# Stormwater Management Report

# Proposed Industrial Building

## Gales Ferry, Connecticut

March 7, 2023

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 the proposed 20,000 SF industrial building at 1761 Route 12 in Gales Ferry, Connecticut. The property is 158 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 158 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.

# 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 area of the Site currently has no existing drainage or stormwater management features. Stormwater is conveyed 100 percent (%) through surface runoff. The 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.

Through available survey information, the existing catch basin network and drainage system on the developed portion of the property 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 five (5) 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 flows through surface flow to a large depressed area east 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. 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 20,000 SF industrial building, which 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. A gravel access road is also proposed to connect to the parking area from the west.

## 3.2 Proposed Subcatchment Areas

The redeveloped Site and overall property is divided into seven (7) subcatchment areas. Subcatchment areas 1 and 2 will be unchanged under proposed conditions. Subcatchment area 3 will be similar to existing conditions, but will instead flow into the new drainage system instead of the depressed area on Site. Subcatchment area 4 is a large portion of the new paved area and building. Subcatchment area 5 is the western portion of the new paved area and building. Subcatchment area 6 is similar to subcatchment area 5 under existing conditions, but will now include a section of the northern paved area and landscaped buffer that will runoff through surface flow to the west. Subcatchment area 7 will flow north off-site, similar to subcatchment area 4 under existing conditions. The Site work will result in an increase in impervious area for the property, from 41% to 49%. Drawing 2, Proposed Drainage Areas, depict 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 and catch basin network to collect most of the paved area and the entirety of the building roof. To attenuate and reduce peak flows, a subsurface infiltration system will be included in the drainage system. The infiltration system is with 12 inches of stone surrounding the system and typical system requirements of 6 inches of stone beneath and above the system. The small amount of runoff that outlets from the system will flow into the existing drainage system south of the Site. Stormwater runoff from the new gravel access road will be captured by a catch basin and discharge via rip rap apron west of the new gravel road.

To improve stormwater quality discharging from the Site, the infiltration system has been sized to hold the full water quality volume (WQV) and will include isolator rows for improved stormwater treatment and suspended solid removal. 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)
Impervious areas (pavement, roofs, etc), CN = 98

The weighted CN of the existing property is 80. The weighted CN of the property with the new Site is 83. This is due to the increase in impervious areas.

## 4.2 Existing and Proposed Peak-Flow Comparison

With the use of subsurface infiltration, total peak flows are reduced during the 2-year and 10-year storm.

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

| | 2-Year Event | | 10-Year Event | | 25-Year Event | | 50-year Event | | 100-year Event | |
|---|---|---|---|---|---|---|---|---|---|---|
| Points of Compliance | Existing | Proposed | Existing | Proposed | Existing | Proposed | Existing | Proposed | Existing | Proposed |
| Allyn's Pond | 17.63 | 17.93 | 31.7 | 32.78 | 41.08 | 42.84 | 48.24 | 50.46 | 55.92 | 58.68 |
| North Off-Site | 0.08 | 0 | 0.29 | 0 | 0.45 | 0.04 | 0.58 | 0.07 | 0.72 | 0.11 |
| West Off-Site | 6.97 | 6.72 | 12.67 | 9.76 | 16.29 | 16.04 | 19.01 | 18.78 | 21.91 | 21.7 |
| Existing Depression | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total West Off-Site | 6.97 | 6.72 | 12.67 | 9.76 | 16.29 | 16.04 | 19.01 | 18.78 | 21.91 | 21.7 |
| Total | 24.68 | 24.65 | 44.66 | 42.54 | 57.82 | 58.92 | 67.83 | 69.31 | 78.55 | 80.49 |

The table shows decreasing peak total peak flow runoff during the 2-year and 10-year storms. There are minor increases in total peak flow runoff in the 25-year, 50-year, and 100-year storms, ranging from 2 percent (%) to 2.4 percent (%). This is due to subcatchment 3 flowing to Allyn's Pond under new conditions, as opposed to West Off-Site under existing conditions. Also, the limited amount of runoff that the new drainage system captures relative to the total property restricts the influence of new stormwater management systems. However, due to Allyn's Pond being on the property and all subcatchment areas ultimately draining to the Thames River, the small increase in peak flows will not result in negative impacts to the property of receiving waters. Overall, new drainage conditions should function similarly to those of existing conditions. Appendix C includes the HydroCAD report for the existing and new Site analysis.

## 4.3 Water Quality

The methods described in the 2004 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 73,000 sf and 95% impervious, resulting in a WQV of 5,612 cf. The subsurface infiltration provides a storage volume of 9,301 cf between the Stormtech chambers and surrounding stone. The infiltration system provides adequate amount of storage to store the WQV. In addition to the aforementioned Isolator Rows, the drainage system also leads to two (2) hydrodynamic separators before entering the subsurface chamber systems. 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 Flow (WQF) of 1.57 cfs. Appendix F includes the calculations used for selecting hydrodynamic separators.

## 4.4 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 subsurface infiltration system includes Isolator Rows and 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 similar flow rates to receiving waters.

**DRAWINGS**

**Drawing 1 –Existing Drainage Areas**

DA 1

DA 2

DA 3

DA 4

DA 5

BLDG 41

BLDG 45
(FOUNDATION REMAINS)

BLDG 42A

BLDG 44

BLDG 46C, D & P
FOUNDATION

BLDG 46L
FOUNDATION

BLDG 46M & N
REMOVED

BLDG 46K
FOUNDATION

BLDG 49
FOUNDATION

46A 46E 46F 46H 46J

N/F
PROVIDENCE AND
WORCESTER RAILROAD COMPANY
VOL. 119 / PG. 1136

N/F
TRINSEO LLC

N/F
KAREN SA
VOL. 565 / PG
#9 RIVER DR

HERBERT
JOAN
VOL. 1
#3

RAILROAD

ROUTE 12

RIVER DR.

#12

HIGHWAY

MILITARY

ACCESS ENTRANCE

ACCESS ENTRANCE

316+0

SCALE IN FEET
10 0 10 20 30

V:\CT\GALES FERRY\ROUTE 12-1761\045C2.06 LOCAL PERMIT FOR STERLING BUILDING\DWGS\CIVIL\NON PLANSET DWG\DRAINAGE AREAS.DWG Tab: EXISTING DRAINAGE AREAS Saved: 3/7/2023 11:16 PM by SRMARQUARDT Plotted: 3/8/2023 10:08 AM

| REV. | DESCRIPTION OF REVISION | DATE | APPR. |
|---|---|---|---|

STAMP


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| SCALE | COMP. NO. | DATE | DATE |
|---|---|---|---|
| 1"= 60' | 045C2.06 | 03/07/2023 | 03/07/2023 |
| DRAWN BY: ESF | | APPROVED BY: SRM | |

EXISTING DRAINAGE AREAS

GALES FERRY INTERMODAL
1761 ROUTE 12, GALES FERRY, CONNECTICUT 06335
PREPARED FOR:
GALES FERRY INTERMODAL LLC
549 SOUTH STREET, QUINCY, MA 02169

DRAWING
DA-1

SHEET NO. 1 NO. OF SHEETS 2

**Drawing 2 – Proposed Drainage Areas**

DA 1

DA 2

DA 3

DA 4

DA 5

DA 6

DA 7

NEW 20,000 SF STERLING INDUSTRIAL BUILDING FF=32.00

BLDG 41

BLDG 45 (FOUNDATION REMAINS)

BLDG 42A

BLDG 44

BLDG 46L FOUNDATION

BLDG 46C, D & P FOUNDATION

BLDG 46M & N REMOVED

BLDG 46K FOUNDATION

BLDG 49 FOUNDATION

46A

46E

46F

46H

46J

POND

TOM ALLYN'S COVE INLET

"ALLYN'S COVE"

"ALLYN'S COVE"

N/F PROVIDENCE AND WORCESTER RAILROAD COMPANY VOL. 119 / PG. 1136

N/F TRINSEO LLC

RAILROAD

ACCESS ENTRANCE

ACCESS ENTRANCE

BROOK

MILITARY HIGHWAY

ROUTE #12

RIVER DR.

316+0

307+0

SCALE IN FEET

30 0 30 60 90

V:\CIT\GALES FERRY\ROUTE 12-1761\045\C2.06 LOCAL PERMIT FOR STERLING BUILDING\DWGS\CIVIL\NON PLANSET DWG\DRAINAGE AREAS DWG Tab: PROPOSED DRAINAGE AREAS Saved: 3/7/2023 11:16 PM by SRKMARQUARDT Plotted: 3/8/2023 9:59 AM

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SCALE: 1" = 60'

COMM. NO.: 045\C2.06

DRAWN BY: ESF — DATE: 03/07/2023

APPROVED BY: SRM — DATE: 03/07/2023

# PROPOSED DRAINAGE AREAS

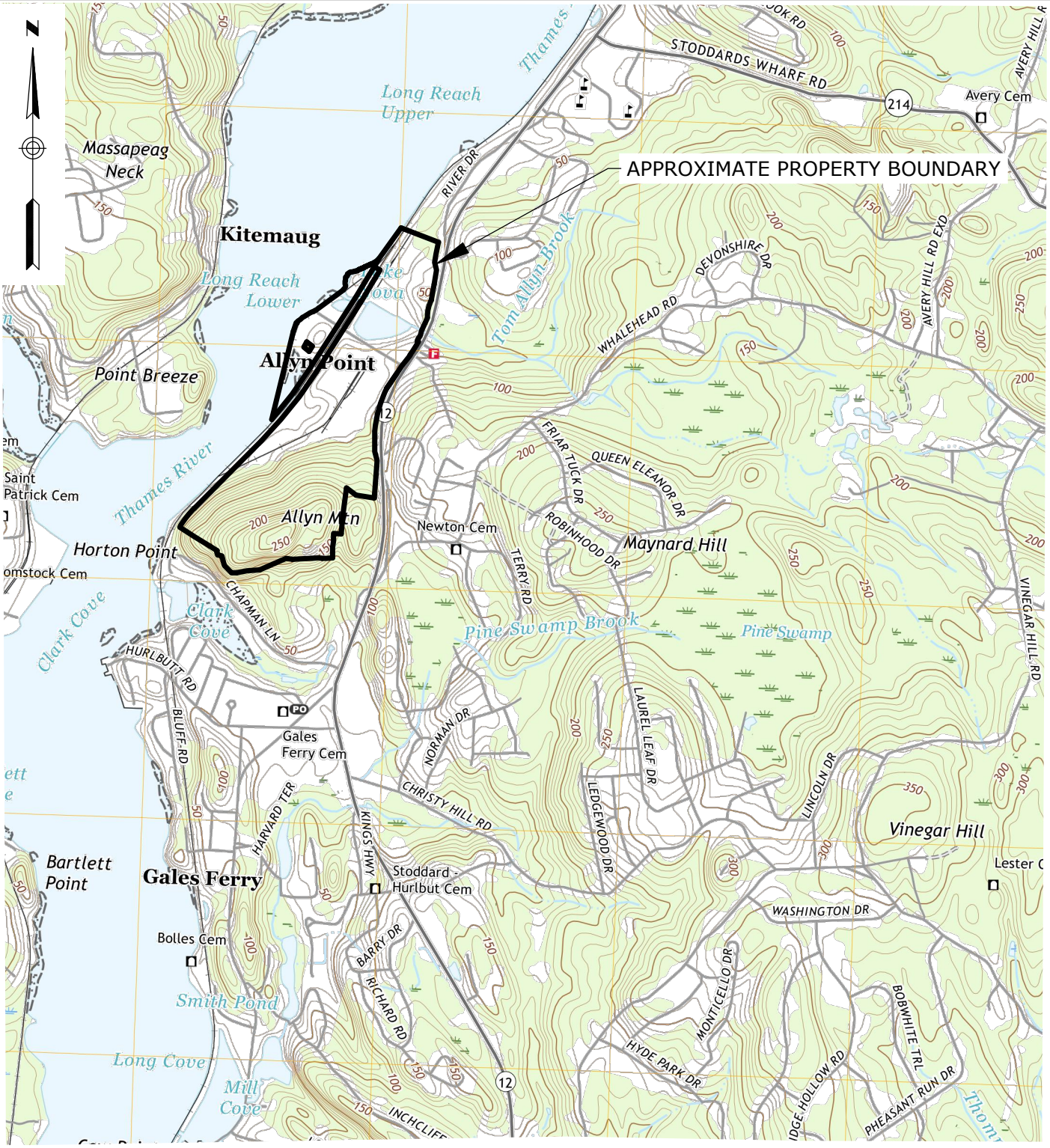
**GALES FERRY INTERMODAL**
1761 ROUTE 12, GALES FERRY, CONNECTICUT 06335
PREPARED FOR:
**GALES FERRY INTERMODAL LLC**
549 SOUTH STREET, QUINCY, MA 02169

DRAWING
**DA-2**

SHEET NO. 2 — NO. OF SHEETS 2

# 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


March 4, 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: 1:2,960 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 40 80 160 240

Feet
0 100 200 400 600

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 |
|---|---|---|---|
| 29B | Agawam fine sandy loam, 3 to 8 percent slopes | 5.6 | 21.7% |
| 34B | Merrimac fine sandy loam, 3 to 8 percent slopes | 1.7 | 6.6% |
| 73C | Charlton-Chatfield complex, 0 to 15 percent slopes, very rocky | 7.3 | 28.2% |
| 307 | Urban land | 11.3 | 43.6% |
| **Totals for Area of Interest** | | **26.0** | **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

## 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

## 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

## 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

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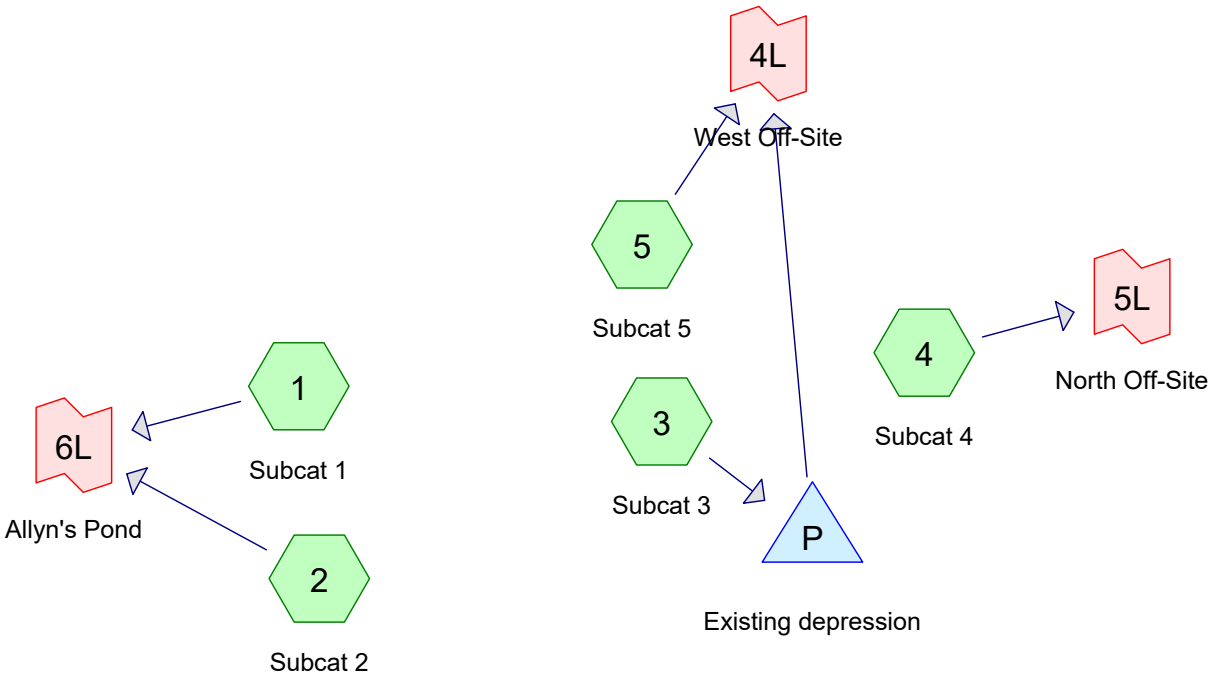
# APPENDIX D

# HydroCAD Reports




Subcat Reach Pond Link

**Routing Diagram for Existing Conditions**
Prepared by Loureiro Engineering Assoc, Inc, Printed 3/7/2023

## 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) |
|---|---|---|
| 5,408 | 84 | 50-75% Grass cover, Fair, HSG D (1, 2) |
| 6,320 | 35 | Brush, Fair, HSG A (3, 4) |
| 117,684 | 56 | Brush, Fair, HSG B (1, 2, 3, 5) |
| 89,342 | 77 | Brush, Fair, HSG D (1, 2, 3, 4, 5) |
| 35,959 | 85 | Gravel roads, HSG B (1, 2) |
| 75,277 | 91 | Gravel roads, HSG D (1, 2, 5) |
| 65,824 | 98 | Unconnected pavement, HSG B (1, 2, 3, 5) |
| 297,862 | 98 | Unconnected pavement, HSG D (1, 2, 5) |
| 572 | 30 | Woods, Good, HSG A (3) |
| 164,356 | 55 | Woods, Good, HSG B (2, 3, 5) |
| 33,664 | 77 | Woods, Good, HSG D (1, 2, 3, 5) |
| **892,267** | **80** | **TOTAL AREA** |

## Soil Listing (all nodes)

| Area (sq-ft) | Soil Group | Subcatchment Numbers |
|---|---|---|
| 6,892 | HSG A | 3, 4 |
| 383,823 | HSG B | 1, 2, 3, 5 |
| 0 | HSG C | |
| 501,553 | HSG D | 1, 2, 3, 4, 5 |
| 0 | Other | |
| **892,267** | | **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 | Sub Num |
|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 5,408 | 0 | 5,408 | 50-75% Grass cover, Fair | |
| 6,320 | 117,684 | 0 | 89,342 | 0 | 213,345 | Brush, Fair | |
| 0 | 35,959 | 0 | 75,277 | 0 | 111,236 | Gravel roads | |
| 0 | 65,824 | 0 | 297,862 | 0 | 363,686 | Unconnected pavement | |
| 572 | 164,356 | 0 | 33,664 | 0 | 198,592 | Woods, Good | |
| **6,892** | **383,823** | **0** | **501,553** | **0** | **892,267** | **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=272,438 sf 90.85% Impervious Runoff Depth=3.11"
Flow Length=254' Tc=28.5 min CN=97 Runoff=12.19 cfs 70,713 cf

**Subcatchment 2: Subcat 2** Runoff Area=354,049 sf 31.26% Impervious Runoff Depth=1.21"
Flow Length=349' Tc=9.0 min CN=74 Runoff=9.99 cfs 35,771 cf

**Subcatchment 3: Subcat 3** Runoff Area=114,415 sf 0.01% Impervious Runoff Depth=0.40"
Tc=5.0 min CN=57 Runoff=0.66 cfs 3,823 cf

**Subcatchment 4: Subcat 4** Runoff Area=8,418 sf 0.00% Impervious Runoff Depth=0.51"
Flow Length=640' Tc=24.9 min CN=60 Runoff=0.05 cfs 361 cf

**Subcatchment 5: Subcat 5** Runoff Area=142,946 sf 3.83% Impervious Runoff Depth=1.75"
Tc=5.0 min CN=82 Runoff=6.97 cfs 20,842 cf

**Pond P: Existing depression** Peak Elev=22.01' Storage=63 cf Inflow=0.66 cfs 3,823 cf
Discarded=0.62 cfs 3,823 cf Primary=0.00 cfs 0 cf Outflow=0.62 cfs 3,823 cf

**Link 4L: West Off-Site** Inflow=6.97 cfs 20,842 cf
Primary=6.97 cfs 20,842 cf

**Link 5L: North Off-Site** Inflow=0.05 cfs 361 cf
Primary=0.05 cfs 361 cf

**Link 6L: Allyn's Pond** Inflow=17.81 cfs 106,483 cf
Primary=17.81 cfs 106,483 cf

**Total Runoff Area = 892,267 sf Runoff Volume = 131,509 cf Average Runoff Depth = 1.77"**
**59.24% Pervious = 528,581 sf 40.76% Impervious = 363,686 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=272,438 sf 90.85% Impervious Runoff Depth=4.77"
Flow Length=254' Tc=28.5 min CN=97 Runoff=18.29 cfs 108,219 cf

**Subcatchment 2: Subcat 2** Runoff Area=354,049 sf 31.26% Impervious Runoff Depth=2.46"
Flow Length=349' Tc=9.0 min CN=74 Runoff=21.07 cfs 72,590 cf

**Subcatchment 3: Subcat 3** Runoff Area=114,415 sf 0.01% Impervious Runoff Depth=1.17"
Tc=5.0 min CN=57 Runoff=3.20 cfs 11,147 cf

**Subcatchment 4: Subcat 4** Runoff Area=8,418 sf 0.00% Impervious Runoff Depth=1.37"
Flow Length=640' Tc=24.9 min CN=60 Runoff=0.17 cfs 962 cf

**Subcatchment 5: Subcat 5** Runoff Area=142,946 sf 3.83% Impervious Runoff Depth=3.19"
Tc=5.0 min CN=82 Runoff=12.67 cfs 37,960 cf

**Pond P: Existing depression** Peak Elev=22.06' Storage=350 cf Inflow=3.20 cfs 11,147 cf
Discarded=2.74 cfs 11,147 cf Primary=0.00 cfs 0 cf Outflow=2.74 cfs 11,147 cf

**Link 4L: West Off-Site** Inflow=12.67 cfs 37,960 cf
Primary=12.67 cfs 37,960 cf

**Link 5L: North Off-Site** Inflow=0.17 cfs 962 cf
Primary=0.17 cfs 962 cf

**Link 6L: Allyn's Pond** Inflow=32.33 cfs 180,809 cf
Primary=32.33 cfs 180,809 cf

**Total Runoff Area = 892,267 sf Runoff Volume = 230,878 cf Average Runoff Depth = 3.11"**
**59.24% Pervious = 528,581 sf 40.76% Impervious = 363,686 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=272,438 sf 90.85% Impervious Runoff Depth=5.79"
Flow Length=254' Tc=28.5 min CN=97 Runoff=22.06 cfs 131,538 cf

**Subcatchment 2: Subcat 2** Runoff Area=354,049 sf 31.26% Impervious Runoff Depth=3.31"
Flow Length=349' Tc=9.0 min CN=74 Runoff=28.48 cfs 97,701 cf

**Subcatchment 3: Subcat 3** Runoff Area=114,415 sf 0.01% Impervious Runoff Depth=1.77"
Tc=5.0 min CN=57 Runoff=5.21 cfs 16,855 cf

**Subcatchment 4: Subcat 4** Runoff Area=8,418 sf 0.00% Impervious Runoff Depth=2.02"
Flow Length=640' Tc=24.9 min CN=60 Runoff=0.27 cfs 1,417 cf

**Subcatchment 5: Subcat 5** Runoff Area=142,946 sf 3.83% Impervious Runoff Depth=4.13"
Tc=5.0 min CN=82 Runoff=16.29 cfs 49,142 cf

**Pond P: Existing depression** Peak Elev=22.18' Storage=1,133 cf Inflow=5.21 cfs 16,855 cf
Discarded=3.20 cfs 16,855 cf Primary=0.00 cfs 0 cf Outflow=3.20 cfs 16,855 cf

**Link 4L: West Off-Site** Inflow=16.29 cfs 49,142 cf
Primary=16.29 cfs 49,142 cf

**Link 5L: North Off-Site** Inflow=0.27 cfs 1,417 cf
Primary=0.27 cfs 1,417 cf

**Link 6L: Allyn's Pond** Inflow=41.94 cfs 229,239 cf
Primary=41.94 cfs 229,239 cf

**Total Runoff Area = 892,267 sf Runoff Volume = 296,653 cf Average Runoff Depth = 3.99"**
**59.24% Pervious = 528,581 sf 40.76% Impervious = 363,686 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=272,438 sf 90.85% Impervious Runoff Depth=6.56"
Flow Length=254' Tc=28.5 min CN=97 Runoff=24.87 cfs 148,983 cf

**Subcatchment 2: Subcat 2** Runoff Area=354,049 sf 31.26% Impervious Runoff Depth=3.97"
Flow Length=349' Tc=9.0 min CN=74 Runoff=34.17 cfs 117,202 cf

**Subcatchment 3: Subcat 3** Runoff Area=114,415 sf 0.01% Impervious Runoff Depth=2.26"
Tc=5.0 min CN=57 Runoff=6.85 cfs 21,550 cf

**Subcatchment 4: Subcat 4** Runoff Area=8,418 sf 0.00% Impervious Runoff Depth=2.55"
Flow Length=640' Tc=24.9 min CN=60 Runoff=0.34 cfs 1,787 cf

**Subcatchment 5: Subcat 5** Runoff Area=142,946 sf 3.83% Impervious Runoff Depth=4.84"
Tc=5.0 min CN=82 Runoff=19.01 cfs 57,670 cf

**Pond P: Existing depression** Peak Elev=22.30' Storage=1,980 cf Inflow=6.85 cfs 21,550 cf
Discarded=3.64 cfs 21,550 cf Primary=0.00 cfs 0 cf Outflow=3.64 cfs 21,550 cf

**Link 4L: West Off-Site** Inflow=19.01 cfs 57,670 cf
Primary=19.01 cfs 57,670 cf

**Link 5L: North Off-Site** Inflow=0.34 cfs 1,787 cf
Primary=0.34 cfs 1,787 cf

**Link 6L: Allyn's Pond** Inflow=49.27 cfs 266,186 cf
Primary=49.27 cfs 266,186 cf

**Total Runoff Area = 892,267 sf Runoff Volume = 347,192 cf Average Runoff Depth = 4.67"**
**59.24% Pervious = 528,581 sf 40.76% Impervious = 363,686 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=272,438 sf 90.85% Impervious Runoff Depth=7.38"
Flow Length=254' Tc=28.5 min CN=97 Runoff=27.85 cfs 167,569 cf

**Subcatchment 2: Subcat 2** Runoff Area=354,049 sf 31.26% Impervious Runoff Depth=4.69"
Flow Length=349' Tc=9.0 min CN=74 Runoff=40.32 cfs 138,487 cf

**Subcatchment 3: Subcat 3** Runoff Area=114,415 sf 0.01% Impervious Runoff Depth=2.82"
Tc=5.0 min CN=57 Runoff=8.71 cfs 26,875 cf

**Subcatchment 4: Subcat 4** Runoff Area=8,418 sf 0.00% Impervious Runoff Depth=3.14"
Flow Length=640' Tc=24.9 min CN=60 Runoff=0.43 cfs 2,203 cf

**Subcatchment 5: Subcat 5** Runoff Area=142,946 sf 3.83% Impervious Runoff Depth=5.61"
Tc=5.0 min CN=82 Runoff=21.91 cfs 66,866 cf

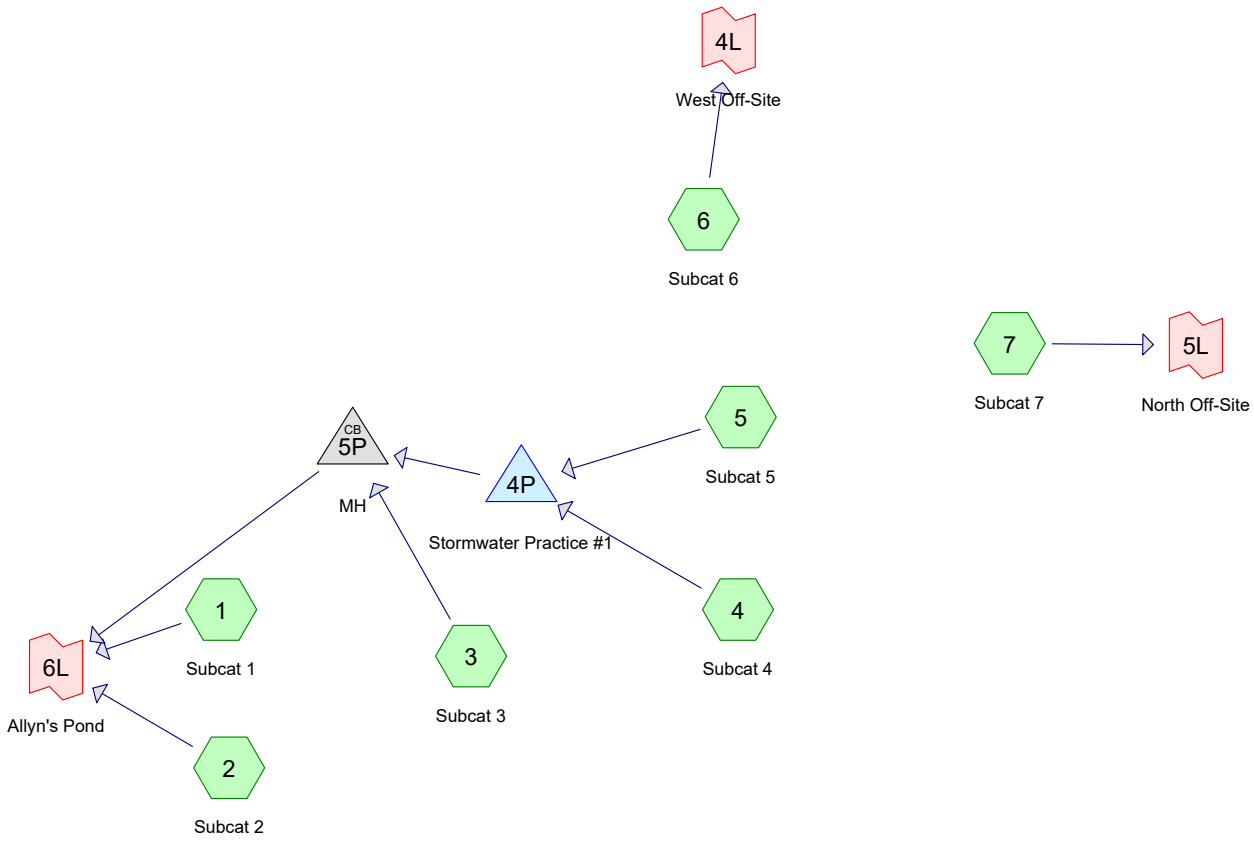
**Pond P: Existing depression** Peak Elev=22.43' Storage=3,074 cf Inflow=8.71 cfs 26,875 cf
Discarded=4.14 cfs 26,875 cf Primary=0.00 cfs 0 cf Outflow=4.14 cfs 26,875 cf

**Link 4L: West Off-Site** Inflow=21.91 cfs 66,866 cf
Primary=21.91 cfs 66,866 cf

**Link 5L: North Off-Site** Inflow=0.43 cfs 2,203 cf
Primary=0.43 cfs 2,203 cf

**Link 6L: Allyn's Pond** Inflow=57.15 cfs 306,055 cf
Primary=57.15 cfs 306,055 cf

**Total Runoff Area = 892,267 sf Runoff Volume = 402,000 cf Average Runoff Depth = 5.41"**
**59.24% Pervious = 528,581 sf 40.76% Impervious = 363,686 sf**




Subcat Reach Pond Link

**Routing Diagram for New Conditions**

Prepared by Loureiro Engineering Assoc, Inc, Printed 3/7/2023

## 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) |
|---|---|---|
| 400 | 61 | >75% Grass cover, Good, HSG B (3, 4) |
| 5,408 | 80 | >75% Grass cover, Good, HSG D (1, 2) |
| 118,798 | 56 | Brush, Fair, HSG B (1, 2, 3, 4, 6) |
| 70,156 | 77 | Brush, Fair, HSG D (1, 2, 6) |
| 35,971 | 85 | Gravel roads, HSG B (1, 2) |
| 85,473 | 91 | Gravel roads, HSG D (1, 2, 6) |
| 2,454 | 98 | Paved parking, HSG A (4, 6) |
| 31,959 | 98 | Paved parking, HSG B (2, 3, 4, 5, 6) |
| 20,333 | 98 | Paved parking, HSG D (4, 5, 6) |
| 8,559 | 98 | Roofs, HSG B (4, 5) |
| 11,468 | 98 | Roofs, HSG D (4, 5) |
| 1 | 98 | Unconnected pavement, HSG A (4, 7) |
| 65,375 | 98 | Unconnected pavement, HSG B (1, 2, 3, 4, 6) |
| 297,887 | 98 | Unconnected pavement, HSG D (1, 2, 6, 7) |
| 4,439 | 30 | Woods, Good, HSG A (4, 6, 7) |
| 122,746 | 55 | Woods, Good, HSG B (2, 3, 4, 6) |
| 10,800 | 77 | Woods, Good, HSG D (1, 2, 6, 7) |
| **892,228** | **83** | **TOTAL AREA** |

## Soil Listing (all nodes)

| Area (sq-ft) | Soil Group | Subcatchment Numbers |
|---|---|---|
| 6,894 | HSG A | 4, 6, 7 |
| 383,808 | HSG B | 1, 2, 3, 4, 5, 6 |
| 0 | HSG C | |
| 501,526 | HSG D | 1, 2, 4, 5, 6, 7 |
| 0 | Other | |
| **892,228** | | **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 | Sub Num |
|---|---|---|---|---|---|---|---|
| 0 | 400 | 0 | 5,408 | 0 | 5,808 | >75% Grass cover, Good | |
| 0 | 118,798 | 0 | 70,156 | 0 | 188,954 | Brush, Fair | |
| 0 | 35,971 | 0 | 85,473 | 0 | 121,444 | Gravel roads | |
| 2,454 | 31,959 | 0 | 20,333 | 0 | 54,746 | Paved parking | |
| 0 | 8,559 | 0 | 11,468 | 0 | 20,027 | Roofs | |
| 1 | 65,375 | 0 | 297,887 | 0 | 363,263 | Unconnected pavement | |
| 4,439 | 122,746 | 0 | 10,800 | 0 | 137,985 | Woods, Good | |
| **6,894** | **383,808** | **0** | **501,526** | **0** | **892,228** | **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 | 4P | 25.45 | 24.90 | 55.0 | 0.0100 | 0.013 | 0.0 | 4.0 | 0.0 |
| 2 | 5P | 24.90 | 24.00 | 90.0 | 0.0100 | 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

**Subcatchment 1: Subcat 1** Runoff Area=272,438 sf 90.86% Impervious Runoff Depth=3.11"
Tc=28.5 min CN=97 Runoff=12.19 cfs 70,713 cf

**Subcatchment 2: Subcat 2** Runoff Area=354,037 sf 31.26% Impervious Runoff Depth=1.21"
Tc=9.0 min CN=74 Runoff=9.99 cfs 35,769 cf

**Subcatchment 3: Subcat 3** Runoff Area=45,329 sf 0.93% Impervious Runoff Depth=0.37"
Flow Length=541' Tc=21.6 min CN=56 Runoff=0.16 cfs 1,382 cf

**Subcatchment 4: Subcat 4** Runoff Area=43,557 sf 92.44% Impervious Runoff Depth=2.80"
Tc=5.0 min CN=94 Runoff=3.24 cfs 10,151 cf

**Subcatchment 5: Subcat 5** Runoff Area=29,501 sf 100.00% Impervious Runoff Depth=3.23"
Tc=5.0 min CN=98 Runoff=2.36 cfs 7,932 cf

**Subcatchment 6: Subcat 6** Runoff Area=144,014 sf 6.71% Impervious Runoff Depth=1.68"
Tc=5.0 min UI Adjusted CN=81 Runoff=6.72 cfs 20,117 cf

**Subcatchment 7: Subcat 7** Runoff Area=3,353 sf 0.01% Impervious Runoff Depth=0.06"
Tc=5.0 min CN=44 Runoff=0.00 cfs 17 cf

**Pond 4P: Stormwater Practice #1** Peak Elev=25.26' Storage=905 cf Inflow=5.60 cfs 18,083 cf
Discarded=3.35 cfs 18,083 cf Primary=0.00 cfs 0 cf Outflow=3.35 cfs 18,083 cf

**Pond 5P: MH** Peak Elev=25.08' Inflow=0.16 cfs 1,382 cf
15.0" Round Culvert n=0.013 L=90.0' S=0.0100 '/' Outflow=0.16 cfs 1,382 cf

**Link 4L: West Off-Site** Inflow=6.72 cfs 20,117 cf
Primary=6.72 cfs 20,117 cf

**Link 5L: North Off-Site** Inflow=0.00 cfs 17 cf
Primary=0.00 cfs 17 cf

**Link 6L: Allyn's Pond** Inflow=17.93 cfs 107,865 cf
Primary=17.93 cfs 107,865 cf

**Total Runoff Area = 892,228 sf Runoff Volume = 146,082 cf Average Runoff Depth = 1.96"**
**50.91% Pervious = 454,192 sf 49.09% Impervious = 438,036 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=272,438 sf 90.86% Impervious Runoff Depth=4.77"
Tc=28.5 min CN=97 Runoff=18.29 cfs 108,219 cf

**Subcatchment 2: Subcat 2** Runoff Area=354,037 sf 31.26% Impervious Runoff Depth=2.46"
Tc=9.0 min CN=74 Runoff=21.07 cfs 72,588 cf

**Subcatchment 3: Subcat 3** Runoff Area=45,329 sf 0.93% Impervious Runoff Depth=1.10"
Flow Length=541' Tc=21.6 min CN=56 Runoff=0.73 cfs 4,170 cf

**Subcatchment 4: Subcat 4** Runoff Area=43,557 sf 92.44% Impervious Runoff Depth=4.43"
Tc=5.0 min CN=94 Runoff=4.99 cfs 16,067 cf

**Subcatchment 5: Subcat 5** Runoff Area=29,501 sf 100.00% Impervious Runoff Depth=4.88"
Tc=5.0 min CN=98 Runoff=3.52 cfs 12,004 cf

**Subcatchment 6: Subcat 6** Runoff Area=144,014 sf 6.71% Impervious Runoff Depth=3.09"
Tc=5.0 min UI Adjusted CN=81 Runoff=12.40 cfs 37,103 cf

**Subcatchment 7: Subcat 7** Runoff Area=3,353 sf 0.01% Impervious Runoff Depth=0.43"
Tc=5.0 min CN=44 Runoff=0.01 cfs 121 cf

**Pond 4P: Stormwater Practice #1** Peak Elev=25.69' Storage=2,839 cf Inflow=8.51 cfs 28,071 cf
Discarded=3.35 cfs 27,962 cf Primary=0.10 cfs 109 cf Outflow=3.45 cfs 28,071 cf

**Pond 5P: MH** Peak Elev=25.33' Inflow=0.82 cfs 4,280 cf
15.0" Round Culvert n=0.013 L=90.0' S=0.0100 '/' Outflow=0.82 cfs 4,280 cf

**Link 4L: West Off-Site** Inflow=12.40 cfs 37,103 cf
Primary=12.40 cfs 37,103 cf

**Link 5L: North Off-Site** Inflow=0.01 cfs 121 cf
Primary=0.01 cfs 121 cf

**Link 6L: Allyn's Pond** Inflow=32.78 cfs 185,086 cf
Primary=32.78 cfs 185,086 cf

**Total Runoff Area = 892,228 sf Runoff Volume = 250,272 cf Average Runoff Depth = 3.37"**
**50.91% Pervious = 454,192 sf 49.09% Impervious = 438,036 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=272,438 sf 90.86% Impervious Runoff Depth=5.79"
Tc=28.5 min CN=97 Runoff=22.06 cfs 131,538 cf

**Subcatchment 2: Subcat 2** Runoff Area=354,037 sf 31.26% Impervious Runoff Depth=3.31"
Tc=9.0 min CN=74 Runoff=28.48 cfs 97,697 cf

**Subcatchment 3: Subcat 3** Runoff Area=45,329 sf 0.93% Impervious Runoff Depth=1.69"
Flow Length=541' Tc=21.6 min CN=56 Runoff=1.21 cfs 6,368 cf

**Subcatchment 4: Subcat 4** Runoff Area=43,557 sf 92.44% Impervious Runoff Depth=5.45"
Tc=5.0 min CN=94 Runoff=6.07 cfs 19,765 cf

**Subcatchment 5: Subcat 5** Runoff Area=29,501 sf 100.00% Impervious Runoff Depth=5.91"
Tc=5.0 min CN=98 Runoff=4.23 cfs 14,533 cf

**Subcatchment 6: Subcat 6** Runoff Area=144,014 sf 6.71% Impervious Runoff Depth=4.02"
Tc=5.0 min UI Adjusted CN=81 Runoff=16.04 cfs 48,253 cf

**Subcatchment 7: Subcat 7** Runoff Area=3,353 sf 0.01% Impervious Runoff Depth=0.80"
Tc=5.0 min CN=44 Runoff=0.04 cfs 222 cf

**Pond 4P: Stormwater Practice #1** Peak Elev=25.98' Storage=4,438 cf Inflow=10.30 cfs 34,298 cf
Discarded=3.35 cfs 33,902 cf Primary=0.20 cfs 396 cf Outflow=3.55 cfs 34,298 cf

**Pond 5P: MH** Peak Elev=25.47' Inflow=1.41 cfs 6,764 cf
15.0" Round Culvert n=0.013 L=90.0' S=0.0100 '/' Outflow=1.41 cfs 6,764 cf

**Link 4L: West Off-Site** Inflow=16.04 cfs 48,253 cf
Primary=16.04 cfs 48,253 cf

**Link 5L: North Off-Site** Inflow=0.04 cfs 222 cf
Primary=0.04 cfs 222 cf

**Link 6L: Allyn's Pond** Inflow=42.84 cfs 235,999 cf
Primary=42.84 cfs 235,999 cf

**Total Runoff Area = 892,228 sf Runoff Volume = 318,376 cf Average Runoff Depth = 4.28"**
**50.91% Pervious = 454,192 sf 49.09% Impervious = 438,036 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=272,438 sf 90.86% Impervious Runoff Depth=6.56"
Tc=28.5 min CN=97 Runoff=24.87 cfs 148,983 cf

**Subcatchment 2: Subcat 2** Runoff Area=354,037 sf 31.26% Impervious Runoff Depth=3.97"
Tc=9.0 min CN=74 Runoff=34.17 cfs 117,198 cf

**Subcatchment 3: Subcat 3** Runoff Area=45,329 sf 0.93% Impervious Runoff Depth=2.17"
Flow Length=541' Tc=21.6 min CN=56 Runoff=1.61 cfs 8,183 cf

**Subcatchment 4: Subcat 4** Runoff Area=43,557 sf 92.44% Impervious Runoff Depth=6.21"
Tc=5.0 min CN=94 Runoff=6.87 cfs 22,537 cf

**Subcatchment 5: Subcat 5** Runoff Area=29,501 sf 100.00% Impervious Runoff Depth=6.68"
Tc=5.0 min CN=98 Runoff=4.76 cfs 16,424 cf

**Subcatchment 6: Subcat 6** Runoff Area=144,014 sf 6.71% Impervious Runoff Depth=4.73"
Tc=5.0 min UI Adjusted CN=81 Runoff=18.78 cfs 56,774 cf

**Subcatchment 7: Subcat 7** Runoff Area=3,353 sf 0.01% Impervious Runoff Depth=1.12"
Tc=5.0 min CN=44 Runoff=0.07 cfs 313 cf

**Pond 4P: Stormwater Practice #1** Peak Elev=26.26' Storage=5,833 cf Inflow=11.63 cfs 38,961 cf
Discarded=3.35 cfs 38,353 cf Primary=0.24 cfs 608 cf Outflow=3.58 cfs 38,961 cf

**Pond 5P: MH** Peak Elev=25.57' Inflow=1.85 cfs 8,791 cf
15.0" Round Culvert n=0.013 L=90.0' S=0.0100 '/' Outflow=1.85 cfs 8,791 cf

**Link 4L: West Off-Site** Inflow=18.78 cfs 56,774 cf
Primary=18.78 cfs 56,774 cf

**Link 5L: North Off-Site** Inflow=0.07 cfs 313 cf
Primary=0.07 cfs 313 cf

**Link 6L: Allyn's Pond** Inflow=50.46 cfs 274,972 cf
Primary=50.46 cfs 274,972 cf

**Total Runoff Area = 892,228 sf Runoff Volume = 370,412 cf Average Runoff Depth = 4.98"**
**50.91% Pervious = 454,192 sf 49.09% Impervious = 438,036 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=272,438 sf 90.86% Impervious Runoff Depth=7.38"
Tc=28.5 min CN=97 Runoff=27.85 cfs 167,569 cf

**Subcatchment 2: Subcat 2** Runoff Area=354,037 sf 31.26% Impervious Runoff Depth=4.69"
Tc=9.0 min CN=74 Runoff=40.32 cfs 138,482 cf

**Subcatchment 3: Subcat 3** Runoff Area=45,329 sf 0.93% Impervious Runoff Depth=2.71"
Flow Length=541' Tc=21.6 min CN=56 Runoff=2.07 cfs 10,248 cf

**Subcatchment 4: Subcat 4** Runoff Area=43,557 sf 92.44% Impervious Runoff Depth=7.02"
Tc=5.0 min CN=94 Runoff=7.72 cfs 25,493 cf

**Subcatchment 5: Subcat 5** Runoff Area=29,501 sf 100.00% Impervious Runoff Depth=7.50"
Tc=5.0 min CN=98 Runoff=5.33 cfs 18,439 cf

**Subcatchment 6: Subcat 6** Runoff Area=144,014 sf 6.71% Impervious Runoff Depth=5.50"
Tc=5.0 min UI Adjusted CN=81 Runoff=21.70 cfs 65,974 cf

**Subcatchment 7: Subcat 7** Runoff Area=3,353 sf 0.01% Impervious Runoff Depth=1.51"
Tc=5.0 min CN=44 Runoff=0.11 cfs 421 cf

**Pond 4P: Stormwater Practice #1** Peak Elev=26.64' Storage=7,429 cf Inflow=13.05 cfs 43,932 cf
Discarded=3.35 cfs 43,057 cf Primary=0.28 cfs 875 cf Outflow=3.62 cfs 43,932 cf

**Pond 5P: MH** Peak Elev=25.66' Inflow=2.34 cfs 11,123 cf
15.0" Round Culvert n=0.013 L=90.0' S=0.0100 '/' Outflow=2.34 cfs 11,123 cf

**Link 4L: West Off-Site** Inflow=21.70 cfs 65,974 cf
Primary=21.70 cfs 65,974 cf

**Link 5L: North Off-Site** Inflow=0.11 cfs 421 cf
Primary=0.11 cfs 421 cf

**Link 6L: Allyn's Pond** Inflow=58.68 cfs 317,173 cf
Primary=58.68 cfs 317,173 cf

**Total Runoff Area = 892,228 sf Runoff Volume = 426,626 cf Average Runoff Depth = 5.74"**
**50.91% Pervious = 454,192 sf 49.09% Impervious = 438,036 sf**

# APPENDIX E

## Water Quality Volume and Water Quality Flow Calculations

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| | | | |
|---|---|---|---|
| **Project:** | Sterling Building Stormwater Practice | | |
| **Calculated By:** | Alex Healy | **Date:** | **07/20/22** |
| **Checked By:** | Susan Marquardt | **Date:** | **07/20/22** |

# Water Quality Volume and Water Quality Flow Worksheet

| | |
|---|---|
| Watershed: | DA-4, DA-5 |
| Condition: | Proposed |

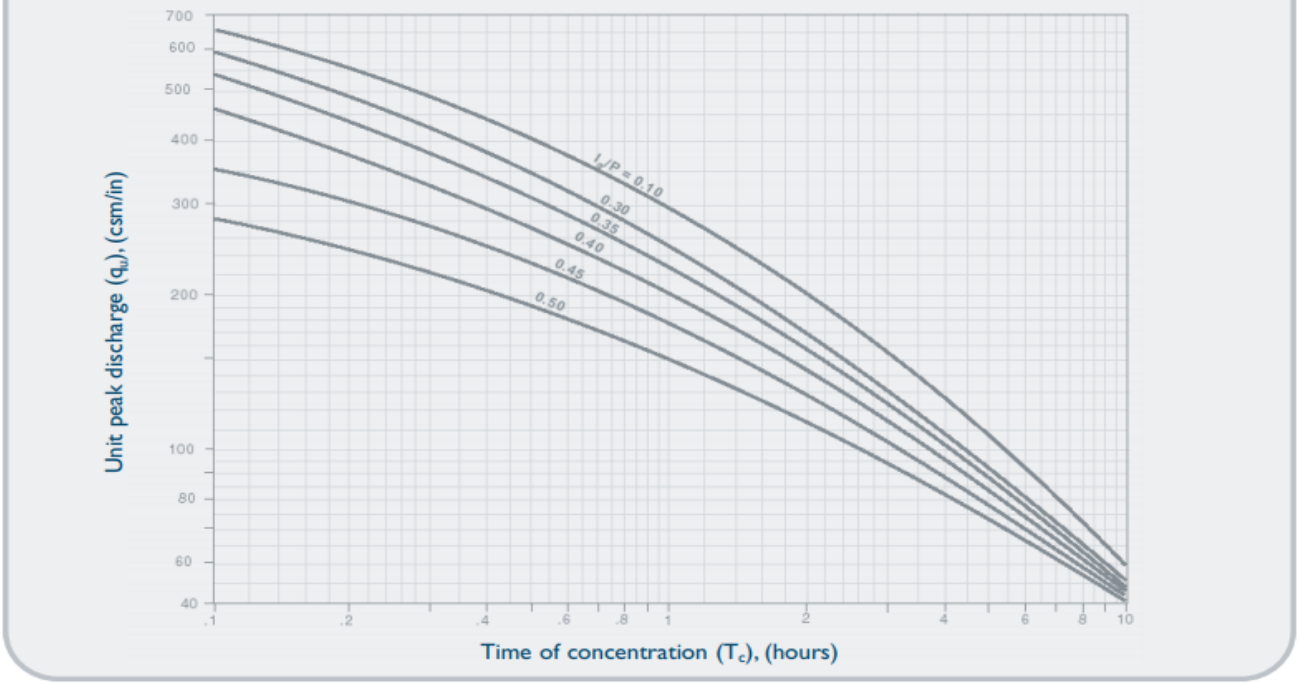
**Water Quality Volume**

| | | |
|---|---|---|
| Design Precipitation, P: | 1 | *in* |
| Percent Impervious Cover, I: | 95% | |
| Volumetric Runoff Coefficient, R: | *0.909* | |
| Area, A: | 1.70 | acres |
| Water Quality Volume, WQV: | ***5,612*** | C.F. |

**Water Quality Flow**

| | | | |
|---|---|---|---|
| Runoff Depth, Q: | *0.909* | *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, $q_u$: | 650 | *csm/in* | (from Exhibit 4-111 below) |
| Area, A: | *0.00266* | $mi^2$ | |
| Water Quality Flow, WQF: | ***1.57*** | *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**

**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** | 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** | 5.00 | **Peak Flow (cfs)** | 7.72 |
| **Groundwater Depth (ft)** | 10 - 15 | **Pipe Invert Depth (ft)** | 0 - 5 | **Bedrock Depth (ft)** | 10 - 15 |
| **Multiple Inlets?** | Yes | **Grate Inlet Required?** | No | **Pipe Size (in)** | 12.00 |
| **Required Particle Size Distribution?** | No | **90° between two inlets?** | No | | |

| 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 #2**

**CDS CDS4045-8-C**

| 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** | 3.52 | **Peak Flow (cfs)** | 5.33 |
| **Groundwater Depth (ft)** | 10 - 15 | **Pipe Invert Depth (ft)** | 0 - 5 | **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** | CDS | **System Model** | CDS4045-8-C | |
| **Target Removal** | 80% | **Particle Size Distribution (PSD)** | 50 | |

# 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. Subsurface detention systems

   Underground detention systems shall be inspected through the surface openings quarterly and sediment/debris shall be removed as needed to ensure proper functioning of structures and inlets/outlets. Areas of disturbance that may be as a result of cleaning shall be seeded and planted in accordance with the original planting plan. Associated structures shall be maintained yearly, or more frequently, as required, by the condition of the site and system. Waste material will be properly disposed of off-site.

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.

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 | | | |
| **Subsurface Infiltration System** | | | |
| Settling Over System | | | |
| Sedimentation Accumulation | | | |
| Large Floating Debris | | | |
| Inspection Structure Integrity | | | |
| Inspection Structure Frame and Cover | | | |
| **Surrounding Lawn and Vegetated Areas** | | | |
| Signs of Erosion | | | |
| Ponding/Settling | | | |
| Overgrowth | | | |

Additional Comments: _____