Stormwater Management Report

Proposed Industrial Building

Gales Ferry, Connecticut

April 25, 2024

Prepared for

Gales Ferry Intermodal, LLC

549 South Street

Quincy, MA 02169

Loureiro

Engineering • Construction • EH&S • Energy
Waste • Facility Services • Laboratory

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An Employee-Owned Company

Comm. No. 045JC2.06

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Table of Contents

1. INTRODUCTION

This stormwater management report has been prepared by Loureiro Engineering Associates, Inc. (Loureiro) on behalf of Gales Ferry Intermodal, LLC to provide a description and calculations for the stormwater management of a new 6,000 SF industrial building and laydown in the area of the approved 10,000 SF industrial building with a future 10,000 SF addition at 1761 Route 12 in Gales Ferry, Connecticut. The property is 165 acres with the proposed work encompassing approximately 3.68 acres of the property (hereinafter referred to as the "Site").

1.1 Physical Setting

The subject property is approximately 165 acres (ac) and is located in the Industrial zone (I). The property is the site of the former DOW Chemical manufacturing facility and been an industrial use for years. A portion of the property is currently used for the manufacturing of Styrofoam products by Americas Styrenics, a tenant of the property. The DOW Chemical facilities at the property terminated their manufacturing existence in 2011 and the former DOW Chemical manufacturing buildings have been removed from the property. The property has rail service with a rail siding and waterfront with an existing pier.

The property has inland wetlands as well as Allyn's Pond. There is no activity with the wetland or 100 foot inland wetland upland review area with the proposed work.

The eastern boundary is bordered by Route 12 as well as some smaller industrial lots and a church that is in the R-40 zone. The western boundary is the Thames River. The northern boundary are residential lots in the R-40 zone. The southern boundary is bordered by properties zoned Commercial Marine (CM) and R-20.

1.2 Flood Plain and Soil Conditions

Federal Emergency Management Agency's (FEMA) National Flood Insurance Program (NFIP) Flood Insurance Rate Map (FIRM) Number 09011C0354G, effective July 18, 2011, for Town of Ledyard identifies a portion of the property within the Zone AE (EL12) and Zone X. The Site is located outside of any FEMA flood zones. Appendix B includes the FEMA FIRM map for the Site.

The National Resource Conservation Service (NRCS) Soil Survey for the State of Connecticut identified soils within the Site area as Agawam (29B) and as Urban Land (307). Agawam fine sandy loam corresponds with the Hydrologic Soil Group (HSG) rating B. Other soils just offsite

correspond with the HSG rating B as well. Urban Land corresponds with the Hydrologic Soil Group (HSG) rating D. HSG D soils generally have slow or unpredictable infiltration rates correlating to high runoff potential. Appendix C includes the NRCS soil map for the site and surrounding area.

Permeability tests were run by Loureiro on representative samples taken from the Site on June 13, 2023. Permeability results were 0.314 in/min, or 37.68 ft/day. Applying a factor of safety of 50% in accordance with the Connecticut Stormwater Quality Manual, a permeability of 18.84 ft/day was used in drainage calculations.

2. EVALUATION OF EXISTING CONDITIONS

2.1 Overview

The property currently has an existing manufacturing area, concrete pads left and paved areas from the removal of the DOW Chemical buildings, and woods. The area of the Site is currently wooded or densely brushed, with less than 2 percent (%) impervious coverage.

2.2 Existing Stormwater Management

The wooded area of the Site currently has no existing drainage or stormwater management features. Stormwater is conveyed 100 percent (%) through surface runoff. The wooded area of the Site currently is a plateaued mound that flows east and south then west toward the railroad tracks, which then flows downslope towards the Thames River. The section along the northern property line flows north offsite. The paved entrance and parking area flow to an existing catch basin that discharges to a depressed area in the northeastern portion of the Site.

Through available survey information, the existing catch basin network and drainage system on the developed western portion of the Site flows south before discharging into Allyn's Pond. Allyn's Pond then flows west into the Thames River.

2.3 Existing Subcatchment Areas

The total analyzed drainage area for the property is approximately 892,258 sf or 20.48 ac. The Site is divided into six (6) subcatchment areas. Subcatchment area 1 is comprised of the existing building foundations and paved area, with runoff being captured by the existing drainage system and discharging into Allyn's Pond, or running off through surface flow into Allyn's Pond. Subcatchment area 2 flows south through surface flow into Allyn's Brook, a tributary of Allyn's Pond, or is captured by the existing drainage system. Subcatchment area 3 includes areas east of

the property and flows through surface flow to a large depressed area of the Site. This depressed area captures and infiltrates all runoff from this subcatchment. Subcatchment area 4 flows north off-Site. Subcatchment area 5 flows west through surface flow west Off-Site towards the Thames River. Subcatchment area 6 is part of the existing parking area that flows to an existing catch basin that discharges to the depressed area to the north. Drawing 1, Existing Drainage Areas, depicts the existing drainage areas on the property. The three points of compliance (Allyn's Pond, North Off-Site, and West Off-Site) are utilized in HydroCAD to evaluate peak-flow leaving the property.

3. PROPOSED DEVELOPMENT

3.1 Overview

The proposed work includes a new 6,000 SF office and workshop. The previously approved new 10,000 SF industrial building with a future 10,000 SF addition is included in land and drainage calculations. These buildings will be utilized by the Applicant for the storage and repair of marine equipment and appurtenances in conjunction with marine contracting and dredging operations. The Site will include a new parking layout, paved entrance, curbing, lighting, landscaped areas, and utilities.

3.2 Proposed Subcatchment Areas

The redeveloped Site and overall property is divided into eight (8) subcatchment areas. Subcatchment areas 1, 2, and 3 will largely be unchanged under proposed conditions. Subcatchment area 4 is a large portion of the previously approved paved area and 10,000 SF building. Subcatchment area 5 is the southern portion of the previously approved paved area. While the 10,000 SF building addition is currently not planned to be constructed, it was modeled as a roof surface in hydrological analysis in anticipation of the future addition. Subcatchment area 6 is similar to subcatchment area 5 under existing conditions and will be relatively unchanged and flow west. Subcatchment area 7 will flow north off-site, similar to subcatchment area 4 under existing conditions. Subcatchment 8 consists of the new 6,000 SF building and parking area that will flow through a drainage network into the proposed drainage system, similar to subcatchment area 6 under existing conditions. The Site work will result in an increase in impervious area for the property, from 31% to 34%. Drawing 2, Proposed Drainage Areas, depicts the new drainage areas on the property.

3.3 Design Criteria & Proposed Stormwater Management Systems

The post-development stormwater runoff analysis was based on the 2-, 10-, 25-, 50-, and 100-year 24-hour storm events. The increase in impervious area requires on-site attenuation to meet the existing runoff rates as closely as possible.

The drainage improvements for the site will include a manhole, catch basin, and swale network to collect most of the paved area, landscaped area, and the entirety of the building roof. To attenuate and reduce peak flows, the existing depressed area will be converted into an infiltration pond. The system is designed to fully retain and infiltrate captured runoff up to the 100-year storm event. Any runoff that outlets from the system will flow into the existing drainage system south of the Site.

To improve stormwater quality discharging from the Site, the infiltration system has been sized to hold the full water quality volume (WQV). WQV calculations are provided in Appendix E.

4. STORMWATER MANAGEMENT EVALUATION

4.1 Stormwater Runoff Calculations

The following evaluation was prepared to identify the qualitative and quantitative stormwater runoff characteristics for the existing and proposed conditions at the site. The stormwater management system was designed for the 2-year, 10-year, 25-year, 50-year, and 100-year design storms.

4.1.1 Design Methodology

Site specific point precipitation frequency estimates used to generate peak stormwater flow were obtained from the National Oceanic and Atmospheric Administration (NOAA) Atlas 14, Volume 10 Version 3: Precipitation-Frequency Atlas of the United States, Northeastern States (rev. 2015). Precipitation-frequency estimates are based upon frequency analysis of partial duration series with a 90% confidence interval of data largely from the National Centers for Environmental Information (NCEI).

The methods described in Urban Hydrology for Small Watersheds, 2nd Edition, (Technical Release Number 55 [TR-55]) from the Natural Resources Conservation Service formerly the Soil Conservation Service – [SCS], 1986) were used to calculate stormwater peak-flow generated from pre- and post-redevelopment conditions. These methods, which are incorporated into the HydroCAD computer software program, use well documented procedures to calculate stormwater runoff volume, peak-flow rate of discharge, hydrographs and storage volumes required for floodwater reservoirs in small watersheds. The method uses the SCS Runoff Curve Number method to estimate runoff volume, calculates times of concentration, produces tabular hydrographs and estimates basin storage capacity.

4.1.2 Curve Numbers

The curve numbers (CN) values utilized for the analysis of the existing and proposed conditions included:

Existing lawn/grassed area, CN = 84 (fair grass cover, HSG D)
New grassed area, CN = 61 (Good grass cover, HSG B)
New grassed area, CN = 80 (Good grass cover, HSG D)
Brush, CN = 35 (fair condition, HSG A)

Brush, CN = 56 (fair condition, HSG B)
Brush, CN = 77 (fair condition, HSG D)
Gravel, CN = 85 (HSG B)
Gravel, CN = 91 (HSG D)
Woods, CN = 30 (Good condition, HSG A)
Woods, CN = 55 (Good condition, HSG B)
Woods, CN = 77 (Good condition, HSG D)
½ acre lots, CN = 70 (HSG B)
Impervious areas (pavement, roofs, etc), CN = 98

The weighted CN of the existing property is 73. The weighted CN of the property with the new development is 74. This is due to the increase in impervious areas.

4.2 Existing and Proposed Peak-Flow Comparison

With the use of infiltration, total peak flows are reduced during all analyzed storm events.

Table 1 – Peak-Flow Comparison, Cubic Feet per Second

	2-Year Event		10-Year Event		25-Year Event		50-year Event		100-year Event	
	Existing	Proposed	Existing	Proposed	Existing	Proposed	Existing	Proposed	Existing	Proposed
Allyn's Pond	15.8	14.66	26.77	25.41	35.2	33.72	41.8	40.21	48.96	47.28
North Off-Site	0.03	0.01	0.18	0.13	0.32	0.26	0.44	0.36	0.57	0.48
West Off-Site	6.96	4.65	12.65	8.22	16.27	10.47	18.99	12.15	21.88	13.95
Existing Depression	0	0	0	0	0	0	0	0	0	0
Total West Off-Site	6.96	4.65	12.65	8.22	16.27	10.47	18.99	12.15	21.88	13.95
Total	22.79	19.32	39.6	33.76	51.79	44.45	61.23	52.72	71.41	61.71

The table shows decreasing total peak flow runoff during all analyzed storm events, ranging from 15.7 percent (%) to 17.9 percent (%). This is due to the robust existing improved infiltration basin capturing and fully infiltrating the Site's runoff. Off-site areas like Subcatchment 3 & 8 were graded or routed to the infiltration basin to influence total peak flows and volumes as much as possible, since the Site is only a small portion of the property relative to the total property. Overall, new drainage conditions should function similarly to those of existing conditions. Appendix D includes the HydroCAD report for the existing and new Site analysis.

4.3 Runoff Volume

Total runoff from the property was also analyzed volumetrically to ensure similar or lower runoff volumes under new conditions as volumes under existing conditions. The results for the 2-year and 100-year storm events for the total Site and for Allyn's Pond are below:

Table 2 – Total Runoff Volume Comparison, Cubic Feet

	Existing (cf)	New (cf)	Volume Infiltrated (cf)	Surface Runoff Volume (cf)
2-Year	145,406	151,217	46,211	105,006
100-year	519,067	525,009	208,413	316,596

Table 3 – Allyn's Pond Runoff Volume Comparison, Cubic Feet

	Existing (cf)	New (cf)	Volume Infiltrated (cf)	Surface Runoff Volume (cf)
2-Year	94,162	133,556	46,211	87,345
100-year	276,019	469,851	208,413	261,438

The tables show that the new infiltration pond reduces total proposed runoff volume below that of existing conditions. Therefore, receiving waters will not receive increased runoff volumes and should not be negatively impacted. Appendix D includes the HydroCAD reports showing runoff volume calculations.

4.4 Water Quality

The methods described in the Connecticut Stormwater Quality Manual were utilized to calculate the WQV of the redevelopment. The WQV for the site is equivalent to the runoff generated with the first one-inch of rainfall. The developed Site is approximately 2.35 ac and 80% impervious, resulting in a WQV of 7,910 cf. The infiltration pond provides a storage volume of approximately 72,000 cf at full capacity. The infiltration system provides adequate amount of storage to store the WQV. Using permeability test results, the WQV is modelled to drain within 72 hours, meeting State and Town requirements. The drainage system also leads to hydrodynamic separators for treatment before discharging. These separators are designed to capture oil, trash, and floatables while removing total suspended solids and other pollutants. The proposed hydrodynamic separators are also designed to treat the Water Quality Flows (WQF) of their respective subcatchments. Appendix F includes the calculations used for selecting hydrodynamic separators.

4.5 Stormwater System Maintenance Program

To help facilitate the function and longevity of the stormwater management system, a maintenance program and inspection checklist has been developed for the components and surrounding areas. The maintenance includes periodic inspections, scheduled cleanings and details on identifying

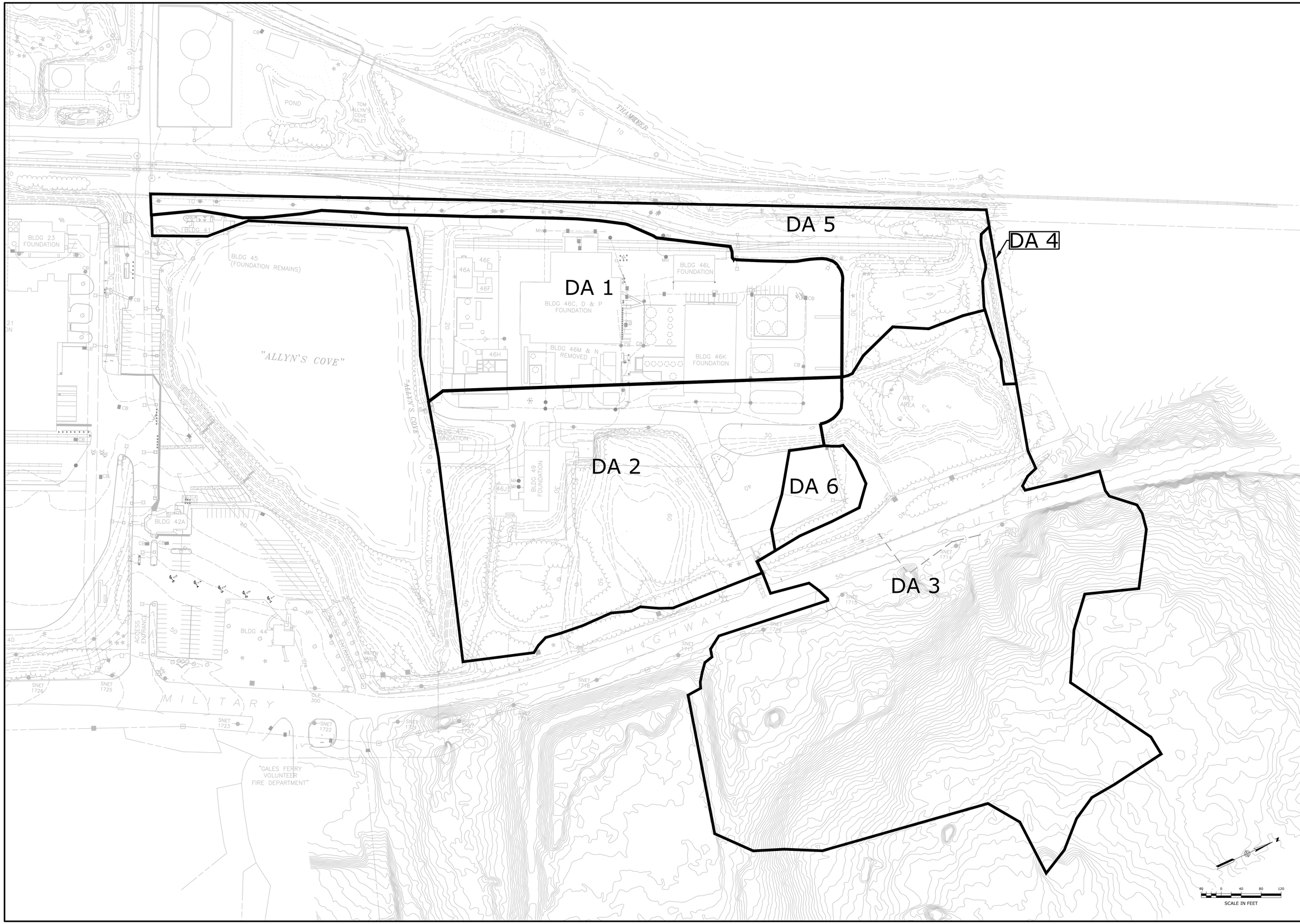
signs of failures in the system. A full checklist of system features shall be completed to provide a log of inspections, cleanings, repairs, and any important information regarding the system. The program will be implemented after installation with more frequent inspections early and fewer inspections after a year or when the system function becomes more predictable. The program, checklist, and past inspection/maintenance logs will be provided to the current or future owners and necessary facility personnel. The maintenance program and checklist is included as Appendix G.

5. CONCLUSION

The new Site work includes a new stormwater management system for the primary conveyance of the stormwater discharging from the Site. The proposed system provides attenuation and treatment of all stormwater events leaving the Site, managing post-development runoff rates and allowing for potential groundwater recharge. The existing improved infiltration basin includes sufficient storage capacity for the WQV to offer treatment of Site stormwater, along with treatment of WQF provided by hydrodynamic separators. Overall, the new drainage system will improve water quality discharging from the property while providing lower flow rates and volume to receiving waters.

DRAWINGS

Drawing 1 –Existing Drainage Areas



STAMP

REV.	DESCRIPTION OF REVISION	DATE	APPR.
1	ADDITIONAL BUILDING REVISIONS	6/22/2023	SRM

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Waste • Facility Services • Laboratory
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SCALE: 1"=80'
COMM. NO.: 0451C2.06
DRAWN BY: ESF — DATE: 06/22/2023
APPROVED BY: SRM — DATE: 06/22/2023

EXISTING DRAINAGE AREAS

GALES FERRY INTERMODAL
1761 ROUTE 12, GALES FERRY, CONNECTICUT 06335
PREPARED FOR

GALES FERRY INTERMODAL LLC
449 SOUTH STREET, GROTON, CT 06340

DRAWING: DA-1
SHEET NO.: 1 — NO. OF SHEETS: 2

K:\CT\GALES FERRY\ROUTE 12 (761)\DA\SUBDIVISION LOCAL PERMIT FOR STEARNS BUILDING\DRAWINGS\DA-1 EXISTING.dwg, 6/22/2023 3:53 PM Printed: 6/22/2023 3:53 PM

Drawing 2 – Proposed Drainage Areas

DA 1

DA 2

DA 3

DA 4

DA 5

DA 6

DA 7

DA 8

"ALLYN'S COVE"

"GALES FERRY VOLUNTEER FIRE DEPARTMENT"

SCALE IN FEET

NO.	DESCRIPTION OF REVISION	DATE	APPR.

STAMP

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SCALE: 1" = 80'

CORR. NO.: 0451C2.06

DRAWN BY: ESF

DATE: 4/25/2024

APPROVED BY: SRM

DATE: 4/25/2024

PROPOSED DRAINAGE AREAS

GALES FERRY INTERMODAL
1761 ROUTE 12, GALES FERRY, CONNECTICUT 06335
PREPARED FOR

GALES FERRY INTERMODAL LLC
549 SOUTH BATTLE STREET, STERLING, CT 06377

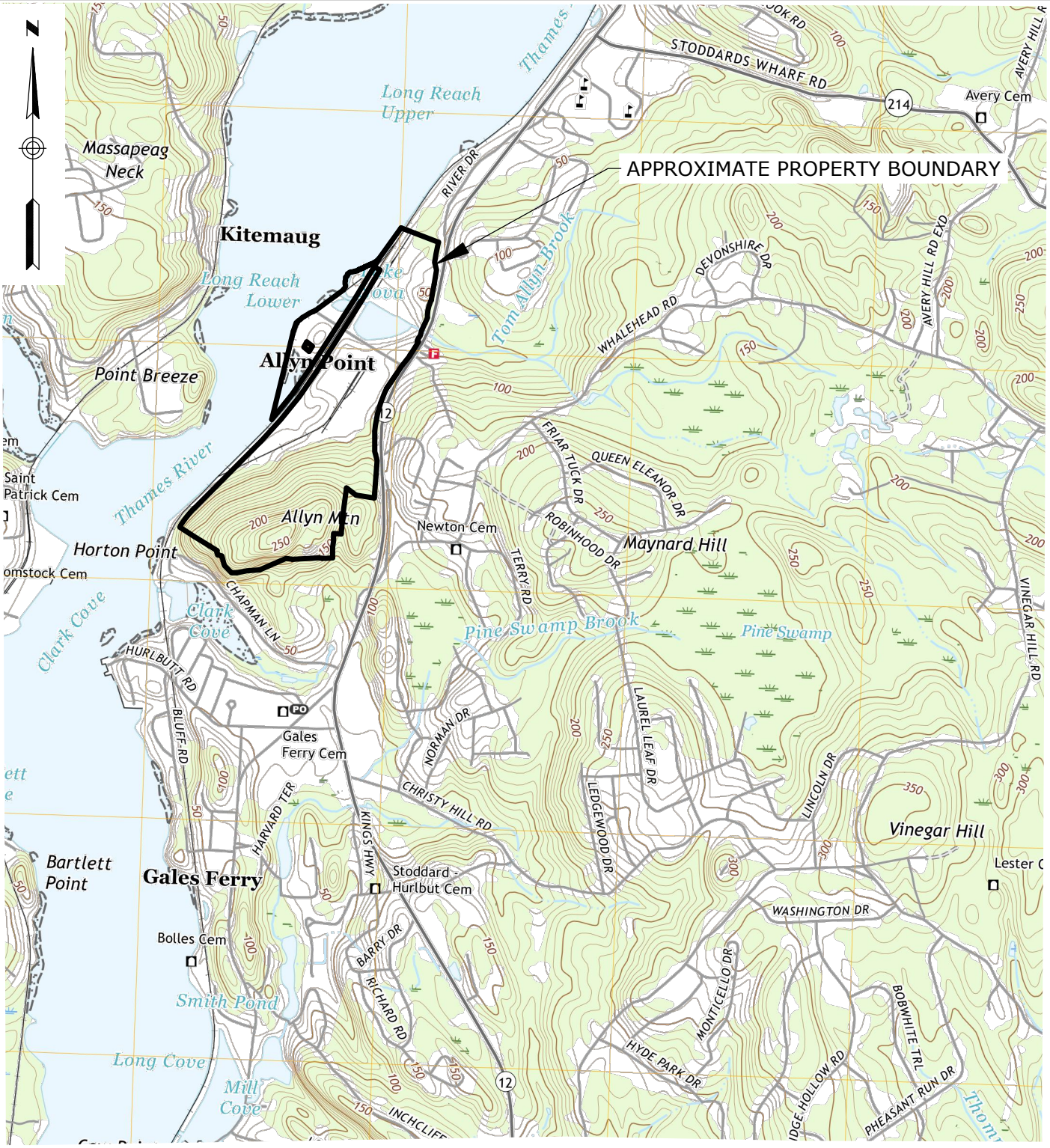
DRAWING: DA-2

SHEET NO.: 2 NO. OF SHEETS: 2

V:\LEI PROJECTS\CT\GALES FERRY\ROUTE 12 1761\DASSC\2A LOCAL PERMIT FOR STERLING\DRAWINGS\DA-2 DRAINAGE AREAS.DWG Dim: PROPOSED Saved: 4/24/2024 5:32 PM Printed: 4/24/2024 5:45 PM

APPENDIX A

USGS Site Location Map



MAP REFERENCE:

SECTION OF THE USGS 7.5 MINUTE SERIES TOPOGRAPHIC MAP FOR UNCASVILLE, CT; MAP VERSION DATE 2021.

0 2000

APPROXIMATE SCALE IN FEET

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DRAINAGE REPORT
ATTACHMENT A
SITE LOCATION MAP

NEW 20,000 SF INDUSTRIAL BUILDING
1761 ROUTE 12, GALES FERRY, CT

PREPARED FOR:

GALES FERRY INTERMODAL LLC
549 SOUTH STREET, QUINCY, MA

SCALE
1" = 2,000'±

COMM. NO.
045JC2.06

DATE
03-07-2023

1

APPENDIX B

FEMA FIREMETTE Map

National Flood Hazard Layer FIRMette

FEMA

72°4'58"W 41°27'2"N

72°4'21"W 41°26'35"N

Feet 1:6,000

0 250 500 1,000 1,500 2,000

Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020

Legend

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

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

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

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

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

OTHER FEATURES
- 20.2 / 17.5 Cross Sections with 1% Annual Chance / Water Surface Elevation
- Coastal Transect
- Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

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

N

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

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

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 3/8/2023 at 8:47 AM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

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

APPENDIX C

Natural Resources Conservation Service – Web Soil Survey

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 State of Connecticut

June 14, 2023

Preface

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

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

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

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

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

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

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Contents

How Soil Surveys Are Made

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

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

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

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

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

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

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

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

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

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

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

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

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

Soil Map

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

Custom Soil Resource Report
Soil Map

Map Scale: 1:5,130 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 50 100 200 300

Feet
0 200 400 800 1200

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N 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 1:12,000.

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: State of Connecticut
Survey Area Data: Version 22, Sep 12, 2022

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

Date(s) aerial images were photographed: Jun 14, 2022—Oct 6, 2022

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
3	Ridgebury, Leicester, and Whitman soils, 0 to 8 percent slopes, extremely stony	8.1	8.3%
29B	Agawam fine sandy loam, 3 to 8 percent slopes	11.2	11.5%
34B	Merrimac fine sandy loam, 3 to 8 percent slopes	0.2	0.3%
51B	Sutton fine sandy loam, 0 to 8 percent slopes, very stony	4.9	5.0%
60C	Canton and Charlton fine sandy loams, 8 to 15 percent slopes	4.9	5.0%
61B	Canton and Charlton fine sandy loams, 0 to 8 percent slopes, very stony	19.2	19.7%
62C	Canton and Charlton fine sandy loams, 3 to 15 percent slopes, extremely stony	5.5	5.6%
73C	Charlton-Chatfield complex, 0 to 15 percent slopes, very rocky	18.3	18.8%
73E	Charlton-Chatfield complex, 15 to 45 percent slopes, very rocky	7.8	8.0%
86D	Paxton and Montauk fine sandy loams, 15 to 35 percent slopes, extremely stony	0.2	0.2%
306	Udorthents-Urban land complex	0.1	0.1%
307	Urban land	12.5	12.8%
W	Water	4.6	4.7%
Totals for Area of Interest		**97.6**	**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.

State of Connecticut

3—Ridgebury, Leicester, and Whitman soils, 0 to 8 percent slopes, extremely stony

Map Unit Setting

National map unit symbol: 2t2qt
Elevation: 0 to 1,480 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Ridgebury, extremely stony, and similar soils: 40 percent
Leicester, extremely stony, and similar soils: 35 percent
Whitman, extremely stony, and similar soils: 17 percent
Minor components: 8 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Ridgebury, Extremely Stony

Setting

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

Typical profile

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

Properties and qualities

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

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s

Hydrologic Soil Group: D
Ecological site: F144AY009CT - Wet Till Depressions
Hydric soil rating: Yes

Description of Leicester, Extremely Stony

Setting

Landform: Ground moraines, hills, drainageways, depressions
Landform position (two-dimensional): Footslope, toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave, linear
Across-slope shape: Concave
Parent material: Coarse-loamy melt-out till derived from gneiss, granite, and/or schist

Typical profile

Oe - 0 to 1 inches: moderately decomposed plant material
A - 1 to 7 inches: fine sandy loam
Bg - 7 to 18 inches: fine sandy loam
BC - 18 to 24 inches: fine sandy loam
C1 - 24 to 39 inches: gravelly fine sandy loam
C2 - 39 to 65 inches: gravelly fine sandy loam

Properties and qualities

Slope: 0 to 8 percent
Surface area covered with cobbles, stones or boulders: 9.0 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 in/hr)
Depth to water table: About 0 to 6 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: High (about 9.0 inches)

Interpretive groups

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

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: F144AY009CT - Wet Till Depressions
Hydric soil rating: Yes

Minor Components

Woodbridge, extremely stony

Percent of map unit: 6 percent
Landform: Hills, drumlins, ground moraines
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

Swansea

Percent of map unit: 2 percent
Landform: Bogs, swamps
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

29B—Agawam fine sandy loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2tyqx
Elevation: 0 to 820 feet

Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 250 days
Farmland classification: All areas are prime farmland

Map Unit Composition

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

Description of Agawam

Setting

Landform: Outwash plains, kames, kame terraces, outwash terraces, moraines
Landform position (two-dimensional): Summit, shoulder, backslope, footslope
Landform position (three-dimensional): Crest, side slope, riser, tread, rise, dip
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Coarse-loamy eolian deposits over sandy and gravelly glaciofluvial deposits derived from gneiss, granite, schist, and/or phyllite

Typical profile

Ap - 0 to 11 inches: fine sandy loam
Bw1 - 11 to 16 inches: fine sandy loam
Bw2 - 16 to 26 inches: fine sandy loam
2C1 - 26 to 45 inches: loamy fine sand
2C2 - 45 to 55 inches: loamy fine sand
2C3 - 55 to 65 inches: loamy sand

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: 15 to 35 inches to strongly contrasting textural stratification
Drainage class: Well drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 3.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2s
Hydrologic Soil Group: B
Ecological site: F145XY008MA - Dry Outwash
Hydric soil rating: No

Minor Components

Sudbury

Percent of map unit: 5 percent
Landform: Deltas, terraces, outwash plains
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread, dip

Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

Hinckley

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

Merrimac

Percent of map unit: 3 percent
Landform: Outwash plains, outwash terraces, moraines, eskers, kames
Landform position (two-dimensional): Summit, shoulder, backslope, footslope
Landform position (three-dimensional): Crest, side slope, riser, tread
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Windsor

Percent of map unit: 2 percent
Landform: Dunes, outwash plains, deltas, outwash terraces
Landform position (three-dimensional): Tread, riser
Down-slope shape: Convex, linear
Across-slope shape: Convex, linear
Hydric soil rating: No

34B—Merrimac fine sandy loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2tyqs
Elevation: 0 to 1,290 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: All areas are prime farmland

Map Unit Composition

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

Description of Merrimac

Setting

Landform: Outwash plains, outwash terraces, moraines, eskers, kames
Landform position (two-dimensional): Summit, shoulder, backslope, footslope

Landform position (three-dimensional): Crest, side slope, riser, tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loamy glaciofluvial deposits derived from granite, schist, and gneiss over sandy and gravelly glaciofluvial deposits derived from granite, schist, and gneiss

Typical profile

Ap - 0 to 10 inches: fine sandy loam
Bw1 - 10 to 22 inches: fine sandy loam
Bw2 - 22 to 26 inches: stratified gravel to gravelly loamy sand
2C - 26 to 65 inches: stratified gravel to very gravelly sand

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 99.90 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 2 percent
Maximum salinity: Nonsaline (0.0 to 1.4 mmhos/cm)
Sodium adsorption ratio, maximum: 1.0
Available water supply, 0 to 60 inches: Low (about 4.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2s
Hydrologic Soil Group: A
Ecological site: F145XY008MA - Dry Outwash
Hydric soil rating: No

Minor Components

Sudbury

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

Hinckley

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

Windsor

Percent of map unit: 3 percent
Landform: Outwash terraces, dunes, deltas, outwash plains
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Tread, riser
Down-slope shape: Linear, convex
Across-slope shape: Linear, convex
Hydric soil rating: No

Agawam

Percent of map unit: 2 percent
Landform: Outwash plains, outwash terraces, moraines, stream terraces, eskers, kames
Landform position (three-dimensional): Rise
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

51B—Sutton fine sandy loam, 0 to 8 percent slopes, very stony

Map Unit Setting

National map unit symbol: 2xfff
Elevation: 0 to 1,410 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

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

Description of Sutton, Very Stony

Setting

Landform: Ground moraines, hills
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Coarse-loamy melt-out till derived from gneiss, granite, and/or schist

Typical profile

Oi - 0 to 2 inches: slightly decomposed plant material
A - 2 to 7 inches: fine sandy loam
Bw1 - 7 to 19 inches: fine sandy loam
Bw2 - 19 to 27 inches: sandy loam
C1 - 27 to 41 inches: gravelly sandy loam

C2 - 41 to 62 inches: gravelly sandy loam

Properties and qualities

Slope: 0 to 8 percent
Surface area covered with cobbles, stones or boulders: 1.6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 in/hr)
Depth to water table: About 12 to 27 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 8.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: B/D
Ecological site: F144AY008CT - Moist Till Uplands
Hydric soil rating: No

Minor Components

Charlton, very stony

Percent of map unit: 7 percent
Landform: Ridges, ground moraines, hills
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Convex
Hydric soil rating: No

Canton, very stony

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

Leicester, very stony

Percent of map unit: 3 percent
Landform: Depressions, ground moraines, drainageways, hills
Landform position (two-dimensional): Footslope, toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear, concave
Across-slope shape: Concave
Hydric soil rating: Yes

Whitman, very stony

Percent of map unit: 1 percent
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
Hydric soil rating: Yes

60C—Canton and Charlton fine sandy loams, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: 2w81z
Elevation: 0 to 1,620 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Canton and similar soils: 50 percent
Charlton and similar soils: 35 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Canton

Setting

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

Typical profile

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

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: 19 to 39 inches to strongly contrasting textural stratification
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 2.7 inches)

Interpretive groups

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

Description of Charlton

Setting

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

Typical profile

Ap - 0 to 7 inches: fine sandy loam
Bw - 7 to 22 inches: gravelly fine sandy loam
C - 22 to 65 inches: gravelly fine sandy loam

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 6.9 inches)

Interpretive groups

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

Minor Components

Leicester

Percent of map unit: 5 percent
Landform: Ground moraines, drainageways, depressions, hills
Landform position (two-dimensional): Footslope, toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave, linear
Across-slope shape: Concave
Hydric soil rating: Yes

Chatfield

Percent of map unit: 5 percent
Landform: Ridges, hills

Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Nose slope, side slope, crest
Down-slope shape: Convex
Across-slope shape: Linear, convex
Hydric soil rating: No

Sutton

Percent of map unit: 5 percent
Landform: Ridges, hills, ground moraines
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

61B—Canton and Charlton fine sandy loams, 0 to 8 percent slopes, very stony

Map Unit Setting

National map unit symbol: 2w81v
Elevation: 0 to 1,480 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

Canton, very stony, and similar soils: 50 percent
Charlton, very stony, and similar soils: 35 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Canton, Very Stony

Setting

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

Typical profile

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

Properties and qualities

Slope: 0 to 8 percent
Surface area covered with cobbles, stones or boulders: 1.6 percent
Depth to restrictive feature: 19 to 39 inches to strongly contrasting textural stratification
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 3.4 inches)

Interpretive groups

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

Description of Charlton, Very Stony

Setting

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

Typical profile

Oe - 0 to 2 inches: moderately decomposed plant material
A - 2 to 4 inches: fine sandy loam
Bw - 4 to 27 inches: gravelly fine sandy loam
C - 27 to 65 inches: gravelly fine sandy loam

Properties and qualities

Slope: 0 to 8 percent
Surface area covered with cobbles, stones or boulders: 1.6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 8.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s

Hydrologic Soil Group: B
Ecological site: F144AY034CT - Well Drained Till Uplands
Hydric soil rating: No

Minor Components

Chatfield, very stony
Percent of map unit: 5 percent
Landform: Ridges, hills
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Nose slope, side slope, crest
Down-slope shape: Convex
Across-slope shape: Linear, convex
Hydric soil rating: No

Sutton, very stony
Percent of map unit: 5 percent
Landform: Ground moraines, hills
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

Leicester, very stony
Percent of map unit: 5 percent
Landform: Hills, drainageways, depressions, ground moraines
Landform position (two-dimensional): Footslope, toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave, linear
Across-slope shape: Concave
Hydric soil rating: Yes

62C—Canton and Charlton fine sandy loams, 3 to 15 percent slopes, extremely stony

Map Unit Setting
National map unit symbol: 2wks7
Elevation: 0 to 1,310 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
Canton, extremely stony, and similar soils: 50 percent
Charlton, extremely stony, and similar soils: 35 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Canton, Extremely Stony

Setting

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

Typical profile

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

Properties and qualities

Slope: 3 to 15 percent
Surface area covered with cobbles, stones or boulders: 9.0 percent
Depth to restrictive feature: 19 to 39 inches to strongly contrasting textural stratification
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 3.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: B
Ecological site: F144AY034CT - Well Drained Till Uplands
Hydric soil rating: No

Description of Charlton, Extremely Stony

Setting

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

Typical profile

Oe - 0 to 2 inches: moderately decomposed plant material
A - 2 to 4 inches: fine sandy loam
Bw - 4 to 27 inches: gravelly fine sandy loam
C - 27 to 65 inches: gravelly fine sandy loam

Properties and qualities

Slope: 3 to 15 percent
Surface area covered with cobbles, stones or boulders: 9.0 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 8.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: B
Ecological site: F144AY034CT - Well Drained Till Uplands
Hydric soil rating: No

Minor Components

Chatfield, extremely stony

Percent of map unit: 5 percent
Landform: Ridges, hills
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Nose slope, side slope, crest
Down-slope shape: Convex
Across-slope shape: Linear, convex
Hydric soil rating: No

Leicester, extremely stony

Percent of map unit: 5 percent
Landform: Hills, drainageways, depressions, ground moraines
Landform position (two-dimensional): Footslope, toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave, linear
Across-slope shape: Concave
Hydric soil rating: Yes

Sutton, extremely stony

Percent of map unit: 5 percent
Landform: Ground moraines, hills
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

73C—Charlton-Chatfield complex, 0 to 15 percent slopes, very rocky

Map Unit Setting

National map unit symbol: 2w698
Elevation: 0 to 1,550 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

Charlton, very stony, and similar soils: 50 percent
Chatfield, very stony, and similar soils: 30 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Charlton, Very Stony

Setting

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

Typical profile

Oe - 0 to 2 inches: moderately decomposed plant material
A - 2 to 4 inches: fine sandy loam
Bw - 4 to 27 inches: gravelly fine sandy loam
C - 27 to 65 inches: gravelly fine sandy loam

Properties and qualities

Slope: 3 to 15 percent
Surface area covered with cobbles, stones or boulders: 1.6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 8.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: B
Ecological site: F144AY034CT - Well Drained Till Uplands
Hydric soil rating: No

Description of Chatfield, Very Stony

Setting

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

Typical profile

Oi - 0 to 1 inches: slightly decomposed plant material
A - 1 to 2 inches: fine sandy loam
Bw - 2 to 30 inches: gravelly fine sandy loam
2R - 30 to 40 inches: bedrock

Properties and qualities

Slope: 3 to 15 percent
Surface area covered with cobbles, stones or boulders: 1.6 percent
Depth to restrictive feature: 20 to 41 inches to lithic bedrock
Drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 4.3 inches)

Interpretive groups

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

Minor Components

Rock outcrop

Percent of map unit: 5 percent
Hydric soil rating: No

Hollis, very stony

Percent of map unit: 5 percent
Landform: Hills, ridges
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Nose slope, side slope, crest
Down-slope shape: Convex
Across-slope shape: Linear, convex
Hydric soil rating: No

Leicester, very stony

Percent of map unit: 5 percent
Landform: Drainageways, depressions
Down-slope shape: Linear
Across-slope shape: Concave
Hydric soil rating: Yes

Sutton, very stony

Percent of map unit: 5 percent
Landform: Ground moraines, hills
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

73E—Charlton-Chatfield complex, 15 to 45 percent slopes, very rocky

Map Unit Setting

National map unit symbol: 9lql
Elevation: 0 to 1,200 feet
Mean annual precipitation: 43 to 56 inches
Mean annual air temperature: 45 to 55 degrees F
Frost-free period: 140 to 185 days
Farmland classification: Not prime farmland

Map Unit Composition

Charlton and similar soils: 45 percent
Chatfield and similar soils: 30 percent
Minor components: 25 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Charlton

Setting

Landform: Hills
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Coarse-loamy melt-out till derived from granite and/or schist and/or gneiss

Typical profile

Ap - 0 to 4 inches: fine sandy loam
Bw1 - 4 to 7 inches: fine sandy loam
Bw2 - 7 to 19 inches: fine sandy loam
Bw3 - 19 to 27 inches: gravelly fine sandy loam
C - 27 to 65 inches: gravelly fine sandy loam

Properties and qualities

Slope: 15 to 45 percent
Surface area covered with cobbles, stones or boulders: 1.6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 5.95 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: Low (about 5.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: B
Ecological site: F144AY034CT - Well Drained Till Uplands
Hydric soil rating: No

Description of Chatfield

Setting

Landform: Ridges, hills
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Coarse-loamy melt-out till derived from granite and/or schist and/or gneiss

Typical profile

Oa - 0 to 1 inches: highly decomposed plant material
A - 1 to 6 inches: gravelly fine sandy loam
Bw1 - 6 to 15 inches: gravelly fine sandy loam
Bw2 - 15 to 29 inches: gravelly fine sandy loam
2R - 29 to 80 inches: unweathered bedrock

Properties and qualities

Slope: 15 to 45 percent
Surface area covered with cobbles, stones or boulders: 1.6 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Low to high (0.01 to 5.95 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: Low (about 3.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: B
Ecological site: F144AY034CT - Well Drained Till Uplands
Hydric soil rating: No

Minor Components

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

Sutton
Percent of map unit: 5 percent
Landform: Drainageways, depressions
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

Leicester
Percent of map unit: 5 percent
Landform: Drainageways, depressions
Down-slope shape: Linear
Across-slope shape: Concave
Hydric soil rating: Yes

Hollis
Percent of map unit: 3 percent
Landform: Ridges, hills
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Unnamed, sandy subsoil
Percent of map unit: 1 percent
Hydric soil rating: No

Unnamed, red parent material
Percent of map unit: 1 percent
Hydric soil rating: No

86D—Paxton and Montauk fine sandy loams, 15 to 35 percent slopes, extremely stony

Map Unit Setting
National map unit symbol: 2w67c
Elevation: 0 to 1,400 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 145 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition
Paxton, extremely stony, and similar soils: 55 percent
Montauk, extremely stony, and similar soils: 30 percent

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

Description of Paxton, Extremely Stony

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

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

Properties and qualities

Slope: 15 to 35 percent
Surface area covered with cobbles, stones or boulders: 9.0 percent
Depth to restrictive feature: 20 to 43 inches to densic material
Drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)
Depth to water table: About 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 4.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: C
Ecological site: F144AY007CT - Well Drained Dense Till Uplands
Hydric soil rating: No

Description of Montauk, Extremely Stony

Setting

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

Typical profile

Oe - 0 to 2 inches: moderately decomposed plant material
A - 2 to 6 inches: fine sandy loam
Bw1 - 6 to 28 inches: fine sandy loam

Bw2 - 28 to 36 inches: sandy loam
2Cd - 36 to 74 inches: gravelly loamy sand

Properties and qualities

Slope: 15 to 35 percent
Surface area covered with cobbles, stones or boulders: 9.0 percent
Depth to restrictive feature: 20 to 43 inches to densic material
Drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 1.42 in/hr)
Depth to water table: About 18 to 37 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 5.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: C
Ecological site: F144AY007CT - Well Drained Dense Till Uplands
Hydric soil rating: No

Minor Components

Charlton, extremely stony

Percent of map unit: 6 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, extremely stony

Percent of map unit: 5 percent
Landform: Ground moraines, hills, drumlins
Landform position (two-dimensional): Summit, backslope, footslope
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

Ridgebury, extremely stony

Percent of map unit: 3 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

Stockbridge, extremely stony

Percent of map unit: 1 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

306—Udorthents-Urban land complex

Map Unit Setting

National map unit symbol: 9lmg
Elevation: 0 to 2,000 feet
Mean annual precipitation: 43 to 56 inches
Mean annual air temperature: 45 to 55 degrees F
Frost-free period: 120 to 185 days
Farmland classification: Not prime farmland

Map Unit Composition

Udorthents and similar soils: 50 percent
Urban land: 35 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Udorthents

Setting

Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Drift

Typical profile

A - 0 to 5 inches: loam
C1 - 5 to 21 inches: gravelly loam
C2 - 21 to 80 inches: very gravelly sandy loam

Properties and qualities

Slope: 0 to 25 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Very low to high (0.00 to 1.98 in/hr)
Depth to water table: About 54 to 72 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 6.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: B
Hydric soil rating: No

Description of Urban Land

Typical profile
H - 0 to 6 inches: material

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

Minor Components

Unnamed, undisturbed soils
Percent of map unit: 8 percent
Hydric soil rating: No

Udorthents, wet substratum
Percent of map unit: 5 percent
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: No

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

307—Urban land

Map Unit Setting
National map unit symbol: 9lmh
Elevation: 0 to 2,000 feet
Mean annual precipitation: 43 to 56 inches
Mean annual air temperature: 45 to 55 degrees F
Frost-free period: 120 to 185 days
Farmland classification: Not prime farmland

Map Unit Composition
Urban land: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Urban Land

Typical profile
H - 0 to 6 inches: material

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8

Hydrologic Soil Group: D
Hydric soil rating: Unranked

Minor Components

Udorthents, wet substratum
Percent of map unit: 10 percent
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: No

Unnamed, undisturbed soils
Percent of map unit: 10 percent
Hydric soil rating: No

W—Water

Map Unit Composition
Water: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

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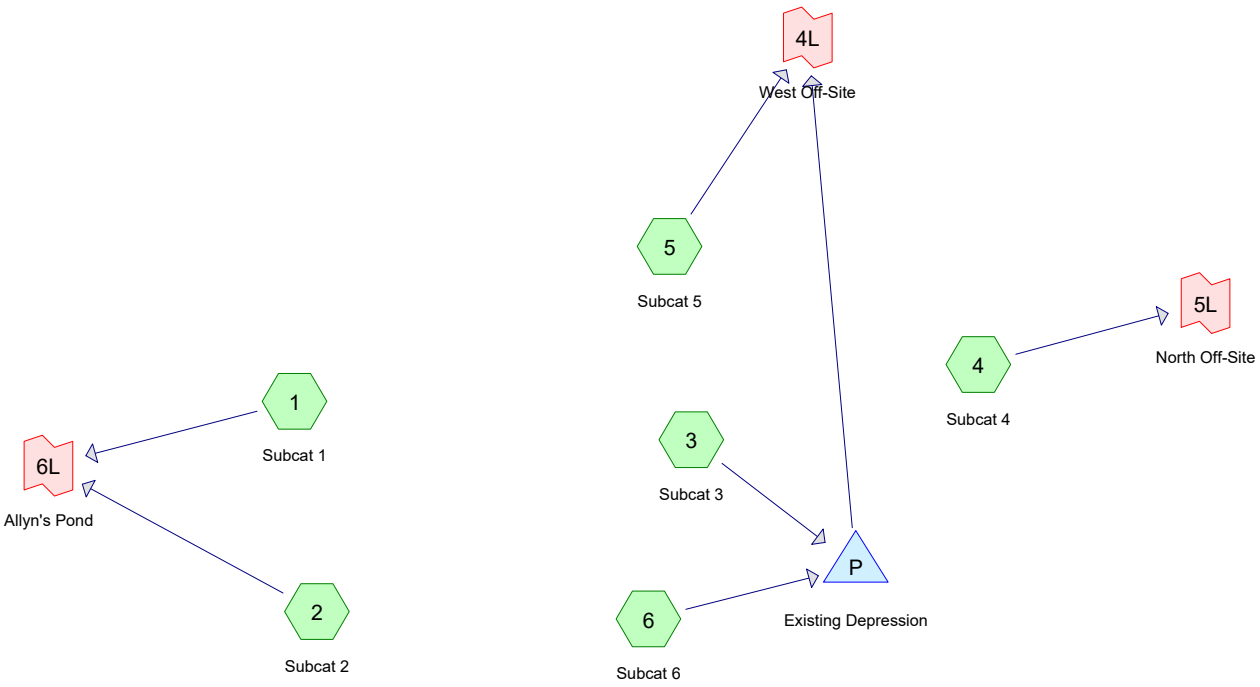
APPENDIX D

HydroCAD Reports



Subcat Reach Pond Link

Routing Diagram for Existing Conditions

Prepared by Loureiro Engineering Assoc, Inc, Printed 4/24/2024

Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-yr	Type III 24-hr		Default	24.00	1	3.46	2
2	10-yr	Type III 24-hr		Default	24.00	1	5.12	2
3	25-yr	Type III 24-hr		Default	24.00	1	6.15	2
4	50-yr	Type III 24-hr		Default	24.00	1	6.92	2
5	100-yr	Type III 24-hr		Default	24.00	1	7.74	2

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
105,404	70	1/2 acre lots, 25% imp, HSG B (3)
1,614	85	1/2 acre lots, 25% imp, HSG D (3)
5,428	84	50-75% Grass cover, Fair, HSG D (1, 2)
6,884	35	Brush, Fair, HSG A (3, 4)
117,547	56	Brush, Fair, HSG B (2, 3, 5, 6)
87,881	77	Brush, Fair, HSG D (1, 2, 3, 4, 5)
36,252	85	Gravel roads, HSG B (1, 2)
74,515	91	Gravel roads, HSG D (1, 2, 5)
110,834	98	Unconnected pavement, HSG B (1, 2, 3, 6)
295,870	98	Unconnected pavement, HSG D (1, 2, 3, 5)
456	30	Woods, Good, HSG A (3)
521,262	55	Woods, Good, HSG B (2, 3, 5, 6)
33,365	77	Woods, Good, HSG D (1, 2, 3, 5)
1,397,310	**73**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
7,340	HSG A	3, 4
891,298	HSG B	1, 2, 3, 5, 6
0	HSG C	
498,673	HSG D	1, 2, 3, 4, 5
0	Other	
1,397,310		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover	Su Nu
0	105,404	0	1,614	0	107,017	1/2 acre lots, 25% imp	
0	0	0	5,428	0	5,428	50-75% Grass cover, Fair	
6,884	117,547	0	87,881	0	212,311	Brush, Fair	
0	36,252	0	74,515	0	110,767	Gravel roads	
0	110,834	0	295,870	0	406,703	Unconnected pavement	
456	521,262	0	33,365	0	555,083	Woods, Good	
7,340	**891,298**	**0**	**498,673**	**0**	**1,397,310**	**TOTAL AREA**	

Time span=0.00-96.00 hrs, dt=0.01 hrs, 9601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1: Subcat 1 Runoff Area=270,407 sf 91.02% Impervious Runoff Depth=3.11"
Flow Length=254' Tc=28.5 min CN=97 Runoff=12.10 cfs 70,186 cf

Subcatchment 2: Subcat 2 Runoff Area=327,638 sf 29.04% Impervious Runoff Depth=0.88"
Flow Length=349' Tc=9.0 min UI Adjusted CN=68 Runoff=6.17 cfs 23,977 cf

Subcatchment 3: Subcat 3 Runoff Area=622,716 sf 11.51% Impervious Runoff Depth=0.51"
Tc=57.1 min UI Adjusted CN=60 Runoff=2.47 cfs 26,690 cf

Subcatchment 4: Subcat 4 Runoff Area=8,555 sf 0.00% Impervious Runoff Depth=0.30"
Tc=5.0 min CN=54 Runoff=0.03 cfs 214 cf

Subcatchment 5: Subcat 5 Runoff Area=142,734 sf 3.81% Impervious Runoff Depth=1.75"
Tc=5.0 min CN=82 Runoff=6.96 cfs 20,811 cf

Subcatchment 6: Subcat 6 Runoff Area=25,260 sf 59.71% Impervious Runoff Depth=1.68"
Tc=5.0 min CN=81 Runoff=1.18 cfs 3,528 cf

Pond P: Existing Depression Peak Elev=22.34' Storage=2,345 cf Inflow=2.60 cfs 30,219 cf
Discarded=1.85 cfs 30,219 cf Primary=0.00 cfs 0 cf Outflow=1.85 cfs 30,219 cf

Link 4L: West Off-Site Inflow=6.96 cfs 20,811 cf
Primary=6.96 cfs 20,811 cf

Link 5L: North Off-Site Inflow=0.03 cfs 214 cf
Primary=0.03 cfs 214 cf

Link 6L: Allyn's Pond Inflow=15.80 cfs 94,162 cf
Primary=15.80 cfs 94,162 cf

Total Runoff Area = 1,397,310 sf Runoff Volume = 145,406 cf Average Runoff Depth = 1.25"
68.98% Pervious = 963,852 sf 31.02% Impervious = 433,458 sf

Time span=0.00-96.00 hrs, dt=0.01 hrs, 9601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1: Subcat 1 Runoff Area=270,407 sf 91.02% Impervious Runoff Depth=4.77"
Flow Length=254' Tc=28.5 min CN=97 Runoff=18.16 cfs 107,412 cf

Subcatchment 2: Subcat 2 Runoff Area=327,638 sf 29.04% Impervious Runoff Depth=1.97"
Flow Length=349' Tc=9.0 min UI Adjusted CN=68 Runoff=15.21 cfs 53,663 cf

Subcatchment 3: Subcat 3 Runoff Area=622,716 sf 11.51% Impervious Runoff Depth=1.37"
Tc=57.1 min UI Adjusted CN=60 Runoff=8.36 cfs 71,182 cf

Subcatchment 4: Subcat 4 Runoff Area=8,555 sf 0.00% Impervious Runoff Depth=0.98"
Tc=5.0 min CN=54 Runoff=0.18 cfs 697 cf

Subcatchment 5: Subcat 5 Runoff Area=142,734 sf 3.81% Impervious Runoff Depth=3.19"
Tc=5.0 min CN=82 Runoff=12.65 cfs 37,903 cf

Subcatchment 6: Subcat 6 Runoff Area=25,260 sf 59.71% Impervious Runoff Depth=3.09"
Tc=5.0 min CN=81 Runoff=2.18 cfs 6,508 cf

Pond P: Existing Depression Peak Elev=23.46' Storage=16,778 cf Inflow=8.58 cfs 77,689 cf
Discarded=4.22 cfs 77,689 cf Primary=0.00 cfs 0 cf Outflow=4.22 cfs 77,689 cf

Link 4L: West Off-Site Inflow=12.65 cfs 37,903 cf
Primary=12.65 cfs 37,903 cf

Link 5L: North Off-Site Inflow=0.18 cfs 697 cf
Primary=0.18 cfs 697 cf

Link 6L: Allyn's Pond Inflow=26.77 cfs 161,076 cf
Primary=26.77 cfs 161,076 cf

Total Runoff Area = 1,397,310 sf Runoff Volume = 277,366 cf Average Runoff Depth = 2.38"
68.98% Pervious = 963,852 sf 31.02% Impervious = 433,458 sf

Time span=0.00-96.00 hrs, dt=0.01 hrs, 9601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1: Subcat 1 Runoff Area=270,407 sf 91.02% Impervious Runoff Depth=5.79"
Flow Length=254' Tc=28.5 min CN=97 Runoff=21.89 cfs 130,558 cf

Subcatchment 2: Subcat 2 Runoff Area=327,638 sf 29.04% Impervious Runoff Depth=2.74"
Flow Length=349' Tc=9.0 min UI Adjusted CN=68 Runoff=21.55 cfs 74,716 cf

Subcatchment 3: Subcat 3 Runoff Area=622,716 sf 11.51% Impervious Runoff Depth=2.02"
Tc=57.1 min UI Adjusted CN=60 Runoff=12.91 cfs 104,842 cf

Subcatchment 4: Subcat 4 Runoff Area=8,555 sf 0.00% Impervious Runoff Depth=1.52"
Tc=5.0 min CN=54 Runoff=0.32 cfs 1,087 cf

Subcatchment 5: Subcat 5 Runoff Area=142,734 sf 3.81% Impervious Runoff Depth=4.13"
Tc=5.0 min CN=82 Runoff=16.27 cfs 49,069 cf

Subcatchment 6: Subcat 6 Runoff Area=25,260 sf 59.71% Impervious Runoff Depth=4.02"
Tc=5.0 min CN=81 Runoff=2.81 cfs 8,463 cf

Pond P: Existing Depression Peak Elev=24.12' Storage=30,117 cf Inflow=13.21 cfs 113,305 cf
Discarded=5.57 cfs 113,305 cf Primary=0.00 cfs 0 cf Outflow=5.57 cfs 113,305 cf

Link 4L: West Off-Site Inflow=16.27 cfs 49,069 cf
Primary=16.27 cfs 49,069 cf

Link 5L: North Off-Site Inflow=0.32 cfs 1,087 cf
Primary=0.32 cfs 1,087 cf

Link 6L: Allyn's Pond Inflow=35.20 cfs 205,273 cf
Primary=35.20 cfs 205,273 cf

Total Runoff Area = 1,397,310 sf Runoff Volume = 368,734 cf Average Runoff Depth = 3.17"
68.98% Pervious = 963,852 sf 31.02% Impervious = 433,458 sf

Time span=0.00-96.00 hrs, dt=0.01 hrs, 9601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1: Subcat 1 Runoff Area=270,407 sf 91.02% Impervious Runoff Depth=6.56"
Flow Length=254' Tc=28.5 min CN=97 Runoff=24.68 cfs 147,873 cf

Subcatchment 2: Subcat 2 Runoff Area=327,638 sf 29.04% Impervious Runoff Depth=3.35"
Flow Length=349' Tc=9.0 min UI Adjusted CN=68 Runoff=26.52 cfs 91,344 cf

Subcatchment 3: Subcat 3 Runoff Area=622,716 sf 11.51% Impervious Runoff Depth=2.55"
Tc=57.1 min UI Adjusted CN=60 Runoff=16.62 cfs 132,178 cf

Subcatchment 4: Subcat 4 Runoff Area=8,555 sf 0.00% Impervious Runoff Depth=1.98"
Tc=5.0 min CN=54 Runoff=0.44 cfs 1,412 cf

Subcatchment 5: Subcat 5 Runoff Area=142,734 sf 3.81% Impervious Runoff Depth=4.84"
Tc=5.0 min CN=82 Runoff=18.99 cfs 57,584 cf

Subcatchment 6: Subcat 6 Runoff Area=25,260 sf 59.71% Impervious Runoff Depth=4.73"
Tc=5.0 min CN=81 Runoff=3.29 cfs 9,958 cf

Pond P: Existing Depression Peak Elev=24.68' Storage=42,850 cf Inflow=16.97 cfs 142,136 cf
Discarded=6.18 cfs 142,136 cf Primary=0.00 cfs 0 cf Outflow=6.18 cfs 142,136 cf

Link 4L: West Off-Site Inflow=18.99 cfs 57,584 cf
Primary=18.99 cfs 57,584 cf

Link 5L: North Off-Site Inflow=0.44 cfs 1,412 cf
Primary=0.44 cfs 1,412 cf

Link 6L: Allyn's Pond Inflow=41.80 cfs 239,217 cf
Primary=41.80 cfs 239,217 cf

Total Runoff Area = 1,397,310 sf Runoff Volume = 440,350 cf Average Runoff Depth = 3.78"
68.98% Pervious = 963,852 sf 31.02% Impervious = 433,458 sf

Time span=0.00-96.00 hrs, dt=0.01 hrs, 9601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1: Subcat 1 Runoff Area=270,407 sf 91.02% Impervious Runoff Depth=7.38"
Flow Length=254' Tc=28.5 min CN=97 Runoff=27.65 cfs 166,319 cf

Subcatchment 2: Subcat 2 Runoff Area=327,638 sf 29.04% Impervious Runoff Depth=4.02"
Flow Length=349' Tc=9.0 min UI Adjusted CN=68 Runoff=31.95 cfs 109,700 cf

Subcatchment 3: Subcat 3 Runoff Area=622,716 sf 11.51% Impervious Runoff Depth=3.14"
Tc=57.1 min UI Adjusted CN=60 Runoff=20.78 cfs 162,925 cf

Subcatchment 4: Subcat 4 Runoff Area=8,555 sf 0.00% Impervious Runoff Depth=2.50"
Tc=5.0 min CN=54 Runoff=0.57 cfs 1,785 cf

Subcatchment 5: Subcat 5 Runoff Area=142,734 sf 3.81% Impervious Runoff Depth=5.61"
Tc=5.0 min CN=82 Runoff=21.88 cfs 66,767 cf

Subcatchment 6: Subcat 6 Runoff Area=25,260 sf 59.71% Impervious Runoff Depth=5.50"
Tc=5.0 min CN=81 Runoff=3.81 cfs 11,572 cf

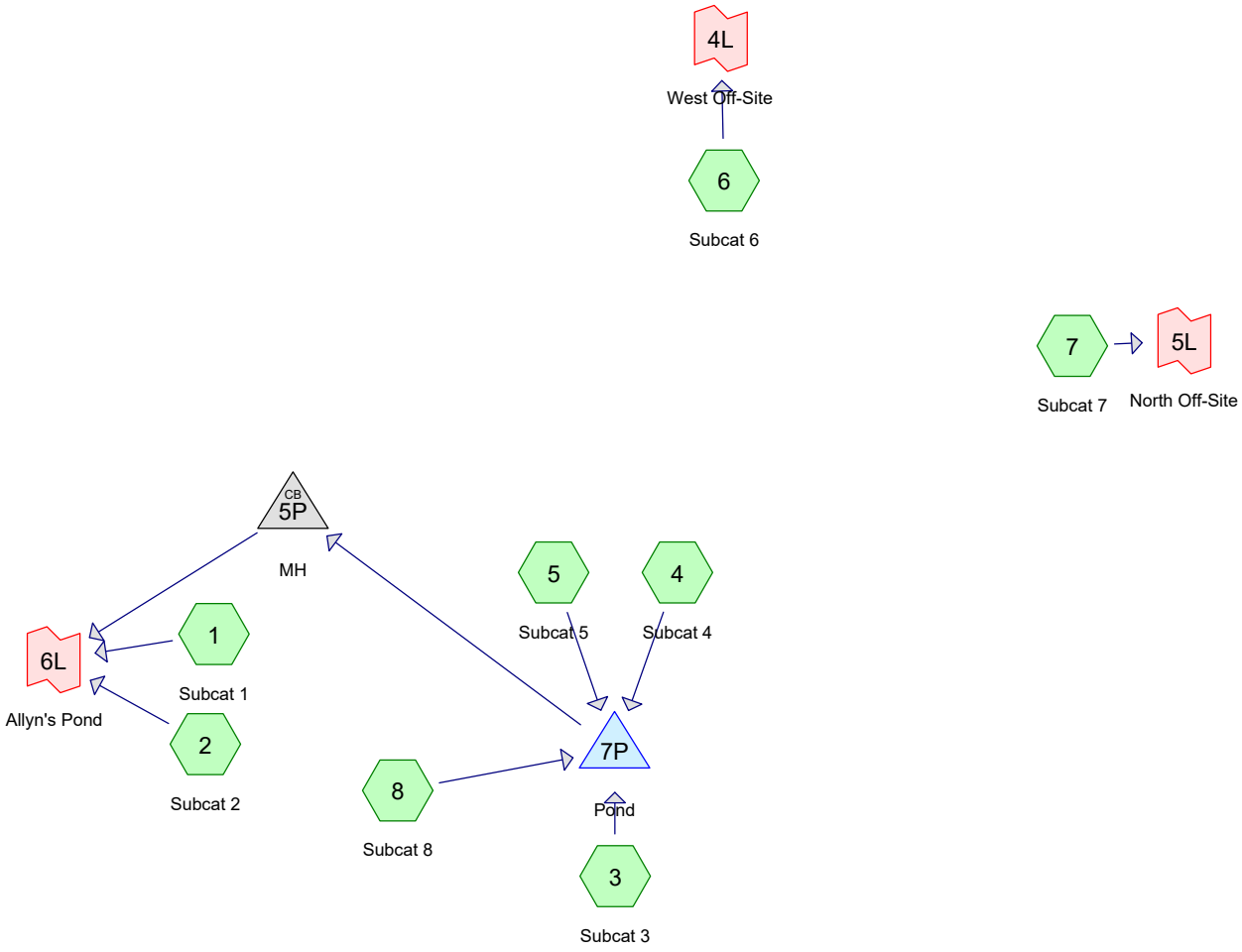
Pond P: Existing Depression Peak Elev=25.29' Storage=58,015 cf Inflow=21.18 cfs 174,496 cf
Discarded=6.88 cfs 174,496 cf Primary=0.00 cfs 0 cf Outflow=6.88 cfs 174,496 cf

Link 4L: West Off-Site Inflow=21.88 cfs 66,767 cf
Primary=21.88 cfs 66,767 cf

Link 5L: North Off-Site Inflow=0.57 cfs 1,785 cf
Primary=0.57 cfs 1,785 cf

Link 6L: Allyn's Pond Inflow=48.96 cfs 276,019 cf
Primary=48.96 cfs 276,019 cf

Total Runoff Area = 1,397,310 sf Runoff Volume = 519,067 cf Average Runoff Depth = 4.46"
68.98% Pervious = 963,852 sf 31.02% Impervious = 433,458 sf



Subcat Reach Pond Link

Routing Diagram for New Conditions

Prepared by Loureiro Engineering Assoc, Inc, Printed 4/24/2024

Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-yr	Type III 24-hr		Default	24.00	1	3.46	2
2	10-yr	Type III 24-hr		Default	24.00	1	5.12	2
3	25-yr	Type III 24-hr		Default	24.00	1	6.15	2
4	50-yr	Type III 24-hr		Default	24.00	1	6.92	2
5	100-yr	Type III 24-hr		Default	24.00	1	7.74	2

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
105,488	70	1/2 acre lots, 25% imp, HSG B (3)
1,625	85	1/2 acre lots, 25% imp, HSG D (3)
110	61	>75% Grass cover, Good, HSG B (2)
5,660	80	>75% Grass cover, Good, HSG D (1, 2, 5)
67	35	Brush, Fair, HSG A (3)
132,424	56	Brush, Fair, HSG B (2, 3, 8)
51,485	77	Brush, Fair, HSG D (1, 2, 6)
25,978	85	Gravel roads, HSG B (1, 2, 8)
76,948	91	Gravel roads, HSG D (1, 2, 4, 5, 6)
417	98	Paved parking, HSG B (2)
5,998	98	Roofs, HSG B (2, 8)
20,025	98	Roofs, HSG D (4, 5)
0	98	Unconnected pavement, HSG A (7)
118,226	98	Unconnected pavement, HSG B (1, 2, 3, 4, 5, 8)
310,687	98	Unconnected pavement, HSG D (1, 2, 3, 4, 5, 6)
7,276	30	Woods, Good, HSG A (3, 7)
503,749	55	Woods, Good, HSG B (2, 3, 8)
34,287	77	Woods, Good, HSG D (1, 2, 3, 4, 6, 7)
1,400,452	**74**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
7,343	HSG A	3, 7
892,391	HSG B	1, 2, 3, 4, 5, 8
0	HSG C	
500,717	HSG D	1, 2, 3, 4, 5, 6, 7
0	Other	
1,400,452		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover	Su Nu
0	105,488	0	1,625	0	107,114	1/2 acre lots, 25% imp	
0	110	0	5,660	0	5,770	>75% Grass cover, Good	
67	132,424	0	51,485	0	183,976	Brush, Fair	
0	25,978	0	76,948	0	102,926	Gravel roads	
0	417	0	0	0	417	Paved parking	
0	5,998	0	20,025	0	26,023	Roofs	
0	118,226	0	310,687	0	428,913	Unconnected pavement	
7,276	503,749	0	34,287	0	545,312	Woods, Good	
7,343	**892,391**	**0**	**500,717**	**0**	**1,400,452**	**TOTAL AREA**	

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Width (inches)	Diam/Height (inches)	Inside-Fill (inches)
1	3	0.00	0.00	96.0	0.0100	0.012	0.0	24.0	0.0
2	5P	23.78	22.12	105.7	0.0157	0.011	0.0	15.0	0.0
3	7P	24.90	23.83	171.0	0.0063	0.013	0.0	15.0	0.0

Time span=0.00-96.00 hrs, dt=0.01 hrs, 9601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1: Subcat 1 Runoff Area=247,789 sf 91.57% Impervious Runoff Depth=3.11"
Tc=28.5 min CN=97 Runoff=11.09 cfs 64,315 cf

Subcatchment2: Subcat 2 Runoff Area=334,920 sf 29.01% Impervious Runoff Depth=0.83"
Tc=9.0 min UI Adjusted CN=67 Runoff=5.82 cfs 23,101 cf

Subcatchment3: Subcat 3 Runoff Area=598,927 sf 11.81% Impervious Runoff Depth=0.48"
Flow Length=1,055' Tc=57.1 min UI Adjusted CN=59 Runoff=2.11 cfs 23,715 cf

Subcatchment4: Subcat 4 Runoff Area=30,771 sf 72.78% Impervious Runoff Depth=2.70"
Tc=5.0 min CN=93 Runoff=2.23 cfs 6,914 cf

Subcatchment5: Subcat 5 Runoff Area=46,548 sf 94.88% Impervious Runoff Depth=3.23"
Tc=5.0 min CN=98 Runoff=3.72 cfs 12,516 cf

Subcatchment6: Subcat 6 Runoff Area=110,009 sf 6.70% Impervious Runoff Depth=1.90"
Tc=11.8 min CN=84 Runoff=4.65 cfs 17,439 cf

Subcatchment7: Subcat 7 Runoff Area=8,563 sf 0.00% Impervious Runoff Depth=0.21"
Tc=5.0 min CN=51 Runoff=0.01 cfs 152 cf

Subcatchment8: Subcat 8 Runoff Area=22,924 sf 58.45% Impervious Runoff Depth=1.60"
Tc=5.0 min CN=80 Runoff=1.02 cfs 3,065 cf

Pond 5P: MH Peak Elev=23.78' Inflow=0.00 cfs 0 cf
15.0" Round Culvert n=0.011 L=105.7' S=0.0157 '/' Outflow=0.00 cfs 0 cf

Pond 7P: Pond Peak Elev=23.01' Storage=5,326 cf Inflow=6.98 cfs 46,211 cf
Discarded=2.43 cfs 46,211 cf Primary=0.00 cfs 0 cf Outflow=2.43 cfs 46,211 cf

Link 4L: West Off-Site Inflow=4.65 cfs 17,439 cf
Primary=4.65 cfs 17,439 cf

Link 5L: North Off-Site Inflow=0.01 cfs 152 cf
Primary=0.01 cfs 152 cf

Link 6L: Allyn's Pond Inflow=14.66 cfs 87,416 cf
Primary=14.66 cfs 87,416 cf

Total Runoff Area = 1,400,452 sf Runoff Volume = 151,217 cf Average Runoff Depth = 1.30"
65.57% Pervious = 918,320 sf 34.43% Impervious = 482,132 sf

Time span=0.00-96.00 hrs, dt=0.01 hrs, 9601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1: Subcat 1 Runoff Area=247,789 sf 91.57% Impervious Runoff Depth=4.77"
Tc=28.5 min CN=97 Runoff=16.64 cfs 98,428 cf

Subcatchment2: Subcat 2 Runoff Area=334,920 sf 29.01% Impervious Runoff Depth=1.89"
Tc=9.0 min UI Adjusted CN=67 Runoff=14.84 cfs 52,669 cf

Subcatchment3: Subcat 3 Runoff Area=598,927 sf 11.81% Impervious Runoff Depth=1.30"
Flow Length=1,055' Tc=57.1 min UI Adjusted CN=59 Runoff=7.53 cfs 65,029 cf

Subcatchment4: Subcat 4 Runoff Area=30,771 sf 72.78% Impervious Runoff Depth=4.32"
Tc=5.0 min CN=93 Runoff=3.48 cfs 11,067 cf

Subcatchment5: Subcat 5 Runoff Area=46,548 sf 94.88% Impervious Runoff Depth=4.88"
Tc=5.0 min CN=98 Runoff=5.55 cfs 18,941 cf

Subcatchment6: Subcat 6 Runoff Area=110,009 sf 6.70% Impervious Runoff Depth=3.38"
Tc=11.8 min CN=84 Runoff=8.22 cfs 30,989 cf

Subcatchment7: Subcat 7 Runoff Area=8,563 sf 0.00% Impervious Runoff Depth=0.80"
Tc=5.0 min CN=51 Runoff=0.13 cfs 570 cf

Subcatchment8: Subcat 8 Runoff Area=22,924 sf 58.45% Impervious Runoff Depth=3.00"
Tc=5.0 min CN=80 Runoff=1.92 cfs 5,727 cf

Pond 5P: MH Peak Elev=23.78' Inflow=0.00 cfs 0 cf
15.0" Round Culvert n=0.011 L=105.7' S=0.0157 '/' Outflow=0.00 cfs 0 cf

Pond 7P: Pond Peak Elev=24.50' Storage=19,815 cf Inflow=11.37 cfs 100,764 cf
Discarded=5.18 cfs 100,764 cf Primary=0.00 cfs 0 cf Outflow=5.18 cfs 100,764 cf

Link 4L: West Off-Site Inflow=8.22 cfs 30,989 cf
Primary=8.22 cfs 30,989 cf

Link 5L: North Off-Site Inflow=0.13 cfs 570 cf
Primary=0.13 cfs 570 cf

Link 6L: Allyn's Pond Inflow=25.41 cfs 151,096 cf
Primary=25.41 cfs 151,096 cf

Total Runoff Area = 1,400,452 sf Runoff Volume = 283,419 cf Average Runoff Depth = 2.43"
65.57% Pervious = 918,320 sf 34.43% Impervious = 482,132 sf

Time span=0.00-96.00 hrs, dt=0.01 hrs, 9601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1: Subcat 1 Runoff Area=247,789 sf 91.57% Impervious Runoff Depth=5.79"
Tc=28.5 min CN=97 Runoff=20.06 cfs 119,637 cf

Subcatchment2: Subcat 2 Runoff Area=334,920 sf 29.01% Impervious Runoff Depth=2.64"
Tc=9.0 min UI Adjusted CN=67 Runoff=21.22 cfs 73,788 cf

Subcatchment3: Subcat 3 Runoff Area=598,927 sf 11.81% Impervious Runoff Depth=1.94"
Flow Length=1,055' Tc=57.1 min UI Adjusted CN=59 Runoff=11.78 cfs 96,584 cf

Subcatchment4: Subcat 4 Runoff Area=30,771 sf 72.78% Impervious Runoff Depth=5.33"
Tc=5.0 min CN=93 Runoff=4.24 cfs 13,669 cf

Subcatchment5: Subcat 5 Runoff Area=46,548 sf 94.88% Impervious Runoff Depth=5.91"
Tc=5.0 min CN=98 Runoff=6.67 cfs 22,932 cf

Subcatchment6: Subcat 6 Runoff Area=110,009 sf 6.70% Impervious Runoff Depth=4.34"
Tc=11.8 min CN=84 Runoff=10.47 cfs 39,760 cf

Subcatchment7: Subcat 7 Runoff Area=8,563 sf 0.00% Impervious Runoff Depth=1.29"
Tc=5.0 min CN=51 Runoff=0.26 cfs 922 cf

Subcatchment8: Subcat 8 Runoff Area=22,924 sf 58.45% Impervious Runoff Depth=3.92"
Tc=5.0 min CN=80 Runoff=2.49 cfs 7,482 cf

Pond 5P: MH Peak Elev=23.78' Inflow=0.00 cfs 0 cf
15.0" Round Culvert n=0.011 L=105.7' S=0.0157 '/' Outflow=0.00 cfs 0 cf

Pond 7P: Pond Peak Elev=25.69' Storage=35,094 cf Inflow=14.64 cfs 140,668 cf
Discarded=6.44 cfs 140,668 cf Primary=0.00 cfs 0 cf Outflow=6.44 cfs 140,668 cf

Link 4L: West Off-Site Inflow=10.47 cfs 39,760 cf
Primary=10.47 cfs 39,760 cf

Link 5L: North Off-Site Inflow=0.26 cfs 922 cf
Primary=0.26 cfs 922 cf

Link 6L: Allyn's Pond Inflow=33.72 cfs 193,425 cf
Primary=33.72 cfs 193,425 cf

Total Runoff Area = 1,400,452 sf Runoff Volume = 374,774 cf Average Runoff Depth = 3.21"
65.57% Pervious = 918,320 sf 34.43% Impervious = 482,132 sf

Time span=0.00-96.00 hrs, dt=0.01 hrs, 9601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1: Subcat 1 Runoff Area=247,789 sf 91.57% Impervious Runoff Depth=6.56"
Tc=28.5 min CN=97 Runoff=22.62 cfs 135,503 cf

Subcatchment2: Subcat 2 Runoff Area=334,920 sf 29.01% Impervious Runoff Depth=3.24"
Tc=9.0 min UI Adjusted CN=67 Runoff=26.23 cfs 90,521 cf

Subcatchment3: Subcat 3 Runoff Area=598,927 sf 11.81% Impervious Runoff Depth=2.45"
Flow Length=1,055' Tc=57.1 min UI Adjusted CN=59 Runoff=15.28 cfs 122,315 cf

Subcatchment4: Subcat 4 Runoff Area=30,771 sf 72.78% Impervious Runoff Depth=6.09"
Tc=5.0 min CN=93 Runoff=4.81 cfs 15,622 cf

Subcatchment5: Subcat 5 Runoff Area=46,548 sf 94.88% Impervious Runoff Depth=6.68"
Tc=5.0 min CN=98 Runoff=7.51 cfs 25,916 cf

Subcatchment6: Subcat 6 Runoff Area=110,009 sf 6.70% Impervious Runoff Depth=5.06"
Tc=11.8 min CN=84 Runoff=12.15 cfs 46,423 cf

Subcatchment7: Subcat 7 Runoff Area=8,563 sf 0.00% Impervious Runoff Depth=1.71"
Tc=5.0 min CN=51 Runoff=0.36 cfs 1,221 cf

Subcatchment8: Subcat 8 Runoff Area=22,924 sf 58.45% Impervious Runoff Depth=4.62"
Tc=5.0 min CN=80 Runoff=2.93 cfs 8,827 cf

Pond 5P: MH Peak Elev=23.78' Inflow=0.00 cfs 0 cf
15.0" Round Culvert n=0.011 L=105.7' S=0.0157 '/' Outflow=0.00 cfs 0 cf

Pond 7P: Pond Peak Elev=26.58' Storage=48,366 cf Inflow=17.25 cfs 172,679 cf
Discarded=7.47 cfs 172,679 cf Primary=0.00 cfs 0 cf Outflow=7.47 cfs 172,679 cf

Link 4L: West Off-Site Inflow=12.15 cfs 46,423 cf
Primary=12.15 cfs 46,423 cf

Link 5L: North Off-Site Inflow=0.36 cfs 1,221 cf
Primary=0.36 cfs 1,221 cf

Link 6L: Allyn's Pond Inflow=40.21 cfs 226,024 cf
Primary=40.21 cfs 226,024 cf

Total Runoff Area = 1,400,452 sf Runoff Volume = 446,348 cf Average Runoff Depth = 3.82"
65.57% Pervious = 918,320 sf 34.43% Impervious = 482,132 sf

Time span=0.00-96.00 hrs, dt=0.01 hrs, 9601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1: Subcat 1 Runoff Area=247,789 sf 91.57% Impervious Runoff Depth=7.38"
Tc=28.5 min CN=97 Runoff=25.33 cfs 152,407 cf

Subcatchment2: Subcat 2 Runoff Area=334,920 sf 29.01% Impervious Runoff Depth=3.91"
Tc=9.0 min UI Adjusted CN=67 Runoff=31.72 cfs 109,030 cf

Subcatchment3: Subcat 3 Runoff Area=598,927 sf 11.81% Impervious Runoff Depth=3.03"
Flow Length=1,055' Tc=57.1 min UI Adjusted CN=59 Runoff=19.21 cfs 151,333 cf

Subcatchment4: Subcat 4 Runoff Area=30,771 sf 72.78% Impervious Runoff Depth=6.90"
Tc=5.0 min CN=93 Runoff=5.41 cfs 17,706 cf

Subcatchment5: Subcat 5 Runoff Area=46,548 sf 94.88% Impervious Runoff Depth=7.50"
Tc=5.0 min CN=98 Runoff=8.41 cfs 29,094 cf

Subcatchment6: Subcat 6 Runoff Area=110,009 sf 6.70% Impervious Runoff Depth=5.85"
Tc=11.8 min CN=84 Runoff=13.95 cfs 53,592 cf

Subcatchment7: Subcat 7 Runoff Area=8,563 sf 0.00% Impervious Runoff Depth=2.19"
Tc=5.0 min CN=51 Runoff=0.48 cfs 1,566 cf

Subcatchment8: Subcat 8 Runoff Area=22,924 sf 58.45% Impervious Runoff Depth=5.38"
Tc=5.0 min CN=80 Runoff=3.39 cfs 10,281 cf

Pond 5P: MH Peak Elev=23.78' Inflow=0.00 cfs 0 cf
15.0" Round Culvert n=0.011 L=105.7' S=0.0157 '/' Outflow=0.00 cfs 0 cf

Pond 7P: Pond Peak Elev=27.52' Storage=63,707 cf Inflow=20.91 cfs 208,413 cf
Discarded=8.60 cfs 208,413 cf Primary=0.00 cfs 0 cf Outflow=8.60 cfs 208,413 cf

Link 4L: West Off-Site Inflow=13.95 cfs 53,592 cf
Primary=13.95 cfs 53,592 cf

Link 5L: North Off-Site Inflow=0.48 cfs 1,566 cf
Primary=0.48 cfs 1,566 cf

Link 6L: Allyn's Pond Inflow=47.28 cfs 261,438 cf
Primary=47.28 cfs 261,438 cf

Total Runoff Area = 1,400,452 sf Runoff Volume = 525,009 cf Average Runoff Depth = 4.50"
65.57% Pervious = 918,320 sf 34.43% Impervious = 482,132 sf

APPENDIX E

Water Quality Volume and Water Quality Flow Calculations

Loureiro
Engineering • Construction • EH&S • Energy
Waste • Facility Services • Laboratory

Project:	1761 Route 12		
Calculated By:	Alex Healy	**Date:**	**04/25/24**
Checked By:	Susan Marquardt	**Date:**	**04/25/24**

Water Quality Volume and Water Quality Flow Worksheet

Watershed:	Developed Site (DA-4, DA-5, DA-8)
Condition:	Proposed

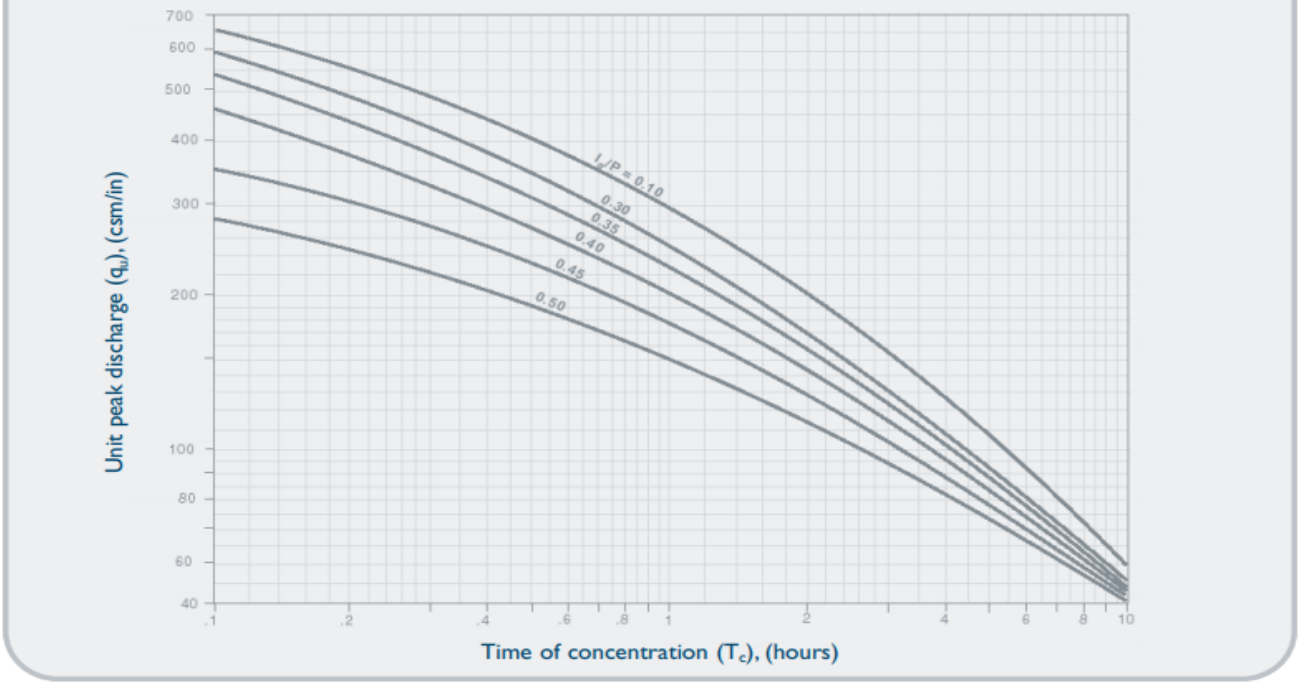
Water Quality Volume

Design Precipitation, P:	1	*in*
Percent Impervious Cover, I:	80%	
Volumetric Runoff Coefficient, R:	*0.770*	
Area, A:	2.83	acres
Water Quality Volume, WQV:	***7,910***	C.F.

Water Quality Flow

Runoff Depth, Q:	*0.770*	*in*	
Runoff Curve Number, CN:	*98*		
Time of Concentration, Tc: (>=10 min)	10.0	*min*	
Time of Concentration, Tc:	0.167	*hr*	
Initial Abstraction, I_a:	*0.041*	*in*	
I_a/P:	*0.041*		
Unit Peak Discharge, q_u:	600	*csm/in*	(from Exhibit 4-111 below)
Area, A:	*0.00442*	mi^2	
Water Quality Flow, WQF:	***2.04***	*cfs*	

Exhibit 4-111 Unit peak discharge (q_u) for NRCS (SCS) type III rainfall distribution



Loureiro
Engineering • Construction • EH&S • Energy
Waste • Facility Services • Laboratory

Project:	1761 Route 12		
Calculated By:	Alex Healy	**Date:**	**06/20/23**
Checked By:	Susan Marquardt	**Date:**	**06/20/23**

Water Quality Volume and Water Quality Flow Worksheet

Watershed:	Hydrodynamic Separator #1 (DA-4)
Condition:	Proposed

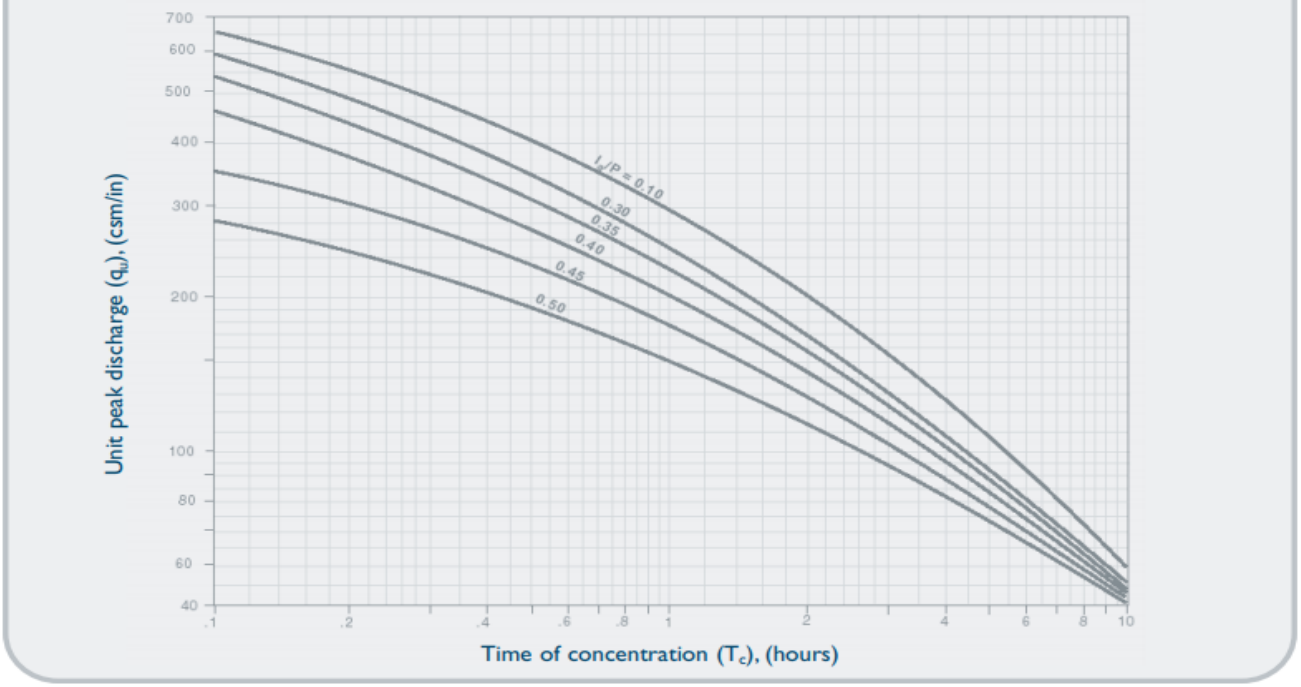
Water Quality Volume

Design Precipitation, P:	1	*in*
Percent Impervious Cover, I:	73%	
Volumetric Runoff Coefficient, R:	*0.705*	
Area, A:	0.70	acres
Water Quality Volume, WQV:	***1,791***	C.F.

Water Quality Flow

Runoff Depth, Q:	*0.705*	*in*	
Runoff Curve Number, CN:	*97*		
Time of Concentration, Tc: (>=10 min)	10.0	*min*	
Time of Concentration, Tc:	0.167	*hr*	
Initial Abstraction, I_a:	*0.062*	*in*	
I_a/P:	*0.062*		
Unit Peak Discharge, q_u:	600	*csm/in*	(from Exhibit 4-111 below)
Area, A:	*0.00109*	mi^2	
Water Quality Flow, WQF:	***0.46***	*cfs*	

Exhibit 4-111 Unit peak discharge (q_u) for NRCS (SCS) type III rainfall distribution



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Waste • Facility Services • Laboratory

Project:	1761 Route 12		
Calculated By:	Alex Healy	**Date:**	**06/20/23**
Checked By:	Susan Marquardt	**Date:**	**06/20/23**

Water Quality Volume and Water Quality Flow Worksheet

Watershed:	Hydrodynamic Separator #2 (DA-5)
Condition:	Proposed

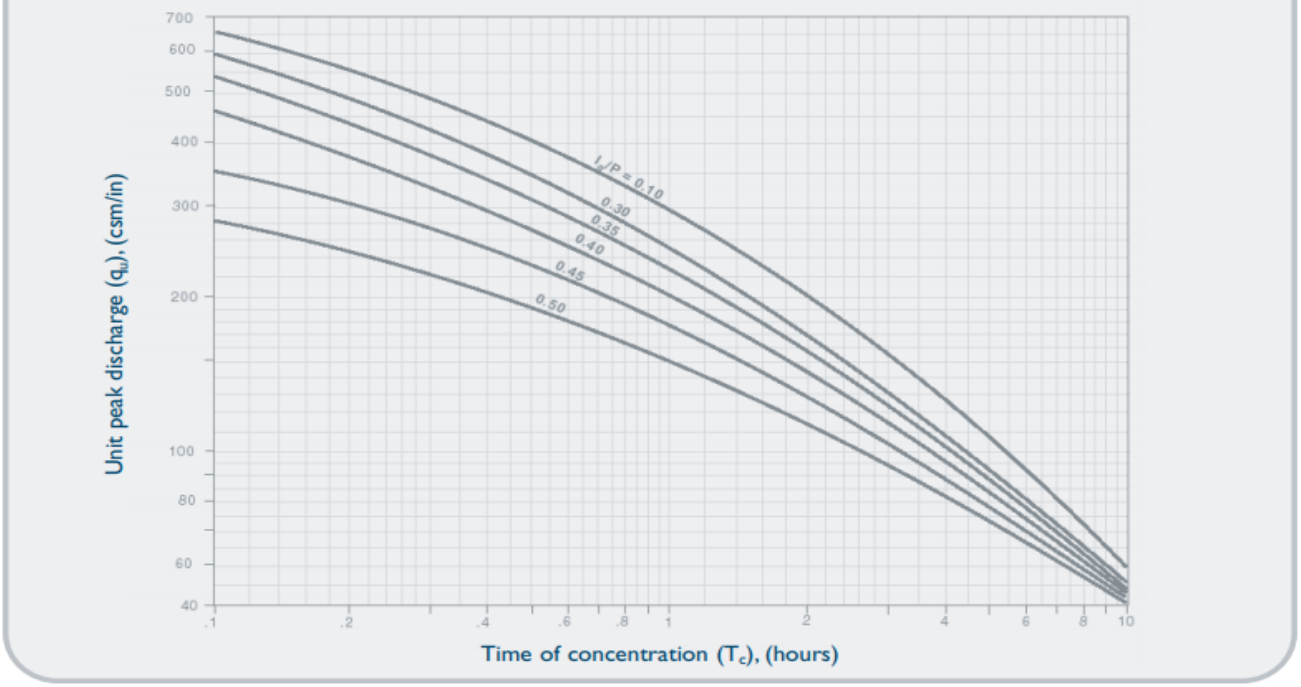
Water Quality Volume

Design Precipitation, P:	1	*in*
Percent Impervious Cover, I:	95%	
Volumetric Runoff Coefficient, R:	*0.904*	
Area, A:	1.07	acres
Water Quality Volume, WQV:	***3,511***	C.F.

Water Quality Flow

Runoff Depth, Q:	*0.904*	*in*	
Runoff Curve Number, CN:	*99*		
Time of Concentration, Tc: (>=10 min)	10.0	*min*	
Time of Concentration, Tc:	0.167	*hr*	
Initial Abstraction, I_a:	*0.041*	*in*	
I_a/P:	*0.041*		
Unit Peak Discharge, q_u:	600	*csm/in*	(from Exhibit 4-111 below)
Area, A:	*0.00167*	mi^2	
Water Quality Flow, WQF:	***0.91***	*cfs*	

Exhibit 4-111 Unit peak discharge (q_u) for NRCS (SCS) type III rainfall distribution



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Waste • Facility Services • Laboratory

Project:	1761 Route 12		
Calculated By:	Alex Healy	**Date:**	**04/25/24**
Checked By:	Susan Marquardt	**Date:**	**04/25/24**

Water Quality Volume and Water Quality Flow Worksheet

Watershed:	Hydrodynamic Separator #3 (DA-8)
Condition:	Proposed

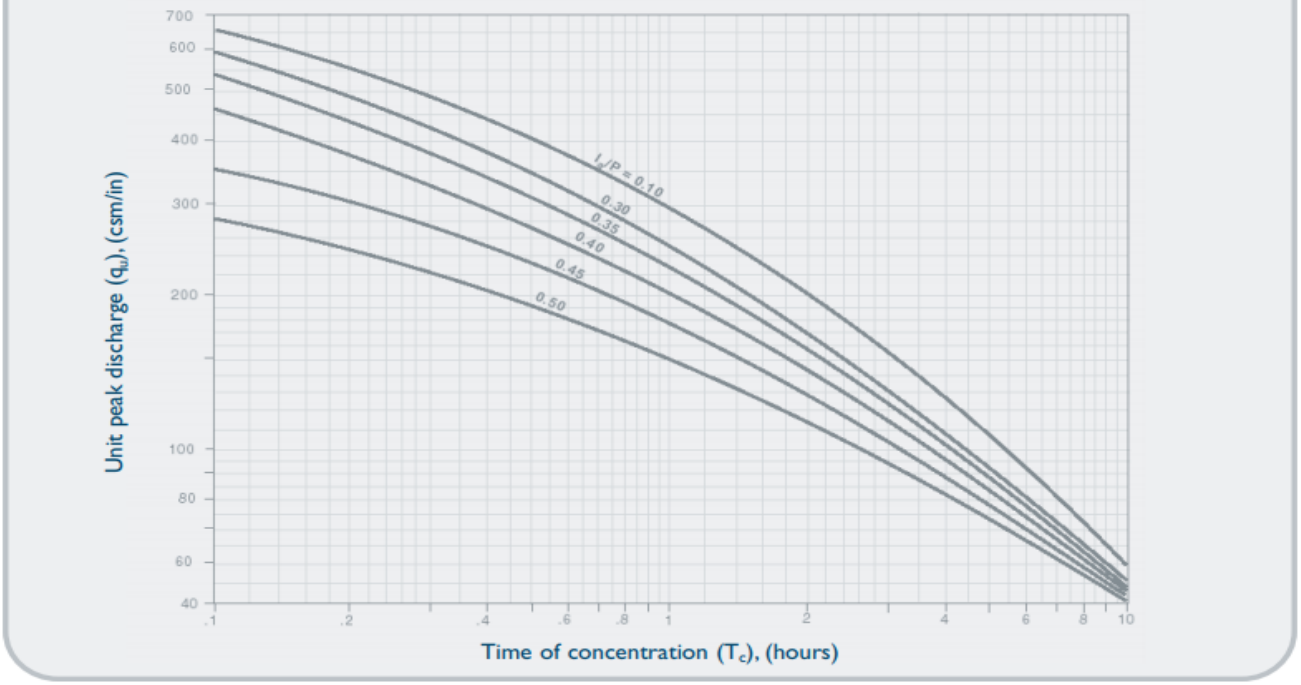
Water Quality Volume

Design Precipitation, P:	1	*in*
Percent Impervious Cover, I:	59%	
Volumetric Runoff Coefficient, R:	*0.577*	
Area, A:	0.39	acres
Water Quality Volume, WQV:	***815***	C.F.

Water Quality Flow

Runoff Depth, Q:	*0.577*	*in*	
Runoff Curve Number, CN:	*95*		
Time of Concentration, Tc: (>=10 min)	10.0	*min*	
Time of Concentration, Tc:	0.167	*hr*	
Initial Abstraction, I_a:	*0.105*	*in*	
I_a/P:	*0.105*		
Unit Peak Discharge, q_u:	600	*csm/in*	(from Exhibit 4-111 below)
Area, A:	*0.00061*	mi^2	
Water Quality Flow, WQF:	***0.21***	*cfs*	

Exhibit 4-111 Unit peak discharge (q_u) for NRCS (SCS) type III rainfall distribution



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Waste • Facility Services • Laboratory

Project:	1761 Route 12		
Calculated By:	Alex Healy	**Date:**	**04/25/24**
Checked By:	Susan Marquardt	**Date:**	**04/25/24**

Water Quality Volume and Water Quality Flow Worksheet

Watershed:	Hydrodynamic Separator #4 (Laydown Area)
Condition:	Proposed

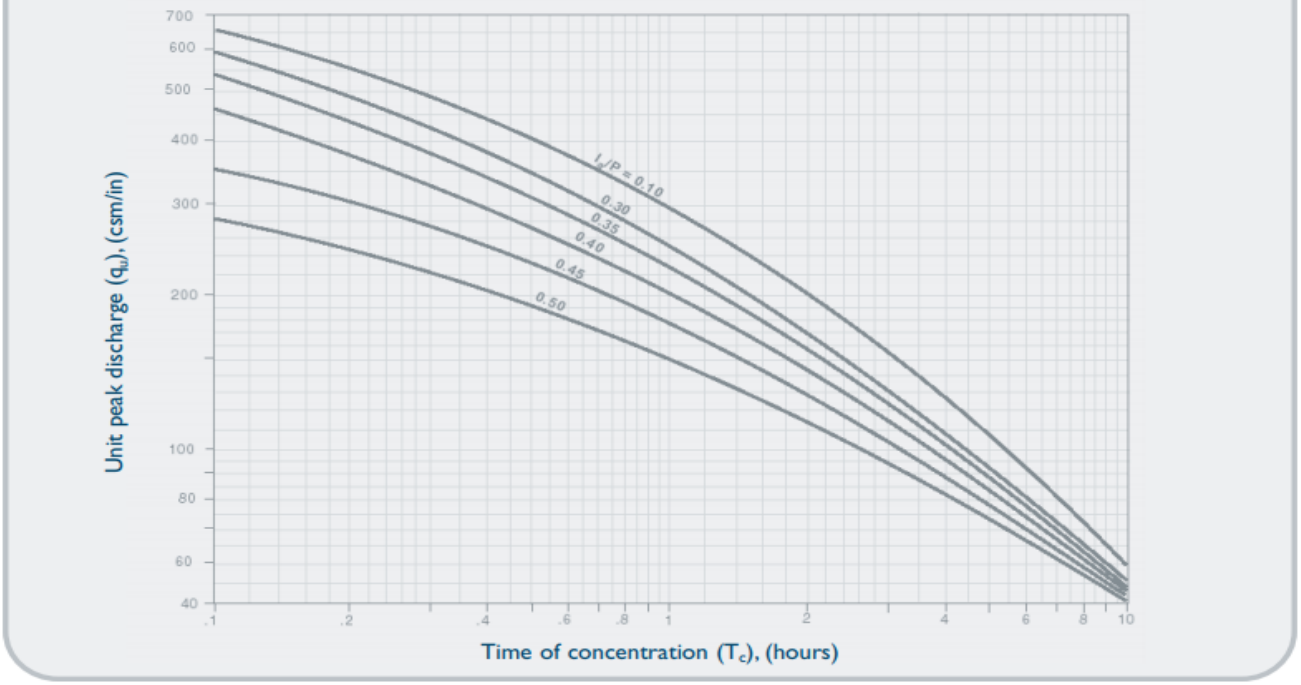
Water Quality Volume

Design Precipitation, P:	1	*in*
Percent Impervious Cover, I:	56%	
Volumetric Runoff Coefficient, R:	*0.550*	
Area, A:	13.00	acres
Water Quality Volume, WQV:	***25,973***	C.F.

Water Quality Flow

Runoff Depth, Q:	*0.550*	*in*	
Runoff Curve Number, CN:	*95*		
Time of Concentration, Tc: (>=10 min)	28.5	*min*	
Time of Concentration, Tc:	0.475	*hr*	
Initial Abstraction, I_a:	*0.105*	*in*	
I_a/P:	*0.105*		
Unit Peak Discharge, q_u:	425	*csm/in*	(from Exhibit 4-111 below)
Area, A:	*0.02031*	mi^2	
Water Quality Flow, WQF:	***4.75***	*cfs*	

Exhibit 4-111 Unit peak discharge (q_u) for NRCS (SCS) type III rainfall distribution



APPENDIX F

Hydrodynamic Separator calculations

Hydrodynamic Separation Product Calculator

Gales Ferry Intermodal LLC

HDS #1

CASCADE SEPARATOR CS-3

Project Information					
Project Name	Gales Ferry Intermodal LLC			**Option #**	A
Country	UNITED_STATES	**State**	Connecticut	**City**	Gales Ferry

Contact Information			
First Name	Susan	**Last Name**	Marquardt
Company	Loureiro Engineering Associates, Inc.	**Phone #**	860-448-0400
Email	srmarquardt@loureiro.com		

Design Criteria					
Site Designation	HDS #1			**Sizing Method**	Treatment Flow Rate
Screening Required?	No	**Treatment Flow Rate**	0.46	**Peak Flow (cfs)**	5.41
Groundwater Depth (ft)	10 - 15	**Pipe Invert Depth (ft)**	0 - 5	**Bedrock Depth (ft)**	10 - 15
Multiple Inlets?	No	**Grate Inlet Required?**	Yes	**Pipe Size (in)**	12.00
Required Particle Size Distribution?	No	**90° between two inlets?**	N/A		

Treatment Selection				
Treatment Unit	CASCADE SEPARATOR	**System Model**	CS-3	
Target Removal	80%	**Particle Size Distribution (PSD)**	250	

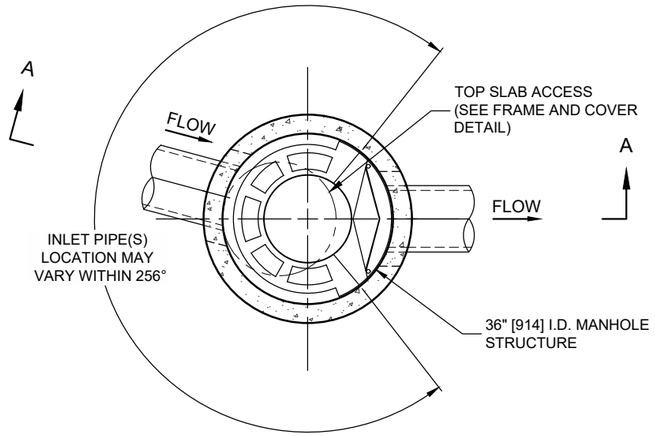
Hydrodynamic Separation Product Calculator

Gales Ferry Intermodal LLC

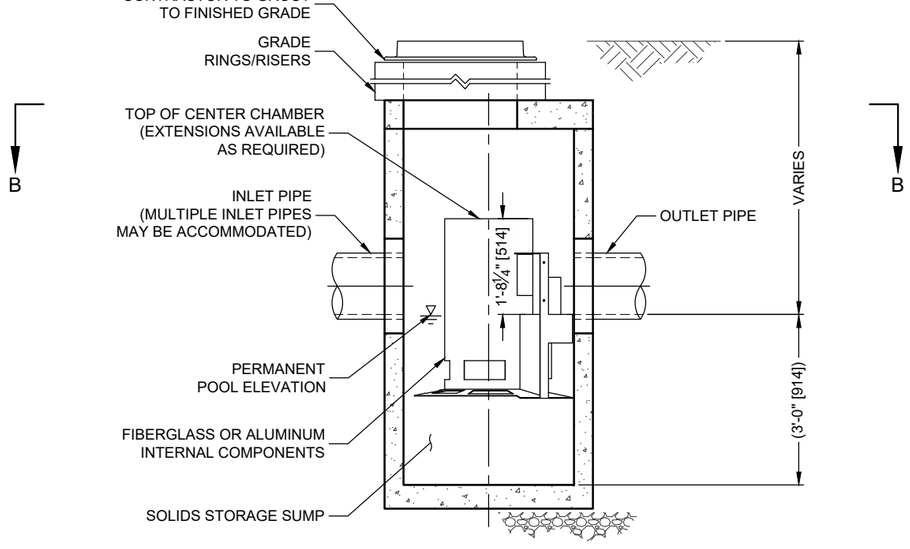
HDS #1

CASCADE SEPARATOR CS-3

CASCADE SEPARATOR ESTIMATED NET ANNUAL SOLIDS LOAD REDUCTION BASED ON THE RATIONAL RAINFALL METHOD								
Rainfall Intensity[1] (in/hr)	**% Rainfall Volume[1]**	**Cumulative Rainfall Volume**	**Rainfall Volume Treated**	**Total Flowrate (cfs)**	**Treated Flowrate (cfs)**	**Hydraulic Loading Rate (%)**	**Removal Efficiency (%)**	**Incremental Removal (%)**
							Removal Efficiency Adjustment[2] =	
							Predicted % Annual Rainfall Treated =	
							Predicted Net Annual Load Removal Efficiency =	
1 -								
2 - Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.								



PLAN VIEW B-B
NOT TO SCALE



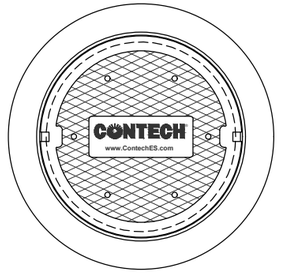
ELEVATION A-A
NOT TO SCALE

CASCADE
separator™

CASCADE SEPARATOR DESIGN NOTES

THE STANDARD CS-3 CONFIGURATION IS SHOWN. ALTERNATE CONFIGURATIONS ARE AVAILABLE AND ARE LISTED BELOW. SOME CONFIGURATIONS MAY BE COMBINED TO SUIT SITE REQUIREMENTS.

CONFIGURATION DESCRIPTION
GRATED INLET ONLY (NO INLET PIPE)
GRATED INLET WITH INLET PIPE OR PIPES
CURB INLET ONLY (NO INLET PIPE)
CURB INLET WITH INLET PIPE OR PIPES



FRAME AND COVER
(DIAMETER VARIES)
NOT TO SCALE

SITE SPECIFIC DATA REQUIREMENTS

STRUCTURE ID	
WATER QUALITY FLOW RATE (cfs [L/s])	
PEAK FLOW RATE (cfs [L/s])	
RETURN PERIOD OF PEAK FLOW (yrs)	
RIM ELEVATION	

PIPE DATA:	INVERT	MATERIAL	DIAMETER
INLET PIPE 1			
INLET PIPE 2			
OUTLET PIPE			

NOTES / SPECIAL REQUIREMENTS:

GENERAL NOTES
1. CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
2. FOR SITE SPECIFIC DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHT, PLEASE CONTACT YOUR CONTECH ENGINEERED SOLUTIONS LLC REPRESENTATIVE. www.ContechES.com
3. CASCADE SEPARATOR WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING. CONTRACTOR TO CONFIRM STRUCTURE MEETS REQUIREMENTS OF PROJECT.
4. CASCADE SEPARATOR STRUCTURE SHALL MEET AASHTO HS20 LOAD RATING, ASSUMING EARTH COVER OF 0' - 2' [610], AND GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION. CASTINGS SHALL MEET AASHTO M306 AND BE CAST WITH THE CONTECH LOGO.
5. CASCADE SEPARATOR STRUCTURE SHALL BE PRECAST CONCRETE CONFORMING TO ASTM C478 AND AASHTO LOAD FACTOR DESIGN METHOD.
6. ALTERNATE UNITS ARE SHOWN IN MILLIMETERS [mm].

INSTALLATION NOTES
A. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
B. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE CASCADE SEPARATOR MANHOLE STRUCTURE.
C. CONTRACTOR TO INSTALL JOINT SEALANT BETWEEN ALL STRUCTURE SECTIONS AND ASSEMBLE STRUCTURE.
D. CONTRACTOR TO PROVIDE, INSTALL, AND GROUT INLET AND OUTLET PIPE(S). MATCH PIPE INVERTS WITH ELEVATIONS SHOWN. ALL PIPE CENTERLINES TO MATCH PIPE OPENING CENTERLINES.
E. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO ASSURE UNIT IS WATER TIGHT, HOLDING WATER TO FLOWLINE INVERT MINIMUM. IT IS SUGGESTED THAT ALL JOINTS BELOW PIPE INVERTS ARE GROUTED.

CONTECH ENGINEERED SOLUTIONS LLC
www.contechES.com
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-338-1122 513-645-7000 513-645-7993 FAX

CS-3
CASCADE SEPARATOR
STANDARD DETAIL

Hydrodynamic Separation Product Calculator

Gales Ferry Intermodal LLC

HDS #2

CASCADE SEPARATOR CS-4

Project Information					
Project Name	Gales Ferry Intermodal LLC			**Option #**	A
Country	UNITED_STATES	**State**	Connecticut	**City**	Gales Ferry

Contact Information			
First Name	Susan	**Last Name**	Marquardt
Company	Loureiro Engineering Associates, Inc.	**Phone #**	860-448-0400
Email	srmarquardt@loureiro.com		

Design Criteria					
Site Designation	HDS #2			**Sizing Method**	Treatment Flow Rate
Screening Required?	No	**Treatment Flow Rate**	0.91	**Peak Flow (cfs)**	8.41
Groundwater Depth (ft)	10 - 15	**Pipe Invert Depth (ft)**	0 - 5	**Bedrock Depth (ft)**	10 - 15
Multiple Inlets?	No	**Grate Inlet Required?**	Yes	**Pipe Size (in)**	12.00
Required Particle Size Distribution?	No	**90° between two inlets?**	N/A		

Treatment Selection				
Treatment Unit	CASCADE SEPARATOR	**System Model**	CS-4	
Target Removal	80%	**Particle Size Distribution (PSD)**	250	

Hydrodynamic Separation Product Calculator

Gales Ferry Intermodal LLC

HDS #2

CASCADE SEPARATOR CS-4

CASCADE SEPARATOR ESTIMATED NET ANNUAL SOLIDS LOAD REDUCTION BASED ON THE RATIONAL RAINFALL METHOD								
Rainfall Intensity[1] (in/hr)	**% Rainfall Volume[1]**	**Cumulative Rainfall Volume**	**Rainfall Volume Treated**	**Total Flowrate (cfs)**	**Treated Flowrate (cfs)**	**Hydraulic Loading Rate (%)**	**Removal Efficiency (%)**	**Incremental Removal (%)**
							Removal Efficiency Adjustment[2] =	
							Predicted % Annual Rainfall Treated =	
							Predicted Net Annual Load Removal Efficiency =	
1 -								
2 - Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.								

Hydrodynamic Separation Product Calculator

Gales Ferry Intermodal LLC

HDS #3

CASCADE SEPARATOR CS-3

Project Information					
Project Name	Gales Ferry Intermodal LLC			**Option #**	A
Country	UNITED_STATES	**State**	Connecticut	**City**	Gales Ferry

Contact Information			
First Name	Alex	**Last Name**	Healy
Company	Loureiro Engineering Associates	**Phone #**	860-221-9185
Email	aphealy@loureiro.com		

Design Criteria					
Site Designation	HDS #3			**Sizing Method**	Treatment Flow Rate
Screening Required?	No	**Treatment Flow Rate**	0.21	**Peak Flow (cfs)**	3.39
Groundwater Depth (ft)	10 - 15	**Pipe Invert Depth (ft)**	5 - 10	**Bedrock Depth (ft)**	10 - 15
Multiple Inlets?	No	**Grate Inlet Required?**	No	**Pipe Size (in)**	12.00
Required Particle Size Distribution?	No	**90° between two inlets?**	N/A		

Treatment Selection				
Treatment Unit	CASCADE SEPARATOR	**System Model**	CS-3	
Target Removal	80%	**Particle Size Distribution (PSD)**	250	

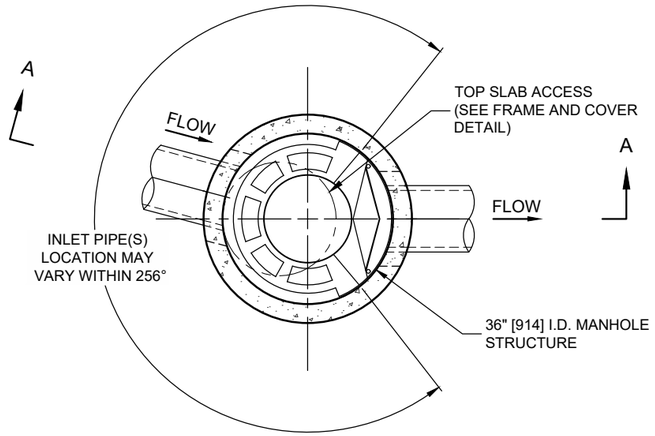
Hydrodynamic Separation Product Calculator

Gales Ferry Intermodal LLC

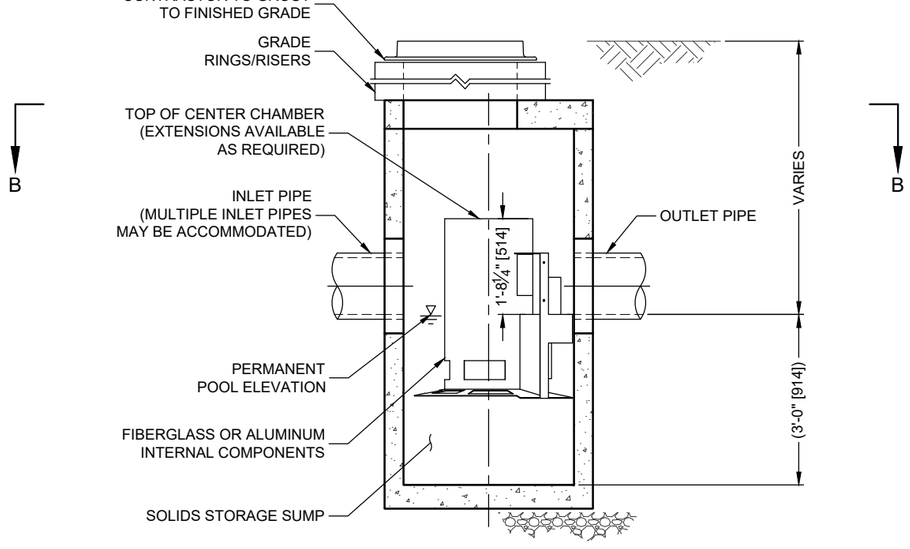
HDS #3

CASCADE SEPARATOR CS-3

CASCADE SEPARATOR ESTIMATED NET ANNUAL SOLIDS LOAD REDUCTION BASED ON THE RATIONAL RAINFALL METHOD								
Rainfall Intensity[1] (in/hr)	**% Rainfall Volume[1]**	**Cumulative Rainfall Volume**	**Rainfall Volume Treated**	**Total Flowrate (cfs)**	**Treated Flowrate (cfs)**	**Hydraulic Loading Rate (%)**	**Removal Efficiency (%)**	**Incremental Removal (%)**
							Removal Efficiency Adjustment[2] =	
							Predicted % Annual Rainfall Treated =	
							Predicted Net Annual Load Removal Efficiency =	
1 -								
2 - Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.								



PLAN VIEW B-B
NOT TO SCALE



ELEVATION A-A
NOT TO SCALE

CASCADE
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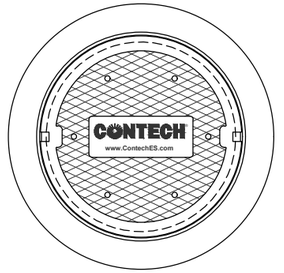
CASCADE SEPARATOR DESIGN NOTES

THE STANDARD CS-3 CONFIGURATION IS SHOWN. ALTERNATE CONFIGURATIONS ARE AVAILABLE AND ARE LISTED BELOW. SOME CONFIGURATIONS MAY BE COMBINED TO SUIT SITE REQUIREMENTS.

CONFIGURATION DESCRIPTION
GRATED INLET ONLY (NO INLET PIPE)
GRATED INLET WITH INLET PIPE OR PIPES
CURB INLET ONLY (NO INLET PIPE)
CURB INLET WITH INLET PIPE OR PIPES



FRAME AND COVER
(DIAMETER VARIES)
NOT TO SCALE

SITE SPECIFIC DATA REQUIREMENTS

STRUCTURE ID	
WATER QUALITY FLOW RATE (cfs [L/s])	
PEAK FLOW RATE (cfs [L/s])	
RETURN PERIOD OF PEAK FLOW (yrs)	
RIM ELEVATION	

PIPE DATA:	INVERT	MATERIAL	DIAMETER
INLET PIPE 1			
INLET PIPE 2			
OUTLET PIPE			

NOTES / SPECIAL REQUIREMENTS:

GENERAL NOTES
1. CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
2. FOR SITE SPECIFIC DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHT, PLEASE CONTACT YOUR CONTECH ENGINEERED SOLUTIONS LLC REPRESENTATIVE. www.ContechES.com
3. CASCADE SEPARATOR WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING. CONTRACTOR TO CONFIRM STRUCTURE MEETS REQUIREMENTS OF PROJECT.
4. CASCADE SEPARATOR STRUCTURE SHALL MEET AASHTO HS20 LOAD RATING, ASSUMING EARTH COVER OF 0' - 2' [610], AND GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION. CASTINGS SHALL MEET AASHTO M306 AND BE CAST WITH THE CONTECH LOGO.
5. CASCADE SEPARATOR STRUCTURE SHALL BE PRECAST CONCRETE CONFORMING TO ASTM C478 AND AASHTO LOAD FACTOR DESIGN METHOD.
6. ALTERNATE UNITS ARE SHOWN IN MILLIMETERS [mm].

INSTALLATION NOTES
A. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
B. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE CASCADE SEPARATOR MANHOLE STRUCTURE.
C. CONTRACTOR TO INSTALL JOINT SEALANT BETWEEN ALL STRUCTURE SECTIONS AND ASSEMBLE STRUCTURE.
D. CONTRACTOR TO PROVIDE, INSTALL, AND GROUT INLET AND OUTLET PIPE(S). MATCH PIPE INVERTS WITH ELEVATIONS SHOWN. ALL PIPE CENTERLINES TO MATCH PIPE OPENING CENTERLINES.
E. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO ASSURE UNIT IS WATER TIGHT, HOLDING WATER TO FLOWLINE INVERT MINIMUM. IT IS SUGGESTED THAT ALL JOINTS BELOW PIPE INVERTS ARE GROUTED.

CONTECH ENGINEERED SOLUTIONS LLC
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CS-3
CASCADE SEPARATOR
STANDARD DETAIL

Hydrodynamic Separation Product Calculator

Gales Ferry Intermodal LLC

HDS #4

CDS CDS5653-10-C

Project Information					
Project Name	Gales Ferry Intermodal LLC			**Option #**	A
Country	UNITED_STATES	**State**	Connecticut	**City**	Gales Ferry

Contact Information			
First Name	Alex	**Last Name**	Healy
Company	Loureiro Engineering Associates	**Phone #**	860-221-9185
Email	aphealy@loureiro.com		

Design Criteria					
Site Designation	HDS #4			**Sizing Method**	Treatment Flow Rate
Screening Required?	Yes	**Treatment Flow Rate**	4.75	**Peak Flow (cfs)**	31.72
Groundwater Depth (ft)	10 - 15	**Pipe Invert Depth (ft)**	5 - 10	**Bedrock Depth (ft)**	10 - 15
Multiple Inlets?	No	**Grate Inlet Required?**	No	**Pipe Size (in)**	36.00
Required Particle Size Distribution?	No	**90° between two inlets?**	N/A		

Treatment Selection				
Treatment Unit	CDS	**System Model**	CDS5653-10-C	
Target Removal	80%	**Particle Size Distribution (PSD)**	50	

Hydrodynamic Separation Product Calculator

Gales Ferry Intermodal LLC

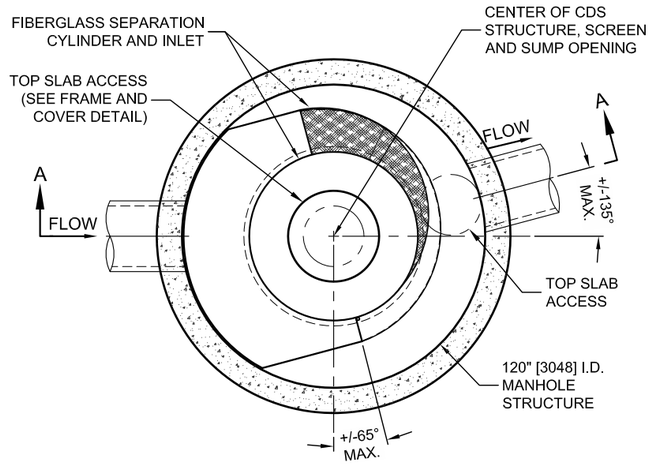
HDS #4

CDS CDS5653-10-C

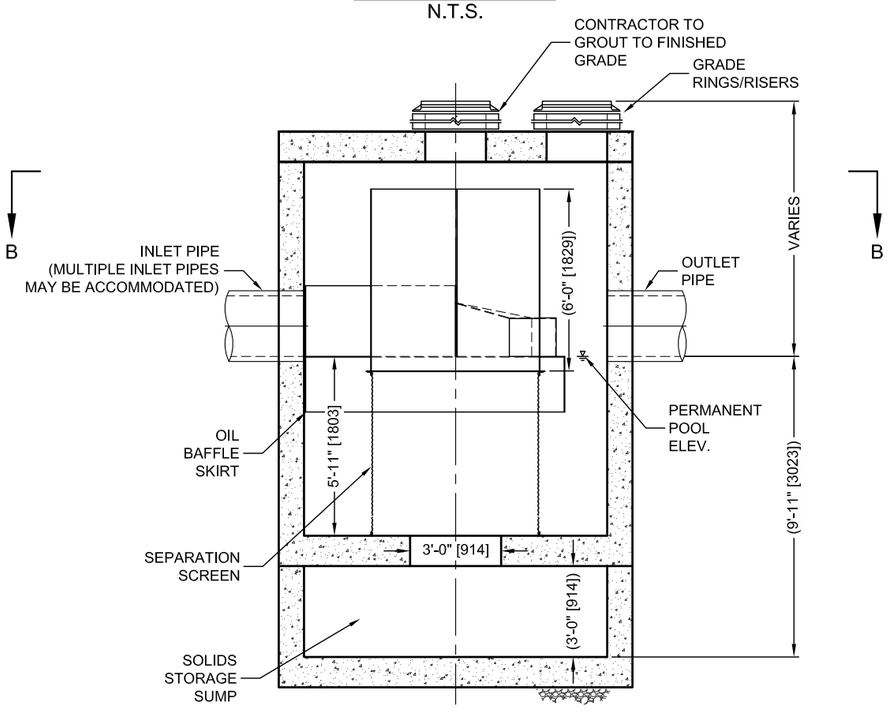
CDS ESTIMATED NET ANNUAL SOLIDS LOAD REDUCTION BASED ON THE RATIONAL RAINFALL METHOD								
Rainfall Intensity[1] (in/hr)	**% Rainfall Volume[1]**	**Cumulative Rainfall Volume**	**Rainfall Volume Treated**	**Total Flowrate (cfs)**	**Treated Flowrate (cfs)**	**Operating Rate (%)**	**Removal Efficiency (%)**	**Incremental Removal (%)**
							Removal Efficiency Adjustment[2] =	
							Predicted % Annual Rainfall Treated =	
							Predicted Net Annual Load Removal Efficiency =	

1 -

2 - Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.



PLAN VIEW B-B
N.T.S.



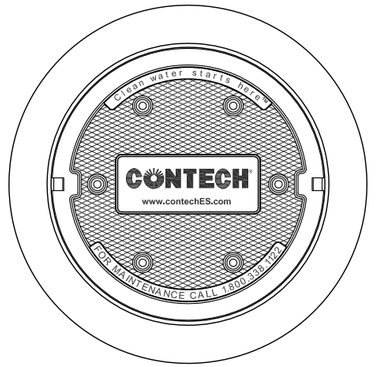
ELEVATION A-A
N.T.S.

THIS PRODUCT MAY BE PROTECTED BY ONE OR MORE OF THE FOLLOWING U.S. PATENTS: 5,766,849; 6,641,720; 6,511,595; 6,581,792; RELATED FOREIGN PATENTS, OR OTHER PATENTS PENDING.

CDS5653-10-C DESIGN NOTES

THE STANDARD CDS5653-10-C CONFIGURATION IS SHOWN. ALTERNATE CONFIGURATIONS ARE AVAILABLE AND ARE LISTED BELOW. SOME CONFIGURATIONS MAY BE COMBINED TO SUIT SITE REQUIREMENTS.

CONFIGURATION DESCRIPTION
GRATED INLET ONLY (NO INLET PIPE)
GRATED INLET WITH INLET PIPE OR PIPES
CURB INLET ONLY (NO INLET PIPE)
CURB INLET WITH INLET PIPE OR PIPES
SEPARATE OIL BAFFLE (SINGLE INLET PIPE REQUIRED FOR THIS CONFIGURATION)
SEDIMENT WEIR FOR NJDEP / NJCAT CONFORMING UNITS



FRAME AND COVER
(DIAMETER VARIES)
N.T.S.

SITE SPECIFIC DATA REQUIREMENTS

STRUCTURE ID	
WATER QUALITY FLOW RATE (CFS OR L/s)	*
PEAK FLOW RATE (CFS OR L/s)	*
RETURN PERIOD OF PEAK FLOW (YRS)	*
SCREEN APERTURE (2400 OR 4700)	*

PIPE DATA:	I.E.	MATERIAL	DIAMETER
INLET PIPE 1	*	*	*
INLET PIPE 2	*	*	*
OUTLET PIPE	*	*	*

RIM ELEVATION	*

ANTI-FLOTATION BALLAST	WIDTH	HEIGHT
	*	*

NOTES/SPECIAL REQUIREMENTS:

* PER ENGINEER OF RECORD

GENERAL NOTES
1. CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
2. DIMENSIONS MARKED WITH ( ) ARE REFERENCE DIMENSIONS. ACTUAL DIMENSIONS MAY VARY.
3. FOR FABRICATION DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHTS, PLEASE CONTACT YOUR CONTECH ENGINEERED SOLUTIONS LLC REPRESENTATIVE. www.contechEScom
4. CDS WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING.
5. STRUCTURE SHALL MEET AASHTO HS20 LOAD RATING, ASSUMING GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION. CASTINGS SHALL MEET HS20 (AASHTO M 306) AND BE CAST WITH THE CONTECH LOGO.
6. IF REQUIRED, PVC HYDRAULIC SHEAR PLATE IS PLACED ON SHELF AT BOTTOM OF SCREEN CYLINDER. REMOVE AND REPLACE AS NECESSARY DURING MAINTENANCE CLEANING.

INSTALLATION NOTES
A. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
B. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE CDS MANHOLE STRUCTURE (LIFTING CLUTCHES PROVIDED).
C. CONTRACTOR TO ADD JOINT SEALANT BETWEEN ALL STRUCTURE SECTIONS, AND ASSEMBLE STRUCTURE.
D. CONTRACTOR TO PROVIDE, INSTALL, AND GROUT PIPES. MATCH PIPE INVERTS WITH ELEVATIONS SHOWN.
E. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO ASSURE UNIT IS WATER TIGHT, HOLDING WATER TO FLOWLINE INVERT MINIMUM. IT IS SUGGESTED THAT ALL JOINTS BELOW PIPE INVERTS ARE GROUTED.

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CDS5653-10-C
INLINE CDS
STANDARD DETAIL

APPENDIX G

Stormwater Management Maintenance Program and Inspection Checklist

1761 Route 12, Gales Ferry, CT

Stormwater Management System Maintenance Program

There shall be periodic maintenance of the stormwater systems on the property after installation. In order to ensure effective performance of the system, the following stormwater maintenance program has been established. The property owner will be responsible for implementation of this program. A log and schedule of all inspections, cleanings, and repairs shall be maintained by the property owner. All maintenance documents shall be transferred to any future owners upon sale or transfer of the property.

A. Catch basins/Manholes

Catch basins are designed with sumps for the purpose of collecting coarse sediment. All catch basins should be inspected two times per year, specifically during times for high levels of maintenance around the site. Sediment should be removed when it extends to within 6 inches of the outlet pipe invert or not less than once per year. Cleanout should be facilitated via vacuum truck or other means that accomplish sediment removal. The sediment shall be disposed of in an approved off-site location in accordance with town and state requirements.

B. Asphalt

Asphalt areas should be swept annually. Ideal sweeping timeframe is in the spring after winter sanding or salting for deicing. Deicing chemicals should be kept to a minimum during the winter months.

C. Infiltration basin

The infiltration basin be inspected twice per year. Inspections shall include the following:

- Check for sediment accumulation, trash, and debris.
- Check for blockages, structural integrity, and evidence of erosion at inlets, outlets, and overflow spillways;
- Check that the trash rack at the low-level outlet is clear and the outlet is functioning properly;

Regular maintenance includes the following:

- Prune trees and shrubs as needed.
- Inspect soil and repair eroded areas seasonally or as necessary.
- Remove any invasive species (including roots) that have become established within the basin and embankments.
- Sediment removal should occur at a minimum of every five years or before the sediment storage capacity has been filled.

D. Lawn and vegetated areas

Vegetated cover shall be maintained on all earth surfaces to minimize soil erosion. Fertilizer use should be minimized and applied using careful application processes.

E. Hydrodynamic Separator (Stormceptor)

1761 Route 12, Gales Ferry,CT

Stormwater Management System Maintenance Checklist

The hydrodynamic separator shall be inspected and maintained during catch basin inspections and cleaning. An inspection is made by checking the depth of sediment in each manhole with a grade stick or similar device. Maintenance is required when the sediment depth in exceeds 20 inches. Minimum inspection is recommended twice a year to maintain operation and function of the unit.

Maintenance Instructions:

1. Remove the manhole cover to provide access to the pollutant storage. Pollutants are stored in the sump, below the bowl assembly visible from the surface. Access this area through the 10" diameter access cylinder.
2. Use a vacuum truck or other similar equipment to remove all water, debris, oils and sediment.
3. Use a high-pressure hose to clean the manhole of all the remaining sediment and debris. Then, use the vacuum truck to remove the water.
4. Fill the cleaned manhole with water until the level reaches the invert of the outlet pipe.
5. Replace the manhole cover.
6. Dispose of the polluted water, oils, sediment and trash at an approved facility.
    - Check with the local sewer authority for authority to discharge the liquid.

1761 Route 12, Gales Ferry,CT

Stormwater Management System Maintenance Checklist

Inspection Date: _____

Inspector: _____

Maintenance Item	Satisfactory	Unsatisfactory	Comments
Drainage Structures			
Sedimentation Accumulation			
Large Floating Debris			
Inlet/Outlet			
Structure walls			
Riser			
Frame and Cover			
Infiltration System			
Settling Over System			
Sedimentation Accumulation			
Large Floating Debris			
Inspection Structure Integrity			
Inspection Inlets/Outlets			
Surrounding Lawn and Vegetated Areas			
Signs of Erosion			
Ponding/Settling			
Overgrowth			

Additional Comments: _____