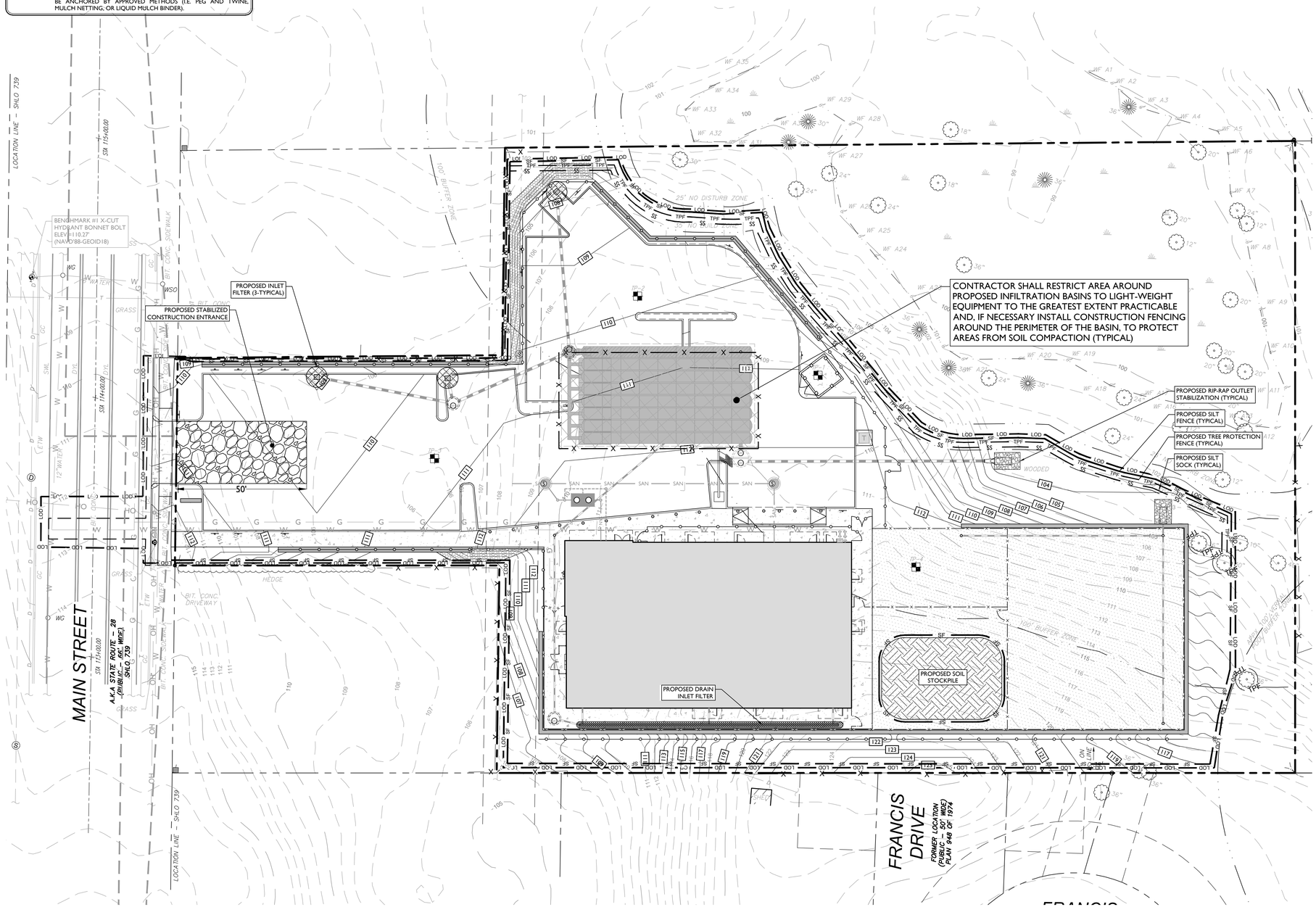
DUST CONTROL NOTES

1. MULCHES - SEE STANDARD OF STABILIZATION WITH MULCHES ONLY, PG. 5-1
2. VEGETATIVE COVER - SEE STANDARD FOR: TEMPORARY VEGETATIVE COVER, PG. 7-1, PERMANENT VEGETATIVE COVER FOR SOIL STABILIZATION PG. 4-1 AND PERMANENT STABILIZATION WITH SOD, PG. 6-1
3. SPRAY-ON ADHESIVES - ON MINERAL SOILS (NOT EFFECTIVE ON MUCK SOILS). KEEP TRAFFIC OFF THESE AREAS.
4. TILLAGE - TO ROUGHEN SURFACE AND BRING CLODS TO THE SURFACE. THIS IS A TEMPORARY EMERGENCY MEASURE WHICH SHOULD BE USED BEFORE SOIL BLOWING STARTS. BEGIN PLOWING ON WINDWARD SIDE OF SITE. CHISEL-TYPE PLOWS SPACED ABOUT 12 INCHES APART AND SPRING-TOOTHED HARROWS ARE EXAMPLES OF EQUIPMENT WHICH MAY PRODUCE THE DESIRED EFFECT.
5. SPRINKLING - SITE IS SPRINKLED UNTIL THE SURFACE IS WET.
6. BARRIERS - SOLID BOARD FENCES, SNOW FENCES, BURLAP FENCES, CRATE WALLS, BALES OF HAY AND SIMILAR MATERIAL CAN BE USED TO CONTROL AIR CURRENTS AND SOIL BLOWING.
7. CALCIUM CHLORIDE - SHALL BE IN THE FORM OF LOOSE, DRY GRANULES OR FLAKES FINE ENOUGH TO FEED THROUGH COMMONLY USED SPREADERS AT A RATE THAT WILL KEEP SURFACE MOIST BUT NOT CAUSE POLLUTION OR PLANT DAMAGE. IF USED ON STEEPER SLOPES, THEN USE OTHER PRACTICES TO PREVENT WASHING INTO STREAMS OR ACCUMULATION AROUND PLANTS.
8. STONE - COVER SURFACE WITH CRUSHED STONE OR COARSE GRAVEL.

NRCS WEB SOIL SURVEY SOIL CHARACTERISTICS CHART

TYPE OF SOIL	WHITMAN FINE SANDY LOAM (73B)	CHARLTON-URBAN LAND-HOLLIS COMPLEX (631C)	UDORTHENTS (655)	PAXTON FINE SANDY LOAM (305C)	CANTON-CHARLTON-URBAN LAND COMPLEX (629C)
PERCENT OF SITE COVERAGE	61.3%	28.5%	5.9%	3.8%	0.5%
HYDROLOGIC SOIL GROUP	D	A	D*	C	A
DEPTH TO RESTRICTIVE LAYER	7 TO 38 INCHES	> 80 INCHES	> 80 INCHES	20 TO 39 INCHES	18 TO 30 INCHES
SOIL PERMEABILITY	0.00 TO 0.14 IN / HR	0.60 TO 6.00 IN / HR	*	0.00 TO 0.14 IN / HR	2.00 TO 6.00 IN / HR
DEPTH TO WATER TABLE	0 TO 6 INCHES	> 80 INCHES	> 80 INCHES	18 TO 37 INCHES	> 80 INCHES

* NOT SPECIFIED IN NRCS SOIL REPORT



SYMBOL / DESCRIPTION

- PROPERTY BOUNDARY
- ADJACENT PROPERTY BOUNDARY
- LOD — PROPOSED LIMIT OF DISTURBANCE
- SF — PROPOSED SILT FENCE
- SS — PROPOSED SILT SOCK
- TPF — PROPOSED TREE PROTECTION FENCE
- PROPOSED STOCKPILE & EQUIPMENT STORAGE
- PROPOSED STABILIZED CONSTRUCTION ENTRANCE
- PROPOSED INLET PROTECTION FILTER

SOIL EROSION AND SEDIMENT CONTROL NOTES

1. THE CONTRACTOR IS RESPONSIBLE FOR SOIL EROSION AND SEDIMENT CONTROL IN ACCORDANCE WITH LOCAL STATE, AND FEDERAL REQUIREMENTS.
2. THE CONTRACTOR IS RESPONSIBLE FOR DUST CONTROL IN COMPLIANCE WITH LOCAL, STATE, AND FEDERAL AIR QUALITY STANDARDS.
3. THE CONTRACTOR IS RESPONSIBLE TO INSPECT ALL SOIL EROSION AND SEDIMENT CONTROL MEASURES WEEKLY AND AFTER A PRECIPITATION EVENT GREATER THAN 1 INCH. THE CONTRACTOR SHALL MAINTAIN AN INSPECTION LOG ON SITE AND DOCUMENT CORRECTIVE ACTION TAKEN THROUGHOUT THE COURSE OF CONSTRUCTION AS REQUIRED.

SEQUENCE OF CONSTRUCTION

1. INSTALL CONSTRUCTION ENTRANCE (2 DAYS)
2. STRIPPING AND CLEARING OF SITE (2 WEEKS)
8. INSTALL CURBSIDE SEDIMENT BARRIERS. (1 DAY)
9. DEMOLISH EXISTING PAVEMENT WHERE APPLICABLE (7 DAYS)
10. ROUGH GRADING AND TEMPORARY SEEDING (21 DAYS)
11. BASIN CONSTRUCTION INCLUDING STABILIZATION (14 DAYS)
12. UTILITY CONSTRUCTION (10 DAYS)
13. BUILDING CONSTRUCTION AND SITE IMPROVEMENTS (100 DAYS)
14. FINAL GRADING (3 DAYS)
15. SOIL RESTORATION MEASURES (3 DAYS)
16. LANDSCAPING IMPROVEMENTS AND FINAL SEEDING & TOP SOILING (7 DAYS)
17. REMOVE SOIL EROSION MEASURES (1 DAY)

NOTE: TIME DURATIONS ARE APPROXIMATE AND ARE INTENDED TO ACT AS A GENERAL GUIDE TO THE CONSTRUCTION TIMELINE. ALL DURATIONS ARE SUBJECT TO CHANGE BY CONTRACTOR. CONTRACTOR SHALL SUBMIT CONSTRUCTION SCHEDULE TO TOWNSHIP AND ENGINEER. CONTRACTOR SHALL PHASE CONSTRUCTION ACCORDINGLY.

811 Know what's **below** **Call** before you dig.

20' 0' 20' 40'
GRAPHIC SCALE IN FEET
1" = 20'

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02	04/26/2025	AJD	ISSUED FOR PEER REVIEW COMMENTS
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JOSHUA H. KLINE, P.E.
MASSACHUSETTS LICENSE No. 53936
LICENSED PROFESSIONAL ENGINEER

STONEFIELD engineering & design

SCALE: 1" = 20' | PROJECT ID: BOS-240115

TITLE: **SOIL EROSION & SEDIMENT CONTROL PLAN**

DRAWING: **C-9**

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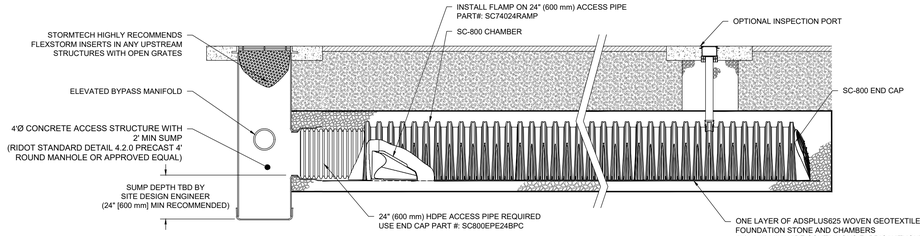
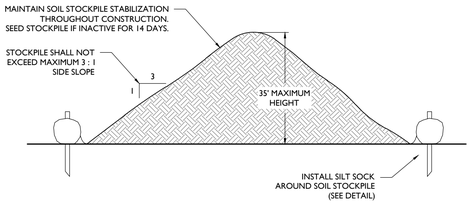


SC-800 ISOLATOR ROW PLUS DETAIL

NOT TO SCALE

1



NOTES:
1. STOCKPILES SHALL BE SITUATED SO AS NOT TO OBSTRUCT NATURAL DRAINAGE OR CAUSE OFF-SITE ENVIRONMENTAL DAMAGE.
2. STOCKPILES SHALL BE STABILIZED IN ACCORDANCE WITH THE STANDARDS FOR PERMANENT OR TEMPORARY VEGETATIVE COVER FOR SOIL STABILIZATION, AS APPROPRIATE (SEE SOIL EROSION NOTES).
3. IN THE EVENT A SOIL STOCKPILE REMAINS INACTIVE FOR A MINIMUM OF 14 DAYS, THE STOCKPILE SHALL BE SEEDED AND STABILIZED IN ACCORDANCE WITH APPLICABLE STANDARDS.

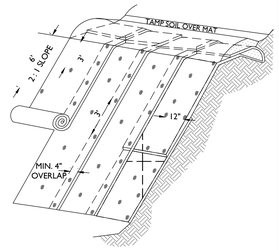
SOIL STOCKPILE DETAIL

NOT TO SCALE

2

NOTES:
1. **SITE PREPARATION:** THE SITE MUST BE GRADED TO THE DESIGN SPECIFICATIONS (GRADE, GEOMETRY, DENSITY OF SOIL, ETC.) AND THEN DRESSED TO BE FREE OF SOIL CLODS, CLUMPS, ROCKS, OR VEHICLE IMPRINTS OF ANY SIGNIFICANT SIZE THAT WOULD PREVENT ENKAMAT FROM LYING FLUSH TO SURFACE CONTOURS.
2. **ANCHOR TRENCH:** ANCHOR TRENCHES ARE REQUIRED TO SECURELY FASTEN THE ENKAMAT TO THE GROUND SURFACE. THE ENKAMAT IS INSTALLED IN TO THE BOTTOM OF THE TRENCH AND FASTENED WITH PINS SPACED 3 FEET APART. THE ANCHOR TRENCH / INTERMEDIATE CHECK SLOTS ARE THEN BACKFILLED AND COMPACTED IN A MANNER AS TO NOT DAMAGE THE ENKAMAT.
3. **ENKAMAT INSTALLATION:** ROLL THE ENKAMAT DOWN THE SLOPE OR CHANNEL. THE OVERLAP BETWEEN ROLLS IS 3 TO 4 INCHES. THE SPLICE BETWEEN ROLLS IS BETWEEN 2 AND 3 FEET. SHINGLE THE ROLL IN THE DIRECTION OF WATER FLOW. INSTALL PINS DOWN THE CENTER OF EACH MAT (MAT IS 3.25 FEET WIDE) STAGGERING THEM BETWEEN THE OUTSIDE PINS WITH A SPACING INTERVAL OF 3 TO 5 FEET. PINS PATTERNS WILL VARY DEPENDING UPON APPLICATION, SOIL TYPE, SLOPE OR CHANNEL SLOPE, GEOMETRY, ETC. A RULE OF THUMB FOR ESTIMATING THE AMOUNT OF PINS REQUIRED FOR A PROJECT IS:
   1:1 TO 2:1 SLOPES: 3-4 PINS PER SQ. YD.
   3:1 AND LESSER SLOPES: 2-3 PINS PER SQ. YD.

   ALWAYS INSTALL TWO ROWS OF PINS SPACED 1.5 X 1.5 FEET APART AT ALL ROLL SPLICE LOCATIONS.
4. **ANCHORING DEVICES:** TYPICALLY 11-8 GAUGE OF A 6" X 1" X 6" METAL PINS ARE USED. WHEN SURFACE SOIL CONDITIONS ARE LOOSE, USE 8" X 1" X 8" OR 12" X 1.5" X 12" METAL PINS, 8"-18" PINS WITH 1.5" DIAMETER WASHER, OR 12-30" J-SHAPE PINS (BENT REBAR) HAVING A ½" DIAMETER. DRIVE PINS OR PINS FLUSH WITH THE GROUND SURFACE.
5. **SEEDING:** FOR NON-SOIL FILLING APPLICATIONS, BROADCAST SEED OR HYDROSEED OVER THE INSTALLED ENKAMAT. MAKE SURE HYDROMULCH OCCURS AFTER SEEDING TO ENSURE THE SEED REACHES THE TOPSOIL. IF SOIL FILLING, SEED AFTER FILLING IS COMPLETED. YOU MAY ALSO SEED BEFORE AND AFTER SOIL FILLING TO CREATE A BETTER ESTABLISHED ROOT STRUCTURE AND INCREASE VEGETATION STRENGTH.



ENKAMAT DETAIL

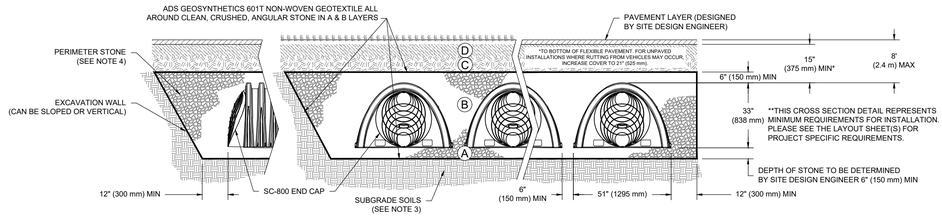
NOT TO SCALE

3

ACCEPTABLE FILL MATERIALS: STORMTECH SC-800 CHAMBER SYSTEMS

	MATERIAL LOCATION	DESCRIPTION	AASHTO MATERIAL CLASSIFICATIONS	COMPACTION / DENSITY REQUIREMENT
D	**FINAL FILL:** FILL MATERIAL FOR LAYER 'D' STARTS FROM THE TOP OF THE 'C' LAYER TO THE BOTTOM OF FLEXIBLE PAVEMENT OR UNPAVED FINISHED GRADE ABOVE. NOTE THAT PAVEMENT SUBBASE MAY BE PART OF THE 'D' LAYER.	ANY SOIL/ROCK MATERIALS, NATIVE SOILS, OR PER ENGINEER'S PLANS. CHECK PLANS FOR PAVEMENT SUBGRADE REQUIREMENTS.	N/A	PREPARE PER SITE DESIGN ENGINEER'S PLANS. PAVED INSTALLATIONS MAY HAVE STRINGENT MATERIAL AND PREPARATION REQUIREMENTS.
C	**INITIAL FILL:** FILL MATERIAL FOR LAYER 'C' STARTS FROM THE TOP OF THE EMBEDMENT STONE ('B' LAYER) TO 15" (375 mm) ABOVE THE TOP OF THE CHAMBER. NOTE THAT PAVEMENT SUBBASE MAY BE A PART OF THE 'C' LAYER.	GRANULAR WELL-GRADED SOIL/AGGREGATE MIXTURES, <35% FINES OR PROCESSED AGGREGATE. MOST PAVEMENT SUBBASE MATERIALS CAN BE USED IN LIEU OF THIS LAYER.	AASHTO M145[1] A-1, A-2-4, A-3 OR AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57, 6, 67, 68, 7, 78, 8, 89, 9, 10	BEGIN COMPACTIONS AFTER 12" (300 mm) OF MATERIAL OVER THE CHAMBERS IS REACHED. COMPACT ADDITIONAL LAYERS IN 6" (150 mm) MAX LIFTS TO A MIN. 95% PROCTOR DENSITY FOR WELL GRADED MATERIAL AND 95% RELATIVE DENSITY FOR PROCESSED AGGREGATE MATERIALS. ROLLER GROSS VEHICLE WEIGHT NOT TO EXCEED 12,000 lbs (53 kN). DYNAMIC FORCE NOT TO EXCEED 20,000 lbs (89 kN).
B	**EMBEDMENT STONE:** FILL SURROUNDING THE CHAMBERS FROM THE FOUNDATION STONE ('A' LAYER) TO THE 'C' LAYER ABOVE.	CLEAN, CRUSHED, ANGULAR STONE OR RECYCLED CONCRETE[3]	AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57	NO COMPACTION REQUIRED.
A	**FOUNDATION STONE:** FILL BELOW CHAMBERS FROM THE SUBGRADE UP TO THE FOOT (BOTTOM) OF THE CHAMBER.	CLEAN, CRUSHED, ANGULAR STONE OR RECYCLED CONCRETE[3]	AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57	PLATE COMPACT OR ROLL TO ACHIEVE A FLAT SURFACE.[2,3]

PLEASE NOTE:
1. THE LISTED AASHTO DESIGNATIONS ARE FOR GRADATIONS ONLY. THE STONE MUST ALSO BE CLEAN, CRUSHED, ANGULAR. FOR EXAMPLE, A SPECIFICATION FOR #4 STONE WOULD STATE: "CLEAN, CRUSHED, ANGULAR NO. 4 (AASHTO M43) STONE".
2. STORMTECH COMPACTION REQUIREMENTS ARE MET FOR 'A' LOCATION MATERIALS WHEN PLACED AND COMPACTED IN 6" (150 mm) (MAX) LIFTS USING TWO FULL COVERAGES WITH A VIBRATORY COMPACTOR.
3. WHERE INFILTRATION SURFACES MAY BE COMPROMISED BY COMPACTION, FOR STANDARD DESIGN LOAD CONDITIONS, A FLAT SURFACE MAY BE ACHIEVED BY RAKING OR DRAGGING WITHOUT COMPACTION EQUIPMENT. FOR SPECIAL LOAD DESIGNS, CONTACT STORMTECH FOR COMPACTION REQUIREMENTS.
4. ONCE LAYER 'C' IS PLACED, ANY SOIL/MATERIAL CAN BE PLACED IN LAYER 'D' UP TO THE FINISHED GRADE. MOST PAVEMENT SUBBASE SOILS CAN BE USED TO REPLACE THE MATERIAL REQUIREMENTS OF LAYER 'C' OR 'D' AT THE SITE DESIGN ENGINEER'S DISCRETION.
5. WHERE RECYCLED CONCRETE AGGREGATE IS USED IN LAYERS 'A' OR 'B' THE MATERIAL SHOULD ALSO MEET THE ACCEPTABILITY CRITERIA OUTLINED IN TECHNICAL NOTE 6.20 "RECYCLED CONCRETE STRUCTURAL BACKFILL".



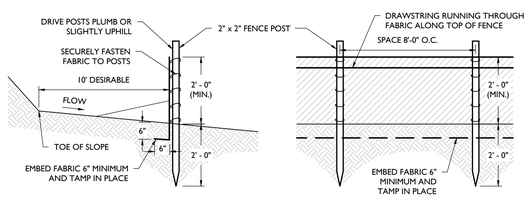
NOTES:

1. CHAMBERS SHALL MEET THE REQUIREMENTS OF ASTM F2418, "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
2. SC-800 CHAMBERS SHALL BE DESIGNED IN ACCORDANCE WITH ASTM F2787 "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
3. THE SITE DESIGN ENGINEER IS RESPONSIBLE FOR ASSESSING THE BEARING RESISTANCE (ALLOWABLE BEARING CAPACITY) OF THE SUBGRADE SOILS AND THE DEPTH OF FOUNDATION STONE WITH CONSIDERATION FOR THE RANGE OF EXPECTED SOIL MOISTURE CONDITIONS.
4. PERIMETER STONE MUST BE EXTENDED HORIZONTALLY TO THE EXCAVATION WALL FOR BOTH VERTICAL AND SLOPED EXCAVATION WALLS.
5. REQUIREMENTS FOR HANDLING AND INSTALLATION:
   - TO MAINTAIN THE WIDTH OF CHAMBERS DURING SHIPPING AND HANDLING, CHAMBERS SHALL HAVE INTEGRAL, INTERLOCKING STACKING LUGS.
   - TO ENSURE A SECURE JOINT DURING INSTALLATION AND BACKFILL, THE HEIGHT OF THE CHAMBER JOINT SHALL NOT BE LESS THAN 2".
   - TO ENSURE THE INTEGRITY OF THE ARCH SHAPE DURING INSTALLATION, a) THE ARCH STIFFNESS CONSTANT AS DEFINED IN SECTION 6.2.8 OF ASTM F2418 SHALL BE GREATER THAN OR EQUAL TO 550 LBS/FT/%. AND b) TO RESIST CHAMBER DEFORMATION DURING INSTALLATION AT ELEVATED TEMPERATURES (ABOVE 73° F / 23° C), CHAMBERS SHALL BE PRODUCED FROM REFLECTIVE GOLD OR YELLOW COLORS.

SC-800 CROSS SECTION DETAIL

NOT TO SCALE

6

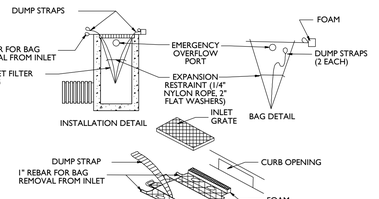


NOTES:
1. SECURELY FASTEN GEOTEXTILE TO FENCE POST BY USE OF WIRE TIES, HOG RINGS, STAPLES OR POCKETS. FOUR TO SIX FASTENERS PER POST.
2. GEOTEXTILE FABRIC TO BE EMBEDDED 6" (MIN.) AND TAMP IN PLACE.
3. SECURELY FASTEN ENDS OF INDIVIDUAL ROLLS OF GEOTEXTILE TO A POST BY WRAPPING EACH END OF THE GEOTEXTILE AROUND THE POST TWICE AND ATTACHING AS SPECIFIED IN NOTE 1 ABOVE. SPLICING OF INDIVIDUAL ROLLS SHALL NOT OCCUR AT LOW POINTS.
4. SET SILT FENCE WITHIN PROJECT LIMITS. 10'-0" IS DESIRABLE.
5. SILT FENCE SHALL BE CLEANED AND SEDIMENTS REMOVED AND PROPERLY DISPOSED OF ONCE SEDIMENT ACCUMULATION REACHES ¼ TO ½ THE HEIGHT OF THE FENCE. FENCE SHALL BE REPAIRED AND/OR REPLACED AS NEEDED.

SILT FENCE DETAIL

NOT TO SCALE

4

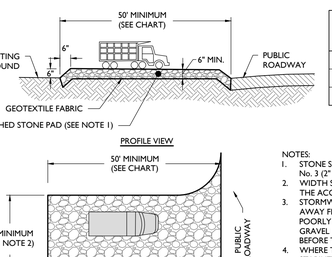


NOTES:
1. THE FILTER BAG SHALL SAFELY PASS FLOWS GREATER THAN THE 1-YEAR 24-HOUR STORM EVENT.
2. SEDIMENT REMOVAL AND MAINTENANCE SHALL BE PERFORMED FREQUENTLY AND AFTER EVERY STORM EVENT, AT MINIMUM. MAINTENANCE SHALL BE CONDUCTED AND SEDIMENTS REMOVED AND DISPOSED OF WHEN SEDIMENT ACCUMULATION REACHES ½ THE DEPTH OF THE FILTER BAG.

INLET FILTER BAG DETAIL

NOT TO SCALE

5



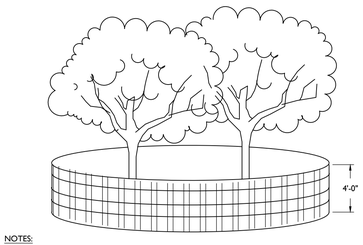
SLOPE OF PUBLIC ROADWAY	LENGTH OF STONE REQ'D	
	COARSE GRAINED SOILS	FINE GRAINED SOILS
0% TO 2%	50 FEET	100 FEET
2% TO 5%	100 FEET	200 FEET
> 5%	SEE NOTE 4	

NOTES:
1. STONE SHALL BE ASTM C-33, SIZE No. 2 (2.5" TO 1.5") OR No. 3 (2" TO 1") CLEAN CRUSHED ANGULAR STONE.
2. WIDTH SHALL BE 15' MINIMUM OR THE FULL WIDTH OF THE ACCESS POINT, WHICHEVER IS GREATER.
3. STORMWATER FROM UP-SLOPE AREAS SHALL BE DIVERTED AWAY FROM THE STABILIZED PAD, WHERE POSSIBLE. AT POORLY DRAINED LOCATIONS, SUBSURFACE DRAINAGE GRAVEL FILTER OR GEOTEXTILE SHALL BE INSTALLED BEFORE THE STABILIZED CONSTRUCTION ENTRANCE.
4. WHERE THE SLOPE OF THE ROADWAY EXCEEDS 5%, A STABILIZED BASE OF HOT MIX ASPHALT BASE COURSE SHALL BE INSTALLED. THE TYPE AND THICKNESS OF THE BASE COURSE AND USE OF DENSE GRADED AGGREGATE SUB-BASE SHALL BE AS PRESCRIBED BY LOCAL MUNICIPAL ORDINANCE OR GOVERNING AUTHORITY.
5. CONTRACTOR SHALL PROVIDE A SMOOTH TRANSITION BETWEEN THE STABILIZED CONSTRUCTION ACCESS AND THE PUBLIC ROADWAY.

STABILIZED CONSTRUCTION ACCESS DETAIL

NOT TO SCALE

7



NOTES:
1. SNOW FENCING IS TO BE 4'-0" HIGH AND SELF SUPPORTED.
2. DO NOT STOCKPILE MATERIALS OR STORE EQUIPMENT WITHIN THE TREE PROTECTION FENCING.
3. SNOW FENCE TO BE INSTALLED AT DRIP LINE OF EXISTING TREE OR TREE CLUSTER TO BE PROTECTED OR NO CLOSER THAN 6' FROM TREE TRUNK IF NECESSARY.
4. IF THE PROJECT AREA ENCOMPASSES A PORTION OF THE DRIP LINE OF THE TREE, NO MORE THAN ONE THIRD OF THE OF THE TOTAL AREA OF WITHIN THE DRIP LINE SHOULD BE DISTURBED BY CONSTRUCTION OR REGRADING AND A 3" THICK LAYER OF MULCH SHALL BE INSTALLED OVER THE AREA OF THE DRIP LINE WHICH IS NOT PROTECTED BY FENCING TO PROVIDE A CUSHION.

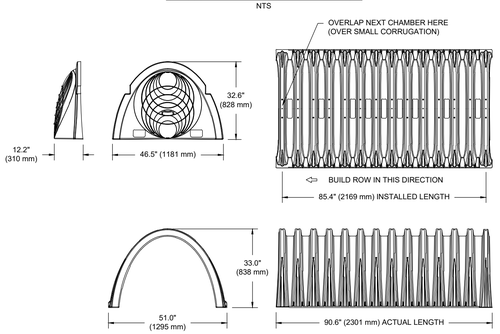
TREE PROTECTION DETAIL

NOT TO SCALE

8

SC-800 TECHNICAL SPECIFICATION

NTS



NOMINAL CHAMBER SPECIFICATIONS

SIZE (W X H X INSTALLED LENGTH)	51.0" X 33.0" X 85.4"	(1295 mm X 838 mm X 2169 mm)
CHAMBER STORAGE	50.6 CUBIC FEET	(1.43 m³)
MINIMUM INSTALLED STORAGE*	81.0 CUBIC FEET	(2.29 m³)
WEIGHT	81.8 lbs.	(37.1 kg)

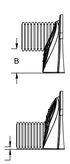
NOMINAL END CAP SPECIFICATIONS

SIZE (W X H X INSTALLED LENGTH)	46.5" X 32.6" X 10.5"	(1181 mm X 828 mm X 267 mm)
END CAP STORAGE	3.4 CUBIC FEET	(0.09 m³)
MINIMUM INSTALLED STORAGE**	15.4 CUBIC FEET	(0.43 m³)
WEIGHT	15.7 lbs.	(7.1 kg)

* ASSUMES 6" (152 mm) STONE ABOVE, BELOW, AND BETWEEN CHAMBERS
** ASSUMES 6" (152 mm) STONE ABOVE AND BELOW END CAPS, 6" (152 mm) BETWEEN ROWS, 12" (305 mm) BEYOND END CAPS

PRE-CORED HOLES AT BOTTOM OF END CAP FOR PART NUMBERS ENDING WITH "BPC"
PRE-CORED HOLES AT TOP OF END CAP FOR PART NUMBERS ENDING WITH "TPC"

PART #	STUB	B	C
SC800EPE06TPC	6" (150 mm)	21.4" (544 mm)	---
SC800EPE06BPC		---	0.9" (23 mm)
SC800EPE08TPC	8" (200 mm)	19.2" (488 mm)	---
SC800EPE08BPC		---	1.0" (25 mm)
SC800EPE10TPC	10" (250 mm)	17.0" (432 mm)	---
SC800EPE10BPC		---	1.2" (30 mm)
SC800EPE12TPC	12" (300 mm)	14.4" (366 mm)	---
SC800EPE12BPC		---	1.6" (41 mm)
SC800EPE15TPC	15" (375 mm)	11.3" (287 mm)	---
SC800EPE15BPC		---	1.7" (43 mm)
SC800EPE18TPC	18" (450 mm)	8.0" (203 mm)	---
SC800EPE18BPC		---	2.0" (51 mm)
SC800EPE24BPC	24" (600 mm)	---	2.3" (58 mm)
SC800EPE	NONE	SOLID END CAP	



NOTE: ALL DIMENSIONS ARE NOMINAL

SC-800 TECHNICAL SPECIFICATIONS

NOT TO SCALE

9

INSPECTION & MAINTENANCE

STEP 1) INSPECT ISOLATOR ROW PLUS FOR SEDIMENT
- A. INSPECTION PORTS (IF PRESENT)
  - A.1. REMOVE/OPEN LID ON NYLOPLAST INLINE DRAIN
  - A.2. REMOVE AND CLEAN FLEXSTORM FILTER IF INSTALLED
  - A.3. USING A FLASHLIGHT AND STADIA ROD, MEASURE DEPTH OF SEDIMENT AND RECORD ON MAINTENANCE LOG
  - A.4. LOWER A CAMERA INTO ISOLATOR ROW PLUS FOR VISUAL INSPECTION OF SEDIMENT LEVELS (OPTIONAL)
  - A.5. IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.
- B. ALL ISOLATOR PLUS ROWS
  - B.1. REMOVE COVER FROM STRUCTURE AT UPSTREAM END OF ISOLATOR ROW PLUS
  - B.2. USING A FLASHLIGHT, INSPECT DOWN THE ISOLATOR ROW PLUS THROUGH OUTLET PIPE
    - i) MIRRORS ON POLES OR CAMERAS MAY BE USED TO AVOID A CONFINED SPACE ENTRY
    - ii) FOLLOW OSHA REGULATIONS FOR CONFINED SPACE ENTRY IF ENTERING MANHOLE
  - B.3. IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.

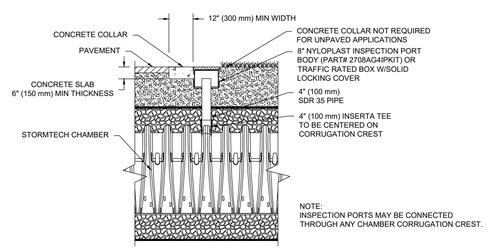
STEP 2) CLEAN OUT ISOLATOR ROW PLUS USING THE JETVAC PROCESS
- A. A FIXED CULVERT CLEANING NOZZLE WITH REAR FACING SPREAD OF 45° (1.1 m) OR MORE IS PREFERRED
- B. APPLY MULTIPLE PASSES OF JETVAC UNTIL BACKFLUSH WATER IS CLEAN
- C. VACUUM STRUCTURE SUMP AS REQUIRED.

STEP 3) REPLACE ALL COVERS, GRATES, FILTERS, AND LIDS; RECORD OBSERVATIONS AND ACTIONS.

STEP 4) INSPECT AND CLEAN BASINS AND MANHOLES UPSTREAM OF THE STORMTECH SYSTEM.

NOTES

1. INSPECT EVERY 6 MONTHS DURING THE FIRST YEAR OF OPERATION. ADJUST THE INSPECTION INTERVAL BASED ON PREVIOUS OBSERVATIONS OF SEDIMENT ACCUMULATION AND HIGH WATER ELEVATIONS.
2. CONDUCT JETTING AND VACTORING ANNUALLY OR WHEN INSPECTION SHOWS THAT MAINTENANCE IS NECESSARY.



4" PVC INSPECTION PORT DETAIL
(SC SERIES CHAMBER)

NOT TO SCALE

10

ISSUE	DATE	BY	DESCRIPTION
02	04/26/2025	AJD	ISSUED FOR PEER REVIEW COMMENTS
01	05/06/2025	SCL	ISSUED FOR TOWN COMMENTS
00	03/07/2025	AJD	ISSUED FOR MUNICIPAL SUBMISSION

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LAND DEVELOPMENT PLANS

PRIMROSE SCHOOLS FRANCHISING COMPANY

PROPOSED CHILD DAY CARE FACILITY

PARCEL ID: 28-113
885 MAIN STREET
TOWN OF READING
MIDDLESEX COUNTY, MASSACHUSETTS

JOSHUA H. KLINE, P.E.
MASSACHUSETTS LICENSE No. 53936
LICENSED PROFESSIONAL ENGINEER

STONEFIELD engineering & design

SCALE: AS NOTED | PROJECT ID: BOS-240115

TITLE: CONSTRUCTION DETAILS

DRAWING: C-14

APPENDIX E
DRAINAGE AREA MAPS

INVENTORY

SHEET 1 OF 2: EXISTING DRAINAGE AREA MAP

SHEET 2 OF 2: PROPOSED DRAINAGE AREA MAP

SYMBOL	DESCRIPTION
	PROPERTY LINE
	ADJACENT PROPERTY LINE
	EXISTING DRAINAGE AREA
	TIME OF CONCENTRATION PATH
	EXISTING GRASS AREA
	EXISTING WOODED AREA

AREA E-3	
2,478 SF =	IMPERVIOUS AREAS
11 SF =	WOODS, GOOD (HSG A)
1,328 SF =	WOODS, GOOD (HSG D)
1,618 SF =	GRASS, GOOD (HSG A)
614 SF =	GRASS, GOOD (HSG C)
1,476 SF =	GRASS, GOOD (HSG D)
7,525 SF =	TOTAL AREA

AREA E-2	
3,525 SF =	IMPERVIOUS AREAS
2,282 SF =	WOODS, GOOD (HSG A)
3,966 SF =	GRASS, GOOD (HSG A)
2,104 SF =	GRASS, GOOD (HSG C)
4,016 SF =	GRASS, GOOD (HSG D)
15,893 SF =	TOTAL AREA

AREA E-1	
5,544 SF =	IMPERVIOUS AREAS
5,696 SF =	WOODS, GOOD (HSG A)
43,615 SF =	WOODS, GOOD (HSG D)
1,290 SF =	GRASS, GOOD (HSG A)
4,717 SF =	GRASS, GOOD (HSG D)
60,862 SF =	TOTAL AREA

MAIN STREET
A.K.A. STATE ROUTE – 28
(PUBLIC – 66' WIDE)
SHLD. 739

FRANCIS DRIVE
FORMER LOCATION
(PUBLIC – 50' WIDE)
PLAN 948 OF 1974

FRANCIS DRIVE
CUL–DE–SAC
(PUBLIC – 50' WIDE)
PLAN 1647 OF 1980

LOCATION LINE – SHLD 739

100' BUFFER ZONE

100' WETLAND BUFFER ZONE

FORMER LOT LINE (PLAN 927 OF 1978)

20' 0' 20' 40'
GRAPHIC SCALE IN FEET
1" = 20'

ISSUE	DATE	BY	DESCRIPTION
02	06/26/2025	AJD	ISSUED PER PEER REVIEW COMMENTS
01	05/06/2025	AJD	ISSUED FOR TOWN COMMENTS
00	02/25/2025	AJD	FOR MUNICIPAL SUBMISSION

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DRAINAGE AREA MAPS

ADA ARCHITECTS

PROP PRIMROSE SCHOOL CHILD CARE CENTER

PARCEL ID: 28-113
885 MAIN STREET
TOWN OF READING
MIDDLESEX COUNTY, MASSACHUSETTS

JOSHUA H. KLINE, P.E.
MASSACHUSETTS LICENSE No. 53936
LICENSED PROFESSIONAL ENGINEER

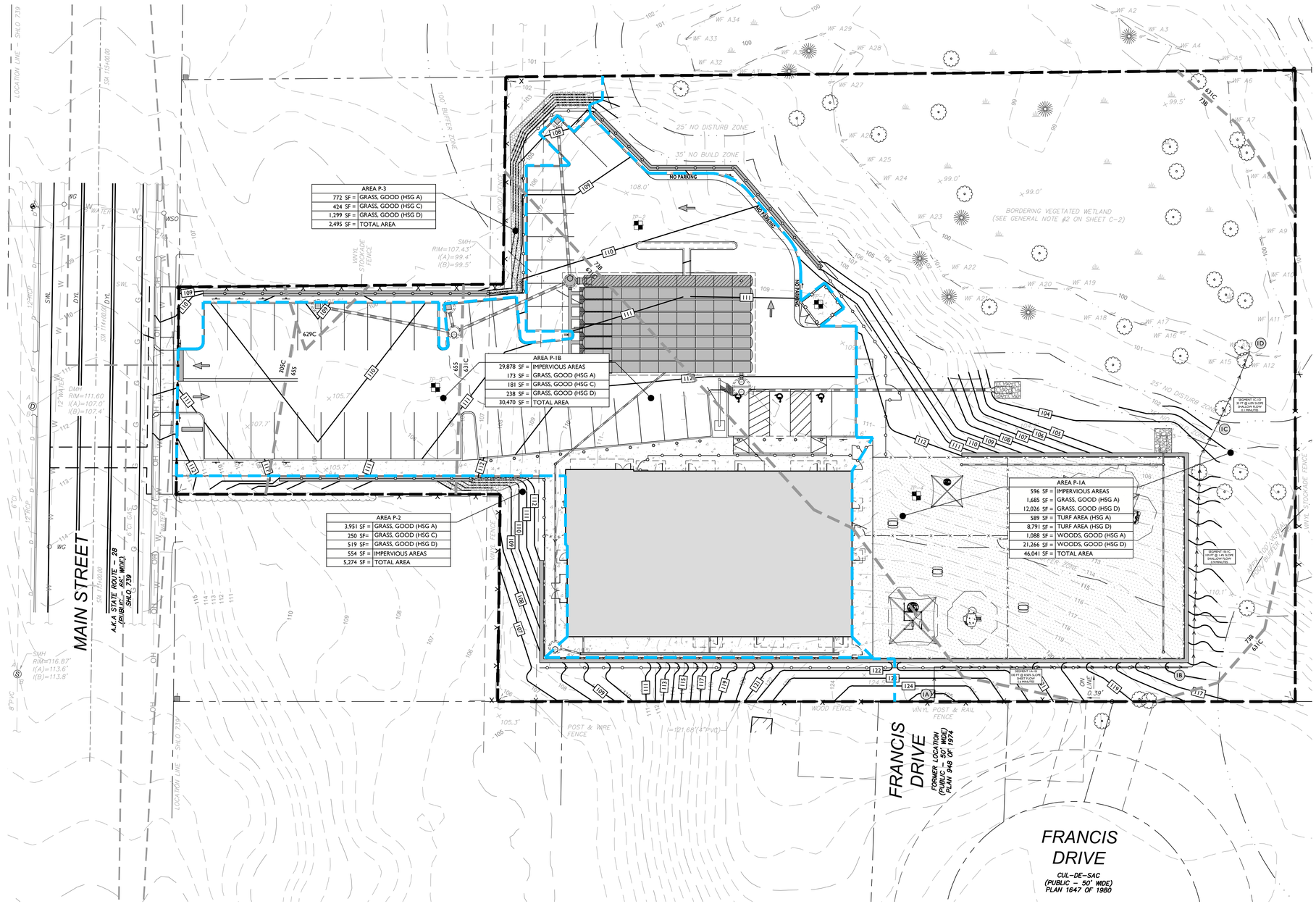
STONEFIELD engineering & design

SCALE: 1" = 20' | PROJECT ID: BOS-240115

TITLE:
EXISTING DRAINAGE AREA MAP

DRAWING:
1 OF 2

Z:\BOSTON\BOS\240115\DWG\240115 PRIMROSE SCHOOLS - 885 MAIN STREET, READING, MA\CAD\SHEETS\DRAINAGE AREA MAPS\240115-DA-20_DRAINAGE AREA MAPS.DWG



SYMBOL	DESCRIPTION
	PROPERTY LINE
	ADJACENT PROPERTY LINE
	PROPOSED DRAINAGE AREA
	TIME OF CONCENTRATION PATH
	PROPOSED TURF AREA

ISSUE	DATE	BY	DESCRIPTION
02	06/26/2025	AJD	ISSUED PER PEER REVIEW COMMENTS
01	05/06/2025	AJD	ISSUED FOR TOWN COMMENTS
00	02/25/2025	AJD	FOR MUNICIPAL SUBMISSION

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DRAINAGE AREA MAPS

ADA ARCHITECTS

PROP PRIMROSE SCHOOL CHILD CARE CENTER

PARCEL ID: 28-113
885 MAIN STREET
TOWN OF READING
MIDDLESEX COUNTY, MASSACHUSETTS

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MASSACHUSETTS LICENSE No. 53936
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SCALE: 1" = 20' | PROJECT ID: BOS-240115

TITLE:

PROPOSED DRAINAGE AREA MAP

DRAWING:

2 OF 2

Z:\BOSTON\BOS\240115\CAD\1-PRIMROSE SCHOOLS - 885 MAIN STREET, READING, MA\CAD\DWG\STD\DRAINAGE AREA MAPS\240115-25 DRAINAGE AREA MAPS.DWG

APPENDIX F
ADS ISOLATOR ROW PLUS NJCAT
TECHNOLOGY VERIFICATION

NJCAT TECHNOLOGY VERIFICATION

Isolator® Row PLUS

Advanced Drainage Systems

July 2020

Revised February 2025

(Incorporating Additional Chambers)

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1. Description of Technology

The Isolator® Row PLUS (**shown in Figures 1 and 2**) is the first row of StormTech chambers that is surrounded with filter fabric and connected to a closely located manhole for easy access. The Isolator Row PLUS provides for settling and filtration of sediment as stormwater rises in the chamber and ultimately passes through the filter fabric. The open-bottom chambers allow stormwater to flow out of the chambers, while sediment is captured in the Isolator Row PLUS.

A single layer of proprietary Advanced Drainage Systems (ADS) PLUS fabric is placed between the angular base stone and the Isolator Row PLUS chamber. The geotextile provides the means for stormwater filtration and provides a durable surface for maintenance operations. A non-woven fabric is placed over the chambers. See link to O&M Manual (pg. 23) for installation pictures.

The Isolator Row PLUS is designed to capture the "first flush" runoff and offers the versatility to be sized on a volume basis or a flow basis. An upstream manhole not only provides access to the Isolator Row PLUS but includes a high/low concept such that stormwater flow rates or volumes that exceed the capacity of the Isolator Row PLUS bypass through a manifold to the other chambers. This is achieved with either an elevated bypass manifold or a high-flow weir. This creates a differential between the Isolator Row PLUS row of chambers and the manifold to the rest of the system, thus allowing for settlement time in the Isolator Row PLUS. After Stormwater flows through the Isolator Row PLUS and into the rest of the StormTech chamber system it is either infiltrated into the soils below or passed at a controlled rate through an outlet manifold and outlet control structure. **Since this technology fits under the infiltration basin BMP in the New Jersey Stormwater BMP Manual, it is not eligible for NJDEP MTD certification.**

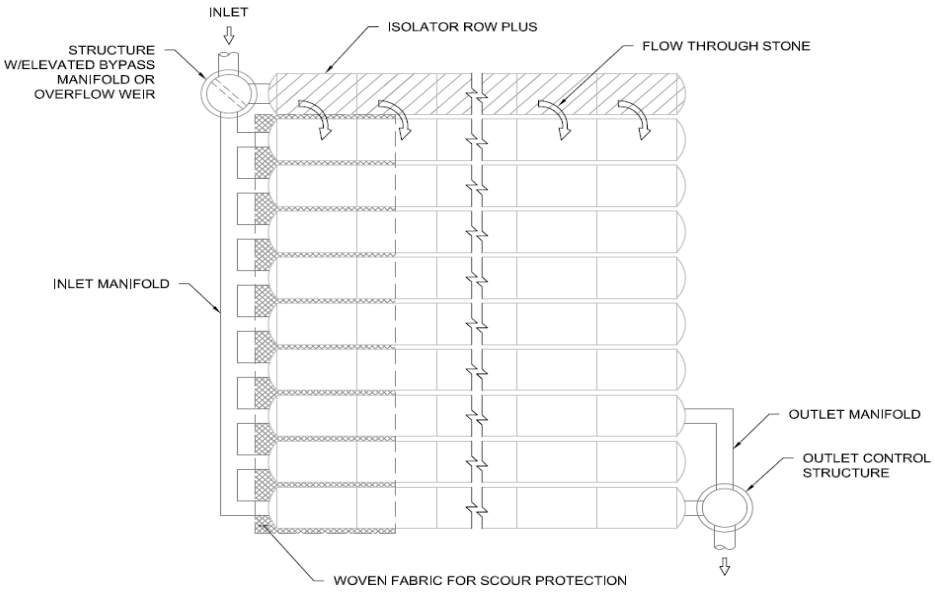

Figure 1 Schematic of the Isolator Row PLUS System

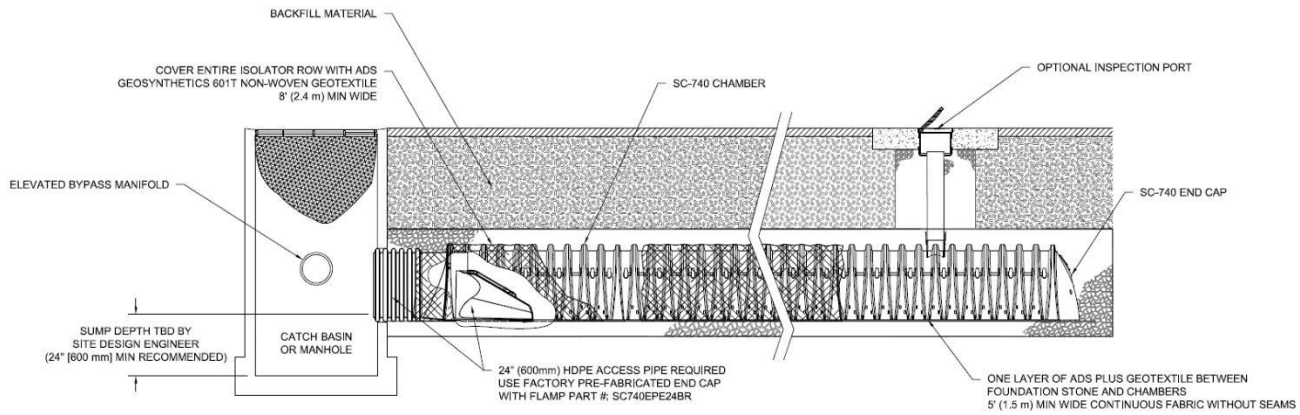

Figure 2 Isolator Row PLUS Detail

Note: ADS acquired StormTech LLC in 2009. This acquisition brought the StormTech brand under ADS oversight and umbrella. Currently, StormTech operates as ADS, and StormTech is a product brand of ADS.

2. Laboratory Testing

Beginning in January 2020, two overlapping StormTech SC-740 Isolator Row PLUS commercial size chambers were installed at the BaySaver Laboratory in Mount Airy, Maryland, to evaluate the performance of the Isolator Row PLUS on Total Suspended Solid (TSS) removal. Boggs Environmental Consultants (BEC) provided third-party review and oversight of all testing and data collection procedures, in accordance with the *New Jersey Department of Environmental Protection Laboratory Protocol to Assess Total Suspended Solids Removal by a Filtration Manufactured Treatment Device (January 2013)*. All sediment concentration samples were analyzed by Fredericktowne Labs (FTL) using ASTM D3977-97 (2019). All sediment PSD analysis was performed by Environmental Consulting Services (ECS), using the methodology of ASTM D422-63 (2007). Prior to the start of testing, a Quality Assurance Project Plan (QAPP), revision dated January 9, 2020, was submitted to, and approved by the New Jersey Corporation for Advanced Technology (NJCAT).

2.1 Test Setup

The testing system, shown in **Figure 3**, consisted of a source tank, feed pump, flow control valve, flow meter, background sample port, screw-auger sediment feeder (doser), and an Isolator Row PLUS test system. This verification report only addresses the performance of the Isolator Row PLUS and not the entire Isolator Row PLUS system, since this is the row designed to remove sediment until the system goes into bypass.

Testing Procedure

The water source was potable water from the Town of Mount Airy Water & Sewer Department, obtained from an onsite tap, which served as the raw water supply for the testing system.

Municipal tap water was used to fill the source tank and then pumped to the system. Flow rate was controlled to the target of 225 gpm by a flow control valve. An inline flow meter (FloCat MFE electromagnetic flow meter) was used to measure the flow, and a SeaMetrics DL76 data logger (pictured in **Figure 4**) recorded the flow at one-minute intervals. The test sediment was introduced to the inlet stream via a 12 -inch dosing port teed with a 12-inch influent line (pictured in **Figure 5**) located approximately 4 feet upstream of the system inlet. The dosing rate was controlled by a screw-auger Velodyne Barracuda 1000A volumetric feeder with a ½ HP variable speed motor. The dosing rate was set to deliver an amount of sediment that, when mixed with the water from the source tank, would produce influent water with a target test sediment concentration of 200 mg/L.

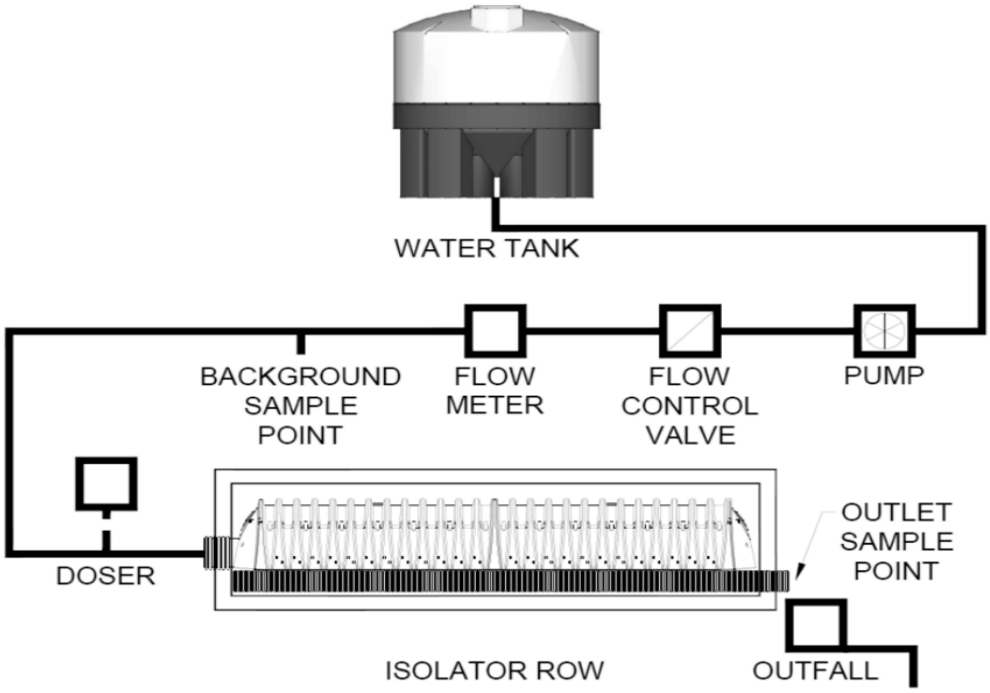

Figure 3 Schematic of the Isolator Row PLUS Test Configuration

The Isolator Row PLUS was installed inside a watertight 16'L x 6'W x 4'H test box (pictured in **Figures 6 and 7**). The Isolator Row PLUS is an arch-shaped stormwater detention/retention sediment collection and filtering device, sealed with end caps, with a 12"-inch inlet pipe welded into the upstream end cap. A ramp apparatus (patent pending) was attached to the inside of the chamber end cap to provide a smooth transition from pipe invert to fabric bottom. It is configured to improve chamber function performance over time by distributing sediment and debris that would otherwise collect at the inlet. It also serves to improve the fluid and solid flow back into the inlet pipe during maintenance and cleaning, and to guide cleaning and inspection equipment back into the inlet pipe when complete.

The chambers were installed on ADS PLUS fabric on top of a 10-inch base of washed, angular, crushed stone, (#57, ¾ inch blue stone) containing an 8-inch perforated underdrain pipe running the length of the test box, penetrating the wall of the downstream end of the test box to the discharge collection point. An ADS non-woven geotextile fabric was placed over the top of the chamber row. The chambers were then backfilled with the washed crushed stone up to the top of

the chamber elevation. Additionally, an opening was cut into the top of one chamber to allow for visual monitoring and head measurement. No bypass or weir was installed upstream of the test box.

The test flow entered the chamber via the influent pipe and flowed across the filter fabric, filling the row. The water then flowed through the filter fabric, driven by hydrostatic head. The treated water exited the test box via the underdrain.

Figures 4 and 5 Photographs of Flow Meter and Sediment Delivery Port

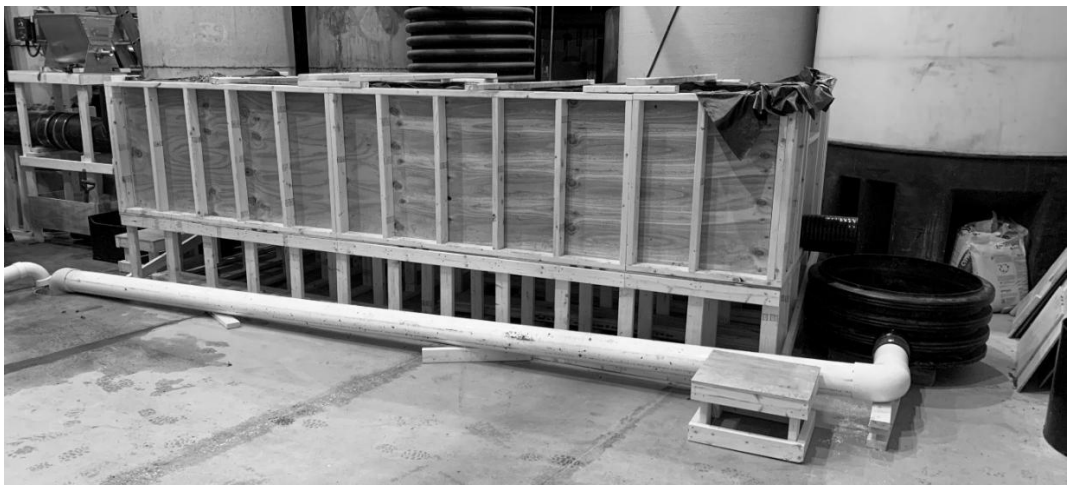

Figure 6 Side View Photograph of Isolator Row PLUS Test Box

Figure 7 Top View Photograph of Isolator Row PLUS Test Box

Test Unit and Scaling Explanation

The Isolator Row PLUS used in this test was constructed from two (2) overlapping polypropylene open-bottom StormTech SC-740 chambers (one shortened by 5-in. to enable fitting into the test box), two (2) SC-740 end caps, a ramp apparatus and one layer of ADS PLUS fabric. The chamber floor filtration area (effective filtration treatment area, EFTA) was approximately 54.5 ft^2. (calculated using an average contact width inside the chamber of 45 in). The target test flow was 225 gpm. The calculated hydraulic loading rate, flow rate/EFTA is 4.13 gpm/ft^2 and the ratio of effective sedimentation treatment area to EFTA is 1.0. Given these data, one can effectively scale the test results for all commercial systems.

Sample Collection

The grab sampling method was used for all sample collection by sweeping a wide-mouth 1-L plastic bottle through the free-discharge effluent stream, to ensure the full cross section of the flow was sampled. The start time for each run was recorded.

The sampling schedule is provided in **Table 1**. The detention time for the Isolator Row PLUS unit operating at 20 inches hydrostatic head (maximum head tested) is 2.1 minutes. To comply with the NJDEP Filter Protocol, after initiating and stabilizing the flow rate at the MTFR and beginning sediment feed, effluent sampling did not begin until the filtration MTD has been in operation for a minimum of three detention times.

Background water samples were collected upstream of the doser (shown in **Figures 3 and 8**) in correspondence with the odd-numbered effluent samples (i.e., Samples E1, E3, E5 at t = 9, 20, 31 minutes).

Table 1 Sampling Schedule for the Isolator Row PLUS Tests

Time (min)	Sample(s)	Time (min)	Sample(s)
0	S1	22	S3
9	E1, BG1	31	E5, BG3
10	E2	32	E6
11	S2	33	Stop Flow
20	E3, BG2	N/A	DDA
21	E4	N/A	DDB

NOTE: S = sediment rate; E = effluent; BG = background; DD = drawdown

Figure 8 Photograph of Background Sampling Port

Two evenly-volume-spaced drawdown samples, DDA and DDB, were taken after the flow and sediment feed to the unit had been stopped.

Sediment injection rates were measured using a stopwatch and the mass collected measured on a calibrated scale once at the very beginning of the run and twice more during the run. A fourth sediment rate sample was taken after the run was finished as an internal check but was not included in the calculations for the report. The duration of each run was 33 minutes.

A Chain of Custody (COC) form was used for each test run to record sampling date and time for externally analyzed samples. Copies of these forms were maintained by BaySaver Laboratory and FTL. Sample bottles were labeled to identify the test run number and sample type (e.g., background, effluent), corresponding to the sample identification on the COC form. BEC was present during each test run and witnessed labeling, completion of COC forms, and packaging of

samples for delivery to the external laboratory (FTL). Each person taking or relinquishing possession of the samples was required to sign a COC form before samples changed hands.

Other Instrumentation and Measurement

Water temperature was recorded every minute by an HOBO data logger placed in the source water tank of the test system. The water level in the Isolator Row PLUS was recorded every 5 minutes by visual observation of a yardstick mounted through the observation port on top of the first chamber. Run and sampling times were measured using a digital timer and a stopwatch, respectively.

2.2 Test Sediment

The test sediment had the particle size distribution (PSD) presented in **Figure 9**. The test sediment was custom-blended using various commercially available silica sands. The resulting blended sediment met the specification for the NJDEP Filter Protocol. The test sediment was batched, labeled, and stored in covered bins for the duration of this project. Under the supervision of BEC, twenty-one subsamples, taken from various locations within the test sediment containers, were composited. From the composite, three random samples were taken for PSD and moisture content analyses, which were performed by ECS, using the methodology of ASTM method D422-63 (2007).

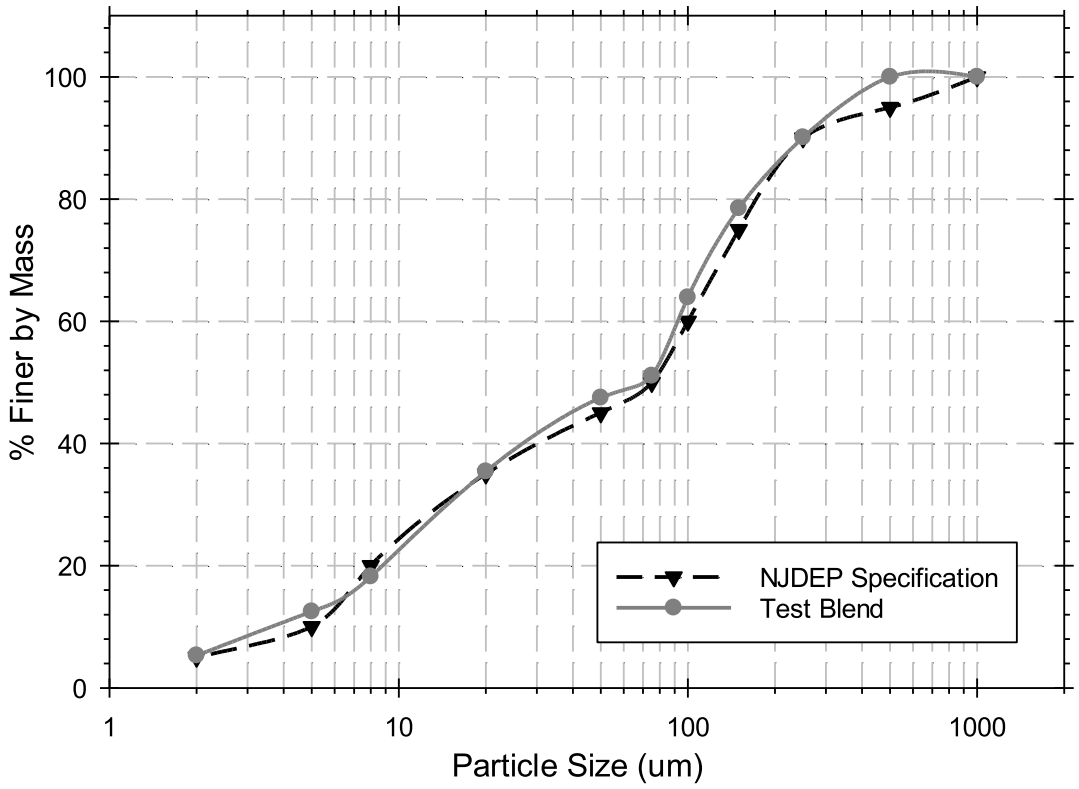

Figure 9 Average Particle Size Distribution of Test Sediment Verified by ECS

The PSD test analysis results are summarized in **Table 2**. ECS results showed that 17-19% of the particles were less than 8 µm and 89-90% of the particles were less than 250 µm. The d_{50} values (approximately 72 µm) also indicated that there was no significant difference between the NJDEP target gradation and the ECS-verified gradation of the test sediment. Thus, the blended test sediment was found to meet the NJDEP particle size specification and was acceptable for use. ECS also analyzed the sediment samples for moisture. The average moisture content was 0.1%.

Table 2 Particle Size Distribution of Test Sediment as Analyzed by ECS

Particle Size (µm)	Test Blend % Finer by Mass Analyzed by ECS				
	NJ Blend A	NJ Blend B	NJ Blend C	Average	NJDEP Specification (minimum % finer)
1000	100.0	100.0	100.0	100.0	98
500	100.0	100.0	100.0	100.0	93
250	90.3	89.8	90.2	90.1	88
150	79.3	78.1	78.1	78.5	73
100	66.0	63.2	62.7	63.9	58
75	52.0	50.9	50.3	51.1	50
50	47.5	47.7	47.4	47.5	43
20	35.9	36.0	34.3	35.4	33
8	18.6	18.7	17.4	18.2	18
5	13.0	13.0	11.6	12.5	8
2	5.5	5.4	5.1	5.3	3
d_{50}	69 µm	72 µm	74 µm	72 µm	75 µm

2.3 Sediment Removal Efficiency Testing

Sediment removal efficiency testing adhered to the guidelines set forth in Section 5 of the NJDEP Laboratory Protocol for Filtration MTDs. The target flow through the system was 225 gpm, with a target sediment concentration of 200 mg/L. All samples were collected in clean, 1-L wide-mouth bottles. Three background samples were taken at 9, 20 and 31 minutes after the test began to ensure the supply water met the sediment concentration requirement. According to the NJDEP Filter Protocol, these background concentrations cannot exceed a TSS concentration of 20 mg/L.

The test sediment screw-auger feeder introduced the test sediment into the influent stream to achieve the target influent TSS concentration of 200 mg/L. According to the NJDEP Filter Protocol, this influent concentration must stay within 10% of target, allowing for a 180 mg/L to 220 mg/L influent concentration. The feeder was calibrated prior to each run. In order to confirm sediment feed rates during the test, in accordance with the NJDEP Filter Protocol, three samples of the test sediment were collected from the injection point (**Figure 3**, "Doser") into a clean one-liter container for verification of sediment feed rate, over an interval timed to the nearest second, with a minimum volume of 0.1 liter or a collection interval not exceeding one minute (whichever came first). The time was measured with a stopwatch. The samples were weighed to the nearest

milligram in the BaySaver Laboratory under the observation of BEC. The sediment feed rate coefficient of variance (COV) for the test sediment samples did not exceed 0.10. The mass from the sediment feed rate measurement samples was subtracted from the total mass introduced to the system when removal efficiency was calculated.

Effluent sampling was performed by the grab sampling method during each run, according to the schedule in **Table 1**. When the test sediment feed was interrupted for test sediment measurements, the next effluent samples were collected after at least three detention times had elapsed. During the drawdown period, two evenly volume-spaced samples were collected after flow and sediment feed had stopped. All sediment concentration samples were analyzed by Fredericktowne Labs (FTL) using ASTM D3977-97 (2019) "Standard Test Methods for Determining Sediment Concentrations in Water Samples."

2.4 Sediment Mass Loading Capacity

The sediment mass loading capacity testing occurred as a continuation of removal efficiency testing, with the target for influent concentration remaining at 200 mg/L, and all aspects of testing procedures kept the same to ensure consistency throughout. The sediment mass loading capacity of the Isolator Row PLUS is defined per the protocol as the point at which the cumulative mass removal drops below 80.0%. For this testing program, the sediment mass loading testing was stopped prior to that point (after Run 16), because it was incorrectly assumed this criterion was reached. Thus, the mass loading is defined as mass loaded into the unit through the end of Run 16.

3. Supporting Documentation

The Procedure for Obtaining Verification of a Stormwater Manufactured Treatment Device from NJCAT states that copies of the laboratory test reports, all data from performance evaluation test runs, original data, pertinent calculations, and documentation of any maintenance activities that occur during the testing process are to be included in this section. All of this information has been provided to NJCAT and is available upon request. It is not practical to include it in this report.

4. Testing Results

A total of 16 removal efficiency testing runs were completed in accordance with the NJDEP filter protocol. The target flow and influent sediment concentration were 225 gpm and 200 mg/L, respectively. The results from all 16 runs were used to calculate the overall cumulative removal efficiency of the Isolator Row PLUS.

4.1 Flow Rate

Flow was monitored by an inline flow meter (FloCat MFE electromagnetic flow meter) and recorded by a SeaMetrics DL76 data logger every minute during each run. For each run, the flow was maintained within 10% of the target (202.5 – 247.5 gpm). The average flow for all 16 runs was 226.1 gpm. The flow data with coefficient of variance (COV) values for all 16 runs are summarized in **Table 3**.

4.2 Water Temperature

Temperatures were recorded every minute by an HOBO water level logger (U20L-04). On average for all runs, the water temperature during testing was 45.7 degrees Fahrenheit, with a maximum of 52.2 degrees Fahrenheit, meeting the NJDEP Filter Protocol requirement to be below 80 degrees Fahrenheit. Data are summarized in **Table 3**.

Table 3 Flow Rate and Temperature Summary for All Runs

Run	Max Flow (gpm)	Min Flow (gpm)	Average Flow (gpm)	Flow COV	Flow Compliance (COV< 0.1)	Maximum Temperature (Fahrenheit)	NJDEP Temperature Compliance (< 80 F)
1	232.8	223.9	226.3	0.0078	Y	48.2	Y
2	228.9	218.6	220.8	0.0104	Y	51.5	Y
3	229.4	220.0	227.2	0.0094	Y	44.7	Y
4	230.2	218.7	223.2	0.0138	Y	40.5	Y
5	228.7	216.9	222.2	0.0103	Y	44.7	Y
6	227.6	217.0	224.2	0.0115	Y	46.7	Y
7	229.7	221.9	226.4	0.0092	Y	44.6	Y
8	230.3	222.2	226.8	0.0089	Y	43.5	Y
9	233.2	218.4	225.6	0.0136	Y	45.5	Y
10	232.2	219.7	228.4	0.0126	Y	44.7	Y
11	226.9	219.2	224.1	0.0088	Y	52.4	Y
12	232.2	222.1	226.9	0.0107	Y	48.5	Y
13	234.7	221.2	226.1	0.0109	Y	48.5	Y
14	231.9	223.4	228.7	0.0103	Y	45.6	Y
15	236.8	224.1	231.4	0.0131	Y	52.2	Y
16	232.5	221.3	229.0	0.0137	Y	47.8	Y
Average			226.1			45.7	
Max						52.2	

4.3 Head

The head level in the Isolator Row PLUS was recorded to the nearest 1/8 inch every five minutes, through visual observation of a yard stick mounted through the observation port of the first chamber. With each run, after the first several measurements, the head during the run remained the same or increased slightly over that of the previous run. The maximum head reached during all 16 runs was 18.75 inches. Maximum head for each run is summarized in **Table 4**.

Table 4 Maximum Head (inches) for All Runs

Run	Maximum Head (inches)	Run	Maximum Head (inches)
1	9.00	9	17.50
2	12.00	10	18.00
3	14.00	11	17.25
4	15.25	12	18.00
5	15.75	13	18.25
6	16.25	14	18.50
7	17.50	15	18.75
8	17.25	16	18.75

4.4 Sediment Concentration and Removal Efficiency

Background TSS

Municipal tap water was used as the water source during testing. The background TSS concentration for all runs was well below the 20 mg/L NJDEP Protocol limit. Background TSS concentrations for each run are provided in **Table 5**. The average background TSS concentration for each run was subtracted from the effluent and drawdown concentrations to provide adjusted figures, per the protocol.

Sediment Dosing Rate and Influent TSS

Influent TSS concentration was calculated by dividing the total mass of sediment added during a given run by the total volume of water flowing through the MTD during the addition of test sediment during that run. The volume of water flowing through the device during the run was calculated by multiplying the average measured flow by the time of sediment addition only. The average influent TSS was 204.2 mg/L, with individual run averages ranging from 195.9 to 216.7 mg/L. All values are within the target range of 200 ± 20 mg/L. **Tables 6 and 7** provide the measured sediment rates for each run, and the resulting calculated influent TSS concentration. In these tables, NJDEP Protocol compliance is defined as a TSS concentration in the range 180 – 220 mg/L and sediment feed rate COV ≤ 0.1.

Table 5 Background TSS Concentrations

Run	BG TSS 9 min (mg/L)	BG TSS 20 min (mg/L)	BG TSS 31 min (mg/L)	Average (mg/L)	MDL (mg/L)
1	0.5	4	2	2.2	1.0
2	1	1	0.5	0.8	1.0
3	1	0.5	0.5	0.7	1.0
4	0.5	0.5	0.5	0.5	1.0
5	0.5	0.5	0.5	0.5	1.0
6	0.5	0.5	0.5	0.5	1.0
7	0.5	0.5	0.5	0.5	1.0
8	0.5	0.5	0.5	0.5	1.0
9	0.5	0.5	0.5	0.5	1.0
10	0.5	0.5	0.5	0.5	1.0
11	0.5	0.5	0.5	0.5	1.0
12	0.5	0.5	0.5	0.5	1.0
13	0.5	0.5	0.5	0.5	1.0
14	0.5	0.5	0.5	0.5	1.0
15	0.5	0.5	0.5	0.5	1.0
16	0.5	0.5	0.5	0.5	1.0

Note: In cases where the measured background TSS concentration was below the Minimum Detection Level (MDL) of 1.0 mg/L, half the MDL was reported for the background concentration.

Table 6 Sediment Rate Measurements for Runs 1-10

Run	Run Time (min)	Sediment Weight (g)	Duration (s)	Sediment Feed Rate (g/min)	Influent Water Flow Rate (gpm)	Influent TSS Conc. (mg/L)	NJDEP Compliance
1	0	117.767	39.78	177.6	226.3	202.9	Y
	11	110.674	40.16	165.4			
	22	118.819	40.00	178.2			
	COV			0.0418			
2	0	114.921	39.91	172.8	220.8	198.5	Y
	11	106.158	39.96	159.4			
	22	110.429	40.10	165.2			
	COV			0.0404			
3	0	117.364	39.85	176.7	227.2	206.8	Y
	11	116.700	39.90	175.5			
	22	120.156	39.72	181.5			
	COV			0.0179			
4	0	121.043	39.79	182.5	223.2	216.7	Y
	11	125.058	39.88	188.2			
	22	118.657	39.85	178.7			
	COV			0.0261			
5	0	111.624	40.03	167.3	222.2	215.0	Y
	11	117.883	40.00	176.8			
	22	132.393	39.88	199.2			
	COV			0.0904			
6	0	114.723	39.94	172.3	224.2	206.6	Y
	11	119.043	40.03	178.4			
	22	117.644	40.28	175.2			
	COV			0.0174			
7	0	115.351	40.00	173.0	226.4	198.1	Y
	11	110.196	40.25	164.3			
	22	114.603	40.00	171.9			
	COV			0.0281			
8	0	115.664	39.72	174.7	226.8	201.5	Y
	11	117.915	39.93	177.2			
	22	110.840	39.82	167.0			
	COV			0.0307			
9	0	116.845	39.87	175.8	225.6	205.2	Y
	11	114.135	39.81	172.0			
	22	117.894	39.75	178.0			
	COV			0.0172			
10	0	111.306	39.57	168.8	228.4	203.0	Y
	11	119.680	39.81	180.4			
	22	118.275	39.90	177.9			
	COV			0.0347			

Table 7 Sediment Rate Measurements for Runs 11-16

Run #	Run Time (min)	Sediment Weight (g)	Duration (s)	Sediment Feed Rate (g/min)	Influent Water Flow Rate (gpm)	Influent TSS Conc. (mg/L)	NJDEP Compliance
11	0	114.505	39.90	172.2	224.1	207.8	Y
	11	119.160	39.94	179.0			
	22	118.629	40.03	177.8			
	COV			0.0207			
12	0	115.516	39.78	174.2	226.9	208.8	Y
	11	118.805	39.87	178.8			
	22	124.236	40.22	185.3			
	COV			0.0311			
13	0	114.776	39.78	173.1	226.1	198.0	Y
	11	106.924	39.85	161.0			
	22	115.083	39.69	174.0			
	COV			0.0429			
14	0	112.871	39.72	170.5	228.7	199.9	Y
	11	116.869	39.84	176.0			
	22	114.529	39.81	172.6			
	COV			0.0161			
15	0	112.091	39.72	169.3	231.4	195.9	Y
	11	112.200	39.81	169.1			
	22	117.588	39.94	176.6			
	COV			0.0250			
16	0	118.503	39.59	179.6	229.0	202.3	Y
	11	116.834	39.78	176.2			
	22	112.971	39.84	170.1			
	COV			0.0273			

Effluent TSS

During each run, grab samples were taken of the effluent according to the schedule in **Table 1**, and all TSS analyses were conducted by Fredericktowne Labs. For each run, the average effluent concentration was adjusted by subtracting the average background TSS concentration. The average adjusted effluent TSS concentration during testing was 39 mg/L, with individual run averages ranging from 32.0 to 45.5 mg/L. Effluent and adjusted effluent TSS concentrations for each run are given in **Table 8**.

Table 8 Effluent Sample TSS Concentrations

Run	EFF TSS 9 min	EFF TSS 10 min	EFF TSS 20 min	EFF TSS 21 min	EFF TSS 31 min	EFF TSS 32 min	Mean	MDL	Adjusted Effluent TSS
	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)
1	48	48	47	47	48	48	47.7	1.0	45.5
2	32	32	33	32	35	33	32.8	1.0	32.0
3	33	37	37	40	38	38	37.2	1.0	36.5
4	28	31	34	38	32	38	33.5	1.0	33.0
5	40	41	39	33	42	42	39.5	1.0	39.0
6	38	41	39	37	41	44	40.0	1.0	39.5
7	37	40	37	36	37	38	37.5	1.0	37.0
8	38	41	38	40	32	38	37.8	1.0	37.3
9	35	41	36	36	42	41	38.5	1.0	38.0
10	39	44	34	38	37	41	38.8	1.0	38.3
11	35	41	38	38	38	43	38.8	1.0	38.3
12	36	43	36	41	46	47	41.5	1.0	41.0
13	41	46	37	37	42	45	41.3	1.0	40.8
14	44	49	39	42	42	45	43.5	1.0	43.0
15	40	43	41	39	40	45	41.3	1.0	40.8
16	43	45	41	44	45	46	44.0	1.0	43.5

Note: Adjusted effluent TSS concentration is the average effluent TSS concentration minus the average background TSS concentration (Table 5).

Drawdown TSS

According to the NJDEP Filter Protocol, the amount of sediment that leaves the filter during the drawdown period must be accounted for and documented. During each run, two evenly volume-spaced grab samples were taken of the drawdown, and all TSS analyses were conducted by Fredericktowne Labs. For each run, the average drawdown concentration was adjusted by subtracting the average background TSS concentration (**Table 9)**.

Table 9 Drawdown Sample TSS Concentrations

Run	DDA	DDB	Average	MDL	Adjusted Drawdown TSS
	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)
1	62	11	36.5	1.0	34.3
2	39	16	27.5	1.0	26.7
3	42	14	28.0	1.0	27.3
4	41	18	29.5	1.0	29.0
5	42	16	29.0	1.0	28.5
6	45	17	31.0	1.0	30.5
7	44	16	30.0	1.0	29.5
8	48	17	32.5	1.0	32.0
9	42	18	30.0	1.0	29.5
10	45	17	31.0	1.0	30.5
11	43	17	30.0	1.0	29.5
12	44	16	30.0	1.0	29.5
13	46	18	32.0	1.0	31.5
14	50	18	34.0	1.0	33.5
15	47	17	32.0	1.0	31.5
16	48	15	31.5	1.0	31.0

Note: Adjusted drawdown TSS concentration is the average drawdown TSS concentration minus the average background TSS concentration (Table 5).

In order to estimate the volume of water during drawdown, under observation by BEC, the unit was filled prior to all testing with clean water and the drawdown volume as a function of time was calculated from the height of the flow stream in the effluent pipe as a function of time. Total drawdown volume was estimated at 268.6 gal at an operating head of 2.5 inches. This volume was used to determine the volume of the void space of the gravel bed, which was then used, along with the dimensions of the Isolator Row PLUS chambers, to calculate the drawdown volume for incremental head levels above 2.5 inches. Adjusted average drawdown TSS concentrations and drawdown losses are given in **Table 10**.

Table 10 Drawdown Losses

Run	Head Level at End of Run (in)	Drawdown Volume (gal)	Average Adjusted Drawdown TSS Conc. (mg/L)	Total Sediment Lost During Drawdown (g)
1	9.00	285.2	34.3	37.1
2	12.00	354.2	26.7	35.7
3	14.00	403.3	27.3	41.7
4	15.25	432.8	29.0	47.5
5	15.75	443.9	28.5	47.9
6	16.25	454.2	30.5	52.4
7	17.50	476.0	29.5	53.2
8	17.00	468.2	32.0	56.7
9	17.25	472.3	29.5	52.7
10	17.75	476.0	30.5	55.0
11	17.25	472.3	29.5	52.7
12	17.5	476.0	29.5	53.2
13	18.00	482.4	31.5	57.5
14	18.25	484.9	33.5	61.5
15	18.50	486.8	31.5	58.1
16	18.25	484.9	31.0	56.9

Removal Efficiency Calculation

Removal efficiency was calculated using the following equation from the NJDEP Filter Protocol:

$$\text{Removal Efficiency (\%)} = \frac{\left(\begin{array}{c}\text{Average Influent}\\ \text{TSS Concentration x}\\ \text{Total Volume}\\ \text{of Test Water}\end{array}\right) - \left(\begin{array}{c}\text{Adjusted Effluent}\\ \text{TSS Concentration x}\\ \text{Total Volume}\\ \text{of Effluent Water}\end{array}\right) - \left(\begin{array}{c}\text{Average}\\ \text{Drawdown Flow}\\ \text{TSS Concentration x}\\ \text{Total Volume}\\ \text{of Drawdown Water}\end{array}\right)}{\text{Average Influent TSS Concentration x Total Volume of Test Water}} \text{ x } 100$$

For each run, sediment concentrations of background, influent, effluent, and drawdown, as well as the calculated removal efficiency, are summarized in **Table 11**. As shown in this summary table, the Isolator Row PLUS demonstrated a cumulative sediment removal efficiency of 81.2% over the course of 16 test runs.

Table 11 Removal Efficiency Results

Run	Average Influent TSS (mg/L)	Influent Water Volume (gal)	Adjusted Average Effluent TSS (mg/L)	Effluent Water Volume (gal)	Adjusted Average Drain Down TSS (mg/L)	Drain Down Water Volume (gal)	Single Run Removal Efficiency (%)	Mass of Captured Sediment (g)	Cumulative Removal Efficiency (%)
1	203	7166	46	6881	34	285	77.8	4282	77.8
2	199	6993	32	6639	27	354	84.0	4415	80.8
3	207	7197	37	6793	27	403	82.6	4654	81.4
4	217	7068	33	6635	29	433	84.9	4923	82.3
5	215	7037	39	6593	29	444	82.2	4705	82.3
6	207	7097	40	6643	31	454	81.2	4504	82.1
7	198	7169	37	6693	30	476	81.6	4386	82.0
8	201	7184	37	6716	32	468	81.6	4473	82.0
9	205	7147	38	6675	30	472	81.8	4539	82.0
10	203	7235	38	6759	31	476	81.4	4523	81.9
11	208	7096	38	6624	30	472	81.8	4567	81.9
12	209	7185	41	6709	30	476	80.7	4584	81.8
13	198	7162	41	6680	32	482	79.7	4277	81.6
14	200	7242	43	6757	34	485	78.8	4318	81.4
15	196	7329	41	6842	32	487	79.5	4320	81.3
16	202	7254	44	6769	31	485	78.9	4384	81.2
Ave.	204.2	7160	39	6713	31	447	81.2	4491	N/A
Cumulative Mass Removed (g)							71854		
Cumulative Mass Removed (lb)							158.4		
Total Mass Loaded (lb)							195.2		
Cumulative Removal Efficiency (%)							81.2		

4.5 Sediment Mass Loading

Sediment mass loading for each run was approximately 12.2 lbs on average. These data are summarized in **Table 12**.

Sediment mass loading was calculated from the summation of the total sediment mass added during dosing in each run.

Table 12 Sediment Mass Loading Summary

Run	Sediment Loading (lbs)	Cumulative Sediment Loading (lbs)	Run	Sediment Loading (lbs)	Cumulative Sediment Loading (lbs)
1	12.1	12.1	9	12.2	110.0
2	11.6	23.7	10	12.3	122.2
3	12.4	36.1	11	12.3	134.5
4	12.8	48.9	12	12.5	147.0
5	12.6	61.5	13	11.8	158.9
6	12.2	73.8	14	12.1	170.9
7	11.9	85.6	15	12.0	182.9
8	12.1	97.7	16	12.2	195.2

Overall, a total of 195.2 lbs of sediment was loaded into the Isolator Row PLUS over the course of the 16 runs. Total captured mass over the 16 runs was 158.4 lbs (**Table 11**).

The relationship between removal efficiency and sediment mass loading is shown in **Figure 10**. The relationship between driving head and sediment mass loading is shown in **Figure 11**.

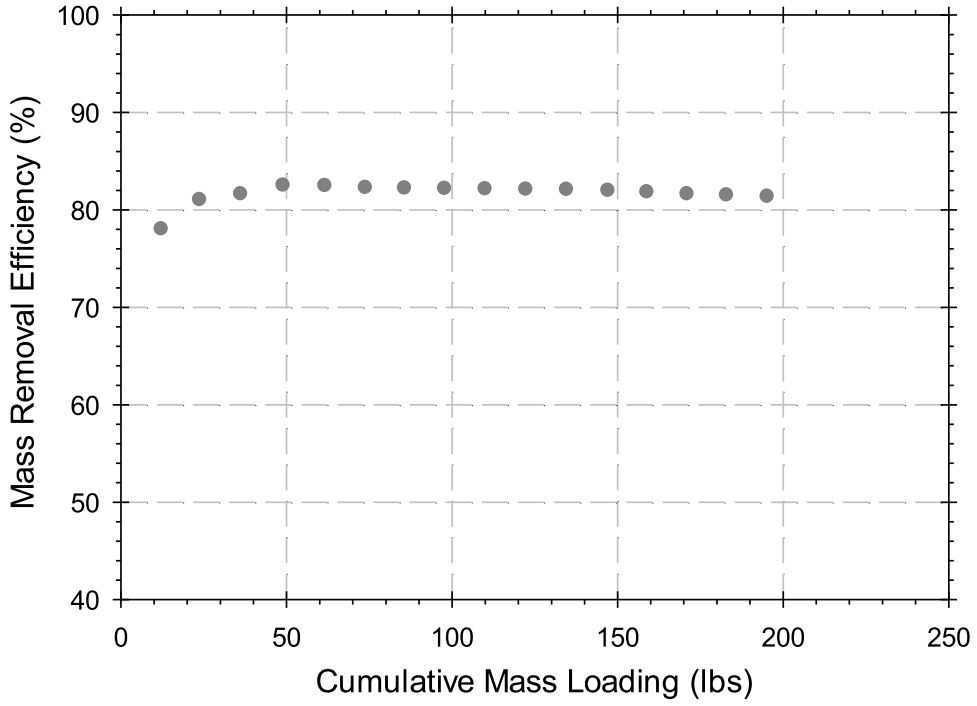

Figure 10 Removal Efficiency vs. Sediment Mass Loading

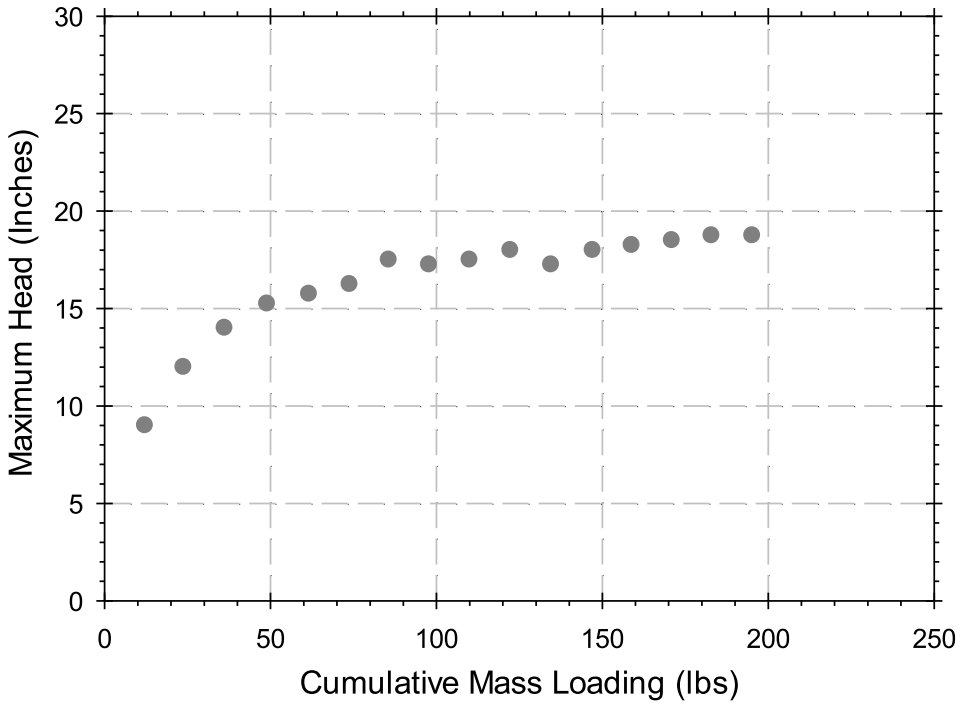

Figure 11 Driving Head vs. Sediment Mass Loading

5. Performance Verification

The Isolator Row PLUS used in this test, constructed from two (2) overlapping StormTech SC-740 chambers and one layer of ADS PLUS fabric, demonstrated a cumulative mass TSS removal efficiency of 81.2% and a sediment mass loading capacity of 3.58 lb./ft^2 (mass capture capacity of 2.91 lb./ft^2) of geotextile fabric filtration area when operated with a driving head < 20 inches at a hydraulic loading rate of 4.13 gpm/ft^2 of ADS PLUS fabric filtration area. The MTFR's and maximum allowable drainage area for other Isolator Row PLUS models are shown in **Table 13**.

Table 13 Isolator Row PLUS System Model Sizes and New Jersey Treatment Capacities

Model	Surface Loading Rate (gpm/ft^2) Single Chamber	Effective Filtration Treatment Area (ft^2) Single Chamber	MTFR (cfs)[1] Single Chamber	Mass Loading Capacity (lbs) Single Chamber	Mass Capture Capacity (lbs) Single Chamber	Drainage Area (acres) Single Chamber
StormTech SC-160	4.13	11.45	0.105	41.0	33.4	0.06
StormTech SC-310	4.13	17.7	0.163	63.4	51.6	0.09
StormTech SC-740	4.13	27.8	0.256	99.6	81.0	0.14
StormTech DC-780	4.13	27.8	0.256	99.6	81.0	0.14
StormTech SC-800	4.13	27.8	0.256	99.6	81.0	0.14
StormTech MC-3500	4.13	42.9	0.395	153.7	125.0	0.21
StormTech MC-4500	4.13	30.1	0.277	107.8	87.7	0.15
StormTech MC-7200	4.13	50.2	0.46	179.8	146.1	0.24

1. Based on 4.13 gpm/ft^2 of effective filtration treatment area.
2. Drainage Area is based on the equation in the NJDEP Filter Protocol wherein drainage area is calculated by dividing the pounds of mass captured by 600 lb/acre.

6. Design Limitations

Maximum Flow Rate

The Isolator Row PLUS unit has an MTFR of 0.501 cfs (225 gpm) and an effective filtration treatment area (EFTA) of 54.5 ft^2 (loading rate 4.13 gpm/ft^2).

Slope

The Isolator Row PLUS is recommended for installation with little to no slope to ensure proper, consistent operation. Steep slopes should be reviewed by ADS Engineering support.

Allowable Head Loss

There is an operational head loss associated with the Isolator Row PLUS. The head loss will increase over time due to the sediment loading to the system. Site-specific treatment flow rates,

peak flow rates, pipe diameter, and pipe slopes should be evaluated to ensure there is appropriate head for the system to function properly.

Sediment Load Capacity

Based on laboratory testing results, the Isolator Row PLUS unit has a mass loading capacity of 195.2 lbs. while operating at a sediment removal efficiency of 81.2%; the total sediment load captured by the tested Isolator Row PLUS is 158.4 lbs.

Pre-treatment Requirements

The Isolator Row PLUS does not require additional pre-treatment.

Configurations

The Isolator Row PLUS is available in multiple configurations. The length and size can be adjusted to meet project specific design volumes or flow rates.

Structure Load Limitations

The Isolator Row PLUS, as part of the overall chamber system, is designed to meet the full scope of design requirements of the American Society of Testing Materials (ASTM) International specification F2787 "Standard Practice for Structural Design of Thermoplastic Corrugated Wall Stormwater Collection Chambers" and produced to the requirements of the ASTM F2418 "Standard Specification for Polypropylene (PP) Corrugated Stormwater Collection Chambers". The StormTech chambers provide the full AASHTO safety factors for live loads and permanent earth loads. The ASTM F 2787 standard provides specific guidance on how to design thermoplastic chambers in accordance with AASHTO Section 12.12. of the AASHTO LRFD Bridge Design Specifications. ASTM F 2787 requires that the safety factors included in the AASHTO guidance are achieved as a prerequisite to meeting ASTM F 2418. The three standards provide both the assurance of product quality and safe structural design.

7. Maintenance Plan

The frequency of Inspection and Maintenance varies by location. A routine inspection schedule needs to be established for each individual location, based upon site-specific variables. The type of land use (i.e. industrial, commercial, public, residential), anticipated pollutant load, percent imperviousness, climate, rainfall data, etc., all play a critical role in determining the actual frequency of inspection and maintenance practices.

The Isolator Row PLUS may also be part of a treatment train. By treating stormwater prior to entry into the chamber system, the service life can be extended and pollutants such as hydrocarbons can be captured.

At a minimum, ADS recommends annual inspections. Initially, the Isolator Row PLUS chamber should be inspected every 6 months for the first year of operation. For subsequent years, the inspection schedule should be adjusted based upon previous observation of sediment deposition.

The Isolator Row PLUS incorporates a combination of standard manhole(s) and strategically located inspection ports (as needed). The inspection ports allow for easy access to the Isolator Row PLUS from the surface, eliminating the need to perform a confined space entry for inspection purposes.

If, upon visual inspection, it is found that sediment has accumulated, a stadia rod should be inserted to determine the depth of sediment. When the average depth of sediment exceeds 3 inches throughout the length of the Isolator Row PLUS, clean-out should be performed.

The Isolator Row PLUS was designed to reduce the cost of periodic maintenance. By "isolating" sediment to just one row of the StormTech system, costs are dramatically reduced by eliminating the need to clean out each row of the entire storage bed. If inspection indicates the potential need for maintenance, access is provided via a manhole(s) located on the end(s) of the row for cleanout.

Maintenance is accomplished with the JetVac process. The JetVac process utilizes a high-pressure water nozzle to propel itself down the Isolator Row PLUS while scouring and suspending sediment. As the nozzle is retrieved, the captured pollutants are flushed back into the manhole for vacuuming. Most sewer and pipe maintenance companies have vacuum/JetVac combination vehicles. Selection of an appropriate JetVac nozzle will improve maintenance efficiency.

Fixed nozzles designed for culverts or large diameter pipe cleaning are preferable. Rear-facing jets with an effective spread of at least 45" are best. Most JetVac reels have 400 feet of hose, allowing maintenance of an Isolator Row PLUS up to 50 chambers long. The JetVac process should only be performed on Isolator Rows PLUS that have AASHTO class 1 woven geotextile (as specified by ADS) over their angular base stone.

Complete details of the design, operation, and maintenance of the Isolator Row PLUS can be found in the Isolator Row PLUS O&M Manual, available online at: Isolator-Row-Plus-O-M-Manual.pdf

8. Statements

The attached pages include signed statements from the manufacturer (Advanced Drainage Systems, Inc.), the third-party environmental consulting firm (Boggs Environmental Consultants, Inc.), and NJCAT. These statements are included as a requirement for the verification process.

June 26th, 2020

Dr. Richard S. Magee, Sc.D., P.E., BCEE
NJCAT
Center for Environmental Systems
Steven Institute of Technology
Castle Point on Hudson
Hoboken, NJ 07030-0000

Dr. Magee,

Advanced Drainage Systems is pleased to provide this letter as our statement certifying that the protocol, "New Jersey Department of Environmental Protection Laboratory Protocol to Assess Total Suspended Solids Removal by a filtration Manufactured Treatment Device" (NJDEP Filter Protocol, January 25, 2013), was strictly followed while testing our StormTech Isolator® Row PLUS. The testing was performed at BaySaver Laboratories, located in Mount Airy, MD. All data pertaining to the StormTech Isolator Row PLUS NJDEP Protocol test is included in the Verification Report.

Respectfully,

Greg Spires, PE
General Manager - StormTech
Advanced Drainage Systems
614.325.0032
greg.spires@ads-pipe.com

BOGGS
ENVIRONMENTAL CONSULTANTS

Middletown, MD & Morgantown, WV
Administrative Office:
200 W Main Street Office (301) 694-5687
Middletown, Maryland 21769 Fax (301) 694-9799

June 25, 2020

StormTech
Advanced Drainage Systems, Inc.
520 Cromwell Avenue
Rocky Hill, CT 06067
gregory.spires@ads-pipe.com

ATTENTION Greg Spires, PE
General Manager, StormTech
Advanced Drainage Systems, Inc.

REFERENCE: Third Party Review of Testing Procedures of the Isolator® Row PLUS at the BaySaver Laboratory
1207 Park Ridge Drive
Mount Airy, MD 21771

BOGGS ENVIRONMENTAL CONSULTANTS, INC. (BEC) provided Third Party Review services for the testing of the Isolator® Row PLUS to evaluate if the required testing meets certification standards established by the New Jersey Department of Environmental Protection (NJDEP).

LABORATORY TESTING PROCEDURES & METHODOLOGIES

The following two procedures and testing requirements were followed during the testing process of the Isolator® Row PLUS:

- *New Jersey Department of Environmental Protection, Laboratory Protocol to Assess Total Suspended Solids Removal by a Filtration Manufactured Treatment Device, dated January 25, 2013.*
- *QAPP for Isolator® Row PLUS, New Jersey Department of Environmental Protection Testing,* prepared by StormTech (a subsidiary of Advanced Drainage Systems, Inc.), Revision dated January 9, 2020.

ONSITE THIRD-PARTY OBSERVATION OF TESTING PROCEDURES

BEC was present at the BaySaver Laboratory, at 1207 Park Ridge Drive, in Mount Airy, MD 21771, to observe the following testing of the Isolator® Row PLUS:

- The mixing and establishment of a sediment blend that included manufactured sands that when delivered to the feed water would result in influent Total Suspended Solids (TSS) concentrations within the established range of approximately 200 mg/L and a particle size distribution specified and approved by NJDEP;
- BEC assisted in the establishment of a Procedure Checklist to be used on each run to verify and document the following: Verify that pumps and measurement devices are turned on and functioning; Verification that the correct measurements of dry sediments are added to the doser and feed stream; Document that, background effluent, and duplicate samples are collected at established intervals during the run; and, Recording of periodic flow rates and head measurements during each run;
- Observation of Runs 1 through 16 from January 14, 2020 to February 12, 2020 and verified that that sediment, background, effluent samples were collected during each 33-minute run, and that drawdown samples were collected after the end of each run.
- After sampling was completed for each run, BEC was present for the downloading of flow data as well as sediment feed rates to verify that calculated sediment feed rates met NJDEP protocols for testing. BEC also verified that that sample containers were properly labeled and chain of custodies were filled and were boxed and sealed for delivery to Fredericktowne Labs for analysis of Total Suspended Solids (TSS).

THIRD-PARTY VERIFICATION & OPINIONS

Based on observations during the runs and the reported TSS analytical results, BEC verified the following:

- That the testing of the Isolator® Row PLUS at the BaySaver Laboratory was conducted in accordance with the *New Jersey Department of Environmental Protection, Laboratory Protocol to Assess Total Suspended Solids Removal by a Filtration Manufactured Treatment Device, dated January 25, 2013* and procedures established in Advanced Drainage Systems, Inc.'s *QAPP for Isolator® Row PLUS, New Jersey Department of Environmental Protection Testing,* prepared by StormTech (a subsidiary of Advanced Drainage Systems), Revision dated January 9, 2020.
- The report titled *NJCAT Technology Verification, of Isolator® Row PLUS,* prepared by StormTech, dated June 2020, used applicable NJCAT protocol and accurately reflects the testing observed by BEC.

BEC has no financial conflict of interest, as defined in the *Procedure for Obtaining Verification of a Stormwater Manufactured Treatment Device from New Jersey Corporation of Advanced Technology* (NJEP 2013).

Should you have any questions, contact our office at your earliest convenience.

Sincerely,
BOGGS ENVIRONMENTAL CONSULTANTS, INC.

William R. Warfel
Principal Environmental Scientist

Center for Environmental Systems
Stevens Institute of Technology
One Castle Point
Hoboken, NJ 07030-0000

May 1, 2020

George F. Ives III, P.E.
StormTech, LLC
520 Cromwell Ave
Rocky Hill, CT 06067

Dear Mr. Ives,

Based on my review, evaluation and assessment of the testing conducted on the Isolator Row PLUS at the BaySaver Laboratory (Storm Tech, LLC and BaySaver Technologies, LLC are subsidiaries of Advanced Drainage Systems, Inc.), under the independent third-party oversight of Boggs Environmental Consultants (BEC), Inc., the test protocol requirements contained in the "New Jersey Department of Environmental Protection Laboratory Protocol to Assess Total Suspended Solids Removal by a Filtration Manufactured Treatment Device" (NJDEP Filter Protocol, January 2013) were met or exceeded. Specifically:

Test Sediment Feed

The test blend was custom-blended using various commercially available silica sands under the oversight of BEC. The particle size distribution was independently analyzed by Environmental Consulting Services (ECS), using the methodology of ASTM method D422-63. The blended silica met the specification within tolerance as described in Section 5B of the NJDEP filter protocol and was acceptable for use.

Removal Efficiency Testing

Sixteen (16) removal efficiency testing runs were completed in accordance with the NJDEP filter protocol. The target flow rate was 225 gpm, and the influent sediment concentration was 200 mg/L. The average flow rate for all 16 runs was 226.1, with a coefficient of variation (COV) below the flow compliance (COV) < 0.1 for all the runs. Likewise, for all runs the sediment feed rate COV was below the < 0.03 protocol limit. The Isolator Row PLUS demonstrated a cumulative sediment removal efficiency of 81.2% over the course of the 16 test runs.

Sediment Mass Loading Capacity

Mass loading capacity testing was conducted concurrently with removal efficiency testing. The Isolator Row PLUS has a mass loading capture capacity of 158.4 lbs (2.91 lbs/ft^2 of filtration area).

No maintenance was performed on the test system during the entire testing program.

Scour Testing

No scour testing was performed. Hence the Isolator Row PLUS is verified for off-line installation only.

Sincerely,

Richard S. Magee, Sc.D., P.E., BCEE

Specifications

Introduction

- Manufacturer – Advanced Drainage Systems, 4640 Trueman Boulevard, Hilliard, OH 43026
- Website: https://adspipe.com. Phone: 1-800-821-6710
- Website: https://cultec.com. Phone:1-800.4.CULTEC
- MTD –Isolator Row PLUS verified models are shown in **Table 13** and Addendum **Table 13a**
- TSS Removal Rate – 81.2%
- Off-line installation

Detailed Specification

• NJDEP sizing tables and physical dimensions of Isolator Row verified models are shown in **Table 13** and **Table 13a**. These sizing tables are valid for NJ following NJDEP Water Quality Design Storm Event of 1.25" in 2 hours (NJAC 7:8-5.5(a)).

• Maximum inflow drainage area

  ◦ The maximum inflow drainage area is governed by the maximum treatment flow rate of each model.

• Driving head will vary for a given Isolator Row PLUS model based on the site-specific configuration. The maximum head without bypass is 36”, but the minimum head varies depending on the flow rate through the unit. Design support is given by ADS for each project, and site-specific drawings (cut sheets) will be provided that show pipe inverts, finish surface elevation, and peak treatment and maximum flow rates through the unit.

• The drawdown flow exits via the underdrain. A clean filter draws down in approximately 20 minutes.

Addendum

Similar to StormTech LLC, Advanced Drainage Systems (ADS) acquired Cultec in 2022. The Cultec brand is now under ADS oversight and umbrella and Cultec operates as an ADS product brand. Cultec utilizes the ADS PLUS fabric along with the Cultec chambers in all its Isolator Row PLUS system models.

Table 13a Isolator Row PLUS System Cultec Model Sizes and New Jersey Treatment Capacities

Model	Surface Loading Rate (gpm/ft^2) Single Chamber	Effective Filtration Treatment Area (ft^2) Single Chamber	MTFR (cfs)[1] Single Chamber	Mass Loading Capacity (lbs) Single Chamber	Mass Capture Capacity (lbs) Single Chamber	Drainage Area (acres) Single Chamber
Cultec 100HD	**4.13**	**20.9**	**0.192**	**74.9**	**60.9**	**0.10**
Cultec 150XLHD	**4.13**	**26.2**	**0.241**	**93.8**	**76.3**	**0.13**
Cultec 180HD	**4.13**	**16.1**	**0.148**	**57.7**	**46.9**	**0.08**
Cultec 280HD	**4.13**	**24.2**	**0.223**	**86.7**	**70.5**	**0.12**
Cultec 330XL	**4.13**	**27.6**	**0.253**	**98.9**	**80.4**	**0.13**
Cultec 300HD	**4.13**	**27.8**	**0.256**	**99.6**	**81.0**	**0.14**
Cultec 360HD	**4.13**	**16.3**	**0.150**	**58.4**	**47.5**	**0.08**
Cultec 902HD	**4.13**	**21.7**	**0.199**	**77.7**	**63.2**	**0.11**

1. Based on 4.13 gpm/ft^2 of effective filtration treatment area.
2. Drainage Area is based on the equation in the NJDEP Filter Protocol wherein drainage area is calculated by dividing the pounds of mass captured by 600 lb/acre.

Operation & Maintenance Manual

A revised O&M Manual has been developed to reflect Cultec's new relationship with ADS and the use of the ADS PLUS fabric in all Cultec Isolator Row installations. This guide can be accessed at: https://cultec.com/Asset/CLT043-ads-isolator-row-plus-o-m.pdf