GPI

STORMWATER MANAGEMENT REPORT

PROPOSED RETAIL MOTOR FUEL OUTLET
ASSESSOR'S MAP 3 LOT WM1436
1436 WEST MAIN STREET
RICHMOND, VERMONT

GPI

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June 22, 2022

(GPI Project No.: MAX-0465419)

Summit Distributing, LLC
Proposed Retail Motor Fuel Outlet
Stormwater Management Report

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SECTION 1 EXECUTIVE SUMMARY

This report contains a stormwater management analysis for the proposed retail motor fuel outlet redevelopment located at 1436 West Main Street (Route 2) in Richmond, Vermont. The analysis includes both pre- and post-development calculations of stormwater runoff rates at specific locations on the project site.

The analysis has been prepared in accordance with both Town of Richmond requirements and the Vermont Stormwater Treatment Standards contained in the 2017 Vermont Stormwater Management Rule and Design Guidance.

The project site consists of one parcel identified as Map 3 Lot WM1436 which totals approximately 4.216 acres and consists mostly of Class II wetlands which surround the area of the existing development. The study area for the purpose of this analysis is approximately 1.203 acres. The site is bordered by West Main Street (Route 2) to the south, an onramp to Interstate 89 to the west, Interstate 89 to the north, and an undeveloped lot to the east.

The applicant is proposing to demolish the existing store and fuel canopy and construct a new 4,050 square foot convenience store with a 640 square foot quick service restaurant, a new fuel canopy with 4 retail fuel islands with 8 fueling locations, and associated paved driveways and parking. Access to the redevelopment will be provided by the existing full access driveway along West Main Street.

In order to mitigate increase in peak discharges rates of stormwater runoff as a result of the new impervious surfaces, a comprehensive stormwater management system has been designed that includes deep-sump, hooded catch basins, two slotted trench drains, two First Defense hydrodynamic separator units, an oil/water separator tank, an underground detention system, and a crushed stone drip strip.

Based on site topography and existing onsite drainage systems, one analysis point is used for the purposed of this analysis. Design Point #1 represents the wetlands which surround the developed upland portion of the site and receive all stormwater runoff.

The table below summarizes the comparative pre- and post-development peak rates of stormwater runoff at each design point.

TABLE 1: PEAK RATE ANALYSIS SUMMARY

Design Storm	Pre-Development (cfs)	Post-Development (cfs)	Change (cfs)
DESIGN POINT #1 – On-site Wetlands			
1-year	1.7	1.5	-0.2
10-year	3.3	2.9	-0.4
25-year	4.4	3.7	-0.7
100-year	6.8	6.0	-0.8

(All values shown are peak rates in CFS)

In conclusion, by incorporating a new on-site drainage system that includes provisions for stormwater treatment and detention, there will be a decrease in the peak rates of stormwater runoff leaving the property at the design point as a result of this project meeting the Overbank Flood and Extreme Flood Protection Standards.

Implementing the maintenance procedures outlined in the Operation and Maintenance Plan (O&M) will ensure the long-term performance of the system.

Compliance with the Channel Protection Standard is shown in the table below.

TABLE 2: CHANNEL PROTECTION CRITERIA SUMMARY

1-Year Pre Volume (cf)	1-Year Post Volume (cf)	Channel Protection Standard Met?
DESIGN POINT #1 – On-site Wetlands		
3,085	3,613	No

Due to the nature of the site as a raised mound surrounded by wetlands, there is limited space available for groundwater recharge practices to reduce the volume of stormwater runoff. A crushed stone drip strip is incorporated at the rear of the proposed convenience store in an effort to provide on-site groundwater recharge. Other recharge measures, including an underground infiltration system were explored, however, site constraints restrict their use due to the required 3-foot separation to groundwater. Additionally, on-site soils identified by NRCS are poorly drained with very shallow depths to seasonal high groundwater. A crushed stone outlet apron is provided at the flared end section discharge point to dissipate runoff leaving the site and protect the surrounding wetland. Peak flow rates of runoff, as shown above, are reduced for all design storms.

SECTION 2 EXISTING CONDITIONS

The project site consists of one parcel identified as Map 3 Lot WM1436 which totals approximately 4.216 acres and consists mostly of Class II wetlands which surround the area of the existing development. The study area for the purpose of this analysis is approximately 1.203 acres. The site is bordered by West Main Street (Route 2) to the south, an onramp to Interstate 89 to the west, Interstate 89 to the north, and an undeveloped lot to the east.

The site is currently developed with a 1,514 square foot convenience store and a fueling canopy with 4 retail fuel islands with 8 fueling locations. The developed portion of the site sits on a mound which is otherwise surrounded by a Class II wetland comprising most of the property.

Site topography within the developed area is generally flat with slopes from 1-3% and topography drops off towards the wetland at slopes of 25% or greater. Elevations range from approximately 306 north of the existing convenience store to 298 along the edge of the delineated wetland.

Existing drainage structures consist of two trench drains at the driveway along the property line, and an existing catch basin in the northern portion of the pavement. The trench drains, which have been partially filled with concrete, discharge through a 12” HDPE pipe to the west into the wetland. The catch basin discharges through a 12” RCP pipe at an existing headwall north of the existing development to the wetland.

The NRCS Web Soil Survey identifies on-site soils as primarily Limerick silt loam with a Hydrologic Soil Group (HSG) classification of B/D. Refer to Appendix B for additional information.

On-site wetlands were delineated by Trudell Consulting Engineers on August 14, 2019.

The site is located in a special flood hazard area (100-year flood) per Flood Insurance Rate Map Number 50007C0292E. The site is located at a base flood elevation of 306.00. An upland area on-site is being regraded for compensatory flood storage.

SECTION 3 PROPOSED CONDITIONS

The applicant is proposing to demolish the existing store and fuel canopy and construct a new 4,050 square foot convenience store with a 640 square foot quick service restaurant, a new fuel canopy with 4 retail fuel islands with 8 fueling locations, and associated paved driveways and parking. Access to the redevelopment will be provided by the existing full access driveway along West Main Street. Water service will be provided by the existing on-site well which is to remain and be plumbed into the new building. Sewer will be provided by a new septic system designed by others with on-site tanks and a pump station which directs effluent through a force main to a new disposal system located off-site. Electric service will be provided via a new underground three-phase service from West Main Street. Gas service will be provided from West Main Street.

In order to mitigate increase in peak discharges rates of stormwater runoff as a result of the new impervious surfaces, a comprehensive stormwater management system has been designed that includes deep-sump, hooded catch basins, two slotted trench drains, two First Defense hydrodynamic separator units, an oil/water separator tank, an underground detention system, and a crushed stone drip strip. BMP's included in the proposed stormwater system are designed to improve stormwater quality and quantity at the design point. Underground drainage pipes have been sized to accommodate a 25-year storm event.

Runoff from paved areas surrounding the fueling area will be captured in hooded catch basins with deep sumps or slotted drains and directed through First Defense hydrodynamic separator units to remove floatables, fine particles, and provide some storage for fuels/oils in the event of a spill. Runoff will then flow through an oil/water separator for additional oil and grit removal prior to entering an underground detention system consisting of 36" diameter HDPE pipes with watertight joints and an outlet control structure (OCS) to reduce peak flow rates discharging off-site at Design Point #1.

Runoff from the rear portion of the proposed convenience store will be captured in a crushed stone drip strip to provide groundwater recharge of the roof runoff.

The use of other treatment BMPs was explored, however, implementing these BMPs is not feasible at this site due to space constraints of the surrounding wetlands, presence of shallow groundwater and poorly drained soils, and limitations due to other utilities, underground storage tanks and fuel product piping. Additionally, the use as a retail motor fuel outlet has the potential to generate runoff with higher concentrations of pollutants (stormwater hotspot) which restricts the use of many non-structural and structural BMPs which could otherwise be implemented.

As described in Section 2, the site is located in a flood hazard area with a base flood elevation of 306.00. The proposed grading has been designed to provide equal to or greater flood storage at each elevation as shown in the summary table on the Grading & Drainage Plan. As part of the flood plain mitigation, an on-site upland area east of the project vicinity will be regraded to provide compensatory storage.

Although the project requires removal of some trees to construct the proposed improvements, additional tree plantings will be provided as shown on the Landscaping Plan to help restore and maintain the natural buffer between the development and the surrounding wetland.

An Operation & Maintenance Plan (O&M) will be implemented to safeguard against future intrusion of contaminants and TSS and ensure proper functioning of drainage components.

To prevent erosion and discharge of sediment during construction, Best Management Practices including silt fence, a stabilized construction exit, erosion control blanket, compost filter sock inlet protection, and mulch and seeding have been incorporated into the construction sequence.

The total area of disturbance related to the proposed construction on this property is approximately 45,000 square feet, therefore, the project will require an EPA Construction General Permit (CGP) under the NPDES program through Vermont Agency of Natural Resources – Department of Environmental Conservation.

SECTION 4 STORMWATER MODELING METHODOLOGY

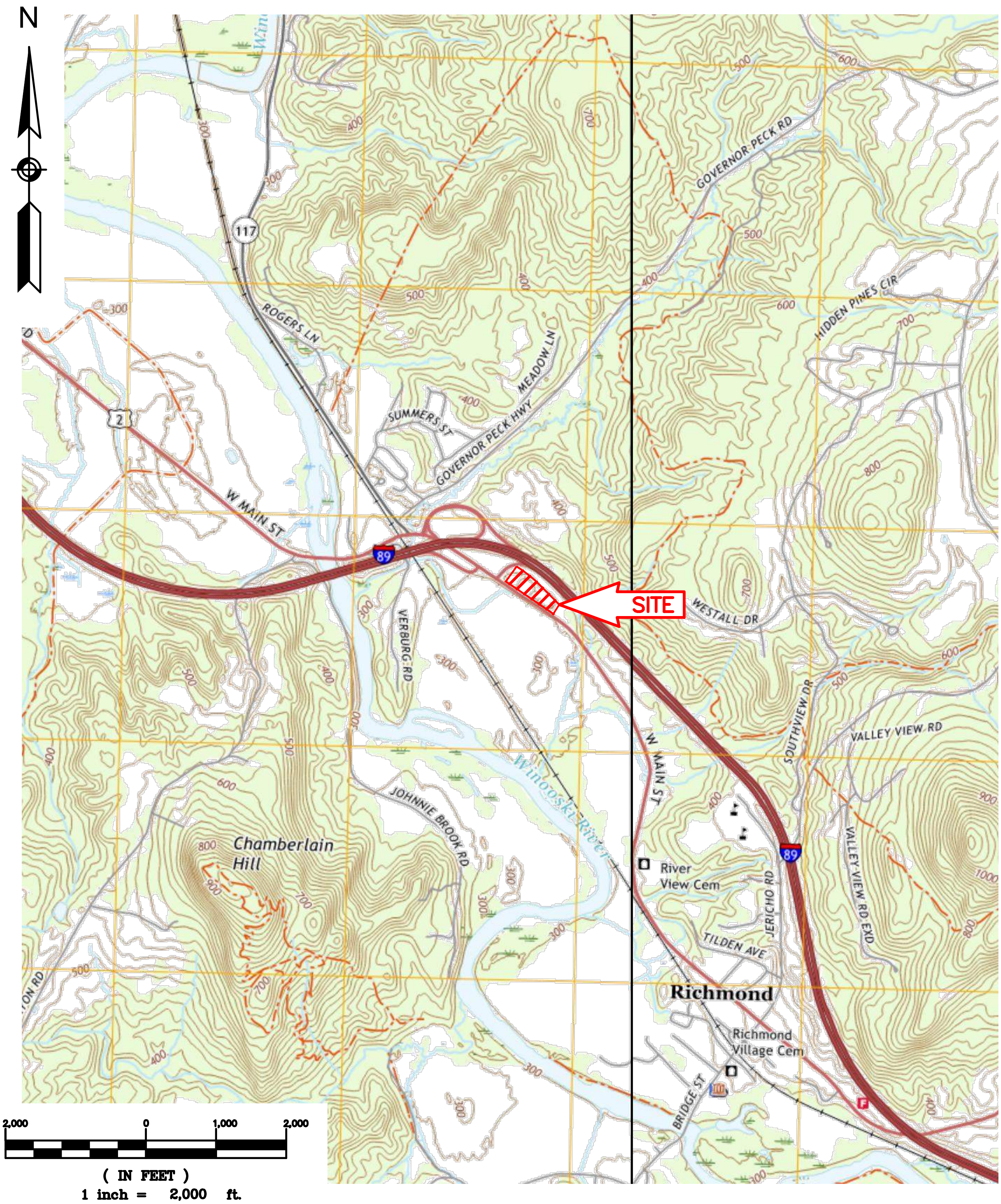
The drainage system for this project was modeled using HydroCAD, a stormwater modeling computer program that analyzes the hydrology, and hydraulics of stormwater runoff. HydroCAD is based largely on the hydrology techniques developed by the Soil Conservation Service (SCS/NRCS), combined with other hydrology and hydraulics calculations. For a given rainfall event, these techniques are used to generate hydrographs throughout a watershed. This provides verification that a given drainage system is adequate for the area under consideration, or to predict where flooding or erosion is likely to occur.

In HydroCAD, each watershed is modeled as a Subcatchment, streams and culverts as a Reach (or Pond, depending on available storage capacity), and large wetlands and other natural or artificial storage areas as a Pond. SCS hydrograph generation and routing procedures were used to model both Pre-development and Post-development runoff conditions.

The Pre-development and Post-development watershed limits and the subcatchment characteristics were determined using both USGS and on-the-ground topographic survey information and through visual, on-site inspection. Conservative estimates were used at all times in estimating the hydrologic characteristics of each watershed or subcatchment.

APPENDIX A

Figures



F:\Projects\Eng\465419\Drainage\Stormwater Report\Appendix A - Figures\4654 USGS MAP.dwg USGS 6/08/22 3:40pm cmason

USGS MAP

SUMMIT DISTRIBUTING, LLC
1436 WEST MAIN STREET
RICHMOND, VT

GPI Engineering Design Planning Construction Management

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DRAWN BY: CNM
PROJECT #: MAX-465419
DATE: 6/15/2022

FIGURE 1

National Flood Hazard Layer FIRMette

FEMA

44°25'32.26"N

73°0'40.78"W

73°0'3.33"W

44°25'6.57"N

Feet 1:6,000

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

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
- B 20.2 / 17.5 Cross Sections with 1% Annual Chance Water Surface Elevation
- 8 Coastal Transect
- 513 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 7/30/2019 at 4:55:10 PM 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 B

Soils Information

United States Department of Agriculture

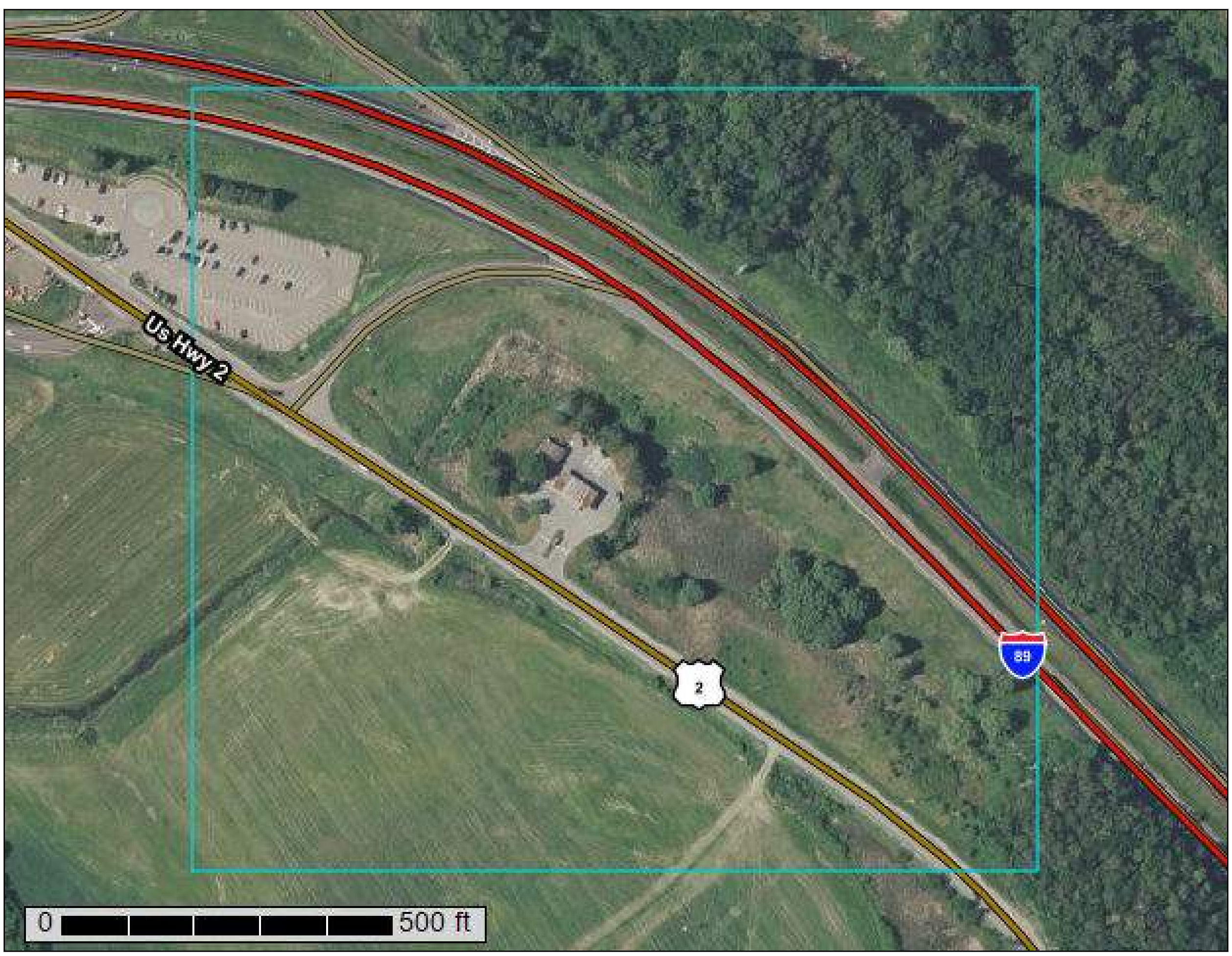
NRCS

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

Chittenden County, Vermont



May 24, 2022

Preface

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

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

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

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

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

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

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How Soil Surveys Are Made

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

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

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

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

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

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

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

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

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

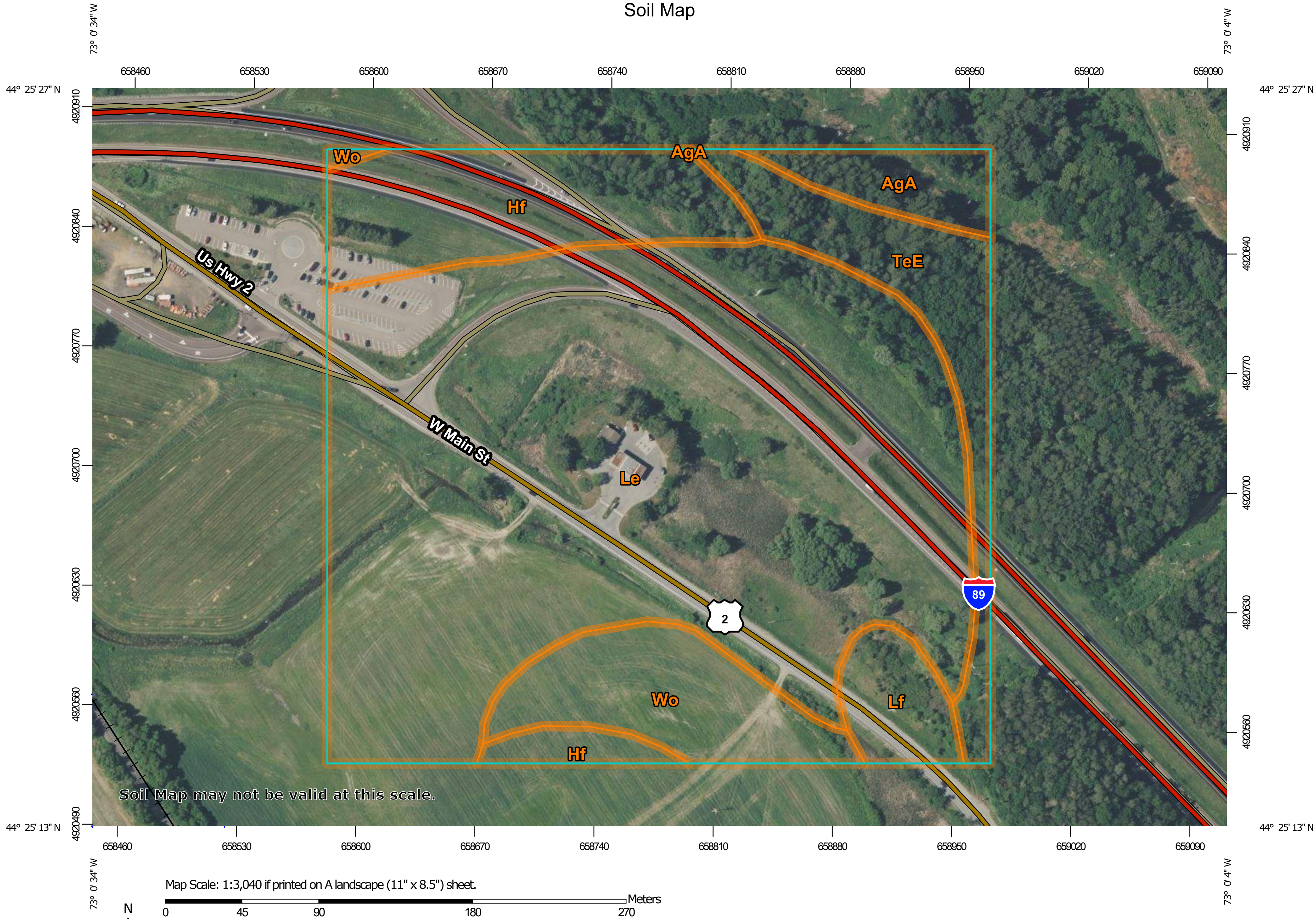
Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree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

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

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

Soil Map



Map Scale: 1:3,040 if printed on A landscape (11" x 8.5") sheet.

N

0 45 90 180 270 Meters

0 100 200 400 600 Feet

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 1:15,800.

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

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

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

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

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

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

Soil Survey Area: Chittenden County, Vermont
Survey Area Data: Version 24, Sep 9, 2021

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

Date(s) aerial images were photographed: Jun 18, 2020—Jun 20, 2020

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
AgA	Agawam fine sandy loam, 0 to 5 percent slopes	1.1	3.2%
Hf	Hadley very fine sandy loam	4.2	12.1%
Le	Limerick silt loam	22.7	65.5%
Lf	Limerick silt loam, very wet	1.1	3.2%
TeE	Terrace escarpments, silty and clayey	2.8	8.1%
Wo	Winooski very fine sandy loam	2.8	7.9%
Totals for Area of Interest		**34.7**	**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.

Chittenden County, Vermont

AgA—Agawam fine sandy loam, 0 to 5 percent slopes

Map Unit Setting

National map unit symbol: 9g2t
Elevation: 90 to 1,200 feet
Mean annual precipitation: 30 to 50 inches
Mean annual air temperature: 37 to 52 degrees F
Frost-free period: 90 to 180 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: Terraces
Landform position (three-dimensional): Tread
Down-slope shape: Convex, linear
Across-slope shape: Convex, linear
Parent material: Coarse-loamy glaciofluvial deposits over sandy and gravelly glaciofluvial deposits

Typical profile

H1 - 0 to 9 inches: fine sandy loam
H2 - 9 to 18 inches: fine sandy loam
H3 - 18 to 32 inches: loamy sand
H4 - 32 to 65 inches: gravelly loamy fine sand

Properties and qualities

Slope: 0 to 5 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 5.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 1
Hydrologic Soil Group: A
Ecological site: F142XB002VT - Dry Outwash
Hydric soil rating: No

Minor Components

Adams

Percent of map unit: 3 percent

Landform: Terraces
Hydric soil rating: No

Deerfield
Percent of map unit: 3 percent
Landform: Terraces, deltas
Hydric soil rating: No

Hartland
Percent of map unit: 3 percent
Hydric soil rating: No

Ninigret
Percent of map unit: 3 percent
Hydric soil rating: No

Windsor
Percent of map unit: 3 percent
Landform: Terraces
Hydric soil rating: No

Hf—Hadley very fine sandy loam

Map Unit Setting
National map unit symbol: 9g48
Elevation: 90 to 1,000 feet
Mean annual precipitation: 30 to 50 inches
Mean annual air temperature: 45 to 52 degrees F
Frost-free period: 120 to 180 days
Farmland classification: All areas are prime farmland

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

Description of Hadley

Setting
Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Coarse-silty alluvium

Typical profile
H1 - 0 to 11 inches: very fine sandy loam
H2 - 11 to 68 inches: very fine sandy loam
H3 - 68 to 72 inches: silt loam

Properties and qualities
Slope: 0 to 3 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 high to high (0.60 to 2.00 in/hr)
Depth to water table: About 48 to 72 inches
Frequency of flooding: NoneOccasional
Frequency of ponding: None
Available water supply, 0 to 60 inches: High (about 10.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 1
Hydrologic Soil Group: B
Ecological site: F145XY001MA - Silty High Floodplain
Hydric soil rating: No

Minor Components

Agawam

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

Winooski

Percent of map unit: 5 percent
Landform: Flood plains
Hydric soil rating: No

Occum

Percent of map unit: 5 percent
Landform: Flood plains
Hydric soil rating: No

Le—Limerick silt loam

Map Unit Setting

National map unit symbol: 9g4m
Elevation: 90 to 1,000 feet
Mean annual precipitation: 30 to 50 inches
Mean annual air temperature: 45 to 52 degrees F
Frost-free period: 120 to 180 days
Farmland classification: Farmland of statewide importance, if drained

Map Unit Composition

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

Description of Limerick

Setting

Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Coarse-silty alluvium

Typical profile

H1 - 0 to 5 inches: silt loam
H2 - 5 to 28 inches: silt loam
H3 - 28 to 65 inches: silt loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: About 0 to 18 inches
Frequency of flooding: NoneFrequent
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very high (about 13.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: B/D
Hydric soil rating: Yes

Minor Components

Winooski

Percent of map unit: 8 percent
Landform: Flood plains
Hydric soil rating: No

Rippowam

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

Lf—Limerick silt loam, very wet

Map Unit Setting

National map unit symbol: 9g4n
Elevation: 90 to 1,000 feet
Mean annual precipitation: 30 to 50 inches
Mean annual air temperature: 45 to 52 degrees F

Frost-free period: 120 to 180 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Limerick

Setting

Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Coarse-silty alluvium

Typical profile

H1 - 0 to 5 inches: silt loam
H2 - 5 to 28 inches: silt loam
H3 - 28 to 65 inches: silt loam

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: About 0 to 18 inches
Frequency of flooding: NoneFrequent
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very high (about 13.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4w
Hydrologic Soil Group: B/D
Hydric soil rating: Yes

Minor Components

Winooski

Percent of map unit: 8 percent
Landform: Flood plains
Hydric soil rating: No

Rippowam

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

TeE—Terrace escarpments, silty and clayey

Map Unit Setting

National map unit symbol: 9g61
Elevation: 90 to 1,000 feet
Mean annual precipitation: 30 to 50 inches
Mean annual air temperature: 45 to 52 degrees F
Frost-free period: 120 to 180 days
Farmland classification: Not prime farmland

Map Unit Composition

Udorthents and similar soils: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Udorthents

Setting

Landform: Terraces
Landform position (three-dimensional): Riser
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Mine spoil or earthy fill

Typical profile

H1 - 0 to 65 inches: gravelly sandy loam

Properties and qualities

Depth to restrictive feature: More than 80 inches
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 6.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: A
Hydric soil rating: Unranked

Wo—Winooski very fine sandy loam

Map Unit Setting

National map unit symbol: 9g68
Elevation: 90 to 1,000 feet

Mean annual precipitation: 30 to 50 inches
Mean annual air temperature: 45 to 52 degrees F
Frost-free period: 120 to 180 days
Farmland classification: All areas are prime farmland

Map Unit Composition

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

Description of Winooski

Setting

Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Coarse-silty alluvium

Typical profile

H1 - 0 to 10 inches: very fine sandy loam
H2 - 10 to 60 inches: very fine sandy loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 6.00 in/hr)
Depth to water table: About 18 to 36 inches
Frequency of flooding: NoneOccasional
Frequency of ponding: None
Available water supply, 0 to 60 inches: High (about 10.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: C
Hydric soil rating: No

Minor Components

Hadley

Percent of map unit: 5 percent
Landform: Flood plains
Hydric soil rating: No

Limerick

Percent of map unit: 5 percent
Landform: Depressions on flood plains
Hydric soil rating: Yes

Pootatuck

Percent of map unit: 5 percent
Landform: Flood plains
Hydric soil rating: No

Soil Information for All Uses

Soil Properties and Qualities

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

Soil Qualities and Features

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

Hydrologic Soil Group

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

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

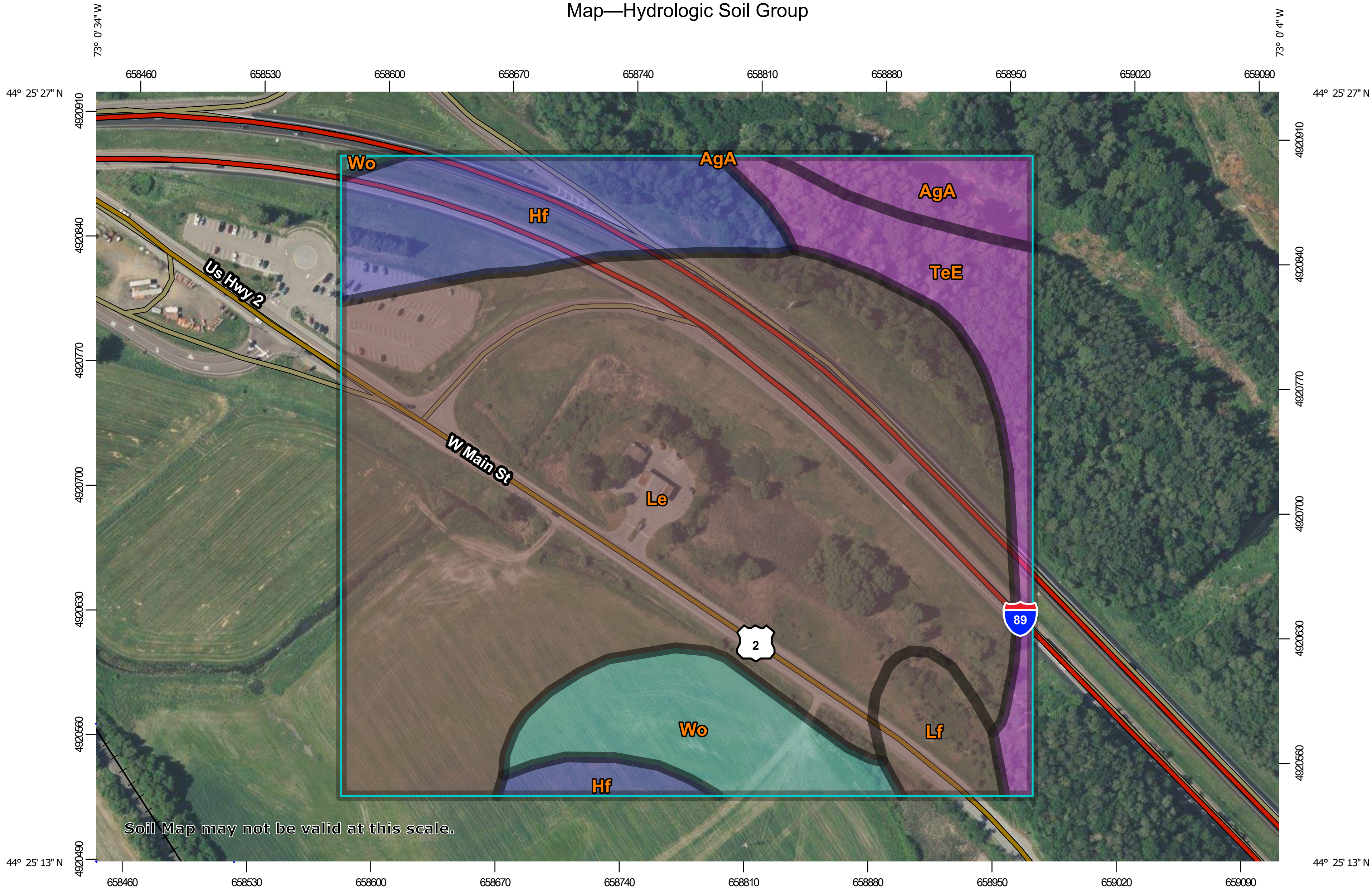
Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

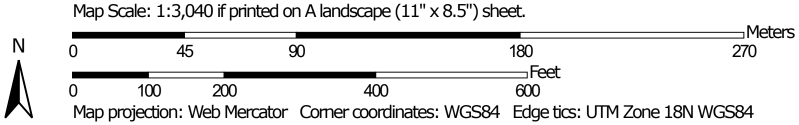
Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Map—Hydrologic Soil Group



Map Scale: 1:3,040 if printed on A landscape (11" x 8.5") sheet.



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 Rating Polygons

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features

Streams and Canals

Transportation

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

Background

Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: Chittenden County, Vermont
Survey Area Data: Version 24, Sep 9, 2021

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

Date(s) aerial images were photographed: Jun 18, 2020—Jun 20, 2020

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

Table—Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
AgA	Agawam fine sandy loam, 0 to 5 percent slopes	A	1.1	3.2%
Hf	Hadley very fine sandy loam	B	4.2	12.1%
Le	Limerick silt loam	B/D	22.7	65.5%
Lf	Limerick silt loam, very wet	B/D	1.1	3.2%
TeE	Terrace escarpments, silty and clayey	A	2.8	8.1%
Wo	Winooski very fine sandy loam	C	2.8	7.9%
Totals for Area of Interest			**34.7**	**100.0%**

Rating Options—Hydrologic Soil Group

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

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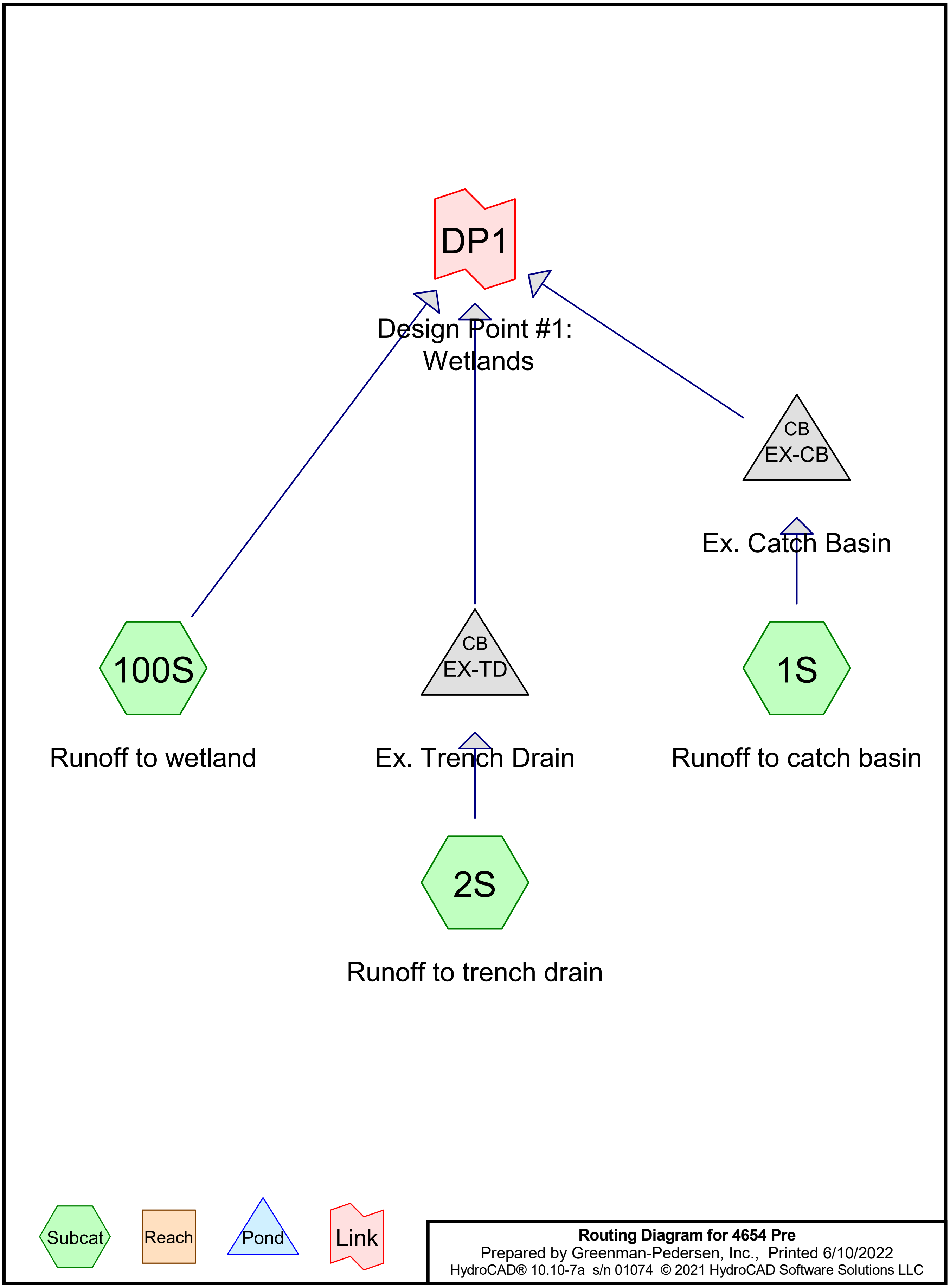
APPENDIX C

Pre-Development HydroCAD Computations



Routing Diagram for 4654 Pre
Prepared by Greenman-Pedersen, Inc., Printed 6/10/2022
HydroCAD® 10.10-7a s/n 01074 © 2021 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
18,449	61	>75% Grass cover, Good, HSG B (1S, 2S, 100S)
20,221	98	Paved parking, HSG B (1S, 2S)
3,388	98	Roofs, HSG B (2S)
10,344	58	Woods/grass comb., Good, HSG B (100S)
52,401	**77**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
0	HSG A	
52,401	HSG B	1S, 2S, 100S
0	HSG C	
0	HSG D	
0	Other	
52,401		**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	S N
0	18,449	0	0	0	18,449	>75% Grass cover, Good	
0	20,221	0	0	0	20,221	Paved parking	
0	3,388	0	0	0	3,388	Roofs	
0	10,344	0	0	0	10,344	Woods/grass comb., Good	
0	**52,401**	**0**	**0**	**0**	**52,401**	**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	EX-CB	299.10	298.00	50.0	0.0220	0.012	0.0	12.0	0.0
2	EX-TD	301.32	298.16	42.0	0.0752	0.012	0.0	12.0	0.0

Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: Runoff to catch basin Runoff Area=9,369 sf 67.71% Impervious Runoff Depth=0.87"
Flow Length=104' Slope=0.0090 '/' Tc=1.2 min CN=86 Runoff=0.40 cfs 681 cf

Subcatchment 2S: Runoff to trench drain Runoff Area=19,153 sf 90.14% Impervious Runoff Depth=1.42"
Flow Length=118' Slope=0.0200 '/' Tc=1.0 min CN=94 Runoff=1.26 cfs 2,273 cf

Subcatchment 100S: Runoff to wetland Runoff Area=23,879 sf 0.00% Impervious Runoff Depth=0.07"
Flow Length=80' Tc=3.6 min CN=60 Runoff=0.01 cfs 131 cf

Pond EX-CB: Ex. Catch Basin Peak Elev=299.41' Inflow=0.40 cfs 681 cf
12.0" Round Culvert n=0.012 L=50.0' S=0.0220 '/' Outflow=0.40 cfs 681 cf

Pond EX-TD: Ex. Trench Drain Peak Elev=301.91' Inflow=1.26 cfs 2,273 cf
12.0" Round Culvert n=0.012 L=42.0' S=0.0752 '/' Outflow=1.26 cfs 2,273 cf

Link DP1: Design Point #1: Wetlands Inflow=1.66 cfs 3,085 cf
Primary=1.66 cfs 3,085 cf

Total Runoff Area = 52,401 sf Runoff Volume = 3,085 cf Average Runoff Depth = 0.71"
54.95% Pervious = 28,793 sf 45.05% Impervious = 23,608 sf

Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: Runoff to catch basin Runoff Area=9,369 sf 67.71% Impervious Runoff Depth=1.90"
Flow Length=104' Slope=0.0090 '/' Tc=1.2 min CN=86 Runoff=0.85 cfs 1,480 cf

Subcatchment 2S: Runoff to trench drain Runoff Area=19,153 sf 90.14% Impervious Runoff Depth=2.61"
Flow Length=118' Slope=0.0200 '/' Tc=1.0 min CN=94 Runoff=2.21 cfs 4,169 cf

Subcatchment 100S: Runoff to wetland Runoff Area=23,879 sf 0.00% Impervious Runoff Depth=0.44"
Flow Length=80' Tc=3.6 min CN=60 Runoff=0.38 cfs 868 cf

Pond EX-CB: Ex. Catch Basin Peak Elev=299.57' Inflow=0.85 cfs 1,480 cf
12.0" Round Culvert n=0.012 L=50.0' S=0.0220 '/' Outflow=0.85 cfs 1,480 cf

Pond EX-TD: Ex. Trench Drain Peak Elev=302.16' Inflow=2.21 cfs 4,169 cf
12.0" Round Culvert n=0.012 L=42.0' S=0.0752 '/' Outflow=2.21 cfs 4,169 cf

Link DP1: Design Point #1: Wetlands Inflow=3.29 cfs 6,517 cf
Primary=3.29 cfs 6,517 cf

Total Runoff Area = 52,401 sf Runoff Volume = 6,517 cf Average Runoff Depth = 1.49"
54.95% Pervious = 28,793 sf 45.05% Impervious = 23,608 sf

Summary for Subcatchment 1S: Runoff to catch basin

Runoff = 0.85 cfs @ 11.92 hrs, Volume= 1,480 cf, Depth= 1.90"
Routed to Pond EX-CB : Ex. Catch Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-yr Rainfall=3.27"

Area (sf)	CN	Description
3,025	61	>75% Grass cover, Good, HSG B
6,343	98	Paved parking, HSG B
9,369	86	Weighted Average
3,025		32.29% Pervious Area
6,343		67.71% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	20	0.0090	0.62		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.32"
0.7	84	0.0090	1.93		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.2	104	Total			

Summary for Subcatchment 2S: Runoff to trench drain

[49] Hint: Tc<2dt may require smaller dt

Runoff = 2.21 cfs @ 11.91 hrs, Volume= 4,169 cf, Depth= 2.61"
Routed to Pond EX-TD : Ex. Trench Drain

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-yr Rainfall=3.27"

Area (sf)	CN	Description
1,888	61	>75% Grass cover, Good, HSG B
13,877	98	Paved parking, HSG B
3,388	98	Roofs, HSG B
19,153	94	Weighted Average
1,888		9.86% Pervious Area
17,265		90.14% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	20	0.0200	0.85		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.32"
0.6	98	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.0	118	Total			

Summary for Subcatchment 100S: Runoff to wetland

Runoff = 0.38 cfs @ 11.97 hrs, Volume= 868 cf, Depth= 0.44"
Routed to Link DP1 : Design Point #1: Wetlands

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-yr Rainfall=3.27"

Area (sf)	CN	Description
13,536	61	>75% Grass cover, Good, HSG B
10,344	58	Woods/grass comb., Good, HSG B
23,879	60	Weighted Average
23,879		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.9	20	0.0250	0.11		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.32"
0.5	35	0.0250	1.11		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.2	25	0.2100	2.29		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
3.6	80	Total			

Summary for Pond EX-CB: Ex. Catch Basin

Inflow Area = 9,369 sf, 67.71% Impervious, Inflow Depth = 1.90" for 10-yr event
Inflow = 0.85 cfs @ 11.92 hrs, Volume= 1,480 cf
Outflow = 0.85 cfs @ 11.92 hrs, Volume= 1,480 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.85 cfs @ 11.92 hrs, Volume= 1,480 cf
Routed to Link DP1 : Design Point #1: Wetlands

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 299.57' @ 11.92 hrs
Flood Elev= 303.48'

Device	Routing	Invert	Outlet Devices
#1	Primary	299.10'	**12.0" Round Culvert** L= 50.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 299.10' / 298.00' S= 0.0220 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.84 cfs @ 11.92 hrs HW=299.57' TW=0.00' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 0.84 cfs @ 2.33 fps)

Summary for Pond EX-TD: Ex. Trench Drain

Inflow Area = 19,153 sf, 90.14% Impervious, Inflow Depth = 2.61" for 10-yr event
Inflow = 2.21 cfs @ 11.91 hrs, Volume= 4,169 cf
Outflow = 2.21 cfs @ 11.91 hrs, Volume= 4,169 cf, Atten= 0%, Lag= 0.0 min
Primary = 2.21 cfs @ 11.91 hrs, Volume= 4,169 cf
Routed to Link DP1 : Design Point #1: Wetlands

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 302.16' @ 11.91 hrs
Flood Elev= 302.82'

Device	Routing	Invert	Outlet Devices
#1	Primary	301.32'	**12.0" Round Culvert** L= 42.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 301.32' / 298.16' S= 0.0752 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=2.21 cfs @ 11.91 hrs HW=302.16' TW=0.00' (Dynamic Tailwater)
1=Culvert (Inlet Controls 2.21 cfs @ 3.13 fps)

Summary for Link DP1: Design Point #1: Wetlands

Inflow Area = 52,401 sf, 45.05% Impervious, Inflow Depth = 1.49" for 10-yr event
Inflow = 3.29 cfs @ 11.91 hrs, Volume= 6,517 cf
Primary = 3.29 cfs @ 11.91 hrs, Volume= 6,517 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: Runoff to catch basin Runoff Area=9,369 sf 67.71% Impervious Runoff Depth=2.54"
Flow Length=104' Slope=0.0090 '/' Tc=1.2 min CN=86 Runoff=1.12 cfs 1,981 cf

Subcatchment 2S: Runoff to trench drain Runoff Area=19,153 sf 90.14% Impervious Runoff Depth=3.31"
Flow Length=118' Slope=0.0200 '/' Tc=1.0 min CN=94 Runoff=2.76 cfs 5,290 cf

Subcatchment 100S: Runoff to wetland Runoff Area=23,879 sf 0.00% Impervious Runoff Depth=0.76"
Flow Length=80' Tc=3.6 min CN=60 Runoff=0.75 cfs 1,506 cf

Pond EX-CB: Ex. Catch Basin Peak Elev=299.65' Inflow=1.12 cfs 1,981 cf
12.0" Round Culvert n=0.012 L=50.0' S=0.0220 '/' Outflow=1.12 cfs 1,981 cf

Pond EX-TD: Ex. Trench Drain Peak Elev=302.35' Inflow=2.76 cfs 5,290 cf
12.0" Round Culvert n=0.012 L=42.0' S=0.0752 '/' Outflow=2.76 cfs 5,290 cf

Link DP1: Design Point #1: Wetlands Inflow=4.43 cfs 8,778 cf
Primary=4.43 cfs 8,778 cf

Total Runoff Area = 52,401 sf Runoff Volume = 8,778 cf Average Runoff Depth = 2.01"
54.95% Pervious = 28,793 sf 45.05% Impervious = 23,608 sf

Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: Runoff to catch basin Runoff Area=9,369 sf 67.71% Impervious Runoff Depth=3.82"
Flow Length=104' Slope=0.0090 '/' Tc=1.2 min CN=86 Runoff=1.64 cfs 2,985 cf

Subcatchment 2S: Runoff to trench drain Runoff Area=19,153 sf 90.14% Impervious Runoff Depth=4.68"
Flow Length=118' Slope=0.0200 '/' Tc=1.0 min CN=94 Runoff=3.81 cfs 7,475 cf

Subcatchment 100S: Runoff to wetland Runoff Area=23,879 sf 0.00% Impervious Runoff Depth=1.53"
Flow Length=80' Tc=3.6 min CN=60 Runoff=1.62 cfs 3,042 cf

Pond EX-CB: Ex. Catch Basin Peak Elev=299.79' Inflow=1.64 cfs 2,985 cf
12.0" Round Culvert n=0.012 L=50.0' S=0.0220 '/' Outflow=1.64 cfs 2,985 cf

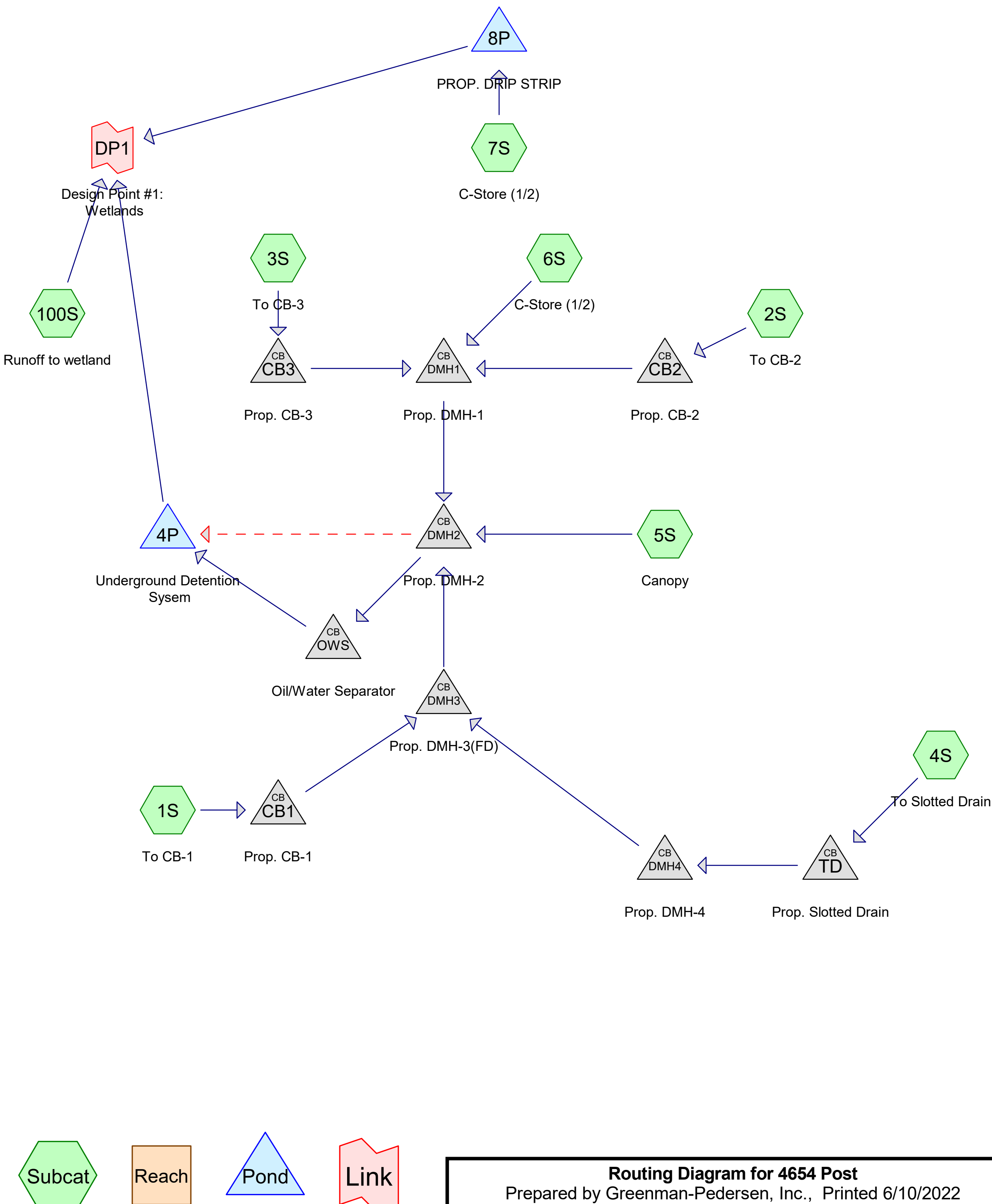
Pond EX-TD: Ex. Trench Drain Peak Elev=302.83' Inflow=3.81 cfs 7,475 cf
12.0" Round Culvert n=0.012 L=42.0' S=0.0752 '/' Outflow=3.81 cfs 7,475 cf

Link DP1: Design Point #1: Wetlands Inflow=6.78 cfs 13,501 cf
Primary=6.78 cfs 13,501 cf

Total Runoff Area = 52,401 sf Runoff Volume = 13,501 cf Average Runoff Depth = 3.09"
54.95% Pervious = 28,793 sf 45.05% Impervious = 23,608 sf

APPENDIX D

Post-Development HydroCAD Computations



Routing Diagram for 4654 Post
Prepared by Greenman-Pedersen, Inc., Printed 6/10/2022
HydroCAD® 10.10-7a s/n 01074 © 2021 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
17,389	61	>75% Grass cover, Good, HSG B (2S, 3S, 4S, 100S)
27,742	98	Paved parking, HSG B (1S, 2S, 3S, 4S, 5S, 6S, 7S, 100S)
7,269	58	Woods/grass comb., Good, HSG B (100S)
52,401	**80**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
0	HSG A	
52,401	HSG B	1S, 2S, 3S, 4S, 5S, 6S, 7S, 100S
0	HSG C	
0	HSG D	
0	Other	
52,401		**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	S N
0	17,389	0	0	0	17,389	>75% Grass cover, Good	
0	27,742	0	0	0	27,742	Paved parking	
0	7,269	0	0	0	7,269	Woods/grass comb., Good	
0	**52,401**	**0**	**0**	**0**	**52,401**	**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	299.00	298.50	19.0	0.0263	0.012	0.0	12.0	0.0
2	CB1	300.30	300.00	79.0	0.0038	0.012	0.0	12.0	0.0
3	CB2	301.00	300.00	102.0	0.0098	0.012	0.0	12.0	0.0
4	CB3	300.30	300.00	20.0	0.0150	0.012	0.0	12.0	0.0
5	DMH1	299.90	299.55	27.0	0.0130	0.012	0.0	12.0	0.0
6	DMH2	299.45	299.35	7.0	0.0143	0.012	0.0	6.0	0.0
7	DMH2	299.95	299.00	20.0	0.0475	0.012	0.0	12.0	0.0
8	DMH3	299.90	299.55	36.0	0.0097	0.012	0.0	12.0	0.0
9	DMH4	300.60	300.00	71.0	0.0085	0.012	0.0	12.0	0.0
10	OWS	299.10	299.00	4.0	0.0250	0.012	0.0	6.0	0.0
11	TD	301.40	301.20	4.0	0.0500	0.012	0.0	8.0	0.0

Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: To CB-1 Runoff Area=2,051 sf 100.00% Impervious Runoff Depth=1.80"
Flow Length=58' Slope=0.0210 '/' Tc=0.6 min CN=98 Runoff=0.16 cfs 308 cf

Subcatchment 2S: To CB-2 Runoff Area=5,479 sf 96.29% Impervious Runoff Depth=1.70"
Flow Length=60' Slope=0.0200 '/' Tc=0.6 min CN=97 Runoff=0.41 cfs 777 cf

Subcatchment 3S: To CB-3 Runoff Area=4,931 sf 93.32% Impervious Runoff Depth=1.60"
Flow Length=76' Slope=0.0140 '/' Tc=0.9 min CN=96 Runoff=0.35 cfs 659 cf

Subcatchment 4S: To Slotted Drain Runoff Area=6,395 sf 94.77% Impervious Runoff Depth=1.60"
Flow Length=70' Slope=0.0280 '/' Tc=0.5 min CN=96 Runoff=0.46 cfs 854 cf

Subcatchment 5S: Canopy Runoff Area=2,496 sf 100.00% Impervious Runoff Depth=1.80"
Tc=1.0 min CN=98 Runoff=0.19 cfs 375 cf

Subcatchment 6S: C-Store (1/2) Runoff Area=2,108 sf 100.00% Impervious Runoff Depth=1.80"
Tc=1.0 min CN=98 Runoff=0.16 cfs 317 cf

Subcatchment 7S: C-Store (1/2) Runoff Area=2,005 sf 100.00% Impervious Runoff Depth=1.80"
Tc=1.0 min CN=98 Runoff=0.15 cfs 301 cf

Subcatchment 100S: Runoff to wetland Runoff Area=26,936 sf 11.67% Impervious Runoff Depth=0.14"
Flow Length=50' Tc=3.1 min CN=65 Runoff=0.08 cfs 322 cf

Pond 4P: Underground Detention Sysem Peak Elev=299.84' Storage=137 cf Inflow=1.73 cfs 3,291 cf
Outflow=1.45 cfs 3,291 cf

Pond 8P: PROP. DRIP STRIP Peak Elev=301.95' Storage=108 cf Inflow=0.15 cfs 301 cf
Discarded=0.01 cfs 301 cf Primary=0.00 cfs 0 cf Outflow=0.01 cfs 301 cf

Pond CB1: Prop. CB-1 Peak Elev=300.65' Inflow=0.16 cfs 308 cf
12.0" Round Culvert n=0.012 L=79.0' S=0.0038 '/' Outflow=0.16 cfs 308 cf

Pond CB2: Prop. CB-2 Peak Elev=301.34' Inflow=0.41 cfs 777 cf
12.0" Round Culvert n=0.012 L=102.0' S=0.0098 '/' Outflow=0.41 cfs 777 cf

Pond CB3: Prop. CB-3 Peak Elev=300.73' Inflow=0.35 cfs 659 cf
12.0" Round Culvert n=0.012 L=20.0' S=0.0150 '/' Outflow=0.35 cfs 659 cf

Pond DMH1: Prop. DMH-1 Peak Elev=300.64' Inflow=0.92 cfs 1,752 cf
12.0" Round Culvert n=0.012 L=27.0' S=0.0130 '/' Outflow=0.92 cfs 1,752 cf

Pond DMH2: Prop. DMH-2 Peak Elev=300.51' Inflow=1.73 cfs 3,291 cf
Primary=0.61 cfs 2,742 cf Secondary=1.14 cfs 549 cf Outflow=1.73 cfs 3,291 cf

Pond DMH3: Prop. DMH-3(FD) Peak Elev=300.58' Inflow=0.62 cfs 1,163 cf
12.0" Round Culvert n=0.012 L=36.0' S=0.0097 '/' Outflow=0.62 cfs 1,163 cf

Pond DMH4: Prop. DMH-4 Peak Elev=300.99' Inflow=0.46 cfs 854 cf
12.0" Round Culvert n=0.012 L=71.0' S=0.0085 '/' Outflow=0.46 cfs 854 cf

Pond OWS: Oil/Water Separator Peak Elev=300.15' Inflow=0.61 cfs 2,742 cf
6.0" Round Culvert n=0.012 L=4.0' S=0.0250 '/' Outflow=0.61 cfs 2,742 cf

Pond TD: Prop. Slotted Drain Peak Elev=301.80' Inflow=0.46 cfs 854 cf
8.0" Round Culvert n=0.012 L=4.0' S=0.0500 '/' Outflow=0.46 cfs 854 cf

Link DP1: Design Point #1: Wetlands Inflow=1.49 cfs 3,613 cf
Primary=1.49 cfs 3,613 cf

Total Runoff Area = 52,401 sf Runoff Volume = 3,914 cf Average Runoff Depth = 0.90"
47.06% Pervious = 24,659 sf 52.94% Impervious = 27,742 sf

Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: To CB-1 Runoff Area=2,051 sf 100.00% Impervious Runoff Depth=3.04"
Flow Length=58' Slope=0.0210 '/' Tc=0.6 min CN=98 Runoff=0.26 cfs 519 cf

Subcatchment 2S: To CB-2 Runoff Area=5,479 sf 96.29% Impervious Runoff Depth=2.93"
Flow Length=60' Slope=0.0200 '/' Tc=0.6 min CN=97 Runoff=0.68 cfs 1,336 cf

Subcatchment 3S: To CB-3 Runoff Area=4,931 sf 93.32% Impervious Runoff Depth=2.82"
Flow Length=76' Slope=0.0140 '/' Tc=0.9 min CN=96 Runoff=0.60 cfs 1,158 cf

Subcatchment 4S: To Slotted Drain Runoff Area=6,395 sf 94.77% Impervious Runoff Depth=2.82"
Flow Length=70' Slope=0.0280 '/' Tc=0.5 min CN=96 Runoff=0.78 cfs 1,502 cf

Subcatchment 5S: Canopy Runoff Area=2,496 sf 100.00% Impervious Runoff Depth=3.04"
Tc=1.0 min CN=98 Runoff=0.31 cfs 632 cf

Subcatchment 6S: C-Store (1/2) Runoff Area=2,108 sf 100.00% Impervious Runoff Depth=3.04"
Tc=1.0 min CN=98 Runoff=0.26 cfs 534 cf

Subcatchment 7S: C-Store (1/2) Runoff Area=2,005 sf 100.00% Impervious Runoff Depth=3.04"
Tc=1.0 min CN=98 Runoff=0.25 cfs 507 cf

Subcatchment 100S: Runoff to wetland Runoff Area=26,936 sf 11.67% Impervious Runoff Depth=0.63"
Flow Length=50' Tc=3.1 min CN=65 Runoff=0.73 cfs 1,425 cf

Pond 4P: Underground Detention Sysem Peak Elev=300.52' Storage=397 cf Inflow=2.87 cfs 5,680 cf
Outflow=2.13 cfs 5,680 cf

Pond 8P: PROP. DRIP STRIP Peak Elev=302.27' Storage=206 cf Inflow=0.25 cfs 507 cf
Discarded=0.01 cfs 507 cf Primary=0.00 cfs 0 cf Outflow=0.01 cfs 507 cf

Pond CB1: Prop. CB-1 Peak Elev=300.94' Inflow=0.26 cfs 519 cf
12.0" Round Culvert n=0.012 L=79.0' S=0.0038 '/' Outflow=0.26 cfs 519 cf

Pond CB2: Prop. CB-2 Peak Elev=301.49' Inflow=0.68 cfs 1,336 cf
12.0" Round Culvert n=0.012 L=102.0' S=0.0098 '/' Outflow=0.68 cfs 1,336 cf

Pond CB3: Prop. CB-3 Peak Elev=301.04' Inflow=0.60 cfs 1,158 cf
12.0" Round Culvert n=0.012 L=20.0' S=0.0150 '/' Outflow=0.60 cfs 1,158 cf

Pond DMH1: Prop. DMH-1 Peak Elev=301.00' Inflow=1.53 cfs 3,028 cf
12.0" Round Culvert n=0.012 L=27.0' S=0.0130 '/' Outflow=1.53 cfs 3,028 cf

Pond DMH2: Prop. DMH-2 Peak Elev=300.86' Inflow=2.87 cfs 5,680 cf
Primary=0.62 cfs 4,208 cf Secondary=2.36 cfs 1,472 cf Outflow=2.87 cfs 5,680 cf

Pond DMH3: Prop. DMH-3(FD) Peak Elev=300.92' Inflow=1.03 cfs 2,021 cf
12.0" Round Culvert n=0.012 L=36.0' S=0.0097 '/' Outflow=1.03 cfs 2,021 cf

Pond DMH4: Prop. DMH-4 Peak Elev=301.18' Inflow=0.78 cfs 1,502 cf
12.0" Round Culvert n=0.012 L=71.0' S=0.0085 '/' Outflow=0.78 cfs 1,502 cf

Pond OWS: Oil/Water Separator Peak Elev=300.67' Inflow=0.62 cfs 4,208 cf
6.0" Round Culvert n=0.012 L=4.0' S=0.0250 '/' Outflow=0.62 cfs 4,208 cf

Pond TD: Prop. Slotted Drain Peak Elev=301.95' Inflow=0.78 cfs 1,502 cf
8.0" Round Culvert n=0.012 L=4.0' S=0.0500 '/' Outflow=0.78 cfs 1,502 cf

Link DP1: Design Point #1: Wetlands Inflow=2.86 cfs 7,105 cf
Primary=2.86 cfs 7,105 cf

Total Runoff Area = 52,401 sf Runoff Volume = 7,612 cf Average Runoff Depth = 1.74"
47.06% Pervious = 24,659 sf 52.94% Impervious = 27,742 sf

Summary for Subcatchment 1S: To CB-1

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.26 cfs @ 11.91 hrs, Volume= 519 cf, Depth= 3.04"
Routed to Pond CB1 : Prop. CB-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-yr Rainfall=3.27"

Area (sf)	CN	Description
2,051	98	Paved parking, HSG B
2,051		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	20	0.0210	0.87		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.32"
0.2	38	0.0210	2.94		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.6	58	Total			

Summary for Subcatchment 2S: To CB-2

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.68 cfs @ 11.91 hrs, Volume= 1,336 cf, Depth= 2.93"
Routed to Pond CB2 : Prop. CB-2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-yr Rainfall=3.27"

Area (sf)	CN	Description
203	61	>75% Grass cover, Good, HSG B
5,276	98	Paved parking, HSG B
5,479	97	Weighted Average
203		3.71% Pervious Area
5,276		96.29% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	20	0.0200	0.85		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.32"
0.2	40	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.6	60	Total			

Summary for Subcatchment 3S: To CB-3

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.60 cfs @ 11.91 hrs, Volume= 1,158 cf, Depth= 2.82"
Routed to Pond CB3 : Prop. CB-3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-yr Rainfall=3.27"

Area (sf)	CN	Description
329	61	>75% Grass cover, Good, HSG B
4,601	98	Paved parking, HSG B
4,931	96	Weighted Average
329		6.68% Pervious Area
4,601		93.32% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	20	0.0140	0.74		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.32"
0.4	56	0.0140	2.40		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.9	76	Total			

Summary for Subcatchment 4S: To Slotted Drain

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.78 cfs @ 11.91 hrs, Volume= 1,502 cf, Depth= 2.82"
Routed to Pond TD : Prop. Slotted Drain

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-yr Rainfall=3.27"

Area (sf)	CN	Description
335	61	>75% Grass cover, Good, HSG B
6,060	98	Paved parking, HSG B
6,395	96	Weighted Average
335		5.23% Pervious Area
6,060		94.77% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	20	0.0280	0.97		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.32"
0.2	50	0.0280	3.40		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.5	70	Total			

Summary for Subcatchment 5S: Canopy

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.31 cfs @ 11.91 hrs, Volume= 632 cf, Depth= 3.04"
Routed to Pond DMH2 : Prop. DMH-2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-yr Rainfall=3.27"

Area (sf)	CN	Description
2,496	98	Paved parking, HSG B
2,496		100.00% Impervious Area

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

Summary for Subcatchment 6S: C-Store (1/2)

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.26 cfs @ 11.91 hrs, Volume= 534 cf, Depth= 3.04"
Routed to Pond DMH1 : Prop. DMH-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-yr Rainfall=3.27"

Area (sf)	CN	Description
2,108	98	Paved parking, HSG B
2,108		100.00% Impervious Area

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

Summary for Subcatchment 7S: C-Store (1/2)

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.25 cfs @ 11.91 hrs, Volume= 507 cf, Depth= 3.04"
Routed to Pond 8P : PROP. DRIP STRIP

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-yr Rainfall=3.27"

Area (sf)	CN	Description
2,005	98	Paved parking, HSG B
2,005		100.00% Impervious Area

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

Summary for Subcatchment 100S: Runoff to wetland

Runoff = 0.73 cfs @ 11.95 hrs, Volume= 1,425 cf, Depth= 0.63"
Routed to Link DP1 : Design Point #1: Wetlands

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-yr Rainfall=3.27"

Area (sf)	CN	Description
16,522	61	>75% Grass cover, Good, HSG B
3,145	98	Paved parking, HSG B
7,269	58	Woods/grass comb., Good, HSG B
26,936	65	Weighted Average
23,791		88.33% Pervious Area
3,145		11.67% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.8	20	0.0280	0.12		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.32"
0.2	14	0.0280	1.17		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.1	16	0.3530	4.16		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.1	50	Total			

Summary for Pond 4P: Underground Detention Sysem

Inflow Area = 23,460 sf, 96.30% Impervious, Inflow Depth = 2.91" for 10-yr event
Inflow = 2.87 cfs @ 11.91 hrs, Volume= 5,680 cf
Outflow = 2.13 cfs @ 11.94 hrs, Volume= 5,680 cf, Atten= 26%, Lag= 2.1 min
Primary = 2.13 cfs @ 11.94 hrs, Volume= 5,680 cf
Routed to Link DP1 : Design Point #1: Wetlands

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 300.52' @ 11.94 hrs Surf.Area= 616 sf Storage= 397 cf
Flood Elev= 302.50' Surf.Area= 616 sf Storage= 983 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.8 min (758.6 - 757.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	299.00'	0 cf	**19.25'W x 32.00'L x 3.50'H Field A** 2,156 cf Overall - 1,227 cf Embedded = 929 cf x 0.0% Voids
#2A	299.00'	983 cf	**ADS N-12 36"** x 4 Inside #1 Inside= 36.1"W x 36.1"H => 7.10 sf x 20.00'L = 142.0 cf Outside= 42.0"W x 42.0"H => 8.86 sf x 20.00'L = 177.2 cf Row Length Adjustment= +5.00' x 7.10 sf x 4 rows 19.25' Header x 7.10 sf x 2 = 273.3 cf Inside
		983 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	299.00'	**12.0" Round Culvert** L= 19.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 299.00' / 298.50' S= 0.0263 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf
#2	Device 1	299.00'	**6.0" Vert. Orifice/Grate X 2.00** C= 0.600 Limited to weir flow at low heads
#3	Device 1	302.00'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=2.13 cfs @ 11.94 hrs HW=300.52' TW=0.00' (Dynamic Tailwater)
└**1=Culvert** (Passes 2.13 cfs of 3.82 cfs potential flow)
  ├**2=Orifice/Grate** (Orifice Controls 2.13 cfs @ 5.43 fps)
  └**3=Orifice/Grate** (Controls 0.00 cfs)

Summary for Pond 8P: PROP. DRIP STRIP

[92] Warning: Device #2 is above defined storage
[87] Warning: Oscillations may require smaller dt or Finer Routing (severity=189)

Inflow Area = 2,005 sf,100.00% Impervious, Inflow Depth = 3.04" for 10-yr event
Inflow = 0.25 cfs @ 11.91 hrs, Volume= 507 cf
Outflow = 0.01 cfs @ 12.58 hrs, Volume= 507 cf, Atten= 95%, Lag= 40.2 min
Discarded = 0.01 cfs @ 12.58 hrs, Volume= 507 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Link DP1 : Design Point #1: Wetlands

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 302.27' @ 12.58 hrs Surf.Area= 768 sf Storage= 206 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 121.4 min (868.8 - 747.4)

Volume	Invert	Avail.Storage	Storage Description
#1	301.60'	461 cf	**8.00'W x 96.00'L x 1.50'H Prismatoid** 1,152 cf Overall x 40.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Discarded	301.60'	**0.600 in/hr Exfiltration over Wetted area**
#2	Primary	303.10'	**96.0' long x 6.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.37 2.51 2.70 2.68 2.68 2.67 2.65 2.65 2.65 2.65 2.66 2.66 2.67 2.69 2.72 2.76 2.83

Discarded OutFlow Max=0.01 cfs @ 12.58 hrs HW=302.27' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=301.60' TW=0.00' (Dynamic Tailwater)
└**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond CB1: Prop. CB-1

Inflow Area = 2,051 sf,100.00% Impervious, Inflow Depth = 3.04" for 10-yr event
Inflow = 0.26 cfs @ 11.91 hrs, Volume= 519 cf
Outflow = 0.26 cfs @ 11.91 hrs, Volume= 519 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.26 cfs @ 11.91 hrs, Volume= 519 cf
Routed to Pond DMH3 : Prop. DMH-3(FD)

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 300.94' @ 11.93 hrs
Flood Elev= 303.80'

Device	Routing	Invert	Outlet Devices
#1	Primary	300.30'	**12.0" Round Culvert** L= 79.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 300.30' / 300.00' S= 0.0038 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.03 cfs @ 11.91 hrs HW=300.89' TW=300.89' (Dynamic Tailwater)
└**1=Culvert** (Outlet Controls 0.03 cfs @ 0.10 fps)

Summary for Pond CB2: Prop. CB-2

Inflow Area = 5,479 sf, 96.29% Impervious, Inflow Depth = 2.93" for 10-yr event
Inflow = 0.68 cfs @ 11.91 hrs, Volume= 1,336 cf
Outflow = 0.68 cfs @ 11.91 hrs, Volume= 1,336 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.68 cfs @ 11.91 hrs, Volume= 1,336 cf
Routed to Pond DMH1 : Prop. DMH-1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 301.49' @ 11.91 hrs
Flood Elev= 304.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	301.00'	**12.0" Round Culvert** L= 102.0' CPP, square edge headwall, Ke= 0.500

Inlet / Outlet Invert= 301.00' / 300.00' S= 0.0098 '/' Cc= 0.900
n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.65 cfs @ 11.91 hrs HW=301.48' TW=300.97' (Dynamic Tailwater)
1=Culvert (Outlet Controls 0.65 cfs @ 2.53 fps)

Summary for Pond CB3: Prop. CB-3

Inflow Area = 4,931 sf, 93.32% Impervious, Inflow Depth = 2.82" for 10-yr event
Inflow = 0.60 cfs @ 11.91 hrs, Volume= 1,158 cf
Outflow = 0.60 cfs @ 11.91 hrs, Volume= 1,158 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.60 cfs @ 11.91 hrs, Volume= 1,158 cf
Routed to Pond DMH1 : Prop. DMH-1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 301.04' @ 11.93 hrs
Flood Elev= 303.80'

Device	Routing	Invert	Outlet Devices
#1	Primary	300.30'	**12.0" Round Culvert** L= 20.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 300.30' / 300.00' S= 0.0150 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.39 cfs @ 11.91 hrs HW=301.00' TW=300.98' (Dynamic Tailwater)
1=Culvert (Outlet Controls 0.39 cfs @ 0.92 fps)

Summary for Pond DMH1: Prop. DMH-1

Inflow Area = 12,518 sf, 95.74% Impervious, Inflow Depth = 2.90" for 10-yr event
Inflow = 1.53 cfs @ 11.91 hrs, Volume= 3,028 cf
Outflow = 1.53 cfs @ 11.91 hrs, Volume= 3,028 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.53 cfs @ 11.91 hrs, Volume= 3,028 cf
Routed to Pond DMH2 : Prop. DMH-2

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 301.00' @ 11.92 hrs
Flood Elev= 304.10'

Device	Routing	Invert	Outlet Devices
#1	Primary	299.90'	**12.0" Round Culvert** L= 27.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 299.90' / 299.55' S= 0.0130 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.36 cfs @ 11.91 hrs HW=300.97' TW=300.84' (Dynamic Tailwater)
1=Culvert (Inlet Controls 1.36 cfs @ 1.73 fps)

Summary for Pond DMH2: Prop. DMH-2

Inflow Area = 23,460 sf, 96.30% Impervious, Inflow Depth = 2.91" for 10-yr event
Inflow = 2.87 cfs @ 11.91 hrs, Volume= 5,680 cf
Outflow = 2.87 cfs @ 11.91 hrs, Volume= 5,680 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.62 cfs @ 11.79 hrs, Volume= 4,208 cf
Routed to Pond OWS : Oil/Water Separator
Secondary = 2.36 cfs @ 11.91 hrs, Volume= 1,472 cf
Routed to Pond 4P : Underground Detention Sysem

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 300.86' @ 11.92 hrs
Flood Elev= 304.80'

Device	Routing	Invert	Outlet Devices
#1	Primary	299.45'	**6.0" Round Culvert** L= 7.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 299.45' / 299.35' S= 0.0143 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.20 sf
#2	Secondary	299.95'	**12.0" Round Culvert** L= 20.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 299.95' / 299.00' S= 0.0475 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.59 cfs @ 11.79 hrs HW=300.45' TW=300.06' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 0.59 cfs @ 3.01 fps)

Secondary OutFlow Max=2.18 cfs @ 11.91 hrs HW=300.84' TW=300.39' (Dynamic Tailwater)
└─**2=Culvert** (Outlet Controls 2.18 cfs @ 3.90 fps)

Summary for Pond DMH3: Prop. DMH-3(FD)

Inflow Area = 8,446 sf, 96.04% Impervious, Inflow Depth = 2.87" for 10-yr event
Inflow = 1.03 cfs @ 11.91 hrs, Volume= 2,021 cf
Outflow = 1.03 cfs @ 11.91 hrs, Volume= 2,021 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.03 cfs @ 11.91 hrs, Volume= 2,021 cf
Routed to Pond DMH2 : Prop. DMH-2

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 300.92' @ 11.92 hrs
Flood Elev= 304.45'

Device	Routing	Invert	Outlet Devices
#1	Primary	299.90'	**12.0" Round Culvert** L= 36.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 299.90' / 299.55' S= 0.0097 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.81 cfs @ 11.91 hrs HW=300.89' TW=300.83' (Dynamic Tailwater)
└─**1=Culvert** (Outlet Controls 0.81 cfs @ 1.29 fps)

Summary for Pond DMH4: Prop. DMH-4

Inflow Area = 6,395 sf, 94.77% Impervious, Inflow Depth = 2.82" for 10-yr event
Inflow = 0.78 cfs @ 11.91 hrs, Volume= 1,502 cf
Outflow = 0.78 cfs @ 11.91 hrs, Volume= 1,502 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.78 cfs @ 11.91 hrs, Volume= 1,502 cf
Routed to Pond DMH3 : Prop. DMH-3(FD)

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 301.18' @ 11.91 hrs
Flood Elev= 303.60'

Device	Routing	Invert	Outlet Devices
#1	Primary	300.60'	**12.0" Round Culvert** L= 71.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 300.60' / 300.00' S= 0.0085 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.73 cfs @ 11.91 hrs HW=301.18' TW=300.89' (Dynamic Tailwater)
1=Culvert (Outlet Controls 0.73 cfs @ 2.24 fps)

Summary for Pond OWS: Oil/Water Separator

Inflow Area = 23,460 sf, 96.30% Impervious, Inflow Depth = 2.15" for 10-yr event
Inflow = 0.62 cfs @ 11.79 hrs, Volume= 4,208 cf
Outflow = 0.62 cfs @ 11.79 hrs, Volume= 4,208 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.62 cfs @ 11.79 hrs, Volume= 4,208 cf
Routed to Pond 4P : Underground Detention Sysem

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 300.67' @ 11.93 hrs
Flood Elev= 304.60'

Device	Routing	Invert	Outlet Devices
#1	Primary	299.10'	**6.0" Round Culvert** L= 4.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 299.10' / 299.00' S= 0.0250 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.20 sf

Primary OutFlow Max=0.59 cfs @ 11.79 hrs HW=300.06' TW=299.67' (Dynamic Tailwater)
1=Culvert (Inlet Controls 0.59 cfs @ 3.00 fps)

Summary for Pond TD: Prop. Slotted Drain

Inflow Area = 6,395 sf, 94.77% Impervious, Inflow Depth = 2.82" for 10-yr event
Inflow = 0.78 cfs @ 11.91 hrs, Volume= 1,502 cf
Outflow = 0.78 cfs @ 11.91 hrs, Volume= 1,502 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.78 cfs @ 11.91 hrs, Volume= 1,502 cf
Routed to Pond DMH4 : Prop. DMH-4

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Peak Elev= 301.95' @ 11.91 hrs
Flood Elev= 302.90'

Device	Routing	Invert	Outlet Devices
#1	Primary	301.40'	**8.0" Round Culvert** L= 4.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 301.40' / 301.20' S= 0.0500 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.35 sf

Primary OutFlow Max=0.77 cfs @ 11.91 hrs HW=301.95' TW=301.18' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 0.77 cfs @ 2.52 fps)

Summary for Link DP1: Design Point #1: Wetlands

Inflow Area =	52,401 sf,	52.94% Impervious,	Inflow Depth = 1.63"	for 10-yr event
Inflow =	2.86 cfs @	11.95 hrs, Volume=	7,105 cf	
Primary =	2.86 cfs @	11.95 hrs, Volume=	7,105 cf,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: To CB-1 Runoff Area=2,051 sf 100.00% Impervious Runoff Depth=3.76"
Flow Length=58' Slope=0.0210 '/' Tc=0.6 min CN=98 Runoff=0.31 cfs 642 cf

Subcatchment 2S: To CB-2 Runoff Area=5,479 sf 96.29% Impervious Runoff Depth=3.64"
Flow Length=60' Slope=0.0200 '/' Tc=0.6 min CN=97 Runoff=0.83 cfs 1,663 cf

Subcatchment 3S: To CB-3 Runoff Area=4,931 sf 93.32% Impervious Runoff Depth=3.53"
Flow Length=76' Slope=0.0140 '/' Tc=0.9 min CN=96 Runoff=0.73 cfs 1,451 cf

Subcatchment 4S: To Slotted Drain Runoff Area=6,395 sf 94.77% Impervious Runoff Depth=3.53"
Flow Length=70' Slope=0.0280 '/' Tc=0.5 min CN=96 Runoff=0.96 cfs 1,881 cf

Subcatchment 5S: Canopy Runoff Area=2,496 sf 100.00% Impervious Runoff Depth=3.76"
Tc=1.0 min CN=98 Runoff=0.38 cfs 781 cf

Subcatchment 6S: C-Store (1/2) Runoff Area=2,108 sf 100.00% Impervious Runoff Depth=3.76"
Tc=1.0 min CN=98 Runoff=0.32 cfs 660 cf

Subcatchment 7S: C-Store (1/2) Runoff Area=2,005 sf 100.00% Impervious Runoff Depth=3.76"
Tc=1.0 min CN=98 Runoff=0.30 cfs 627 cf

Subcatchment 100S: Runoff to wetland Runoff Area=26,936 sf 11.67% Impervious Runoff Depth=1.02"
Flow Length=50' Tc=3.1 min CN=65 Runoff=1.23 cfs 2,296 cf

Pond 4P: Underground Detention Sysem Peak Elev=300.98' Storage=587 cf Inflow=3.53 cfs 7,077 cf
Outflow=2.49 cfs 7,077 cf

Pond 8P: PROP. DRIP STRIP Peak Elev=302.47' Storage=268 cf Inflow=0.30 cfs 627 cf
Discarded=0.01 cfs 627 cf Primary=0.00 cfs 0 cf Outflow=0.01 cfs 627 cf

Pond CB1: Prop. CB-1 Peak Elev=301.42' Inflow=0.31 cfs 642 cf
12.0" Round Culvert n=0.012 L=79.0' S=0.0038 '/' Outflow=0.31 cfs 642 cf

Pond CB2: Prop. CB-2 Peak Elev=301.70' Inflow=0.83 cfs 1,663 cf
12.0" Round Culvert n=0.012 L=102.0' S=0.0098 '/' Outflow=0.83 cfs 1,663 cf

Pond CB3: Prop. CB-3 Peak Elev=301.56' Inflow=0.73 cfs 1,451 cf
12.0" Round Culvert n=0.012 L=20.0' S=0.0150 '/' Outflow=0.73 cfs 1,451 cf

Pond DMH1: Prop. DMH-1 Peak Elev=301.52' Inflow=1.88 cfs 3,773 cf
12.0" Round Culvert n=0.012 L=27.0' S=0.0130 '/' Outflow=1.88 cfs 3,773 cf

Pond DMH2: Prop. DMH-2 Peak Elev=301.34' Inflow=3.53 cfs 7,077 cf
Primary=0.61 cfs 5,030 cf Secondary=2.96 cfs 2,047 cf Outflow=3.53 cfs 7,077 cf

Pond DMH3: Prop. DMH-3(FD) Peak Elev=301.41' Inflow=1.27 cfs 2,523 cf
12.0" Round Culvert n=0.012 L=36.0' S=0.0097 '/' Outflow=1.27 cfs 2,523 cf

Pond DMH4: Prop. DMH-4 Peak Elev=301.49' Inflow=0.96 cfs 1,881 cf
12.0" Round Culvert n=0.012 L=71.0' S=0.0085 '/' Outflow=0.96 cfs 1,881 cf

Pond OWS: Oil/Water Separator Peak Elev=301.12' Inflow=0.61 cfs 5,030 cf
6.0" Round Culvert n=0.012 L=4.0' S=0.0250 '/' Outflow=0.61 cfs 5,030 cf

Pond TD: Prop. Slotted Drain Peak Elev=302.05' Inflow=0.96 cfs 1,881 cf
8.0" Round Culvert n=0.012 L=4.0' S=0.0500 '/' Outflow=0.96 cfs 1,881 cf

Link DP1: Design Point #1: Wetlands Inflow=3.72 cfs 9,373 cf
Primary=3.72 cfs 9,373 cf

Total Runoff Area = 52,401 sf Runoff Volume = 10,000 cf Average Runoff Depth = 2.29"
47.06% Pervious = 24,659 sf 52.94% Impervious = 27,742 sf

Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: To CB-1 Runoff Area=2,051 sf 100.00% Impervious Runoff Depth=5.14"
Flow Length=58' Slope=0.0210 '/' Tc=0.6 min CN=98 Runoff=0.42 cfs 879 cf

Subcatchment 2S: To CB-2 Runoff Area=5,479 sf 96.29% Impervious Runoff Depth=5.03"
Flow Length=60' Slope=0.0200 '/' Tc=0.6 min CN=97 Runoff=1.13 cfs 2,295 cf

Subcatchment 3S: To CB-3 Runoff Area=4,931 sf 93.32% Impervious Runoff Depth=4.91"
Flow Length=76' Slope=0.0140 '/' Tc=0.9 min CN=96 Runoff=1.00 cfs 2,018 cf

Subcatchment 4S: To Slotted Drain Runoff Area=6,395 sf 94.77% Impervious Runoff Depth=4.91"
Flow Length=70' Slope=0.0280 '/' Tc=0.5 min CN=96 Runoff=1.31 cfs 2,617 cf

Subcatchment 5S: Canopy Runoff Area=2,496 sf 100.00% Impervious Runoff Depth=5.14"
Tc=1.0 min CN=98 Runoff=0.51 cfs 1,070 cf

Subcatchment 6S: C-Store (1/2) Runoff Area=2,108 sf 100.00% Impervious Runoff Depth=5.14"
Tc=1.0 min CN=98 Runoff=0.43 cfs 903 cf

Subcatchment 7S: C-Store (1/2) Runoff Area=2,005 sf 100.00% Impervious Runoff Depth=5.14"
Tc=1.0 min CN=98 Runoff=0.41 cfs 859 cf

Subcatchment 100S: Runoff to wetland Runoff Area=26,936 sf 11.67% Impervious Runoff Depth=1.91"
Flow Length=50' Tc=3.1 min CN=65 Runoff=2.36 cfs 4,290 cf

Pond 4P: Underground Detention Sysem Peak Elev=302.13' Storage=969 cf Inflow=4.80 cfs 9,781 cf
Outflow=3.67 cfs 9,781 cf

Pond 8P: PROP. DRIP STRIP Peak Elev=302.89' Storage=396 cf Inflow=0.41 cfs 859 cf
Discarded=0.01 cfs 859 cf Primary=0.00 cfs 0 cf Outflow=0.01 cfs 859 cf

Pond CB1: Prop. CB-1 Peak Elev=302.85' Inflow=0.42 cfs 879 cf
12.0" Round Culvert n=0.012 L=79.0' S=0.0038 '/' Outflow=0.42 cfs 879 cf

Pond CB2: Prop. CB-2 Peak Elev=303.14' Inflow=1.13 cfs 2,295 cf
12.0" Round Culvert n=0.012 L=102.0' S=0.0098 '/' Outflow=1.13 cfs 2,295 cf

Pond CB3: Prop. CB-3 Peak Elev=303.10' Inflow=1.00 cfs 2,018 cf
12.0" Round Culvert n=0.012 L=20.0' S=0.0150 '/' Outflow=1.00 cfs 2,018 cf

Pond DMH1: Prop. DMH-1 Peak Elev=303.04' Inflow=2.56 cfs 5,216 cf
12.0" Round Culvert n=0.012 L=27.0' S=0.0130 '/' Outflow=2.56 cfs 5,216 cf

Pond DMH2: Prop. DMH-2 Peak Elev=302.72' Inflow=4.80 cfs 9,781 cf
Primary=0.77 cfs 6,670 cf Secondary=4.03 cfs 3,111 cf Outflow=4.80 cfs 9,781 cf

Pond DMH3: Prop. DMH-3(FD) Peak Elev=302.84' Inflow=1.73 cfs 3,496 cf
12.0" Round Culvert n=0.012 L=36.0' S=0.0097 '/' Outflow=1.73 cfs 3,496 cf

Pond DMH4: Prop. DMH-4 Peak Elev=302.92' Inflow=1.31 cfs 2,617 cf
12.0" Round Culvert n=0.012 L=71.0' S=0.0085 '/' Outflow=1.31 cfs 2,617 cf

Pond OWS: Oil/Water Separator Peak Elev=302.41' Inflow=0.77 cfs 6,670 cf
6.0" Round Culvert n=0.012 L=4.0' S=0.0250 '/' Outflow=0.77 cfs 6,670 cf

Pond TD: Prop. Slotted Drain Peak Elev=303.22' Inflow=1.31 cfs 2,617 cf
8.0" Round Culvert n=0.012 L=4.0' S=0.0500 '/' Outflow=1.31 cfs 2,617 cf

Link DP1: Design Point #1: Wetlands Inflow=6.04 cfs 14,072 cf
Primary=6.04 cfs 14,072 cf

Total Runoff Area = 52,401 sf Runoff Volume = 14,931 cf Average Runoff Depth = 3.42"
47.06% Pervious = 24,659 sf 52.94% Impervious = 27,742 sf

APPENDIX E

Supplemental Calculations and Backup Data

Extreme Precipitation Tables

Northeast Regional Climate Center

Data represents point estimates calculated from partial duration series. All precipitation amounts are displayed in inches.

Smoothing	Yes
State	Vermont
Location	
Longitude	73.006 degrees West
Latitude	44.422 degrees North
Elevation	0 feet
Date/Time	Tue, 24 May 2022 09:26:04 -0400

Extreme Precipitation Estimates

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.28	0.43	0.53	0.70	0.87	1.07	**1yr**	0.75	0.97	1.21	1.45	1.72	2.03	2.29	**1yr**	1.79	2.21	2.60	3.17	3.69	**1yr**
2yr	0.31	0.47	0.59	0.78	0.98	1.21	**2yr**	0.84	1.10	1.37	1.65	1.96	2.32	2.66	**2yr**	2.05	2.56	3.03	3.64	4.24	**2yr**
5yr	0.37	0.57	0.71	0.96	1.22	1.52	**5yr**	1.06	1.37	1.72	2.06	2.42	2.82	3.21	**5yr**	2.50	3.09	3.64	4.38	5.03	**5yr**
10yr	0.41	0.65	0.82	1.11	1.45	1.80	**10yr**	1.25	1.62	2.05	2.44	2.84	3.27	3.71	**10yr**	2.90	3.56	4.17	5.04	5.73	**10yr**
25yr	0.49	0.78	0.99	1.37	1.82	2.27	**25yr**	1.57	2.04	2.57	3.04	3.51	3.99	4.48	**25yr**	3.53	4.31	5.01	6.07	6.81	**25yr**
50yr	0.56	0.90	1.15	1.60	2.16	2.70	**50yr**	1.86	2.42	3.06	3.59	4.12	4.63	5.18	**50yr**	4.10	4.99	5.76	7.00	7.77	**50yr**
100yr	0.63	1.03	1.33	1.88	2.56	3.22	**100yr**	2.21	2.87	3.64	4.25	4.83	5.38	6.00	**100yr**	4.76	5.77	6.61	8.07	8.86	**100yr**
200yr	0.73	1.20	1.55	2.22	3.06	3.84	**200yr**	2.64	3.41	4.33	5.02	5.66	6.26	6.94	**200yr**	5.54	6.67	7.60	9.32	10.13	**200yr**
500yr	0.88	1.45	1.90	2.75	3.85	4.84	**500yr**	3.33	4.30	5.45	6.27	6.99	7.64	8.42	**500yr**	6.76	8.10	9.15	11.29	12.10	**500yr**

Lower Confidence Limits

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.23	0.35	0.43	0.58	0.71	0.80	**1yr**	0.61	0.78	0.86	1.27	1.52	1.67	1.96	**1yr**	1.47	1.89	2.32	2.85	3.13	**1yr**
2yr	0.30	0.46	0.57	0.77	0.96	1.08	**2yr**	0.82	1.06	1.21	1.50	1.83	2.21	2.55	**2yr**	1.96	2.46	2.90	3.53	4.10	**2yr**
5yr	0.33	0.52	0.64	0.88	1.12	1.29	**5yr**	0.96	1.26	1.44	1.77	2.14	2.55	2.91	**5yr**	2.26	2.80	3.33	4.00	4.62	**5yr**
10yr	0.36	0.56	0.70	0.97	1.26	1.46	**10yr**	1.08	1.43	1.62	2.00	2.40	2.79	3.21	**10yr**	2.47	3.08	3.68	4.37	5.03	**10yr**
25yr	0.41	0.63	0.78	1.12	1.47	1.73	**25yr**	1.27	1.70	1.89	2.35	2.80	3.13	3.63	**25yr**	2.77	3.49	4.16	4.90	5.55	**25yr**
50yr	0.45	0.68	0.85	1.22	1.64	1.96	**50yr**	1.42	1.92	2.14	2.66	3.15	3.40	3.98	**50yr**	3.01	3.83	4.58	5.32	5.97	**50yr**
100yr	0.49	0.74	0.93	1.35	1.85	2.23	**100yr**	1.59	2.18	2.40	3.00	3.54	3.68	4.33	**100yr**	3.26	4.17	5.05	5.74	6.39	**100yr**
200yr	0.53	0.80	1.02	1.47	2.05	2.54	**200yr**	1.77	2.48	2.71	3.39	3.98	4.00	4.73	**200yr**	3.54	4.55	5.56	6.15	6.80	**200yr**
500yr	0.61	0.90	1.16	1.68	2.39	3.00	**500yr**	2.07	2.93	3.16	4.00	4.65	4.42	5.27	**500yr**	3.91	5.07	6.33	6.66	7.29	**500yr**

Upper Confidence Limits

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.30	0.47	0.57	0.77	0.94	1.10	**1yr**	0.82	1.08	1.23	1.49	1.78	2.22	2.54	**1yr**	1.96	2.45	2.85	3.44	4.05	**1yr**
2yr	0.33	0.50	0.62	0.84	1.03	1.16	**2yr**	0.89	1.14	1.30	1.59	1.94	2.47	2.78	**2yr**	2.19	2.67	3.17	3.81	4.45	**2yr**
5yr	0.39	0.61	0.76	1.04	1.32	1.53	**5yr**	1.14	1.49	1.67	2.01	2.43	3.11	3.56	**5yr**	2.76	3.42	3.98	4.79	5.47	**5yr**
10yr	0.47	0.73	0.90	1.26	1.63	1.87	**10yr**	1.40	1.83	2.01	2.42	2.90	3.76	4.29	**10yr**	3.33	4.12	4.77	5.72	6.45	**10yr**
25yr	0.60	0.91	1.13	1.62	2.13	2.46	**25yr**	1.84	2.41	2.60	3.07	3.67	4.88	5.51	**25yr**	4.32	5.30	6.06	7.28	8.06	**25yr**
50yr	0.72	1.09	1.36	1.95	2.63	3.03	**50yr**	2.27	2.96	3.16	3.69	4.38	5.93	6.67	**50yr**	5.25	6.41	7.25	8.76	9.58	**50yr**
100yr	0.86	1.30	1.63	2.36	3.24	3.74	**100yr**	2.79	3.66	3.85	4.43	5.25	7.23	8.07	**100yr**	6.40	7.76	8.70	10.56	11.45	**100yr**
200yr	1.04	1.56	1.98	2.87	4.00	4.61	**200yr**	3.45	4.51	4.70	5.32	6.28	8.82	9.81	**200yr**	7.81	9.43	10.45	12.80	13.70	**200yr**
500yr	1.34	1.99	2.56	3.72	5.29	6.09	**500yr**	4.56	5.95	6.12	6.80	7.96	11.47	12.72	**500yr**	10.15	12.23	13.31	16.57	17.48	**500yr**

Powered by ACIS Northeast Regional Climate Center

OUTLET APRON DESIGN

Project: Richmond, VT   Job # 465419

Date: 22-Jun-22

GPI Engineering Design Planning Construction Management 603.893.0720 GPINET.COM

Greenman-Pedersen, Inc.
44 Stiles Road
Suite One
Salem, NH 03079

FES-1 (from HydroCAD POND DMH2)

Q10 = 2.13 cfs

D_o = 12 inches

Tw = 0.2 feet

Design Criteria

Apron Dimensions

The dimensions of the apron at the outlet of the pipe shall be determined as follows:

1.) The width of the apron at the outlet of the pipe or channel shall be 3 times the diameter of the pipe, or the width of the channel.

USE THIS W= **3** feet

2.) The length of the apron shall be determined from the following formula when the tailwater depth at the outlet of the pipe or channel is less than one-half the diameter of the pipe or one-half the width of the channel:

La=1.8*Q/ Do^3/2+ 7Do

USE THIS La= **10.83** feet

Where:

La is the length of the apron

Q is the discharge from the pipe or channel

D_o is the diameter of pipe of width of channel

3.) When the depth of the tailwater at the outlet of the pipe or channel is equal to or greater than one-half the diameter of the pipe or the width of the channel. Then the following formula applies:

La=3.0*Qo/ Do^1.5 +7D_o

La= **13.39** feet

4.) Where there is no well defined channel downstream of the outlet, the width of the downstream end of the apron shall be determined as follows:

a. For minimum tailwater conditions where the tailwater depth is less than the elevation of the center of the pipe:

W=3*Do+La

USE THIS W= **13.83** feet

b. For maximum tailwater conditions where the tailwater depth is greater than the elevation of the center of the pipe:

W=3*Do+0.4*La

W= **8.36** feet

5.) Where there is a stable well-defined channel downstream of the apron, the bottom of the apron shall be equal to the width of the channel.

6.) The side of the apron in a well-defined channel shall be 2:1 (horizontal to vertical) or flatter. The height of the structural lining along the channel sides shall begin at the elevation equal to the top of conduit and taper down to the channel bottom through the length of the apron.

7.) The bottom grade of the apron shall be level (0% grade). No overfall is allowable at the end of the apron.

8.) The apron shall be located so that there are no bends in the horizontal alignment of the apron.

Rock Riprap

The following criteria shall be used to determine the dimensions of the rock riprap used for the apron:

1.) The median stone diameter shall be determined using the formula:

d_{50}=0.02*Q^4/3/(Tw*D_o)

d_{50}= **3.28** inches **USE** **3** inches

d_{50} minimum 3 inches

Where:

d_{50} is the median stone diameter in feet

Tw is the tailwater depth above the invert of the pipe channel in feet

Q is the discharge from the pipe or channel in cubic feet per second

D_o is the diameter of the pipe or width of the channel in feet

2.) Fifty percent by weight of the riprap mixture shall be smaller the than median size stone designated as d_{50}. The largest stone size in the mixture shall be 1.5 times the d_{50} size.

3.) The quality and gradation of the rock, the thickness of the riprap lining, filter material and the quality of the stone shall meet the requirements in the Rock Riprap BMP. The minimum depth shall be 6 inches or 1.5 times the largest stone size in the mixture whichever is larger (d).

Thickness of the riprap

d = 1.5*(d100 avg.(largest stone size))

d= **9** inches*

* must use a minimum of 6"

Rock Rip Rap Gradation

% of weight smaller than the given size	size of stone in inches		
100	**4.9**	to	**6.6**
85	**4.3**	to	**5.9**
50	**3.3**	to	**4.9**
15	**1.0**	to	**1.6**

First Defense® High Capacity

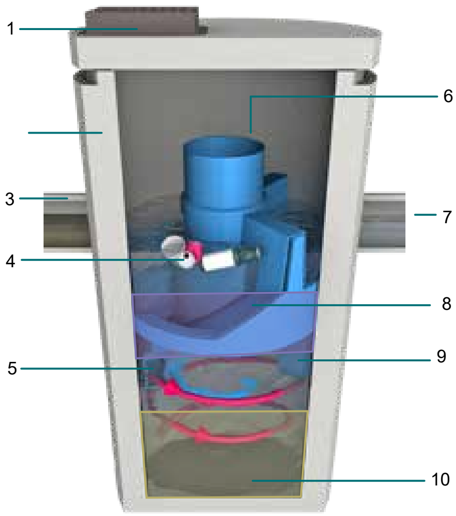
Advanced Hydrodynamic Separator

Product Summary

A Simple Solution for your Trickiest Sites

First Defense® High Capacity is a versatile stormwater separator with some of the highest approved flow rates in the United States, enabling engineers and contractors to save site space and projects costs by using the smallest possible footprint. It also works with single and multiple inlet pipes and inlet grates has an internal bypass to convey infrequent peak flows directly to the outlet.

Fig.1 The First Defense® High Capacity has internal components designed to efficiently capture pollutants and prevent washout at



Product Profile

1. Inlet Grate (optional)
2. Precast chamber
3. Inlet Pipe (optional)
4. Floatables Draw Off Slot (not pictured)
5. Inlet Chute
6. Internal Bypass
7. Outlet pipe
8. Oil and Floatables Storage
9. Outlet chute
10. Sediment Storage Sump

Applications

» Areas requiring a minimum of 50% TSS removal

» Stormwater treatment at the point of entry into the drainage line

» Sites constrained by space, topography or drainage profiles with limited slope and depth of cover

» Highways, car parks, industrial areas and urban developments

» Pre-treatment to ponds, storage systems, green infrastructure

How it Works

Highest Flow through the Smallest Footprint

Contaminated stormwater runoff enters the inlet chute from a surface grate and/or inlet pipe. The inlet chute introduces flow into the chamber tangentially to create a low energy vortex flow regime (magenta arrow) that directs sediment into the sump while oils, floating trash and debris rise to the surface.

Treated stormwater exits through a submerged outlet chute located opposite to the direction of the rotating flow (blue arrow). Enhanced vortex separation is provided by forcing the rotating flow within the vessel to follow the longest path possible rather than directly from inlet to outlet.

Higher flows bypass the treatment chamber to prevent turbulence and washout of captured pollu- tants. An internal bypass conveys infrequent peak flows directly to the outlet eliminating the need for, and expense of, external bypass control structures. A floatables draw off slot functions to convey floatables into the treatment chamber prior to bypass.

Benefits

Small & Simple

» Cut footprint size, cut costs: First Defense® provides space-saving, easy-to-install surface water treatment in standard sized chambers/ manholes.

» Adapt to site limitations: Variable configuratoins will help you effectively slip First Defense® into a tight spot. It also works well with large pipes, multiple inlet pipes and inlet grates.

» Save installation time: Every First Defense® unit is delivered to site pre-assembled and ready for installation – so installation is as easy as fitting any chamber/manhole.

Stormwater Solutions

→ hydro-int.com/firstdefense

Sizing & Design

This adaptable online treatment system works easily with large pipes, multiple inlet pipes, inlet grates and now, contains a high capacity bypass for the conveyance of large peak flows. Designed with site flexibility in mind, the First Defense® High Capacity allows engineers to maximize available site space without compromising treatment level.

Free Sizing Tool

This simple online tool will recommend the best separator, model size and online/offline arrangement based on site-specific data entered by the user.

Go to hydro-int.com/sizing to access the tool.

First Defense® High Capacity Model Number	Diameter	Typical TSS Treatment Flow Rates		Peak Online Flow Rate	Maximum Pipe Diameter[1]	Oil Storage Capacity	Typical Sediment Storage Capacity[2]	Minimum Distance from Outlet Invert to Top of Rim[3]	Standard Distance from Outlet Invert to Sump Floor
		NJDEP Certified	110µm						
	(ft / m)	(cfs / L/s)	(cfs / L/s)	(cfs / L/s)	(in / mm)	(gal / L)	(yd^3 / m^3)	(ft / m)	(ft / m)
FD-3HC	3 / 0.9	0.84 / 23.7	1.06 / 30.0	15 / 424	18 / 450	125 / 473	0.4 / 0.3	2.0 - 3.5 / 0.6 - 1.0	3.71 / 1.13
FD-4HC	4 / 1.2	1.50 / 42.4	1.88 / 53.2	18 / 510	24 / 600	191 / 723	0.7 / 0.5	2.3 - 3.9 / 0.7 - 1.2	4.97 / 1.5
FD-5HC	5 / 1.5	2.35 / 66.2	2.94 / 83.2	20 / 566	24 / 600	300 / 1135	1.1 / .84	2.5 - 4.5 / 0.7 - 1.3	5.19 / 1.5
FD-6HC	6 / 1.8	3.38 / 95.7	4.23 / 119.8	32 / 906	30 / 750	496 / 1,878	1.6 / 1.2	3.0 - 5.1 / 0.9 - 1.6	5.97 / 1.8
FD-8HC	8 / 2.4	6.00 / 169.9	7.52 / 212.9	50 / 1415	48 / 1200	1120 / 4239	2.8 / 2.1	3.0 - 6.0 / 0.9 -1.8	7.40 / 2.2
FD-10HC	10 / 3.0	9.38 / 265.6	11.75 / 332.7	50 / 1415	48 / 1200	1742 / 6594	4.4 / 3.3	6.5 -8.0 / 2.0 - 2.4	10.25 / 3.12

[1]Contact Hydro International when larger pipe sizes are required.
[2]Contact Hydro International when custom sediment storage capacity is required.
[3]Minimum distance for models depends on pipe diameter.

Maintenance

Easy vactor hose access through the center shaft of the system makes for quick, simple sump cleanout while trash and floatables can be fished out from the surface with a net.

Nobody maintains our systems better than we do. To ensure optimal, ongoing device performance, be sure to recommend Hydro International as a preferred service and maintenance provider to your clients.

Hydro International®

Hydro International, 94 Hutchins Drive, Portland, ME 04102
Tel: (207) 756-6200
Email: stormwaterinquiry@hydro-int.com
Web: www.hydro-int.com/firstdefense

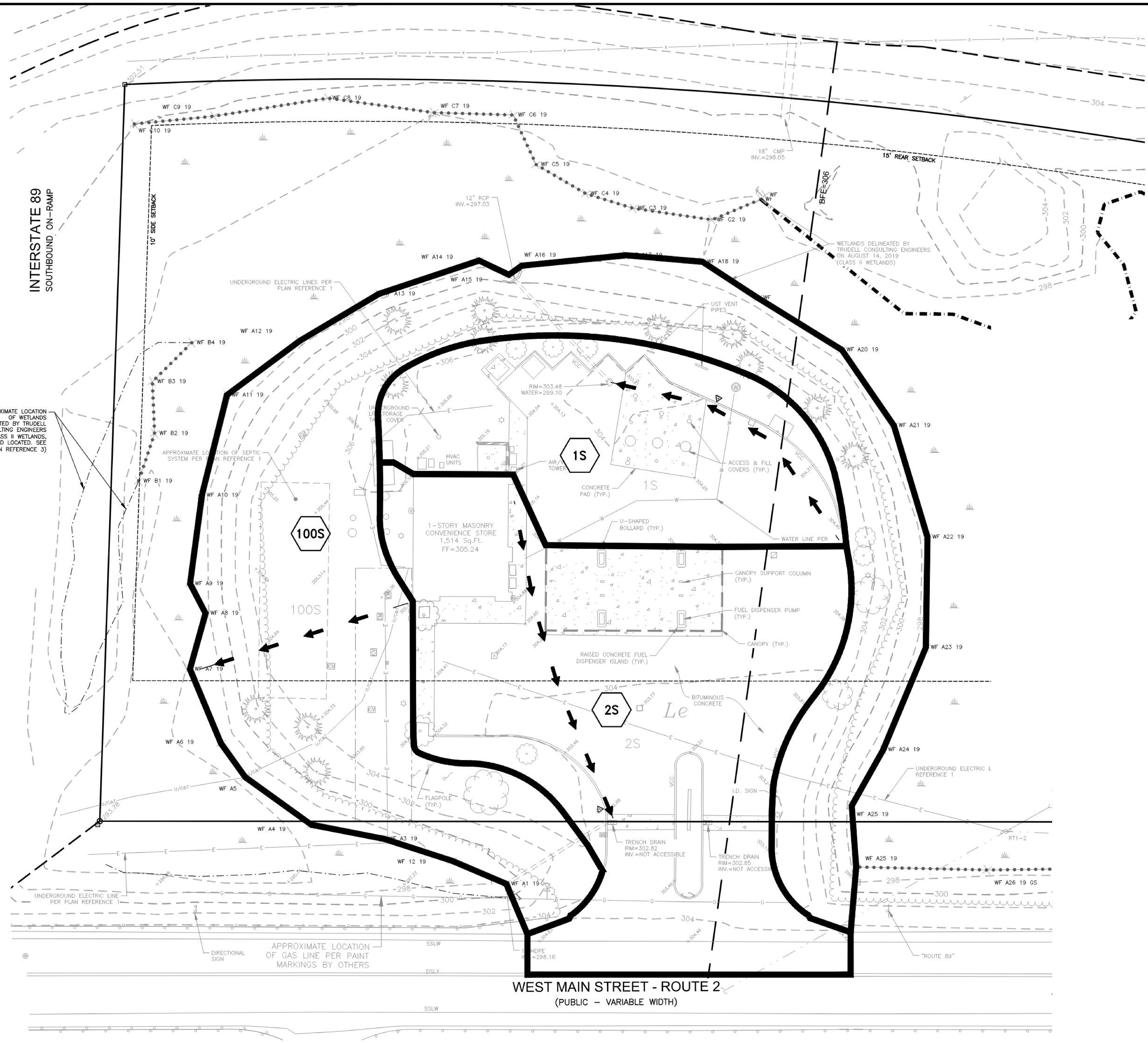
FD_SS_B_2105

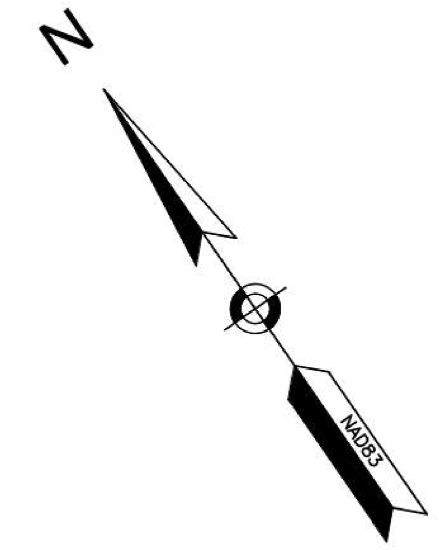
Download Drawings!

→ hydro-int.com/fddrawings

Access the Operation & Maintenance Manual

→ hydro-int.com/fd-om





WATERSHED LEGEND

SUB — SUBCATCHMENT: A relatively homogeneous area of land that drains into a single reach or pond. Each subcatchment generates a runoff hydrograph. (A subcatchment may also be used to account for the rain falling directly on the surface of a pond.)

REACH — REACH: A uniform stream, channel, or pipe that conveys water from one point to another reach or pond. The outflow of each reach is determined by a hydrograph routing calculation.

POND — POND: A pond, swamp, dam, or other impoundment that fills with water from one or more sources and empties in a manner determined by a weir, culvert, or other device(s) at its outlet. The outflow(s) of each pond is determined by a hydrograph routing calculation. The primary and/or secondary outflow may drain into a reach or into another pond.

DP#1 — DESIGN POINT

Time of Concentration Path (Tc)

Watershed Divide Line

SOIL LEGEND

Le — SOIL TYPE DESIGNATION

SOIL BOUNDARY

0 20 50 100

SCALE: 1" = 20'

GPI Engineering Design Planning Construction Management
603.893.0720 GPINET.COM
Greenman-Pedersen, Inc.
44 Stiles Road, Suite One
Salem, NH 03079

PREPARED FOR

SUMMIT DISTRIBUTING, LLC
240 MECHANIC STREET
LEBANON, NH 03766

PROPOSED REDEVELOPMENT ASSESSORS MAP 3 LOT WM1436

1436 WEST MAIN STREET RICHMOND, VERMONT

REVISIONS

NO.	REVISION	DATE

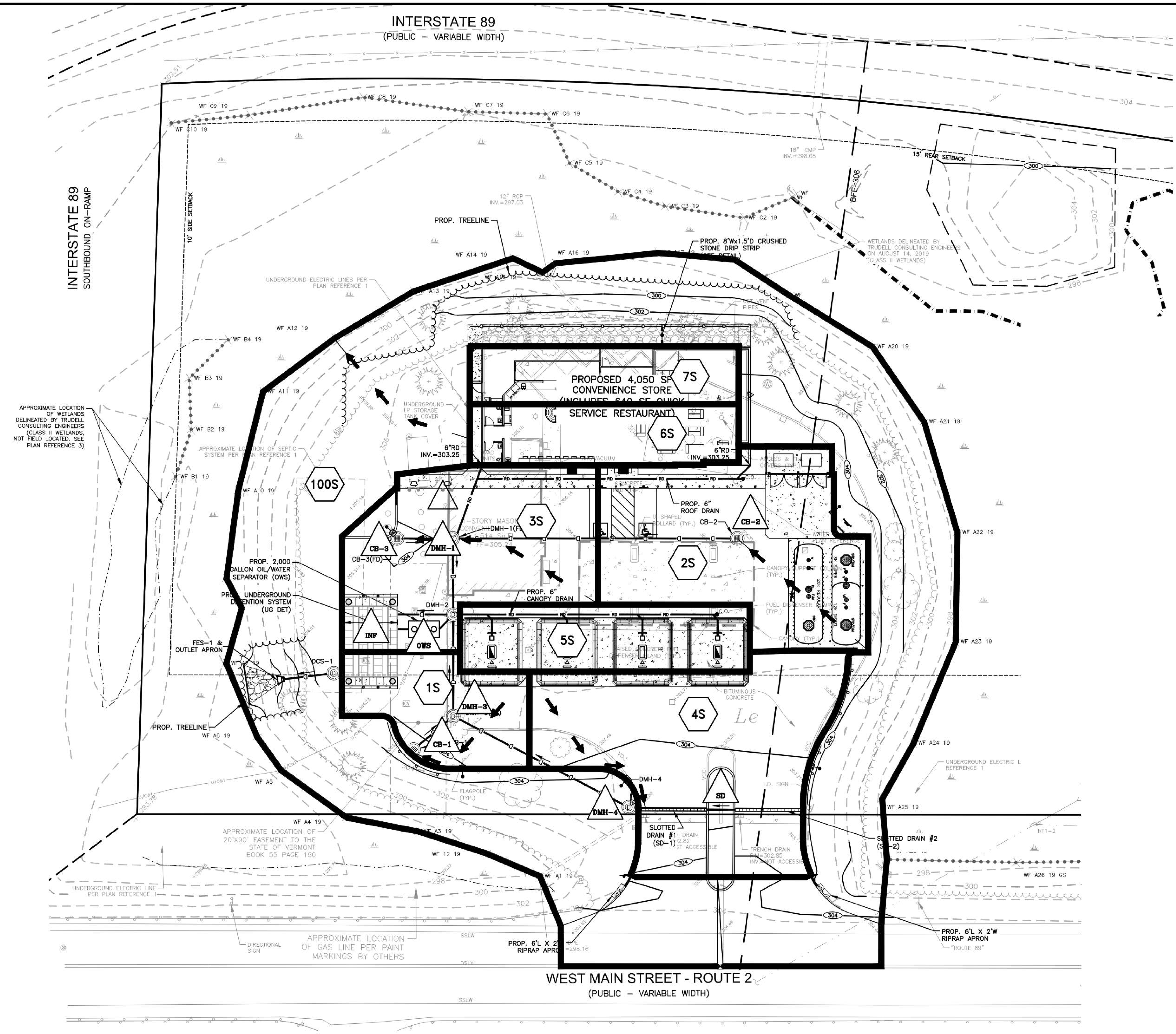
JUNE 22, 2022

DRAWN/DESIGN BY	CHECKED BY
SJB	HS

PRE-DEVELOPMENT DRAINAGE AREA PLAN

SCALE: 1"=20'

NEX-465419



WATERSHED LEGEND

SUB — SUBCATCHMENT: A relatively homogeneous area of land that drains into a single reach or pond. Each subcatchment generates a runoff hydrograph. (A subcatchment may also be used to account for the rain falling directly on the surface of a pond.)

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DP#1 — DESIGN POINT

Time of Concentration Path (Tc)

Watershed Divide Line

SOIL LEGEND

Le — SOIL TYPE DESIGNATION

SOIL BOUNDARY

0 20 50 100

SCALE: 1" = 20'

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PROPOSED REDEVELOPMENT ASSESSORS MAP 3 LOT WM1436
1436 WEST MAIN STREET RICHMOND, VERMONT

REVISIONS		
NO.	REVISION	DATE

JUNE 22, 2022

DRAWN/DESIGN BY	CHECKED BY
SJB	HS

POST-DEVELOPMENT DRAINAGE AREA PLAN

SCALE: 1"=20'

NEX-465419

OPERATION & MAINTENANCE PLAN
For
STORMWATER MANAGEMENT SYSTEMS

PROPOSED RETAIL MOTOR FUEL OUTLET
ASSESSORS MAP 3 LOT WM1436
1436 WEST MAIN STREET
RICHMOND, VT

GPI

44 Stiles Road, Suite One
Salem, NH 03079
(603) 893-0720

Prepared For:

SUMMIT DISTRIBUTING, LLC

240 Mechanic Street
Lebanon, NH 03766

June 22, 2022

Summit Distributing, LLC
Propsoed Retail Motor Fuel Outlet
Stormwater O&M

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BMP Specific O&M Procedures .... **Section 2**

Long-Term Maintenance Plan Exhibit .... **Section 3**

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De-Icing Log .... **Section 5**

Loose Copy of Log Forms .... **Inside Back Cover**

SECTION 1 O & M DOCUMENTATION REQUIREMENTS

The property owner shall be responsible for the operation and maintenance of all stormwater management systems after construction in accordance with the below criteria. Logs of inspections and cleanings shall be maintained by the owner and annual BMP inspection forms shall be made available to the Town of Richmond upon request.

As required by the Vermont Stormwater Management Manual Rule and Design Guidance, the following post construction operation and maintenance plan has been prepared.

Stormwater Management System Owner: Property owner

Party or Parties Responsible for Operation and Maintenance: Property owner

Documentation: A maintenance log shall be kept summarizing inspections, maintenance and any corrective actions taken. The log shall include the date on which each inspection or maintenance task was performed, a description of the inspection findings or maintenance completed, and the name of the inspector or maintenance personnel performing the task. If a maintenance task requires the clean out of any sediments or debris, the location where the sediment and debris was disposed after removal will be indicated. Disposal of the accumulated sediment and hydrocarbons must be in accordance with applicable local, state, and federal guidelines and regulations. The logs shall be made accessible to the Town of Richmond upon request.

All stormwater facilities associated with this redevelopment are identified on Figure 1 contained within Section 3 of this manual and listed individually on the log form included herein and shall be inspected and maintained in accordance with the procedures outlined in Section 2.

SECTION 2 BMP SPECIFIC O & M PROCEDURES

Driveway/Parking Lot Sweeping

Sweeping shall be done once in the early fall and then immediately following spring snowmelt to remove sand and other debris and when visual buildup of debris is apparent. Pavement surfaces shall be swept at other times such as in the fall after leaves have dropped to remove accumulated debris. Since contaminants typically accumulate within 12 inches of the curbline, street cleaning operations should concentrate in cleaning curb and gutter lines for maximum pollutant removal efficiency. Other areas shall also be swept periodically when visual buildup of debris is apparent. Once removed from paved surfaces, the sweeping must be handled and disposed of properly. Disposal of the accumulated sediment and hydrocarbons must be in accordance with applicable local, state, and federal guidelines and regulations.

Deep Sump Hooded Catch Basins/Slotted Drains

Inspect catch basins and slotted drains at least twice per year and at the end of the foliage and snow removal seasons (preferably in spring and fall) to ensure that the catch basins are working in their intended fashion and that they are free of debris. Sediment must also be removed 4 times per year or whenever the depth of deposits is greater than or equal to one half the depth from the bottom of the invert of the lowest pipe in the basin. If the basin outlet is designed with a hood to trap floatable materials check to ensure watertight seal is working. At a minimum, remove floating debris and hydrocarbons at the time of the inspection. Sediment and debris can be removed by a clamshell bucket however, a vacuum truck is preferred. A vacuum truck must be used at a minimum of once per year for sediment removal. Disposal of the accumulated sediment and hydrocarbons must be in accordance with applicable local, state, and federal guidelines and regulations.

Oil/Water Separator

The system should initially be inspected within the first three months after completion of the site’s construction and after any rainfall greater than 1-inch. The units should be inspected after every major storm but at least on a monthly basis. Cleaning of the units should be done at least twice a year and should include the following:

Removal of accumulated oil and grease and sediment by using a vacuum truck or similar catch basin cleaning device. Visually inspect, and clean as needed, inlet and outlets including tees during each inspection. At a minimum, remove any floating debris at the time of the inspection.

Disposal of the accumulated sediment and hydrocarbons must be in accordance with applicable local, state, and federal guidelines and regulations.

Hydrodynamic Separator (First Defense Units)

Initial maintenance to be performed twice a year for the first year after the unit is online and operational. A vacuum truck must be used at a minimum of once per year for sediment removal. Refer to the attached First Defense Maintenance Guide for operation and maintenance procedures and schedules thereafter.

Underground Detention System

All subsurface systems should initially be inspected within the first three months after completion of the site's construction.

Preventive maintenance should be performed at least every six months and sediment shall be removed from pretreatment BMP's after every major storm event. The Detention System shall be inspected on regular bi-annual scheduled dates. Sediment and debris removal should be through the use of truck mounted vacuum equipment. Outlet pipes should be flushed to point of discharge on the same frequency as mentioned above. Disposal of the accumulated sediment and hydrocarbons must be in accordance with applicable local, state, and federal guidelines and regulations.

The following is the recommended procedure to inspect the underground system in service:

1. Locate the riser or cleanout section of the system. The riser/cleanout will typically be 6 or 12" in diameter or larger.
2. Remove the lid from the riser/cleanout.
3. Measure the sediment buildup at each riser and cleanout location. Only certified confined space entry personnel having appropriate equipment should be permitted to enter the system.
4. Inspect each manifold, all laterals, and outlet pipes for sediment build up, obstructions, or other problems. Obstructions should be removed at this time.
5. If measured sediment build up is between 2" to 8", cleaning should be considered; if sediment build up exceeds 8", cleaning should be performed at the earliest opportunity. A thorough cleaning of the system (manifolds and laterals) shall be performed by water jets and/or truck mounted vacuum equipment.

Pretreatment BMP's shall be inspected and cleaned during the regular bi-annual inspections.

The inlet and outlet of the subsurface systems should be checked periodically to ensure that flow structures are not blocked by debris. All pipes connecting the structures to the system should be checked for debris that may obstruct flow. Inspections should be conducted monthly during wet weather conditions from March to November.

Stone Outlet Aprons/ Weirs

Inspect at least once annually for damage and deterioration. Repair damage immediately.

Crushed Stone Drip Edge

Inspect annually for erosion, sediment accumulation, and the presence of invasive species. Perform periodic maintenance as needed to prevent the emergence of woody vegetation. Remove debris and accumulated sediment as needed, based on inspection. Repair eroded areas as warranted by inspection.

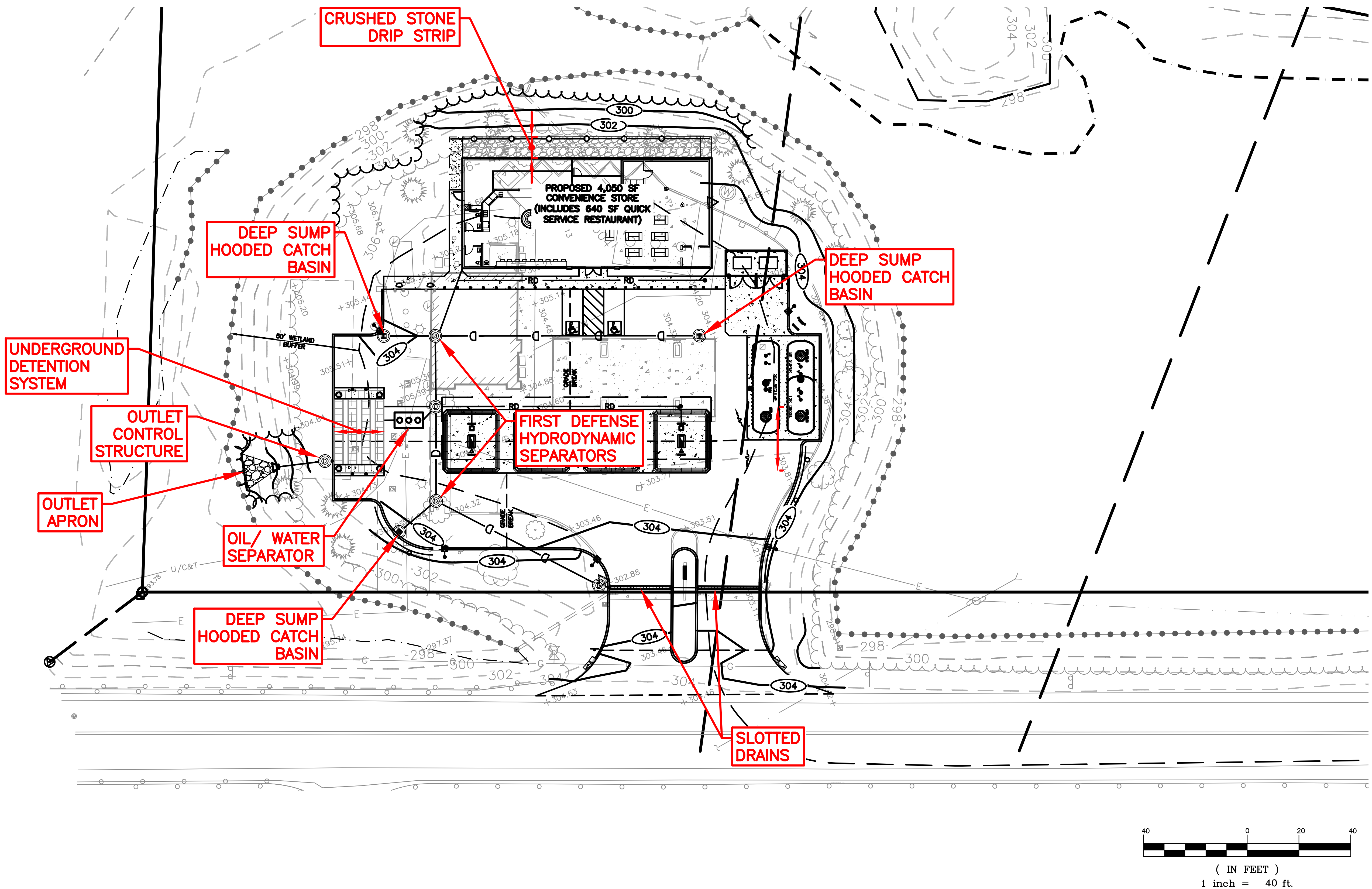
Vegetated Areas

Inspect slopes and embankments early in the growing season to identify active or potential erosion problems. Replant bare areas or areas with sparse growth. Where rill erosion is evident, armor the area with an appropriate lining or divert the erosive flows to on-site areas able to withstand the concentrated flows. During the summer months, all landscape features are to be maintained with the minimum possible amount of fertilizers, pesticides or herbicides.

Winter Maintenance

Proposed snow storage is located along the edge of the driveways and parking areas. Any excess snow is to be trucked offsite. During the winter months all snow is to be stored such that snowmelt is controlled. Avoid disposing of snow on top of storm drain catch basins or in stormwater drainage swales or ditches. The minimum amount of deicing chemicals needed is to be used.

SECTION 3 LONG-TERM MAINTENANCE PLAN EXHIBIT



LONG TERM MAINTENANCE EXHIBIT

1436 WEST MAIN STREET
RICHMOND, VERMONT

GPI
Engineering
Design
Planning
Construction Management
603.893.0720
GPINET.COM
Greenman-Pedersen, Inc.
44 Stiles Road, Suite One
Salem, NH 03079

DRAWN BY: SJB
PROJECT #: 456419
DATE: 6/22/22
REV.: -

FIGURE 1

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SECTION 4 STORMWATER OPERATION & MAINTENANCE LOG

STORMWATER INSPECTION AND MAINTENANCE LOG

1436 West Main Street - Richmond, VT

General Information			
Project Name	Proposed Retail Motor Fuel Outlet	**Location**	Richmond, VT
Date of Inspection		**Start/ End Time**	
Inspector's Name(s)			
Inspector's Title(s)			
Inspector's Contact Information			

	Site Specific BMP's	Maintenance Interval
1	Street Sweeping	6 months
2	Deep Sump Catch Basins/Slotted Drains	6 months
3	Outlet Aprons/ Weirs	1 year
4	Crushed Stone Drip Edge	1 year
5	Oil/ Water Separator	6 months
6	Underground Detention System	6 months
7	Hydrodynamic Separators (First Defense Unit)	1 year (See separate maintenance log for First Defense Unit)

STORMWATER INSPECTION AND MAINTENANCE LOG

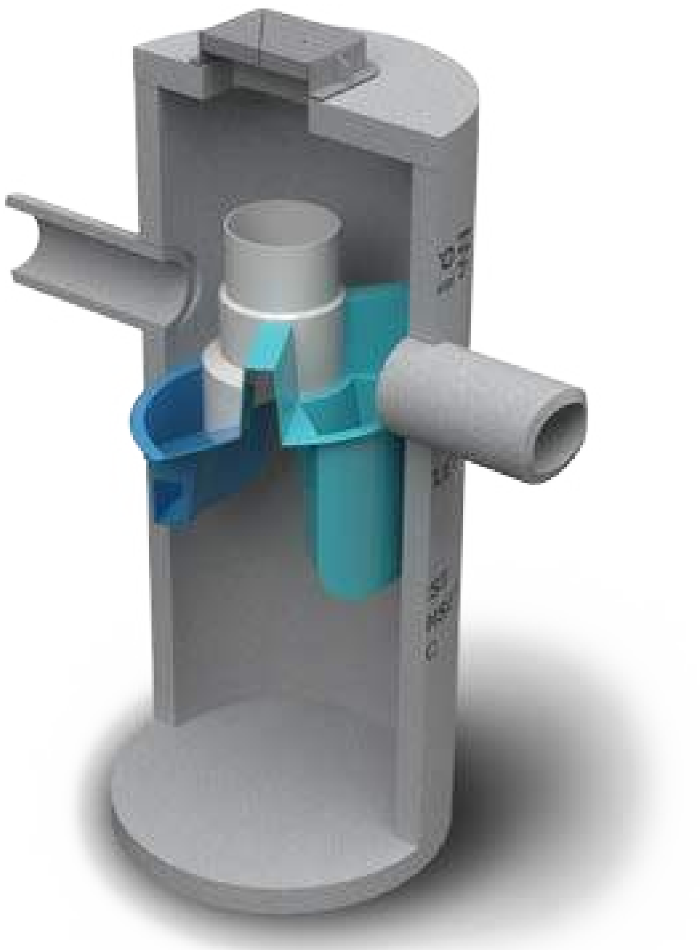
1436 West Main Street - Richmond, VT

BMP Description	Corrective Action Required?		Notes
Street Sweeping			
Evidence of debris accumulation	YES	NO	
Evidence of oil grease	YES	NO	
Other (specify)	YES	NO	
Deep Sump Catch Basins/Slotted Drains			
Grates clear of debris	YES	NO	
Inlet and outlet clear of debris	YES	NO	
Evidence of oil grease	YES	NO	
Observance of accumulated sediment	YES	NO	Sediment Depth =
Evidence of structural deterioration	YES	NO	
Evidence of flow bypassing facility	YES	NO	
Other (specify)	YES	NO	
Outlet Apron/Weirs			
Inlet/ inflow pipe clear of debris	YES	NO	
Overflow spillway clear of debris	YES	NO	
Evidence of rilling or gullying	YES	NO	
Tree growth	YES	NO	
Other (specify)	YES	NO	
Crushed Stone Drip Edge			
Clear of debris	YES	NO	
Evidence of rilling or gullying	YES	NO	
Tree growth	YES	NO	
Observance of accumulated sediment	YES	NO	Sediment Depth =
Other (specify)	YES	NO	
Oil / Water Seperator			
Grates clear of debris	YES	NO	
Inlet and outlet clear of debris	YES	NO	
Observance of accumulated sediment	YES	NO	Sediment Depth =
Evidense of oil grease	YES	NO	
Evidence of flow bypassing facility	YES	NO	
Underground Detention System			
Inlet and outlet clear of debris	YES	NO	
Pipe bottom clear of debris	YES	NO	
Outlet control structure clear of debris	YES	NO	
Observance of accumulated sediment	YES	NO	Sediment Depth =
Bottom dewaters within 72 hrs. of a storm event	YES	NO	
Other (specify)	YES	NO	
Hydrodynamic Separators (First Defense Units)			
See separate maintenance log for First Defense Units			

NOTE: Photos shall be provided with each inspection log and shall be sufficiently labeled to identify photo location.

Deicing Log

Date Applied	Type of Deicing Material	Amount Applied



Operation and Maintenance Manual

First Defense® and First Defense® High Capacity

Vortex Separator for Stormwater Treatment

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- **Introduction**
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- **Pollutant Capture and Retention**

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9 **First Defense® Inspection and Maintenance Log**

Hydro International (Stormwater), 94 Hutchins Drive, Portland ME 04102
Tel: (207) 756-6200 Fax: (207) 756-6212 Web: www.hydro-int.com

Hydro Maintenance Services

Hydro International has been engineering stormwater treatment systems for over 30 years. We understand the mechanics of removing pollutants from stormwater and how to keep systems running at an optimal level.

Nobody Knows our Systems Better than we do

Avoid Service Negligence

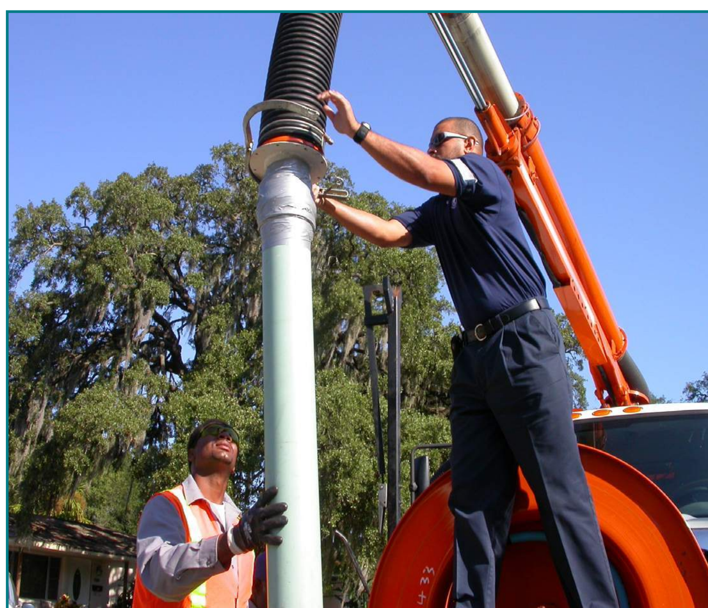
Sanitation services providers not intimately familiar with stormwater treatment systems are at risk of the following:

- Inadvertently breaking parts or failing to clean/replace system components appropriately.
- Charging you for more frequent maintenance because they lacked the tools to service your system properly in the first place.
- Billing you for replacement parts that might have been covered under your Hydro warranty plan
- Charging for maintenance that may not yet have been required.

Leave the Dirty Work to us

Trash, sediment and polluted water is stored inside treatment systems until they are removed by our team with a vactor truck. Sometimes teams must physically enter the system chambers in order to prepare the system for maintenance and install any replacement parts. Services include but are not limited to:

- Solids removal
- Removal of liquid pollutants
- Replacement media installation (when applicable)



Hydro International (Stormwater), 94 Hutchins Drive, Portland ME 04102
Tel: (207) 756-6200 Fax: (207) 756-6212 Web: www.hydro-int.com

Better Tools, Better Results

Not all vactor trucks are created equal. Appropriate tools and suction power are needed to service stormwater systems appropriately. Companies who don't specialize in stormwater treatment won't have the tools to properly clean systems or install new parts.



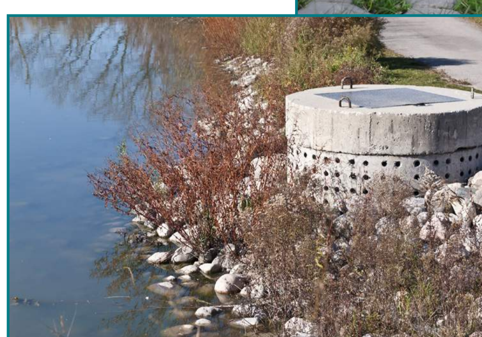
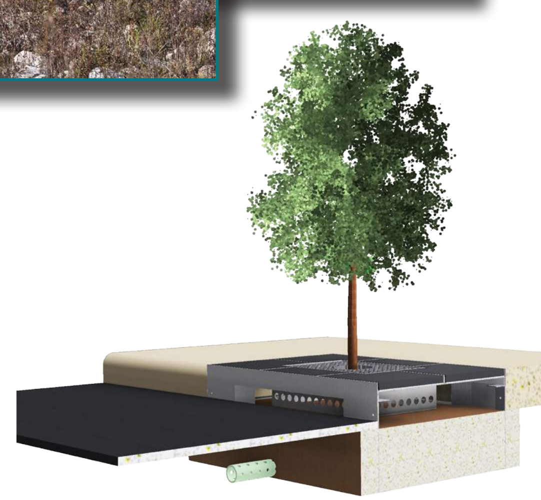
Service Warranty

Make sure you're not paying for service that is covered under your warranty plan. Only Hydro International's service teams can identify tune-ups that should be on us, not you.

Treatment Systems Serviced by Hydro:

- Stormwwater filters
- Stormwater separators
- Baffle boxes
- Biofilters/biorention systems
- Storage structures
- Catch basins
- Stormwater ponds
- Permeable pavement



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I. First Defense® by Hydro International

Introduction

The First Defense® is an enhanced vortex separator that combines an effective and economical stormwater treatment chamber with an integral peak flow bypass. It efficiently removes total suspended solids (TSS), trash and hydrocarbons from stormwater runoff without washing out previously captured pollutants. The First Defense® is available in several model configurations (refer to *Section II. Model Sizes & Configurations*, page 4) to accommodate a wide range of pipe sizes, peak flows and depth constraints.

Operation

The First Defense® operates on simple fluid hydraulics. It is self-activating, has no moving parts, no external power requirement and is fabricated with durable non-corrosive components. No manual procedures are required to operate the unit and maintenance is limited to monitoring accumulations of stored pollutants and periodic clean-outs. The First Defense® has been designed to allow for easy and safe access for inspection, monitoring and clean-out procedures. Neither entry into the unit nor removal of the internal components is necessary for maintenance, thus safety concerns related to confined-space-entry are avoided.

Pollutant Capture and Retention

The internal components of the First Defense® have been designed to optimize pollutant capture. Sediment is captured and retained in the base of the unit, while oil and floatables are stored on the water surface in the inner volume (Fig.1).

The pollutant storage volumes are isolated from the built-in bypass chamber to prevent washout during high-flow storm events. The sump of the First Defense® retains a standing water level between storm events. This ensures a quiescent flow regime at the onset of a storm, preventing resuspension and washout of pollutants captured during previous events.

Accessories such as oil absorbent pads are available for enhanced oil removal and storage. Due to the separation of the oil and floatable storage volume from the outlet, the potential for washout of stored pollutants between clean-outs is minimized.

Applications

- Stormwater treatment at the point of entry into the drainage line
- Sites constrained by space, topography or drainage profiles with limited slope and depth of cover
- Retrofit installations where stormwater treatment is placed on or tied into an existing storm drain line
- Pretreatment for filters, infiltration and storage

Advantages

- Inlet options include surface grate or multiple inlet pipes
- Integral high capacity bypass conveys large peak flows without the need for “offline” arrangements using separate junction manholes
- Proven to prevent pollutant washout at up to 500% of its treatment flow
- Long flow path through the device ensures a long residence time within the treatment chamber, enhancing pollutant settling
- Delivered to site pre-assembled and ready for installation

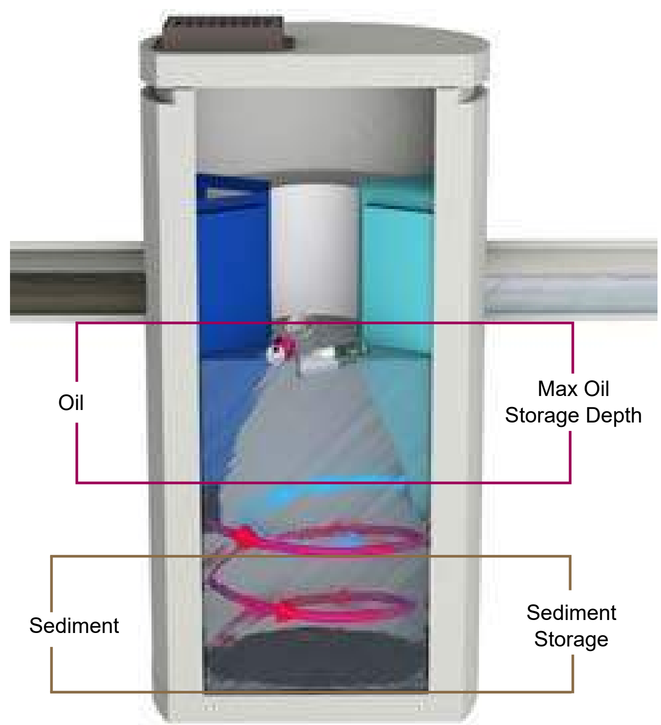


Fig.1 Pollutant storage volumes in the First Defense®.

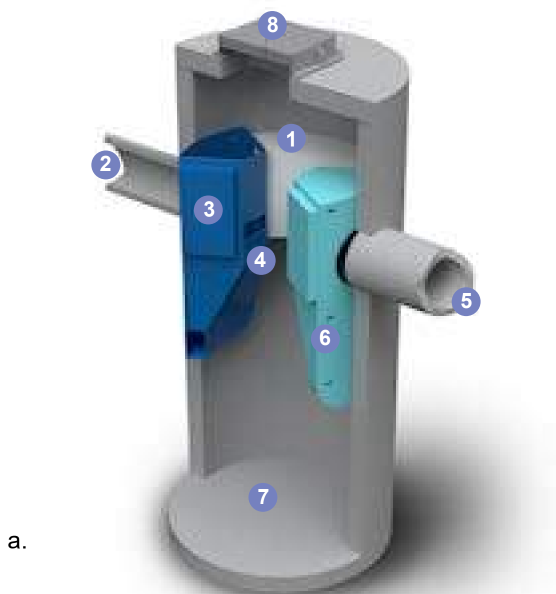
II. Model Sizes & Configurations

The First Defense® inlet and internal bypass arrangements are available in several model sizes and configurations. The components of the First Defense®-4HC and First Defense®-6HC have modified geometries as to allow greater design flexibility needed to accommodate various site constraints.

All First Defense® models include the internal components that are designed to remove and retain total suspended solids (TSS), gross solids, floatable trash and hydrocarbons (Fig.2a - 2b). First Defense® model parameters and design criteria are shown in Table 1.

First Defense® Components

1. **Built-In Bypass**
2. **Inlet Pipe**
3. **Inlet Chute**
4. **Floatables Draw-off Port**
5. **Outlet Pipe**
6. **Floatables Storage**
7. **Sediment Storage**
8. **Inlet Grate or Cover**



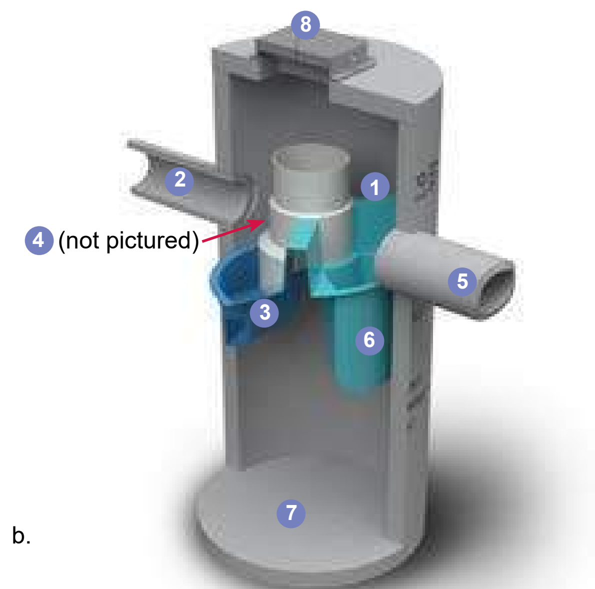


Fig.2a) First Defense®-4 and First Defense®-6; b) First Defense®-4HC and First Defense®-6HC, with higher capacity dual internal bypass and larger maximum pipe diameter.

First Defense® High Capacity Model Number	Diameter	Typical TSS Treatment Flow Rates		Peak Online Flow Rate	Maximum Pipe Diameter[1]	Oil Storage Capacity	Typical Sediment Storage Capacity[2]	Minimum Distance from Outlet Invert to Top of Rim[3]	Standard Distance from Outlet Invert to Sump Floor
		NJDEP Certified	106µm						
	(ft / m)	(cfs / L/s)	(cfs / L/s)	(cfs / L/s)	(in / mm)	(gal / L)	(yd^3 / m^3)	(ft / m)	(ft / m)
FD-3HC	3 / 0.9	0.84 / 23.7	1.60 / 45.3	15 / 424	18 / 457	125 / 473	0.4 / 0.3	2.0 - 3.5 / 0.6 - 1.0	3.71 / 1.13
FD-4HC	4 / 1.2	1.50 / 42.4	1.88 / 50.9	18 / 510	24 / 600	191 / 723	0.7 / 0.5	2.3 - 3.9 / 0.7 - 1.2	4.97 / 1.5
FD-5HC	5 / 1.5	2.34 / 66.2	2.94 / 82.1	20 / 566	24 / 609	300 / 1135	1.1 / .84	2.5 - 4.5 / 0.7 - 1.3	5.19 / 1.5
FD-6HC	6 / 1.8	3.38 / 95.7	4.73 / 133.9	32 / 906	30 / 750	496 / 1,878	1.6 / 1.2	3.0 - 5.1 / 0.9 - 1.6	5.97 / 1.8
FD-8HC	8 / 2.4	6.00 / 169.9	7.52 / 212.9	50 / 1,415	48 / 1219	1120 / 4239	2.8 / 2.1	3.0 - 6.0 / 0.9 -1.8	7.40 / 2.2

[1]Contact Hydro International when larger pipe sizes are required.
[2]Contact Hydro International when custom sediment storage capacity is required.
[3]Minimum distance for models depends on pipe diameter.

III. Maintenance

Overview

The First Defense® protects the environment by removing a wide range of pollutants from stormwater runoff. Periodic removal of these captured pollutants is essential to the continuous, long-term functioning of the First Defense®. The First Defense® will capture and retain sediment and oil until the sediment and oil storage volumes are full to capacity. When sediment and oil storage capacities are reached, the First Defense® will no longer be able to store removed sediment and oil. Maximum pollutant storage capacities are provided in Table 1.

The First Defense® allows for easy and safe inspection, monitoring and clean-out procedures. A commercially or municipally owned sump-vac is used to remove captured sediment and floatables. Access ports are located in the top of the manhole.

Maintenance events may include Inspection, Oil & Floatables Removal, and Sediment Removal. Maintenance events do not require entry into the First Defense®, nor do they require the internal components of the First Defense® to be removed. In the case of inspection and floatables removal, a vactor truck is not required. However, a vactor truck is required if the maintenance event is to include oil removal and/or sediment removal.

Maintenance Equipment Considerations

The internal components of the First Defense®-HC have a centrally located circular shaft through which the sediment storage sump can be accessed with a sump vac hose. The open diameter of this access shaft is 15 inches in diameter (Fig.3). Therefore, the nozzle fitting of any vactor hose used for maintenance should be less than 15 inches in diameter.

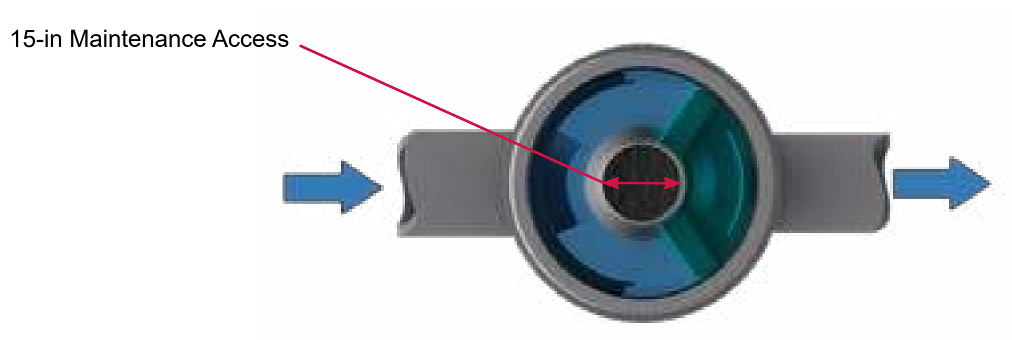


Fig.3 The central opening to the sump of the First Defense®-HC is 15 inches in diameter.

Determining Your Maintenance Schedule

The frequency of clean out is determined in the field after installation. During the first year of operation, the unit should be inspected every six months to determine the rate of sediment and floatables accumulation. A simple probe such as a Sludge-Judge® can be used to determine the level of accumulated solids stored in the sump. This information can be recorded in the maintenance log (see page 9) to establish a routine maintenance schedule.

The vactor procedure, including both sediment and oil / flotables removal, for a 6-ft First Defense® typically takes less than 30 minutes and removes a combined water/oil volume of about 765 gallons.

Inspection Procedures

1. Set up any necessary safety equipment around the access port or grate of the First Defense® as stipulated by local ordinances. Safety equipment should notify passing pedestrian and road traffic that work is being done.

2. Remove the grate or lid to the manhole.

3. Without entering the vessel, look down into the chamber to inspect the inside. Make note of any irregularities. Fig.4 shows the standing water level that should be observed.

4. Without entering the vessel, use the pole with the skimmer net to remove floatables and loose debris from the components and water surface.

5. Using a sediment probe such as a Sludge Judge®, measure the depth of sediment that has collected in the sump of the vessel.

6. On the Maintenance Log (see page 9), record the date, unit location, estimated volume of floatables and gross debris removed, and the depth of sediment measured. Also note any apparent irregularities such as damaged components or blockages.

7. Securely replace the grate or lid.

8. Take down safety equipment.

9. Notify Hydro International of any irregularities noted during inspection.

Floatables and Sediment Clean Out

Floatables clean out is typically done in conjunction with sediment removal. A commercially or municipally owned sump-vac is used to remove captured sediment and floatables (Fig.5).

Floatables and loose debris can also be netted with a skimmer and pole. The access port located at the top of the manhole provides unobstructed access for a vactor hose and skimmer pole to be lowered to the base of the sump.

Scheduling

- Floatables and sump clean out are typically conducted once a year during any season.

- Floatables and sump clean out should occur as soon as possible following a spill in the contributing drainage area.

Fig.4 Floatables are removed with a vactor hose (First Defense model FD-4, shown).

Recommended Equipment

- Safety Equipment (traffic cones, etc)

- Crow bar or other tool to remove grate or lid

- Pole with skimmer or net (if only floatables are being removed)

- Sediment probe (such as a Sludge Judge®)

- Vactor truck (flexible hose recommended)

- First Defense® Maintenance Log

Floatables and sediment Clean Out Procedures

1. Set up any necessary safety equipment around the access port or grate of the First Defense® as stipulated by local ordinances. Safety equipment should notify passing pedestrian and road traffic that work is being done.

2. Remove the grate or lid to the manhole.

3. Without entering the vessel, look down into the chamber to inspect the inside. Make note of any irregularities.

4. Remove oil and floatables stored on the surface of the water with the vactor hose (Fig.5) or with the skimmer or net (not pictured).

5. Using a sediment probe such as a Sludge Judge®, measure the depth of sediment that has collected in the sump of the vessel and record it in the Maintenance Log (page 9).

6. Once all floatables have been removed, drop the vactor hose to the base of the sump. Vactor out the sediment and gross debris off the sump floor (Fig.5).

7. Retract the vactor hose from the vessel.

8. On the Maintenance Log provided by Hydro International, record the date, unit location, estimated volume of floatables and gross debris removed, and the depth of sediment measured. Also note any apparent irregularities such as damaged components, blockages, or irregularly high or low water levels.

9. Securely replace the grate or lid.

Fig.5 Sediment is removed with a vactor hose (First Defense model FD-4, shown).

Maintenance at a Glance

Inspection	- Regularly during first year of installation - Every 6 months after the first year of installation
Oil and Floatables Removal	- Once per year, with sediment removal - Following a spill in the drainage area
Sediment Removal	- Once per year or as needed - Following a spill in the drainage area
NOTE: For most clean outs the entire volume of liquid does not need to be removed from the manhole. Only remove the first few inches of oils and floatables from the water surface to reduce the total volume of liquid removed during a clean out.	

First Defense® Installation Log

HYDRO INTERNATIONAL REFERENCE NUMBER:	
SITE NAME:	
SITE LOCATION:	
OWNER:	CONTRACTOR:
CONTACT NAME:	CONTACT NAME:
COMPANY NAME:	COMPANY NAME:
ADDRESS:	ADDRESS:
TELEPHONE:	TELEPHONE:
FAX:	FAX:

INSTALLATION DATE: / /

MODEL SIZE (CIRCLE ONE): FD-4 FD-4HC FD-6 FD-6HC

INLET (CIRCLE ALL THAT APPLY): GRATED INLET (CATCH BASIN) INLET PIPE (FLOW THROUGH)

Hydro International (Stormwater), 94 Hutchins Drive, Portland ME 04102
Tel: (207) 756-6200 Fax: (207) 756-6212 Web: www.hydro-int.com

First Defense® Inspection and Maintenance Log

Date	Initials	Depth of Floatables and Oils	Sediment Depth Measured	Volume of Sediment Removed	Site Activity and Comments

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