BARBER COVE DEVELOPMENT

Drainage Report

Prepared for:
32-36 Iron Horse, LLC
75 West Street
Simsbury, Connecticut 06070

141.17126.00001

May 28, 2021

Drainage Report

Barber Cove Development
32 and 36 Iron Horse Boulevard
Simsbury, CT
May 28, 2021
141.17126.00001

This Drainage Report has been prepared in support of the Barber Cove Development to be constructed at the two abutting parcels located at 32 and 36 Iron Horse Boulevard in the town of Simsbury, Connecticut. The 13.6-acre development site is located along the Farmington River and within the Simsbury Center (SC) Zone SC-5. The property is currently active as a contractor's storage yard with remnants of prior industrial activities, stockpiles, compacted graveled roads, contractor's equipment, and two buildings. The access drives and parking areas around and between the buildings consist of a compacted gravel mix over remnants of old bituminous milling from prior operations. The site is proposed to be redeveloped as a residential development with five multifamily apartment buildings, outdoor parking areas, three garage buildings, a clubhouse, pool area, paved sidewalks, and a walking trail around the perimeter of the development.

Figure 1 – #32 and #36 Parcels

Table 1 – Stormwater Data

Parcel Size Total	13.56 acres
Existing Impervious Area (Project Area)	8.79 acres
Proposed Impervious Area (Project Area)	7.46 acres
Soil Types (Hydrologic Soil Group)	"B," "C," and "D"
Existing Land Use	Woods, meadow, open space, compacted graveled road, concrete walks, bituminous pavement, building, and water surface
Proposed Land Use	Woods, meadow, lawn, bituminous pavement, sidewalks, parking, patios, building, and water surface
Design Storm for Stormwater Management	No increases in peak rates of runoff for the 2-, 10-, 25-, 50-, and 100-year storms. Recharge Volume and Water Quality Volume per Simsbury regulations and CTDEEP Stormwater Manual (CTDEEP WQV and GRV).
Water Quality Measures	2-foot-sump catch basins, underground infiltration chambers, hydrodynamic separator, water quality swale (wet swale), tree planting, and stone-lined energy dissipator
Design Storm for Storm Drainage	25-year storm
Federal Emergency Management Agency Special Flood Hazard Areas	Regulatory Floodway, Zone AE with BFE (100-year), 0.2% Annual Chance Flood Hazard (500-year)
Connecticut Department of Energy & Environmental Protection Aquifer Protection Areas	Not applicable

STORMWATER MANAGEMENT APPROACH

The stormwater management system for this site has been designed utilizing Best Management Practices (BMPs) to provide water quality management and ensure that predevelopment peak rates of runoff would not be exacerbated due to the new development. The proposed design was planned in accordance with the Simsbury Stormwater Article dated September 28, 2011, as included as part of the town's Land Use Department, and the Connecticut Department of Energy and Environmental (CTDEEP) *2004 Stormwater Manual.*

The performance standards outlined in the Simsbury Stormwater Article are organized into three areas:

1. Planning and Site Design Criteria Checklist

2. Stormwater Quantity and Quality Requirements:

    2.1. Redevelopment
    2.2. Peak Rate
    2.3. Recharge Volume

   2.4. Water Quality
   2.5. Conveyance
   2.6. Offsite Mitigation and Stormwater Mitigation Bank
   2.7. Site BMP Incentive Credits

3. Design and Construction Requirements:
   3.1. BMP Requirements
   3.2. Special Detention Areas

1. Planning and Site Design Criteria Checklist

The new site has been planned to be a compact and walkable development including several sidewalks that will be integrated with the existing walking trail that runs on Iron Horse Boulevard. The goal is to preserve natural resources, maintain existing drainage patterns to the maximum extent possible, and manage rainfall on the site through a series of Low Impact Design (LID) techniques and BMPs. An improvement in site runoff conditions is expected based on the proposed stormwater improvements planned for the project. There is currently no stormwater infrastructure on the site, and runoff from the storage yard operations drains off site toward the eastern wetlands and Farmington River without any type of water quality treatment. The proposed project will introduce a new stormwater treatment train consisting of new landscaped and grassed areas, new planted trees, catch basins with 2-foot sumps, a hydrodynamic separator, underground infiltration chambers, and a final water quality swale – a wet swale as a CTDEEP primary stormwater practice.

2. Stormwater Quantity and Quality Requirements

The stormwater quantity and quality performance standards are adjusted based on the zoning district. The site is subject to the requirements of the Simsbury Center SC-5 zone, and the performance standards are multiplied by the location-based adjustment factor per Stormwater Article requirements (Table 1.1), which are summarized as follows:

- Peak Rate = Peak rate reduction not required for the 100-year storm event. The development must still provide safe overflow conveyance for the postdevelopment peak runoff rate from the 100-year design storm event.
- Water Quality = 100% = multiplying factor equal to 1
- Recharge Volume = 50% = multiplying factor equal to 0.5

2.1 Redevelopment

Projects with more than 50% pre-development impervious surface cover are considered redevelopment projects. At a minimum, redevelopment projects must implement planning, design criteria, and structural BMP measures to meet water quality treatment and recharge volume requirements for at least 50% of the postdevelopment effective impervious area.

Based on visual investigation of existing land use, soil subsurface testing, and historical aerial photogrammetry, the site's land use consists mostly of compacted graveled access roads, a mix of compacted gravel and remnants of bituminous milling on the parking areas around and between the two existing buildings, some paved areas, stockpiles, and sparse wooded areas along the perimeter of the site.

Existing infiltration is minimum based upon land use investigation, which was evidenced by water ponding after rain events.

Table 2 – Existing Impervious Area Chart

Types of Impervious Areas	Area (acres)
Buildings	0.40
Graveled Roads	4.27
Mix Gravel and Bituminous Milling	3.99
Paved	0.13
Total Impervious Area	8.79
Site Area	13.56
% Impervious = 64%	

Per the definition of impervious area in the Simsbury zoning regulations, the existing land use was delineated. The property site was determined to contain approximately 64% of impervious area. Therefore, the adjustment factor of 50% was applied to the water quality and recharge volume performance standard requirements.

2.2 Peak Rate

The postdevelopment impervious area will be less than the predevelopment conditions' impervious coverage. As an improvement in land coverage is expected from the new development, the postdevelopment peak rates of runoff will be less than the predevelopment peak rates of runoff. Therefore, the peak-rate requirements from the Simsbury Stormwater Article for the 2-, 10-,25- and 100-year, 24-hour design storm events are met. A detailed hydrologic analysis has been prepared and the results of the peak rates of runoff are included in that section of this report.

2.3 Recharge Volume

The required recharge volume was calculated by multiplying the Effective Impervious Area – Volume (EIA-V) by the groundwater recharge depth. The EIA-V is the effective impervious area after the application of Site BMP volume incentives. The Barber Cove project has a considerable amount of new tree planting; thus, a credit from tree planting – which reduces the postdevelopment impervious area – was applied towards the computations. This is explained further under Section 2.7 "Site BMP Incentive Credits."

The site is predominantly located within Hydrologic Soil Group "B." Therefore, the groundwater recharge depth used in the computations was 0.35 inches per Table 1.2 of the Stormwater Article.

The required Recharge Volume, after multiplying the calculated recharge volume by 50% due to the redevelopment factor and by another 50% due to the location-based factor (SC-5 Zone), was calculated to be 2,339 cubic feet. The provided volume achieved by the proposed infiltration chambers is approximately 11,750 cubic feet, thus meeting Simsbury's Recharge Volume requirements. The chambers were strategically located on the site observing groundwater levels and proposed finished grades. The galleries will receive stormwater runoff only from the proposed rooftop areas from the five new buildings. The volume provided in the chambers is also used toward meeting the CTDEEP Water Quality Volume (WQV) and Groundwater Recharge Volume (GRV) requirements, which is further discussed in this report.

2.4 Water Quality

The required water quality volume for the project is 1-inch of rainfall over the Effective Impervious Area – Water Quality (EIA-WQ). The EIA-WQ for the site was calculated by applying the redevelopment credit of 50% and subtracting the Site BMP Incentive from the Post-Development Impervious Area, for a total of 13,362 cubic feet required water quality volume. There is no adjustment factor due the location-based SC-5, based on Table 1.1 from the Simsbury Stormwater Article.

The proposed water quality swale has approximately 15,440 cubic feet of storage volume below the overflow elevation. Therefore, the volume provided meets Simsbury's water quality volume requirements. The wet swale will include a sediment forebay area and will be preceded by a pretreatment proprietary hydrodynamic separator. This unit was sized based on CTDEEP requirements for Water Quality Flow (WQF), which is discussed in the Water Quality Management Section of this report.

2.5 Conveyance

The proposed storm drainage systems were designed to provide adequate capacity to convey the 25-year storm event. The wet swale will have two emergency outlets that will function simultaneously during large storm events. The primary emergency outlet consists of a trapezoidal-shaped spillway located on the south end of the swale. A secondary overflow consisting of a 24-inch riser pipe will be installed on the north end of the swale, fitted with a dome grate and an outlet pipe. The discharge capacity of both outlets combined is greater than the contributing discharge from a 100-year storm event.

The computer program entitled *Hydraflow Storm Sewers Extension for AutoCAD® Civil 3D® 2019* by Autodesk, Inc., Version 2018.3, was used for designing the proposed storm drainage collection system. Storm drainage computations performed include pipe capacity and hydraulic grade line calculations. The contributing watershed to each individual catch basin inlet was delineated to determine the drainage area and land coverage. These values were used to determine the stormwater runoff to each inlet using the Rational Method. The rainfall intensities for the site were obtained from the National Oceanic and Atmospheric Administration (NOAA) Atlas 14, Volume 10, Precipitation Frequency Data Server (PFDS).

2.6 Off-Site Mitigation and Stormwater Mitigation Bank

Off-site mitigation and stormwater mitigation bank are not applicable to this project. Stormwater runoff rates and volumes requirements are met as part of the proposed project.

2.7 Site BMP Incentive Credits

Site BMP Incentive Credits allow for a reduction in the postdevelopment impervious area used for calculation purposes, resulting in the Effective Impervious Area (EIA). For this project, a considerable amount of new planted trees was used as a BMP incentive credit. This credit is applied such that 100 square feet of impervious area is deducted from the final postdevelopment impervious area for each qualifying new tree planted within 10 feet of ground-level impervious surfaces. However, a maximum of 25% of the trees can be counted toward the tree credit.

A total of 168 trees that are part of the Landscaping Plan qualifies for this credit. 42 trees (25%) were counted toward the credit, resulting in a reduction of 4,200 square feet of the actual postdevelopment impervious area, which is 324,910 square feet, or 7.46 acres. By applying the reduction area credit from tree planting, the effective impervious area used toward the computations was reduced to 320,710 square feet, or 7.36 acres.

3. Design and Construction Requirements

3.1 BMP Requirements

The development has been designed in accordance with the guidelines of the CTDEEP *2004 Stormwater Quality Manual.* All construction and erosion and sediment controls provided are in accordance with the *2002 Connecticut Guidelines for Soil Erosion and Sediment Control.* Structural stormwater BMPs were selected using the guidance of the Site BMP Selection Matrix (Table 1.3) of the Simsbury Stormwater Article. A pretreatment device will be installed prior to the final stormwater discharge into the water quality swale and the wetland areas. The infiltration chambers will receive clean runoff from rooftop areas; therefore, a pretreatment device preceding the chambers will not be needed.

3.2 Special Detention Areas

Special Detention Areas are not applicable to the proposed project.

Stormwater Operation and Maintenance

A detailed Stormwater Management Operation and Maintenance Plan is included in the proposed Utilities Plan Sheet UT, which comprises of recommended frequency of services, procedures for inspection and maintenance of the proposed BMPs, disposal of materials, and owner's responsibilities.

WATER QUALITY MANAGEMENT

In addition to the water quality requirements from the town of Simsbury, the proposed drainage plan has also been developed following the recommendations set forth in the CTDEEP *2004 Stormwater Quality Manual.* All of the treatment measures described in this section will help maintain water quality of the stormwater runoff from the proposed site.

Stormwater runoff from the proposed improvements will be collected by a subsurface pipe and catch basin drainage system. The proposed drainage system will include catch basins with 2-foot sumps that will trap sediments.

The proposed hydrodynamic separator selected is a CDS® unit, which is manufactured by Contech Engineered Solutions. The unit will be installed in the storm drainage system prior to discharging runoff into the proposed water quality swale and the final discharge toward the eastern wetland areas. This unit will further remove suspended solids before discharging downgradient; this will in turn remove other pollutants that tend to attach to suspended solids and effectively remove other debris and floatables that may be present within stormwater runoff. The hydrodynamic separator has been designed to meet the criteria recommended by the CTDEEP *2004 Stormwater Quality Manual* and was sized based on the determined WQF, which is the peak-flow rate associated with the WQV, following the manufacturer's specifications.

The wet water quality swale will be constructed as a multi-cell system with several shallow depressions formed by berms. The bottom of the swale is planned to be saturated to support vegetation growth. The multi-cell system will enhance plug flow conditions where incoming water displaces the water retained in the system from the previous rain event. The first depression will act as a sediment forebay where floatables can be trapped and coarse sediment and other pollutants can be filtered. The forebay will contain the deposited sediment within a small area of the basin and will allow for maintenance accessibility.

The volume requirements associated with the CTDEEP WQV and GRV were achieved by the combined retention volume provided in the infiltration chambers and the water quality swale. The CTDEEP *2004 Stormwater Quality Manual* (Chapter 7) recommends methods for sizing stormwater treatment measures with WQV and GRV computations. The WQV addresses the initial stormwater runoff also commonly referred to as the "first flush" runoff. The WQV provides adequate volume to store the initial 1 inch of runoff, which tends to contain the highest concentrations of potential pollutants. The GRV provides adequate volume to maintain the predevelopment annual ground water recharge and promote infiltration based on the soils found on the site. When provided, the GRV will achieve similar stormwater infiltration capabilities and maintain adequate ground water recharge. All supporting calculations for the volume provided as well as WQV and GRV computations have been included in the Appendix of this report.

HYDROLOGIC ANALYSIS

A detailed hydrologic analysis has been conducted to analyze the predevelopment and postdevelopment peak-flow rates from the site. Five analysis points were chosen based on the fact that each area receives stormwater runoff from a portion of the proposed project site, including the contributing off-site upstream areas. The existing subwatersheds were used to determine runoff for current site conditions. The existing watersheds were then modified and subdivided further to reflect the proposed changes to the site and analyze the hydrology under proposed conditions. The total combined watershed area delineated is approximately 14.6 acres under both existing and proposed conditions. A watershed map for both existing and proposed conditions is included in the Appendix of this report. The following table provides a brief description of the eight analysis points used in this hydrology study:

Analysis Point	Description
A	Eastern Property Boundary (subwatersheds numbered in the 10s)
B	Northern Property Boundary (subwatersheds numbered in the 20s)
C	Northwestern Property Boundary (subwatersheds numbered in the 30s)
D	Southwestern Property Boundary (subwatersheds numbered in the 40s)
E	Southern Property Boundary (subwatersheds numbered in the 50s)

The method of predicting the surface water runoff rates utilized in this analysis is a computer program entitled *Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2019* by Autodesk, Inc., Version 2020. The *Hydrographs* program is a computer model that utilizes the methodologies set forth in the *Technical Release No. 55* (TR-55) manual and *Technical Release No. 20* (TR-20) computer model, originally developed by the United States Department of Agriculture – Natural Resources Conservation Service (USDA-NRCS). The *Hydrographs* computer modeling program is primarily used for conducting hydrology studies such as this one.

The *Hydrographs* computer program forecasts the rate of surface water runoff based upon several factors. The input data includes information on land use, hydrologic soil type, vegetation, contributing watershed area, time of concentration, rainfall data, storage volumes, and the hydraulic capacity of structures. The computer model predicts the amount of runoff as a function of time, with the ability to include the attenuation effect due to dams, lakes, large wetlands, floodplains, and stormwater management basins. The input data for rainfalls with statistical recurrence frequencies of 2, 10, 25, 50, and 100 years was obtained from the NOAA Atlas 14, Volume 10 database.

Table 4 – NOAA Rainfall Amounts

Storm Frequency	Rainfall (inches)
2-year	3.31
10-year	5.32
25-year	6.58
50-year	7.50
100-year	8.52

Land use for the site under existing and proposed conditions was determined from field survey, town topographic maps, and aerial photogrammetry. Land use types used in the analysis included woods, meadow, grassed or open space, graveled roads, building, impervious (drives, sidewalks, parking, patios), and water surface. Soil types in the watershed were determined from the CTDEEP Geographic Information System (GIS) database of the USDA-NRCS soil survey for Hartford County, Connecticut. For the analysis, the site was determined to contain hydrologic soil types "B," "C," and "D" as classified by NRCS. Composite runoff Curve Number (CN) for each subwatershed was calculated based on the different land use and soil types. The time of concentration (Tc) was estimated for each subwatershed using the TR-55 methodology and was computed by summing all travel times through the watershed as sheet flow, shallow concentrated flow, and channel flow.

The existing conditions were modeled with the *Hydrographs* program to determine the peak-flow rates for the various storm events at each analysis point. A revised model was developed incorporating the proposed grading, storm drainage, and proposed land coverage. The flows obtained with the revised model were then compared to the results of the existing conditions model. A reduction in the predevelopment peak runoff rates is expected under proposed conditions due to the proposed improvements to the site. The following peak rates of runoff were obtained from the *Hydrographs* hydrology results:

Analysis Point A – Eastern Property Boundary					
	Peak Runoff Rate (cubic feet per second)				
Storm Frequency (years)	**2**	**10**	**25**	**50**	**100**
Existing Conditions	23.0	46.5	61.5	72.4	84.6
Proposed Conditions	19.1	40.2	53.9	64.0	75.2

Analysis Point B – Northern Property Boundary					
	Peak Runoff Rate (cubic feet per second)				
Storm Frequency (years)	**2**	**10**	**25**	**50**	**100**
Existing Conditions	0.6	1.3	1.7	2.0	2.3
Proposed Conditions	0.3	0.6	0.9	1.0	1.2

Analysis Point C – Northwestern Property Boundary					
	Peak Runoff Rate (cubic feet per second)				
Storm Frequency (years)	**2**	**10**	**25**	**50**	**100**
Existing Conditions	0.2	0.7	1.0	1.3	1.5
Proposed Conditions	0.2	0.4	0.6	0.7	0.8

Analysis Point D – Southwestern Property Boundary					
	Peak Runoff Rate (cubic feet per second)				
Storm Frequency (years)	**2**	**10**	**25**	**50**	**100**
Existing Conditions	0.2	0.4	0.5	0.5	0.6
Proposed Conditions	0.2	0.3	0.4	0.5	0.6

Analysis Point E – Southern Property Boundary					
	Peak Runoff Rate (cubic feet per second)				
Storm Frequency (years)	**2**	**10**	**25**	**50**	**100**
Existing Conditions	0.1	0.5	0.9	1.1	1.4
Proposed Conditions	0.1	0.4	0.7	1.0	1.2

CONCLUSION

The results of the hydrologic analysis demonstrate that there will be no increases in peak-flow rates from the project site. Since impervious coverage will be reduced and new lawn areas will be established under proposed conditions, an improvement in site runoff conditions is expected to occur after the new development is fully constructed.

There is currently no stormwater infrastructure on the property, and runoff from the storage yard drains off site toward the eastern wetlands and Farmington River without any type of water quality treatment. The proposed project will introduce a new stormwater treatment train consisting of new landscaped and grassed areas, new planted trees, catch basins with 2-foot sumps, a hydrodynamic separator underground infiltration chambers, and a final water quality swale – wet swale as a CTDEEP primary stormwater practice.

The proposed stormwater management design was planned in accordance with the *Simsbury Stormwater Article,* Simsbury Center Code, and the CTDEEP *2004 Stormwater Manual.* The design meets Simsbury's stormwater requirements for redevelopment, peak rate, recharge volume, water quality, and conveyance. The proposed design will use a considerable amount of new trees planted throughout the site as a BMP incentive credit toward reducing the effective impervious area.

The hydrodynamic separator will pretreat stormwater runoff generated from the proposed impervious surfaces prior to it entering the receiving water quality swale and prior to the final discharge toward the wetland areas. A CDS® unit, manufactured by Contech Engineered Solutions, was selected and sized based on the contributing WQF, which is the peak-flow rate associated with the WQV. Furthermore, the combined retention volume provided in the infiltration chambers and water quality swale meets the CTDEEP WQV and GRV, which are volume requirements associated with the runoff generated by the first 1 inch of rainfall.

All supporting documentation and stormwater-related computations are attached to this report along with the *Hydraflow Hydrographs* model results for stormwater management and *Hydraflow Storm Sewers* model results for the proposed storm drainage system. Illustrative watershed maps for both existing and proposed conditions are also attached to this report.

Attachments

Attachment A – United States Geological Survey (USGS) Location Map
Attachment B – Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map
Attachment C – Natural Resources Conservation Service (NRCS) Hydrologic Soil Group Map
Attachment D – Simsbury Stormwater Article Computations
Attachment E – On-Site Soil Testing Results
Attachment F – Storm Drainage Computations
Attachment G – Water Quality Computations
Attachment H – Hydrologic Analysis – Input Computations
Attachment I– Hydrologic Analysis – Computer Model Results
Attachment J – Watershed Maps

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APPENDIX A

UNITED STATES GEOLOGICAL SURVEY (USGS) LOCATION MAP

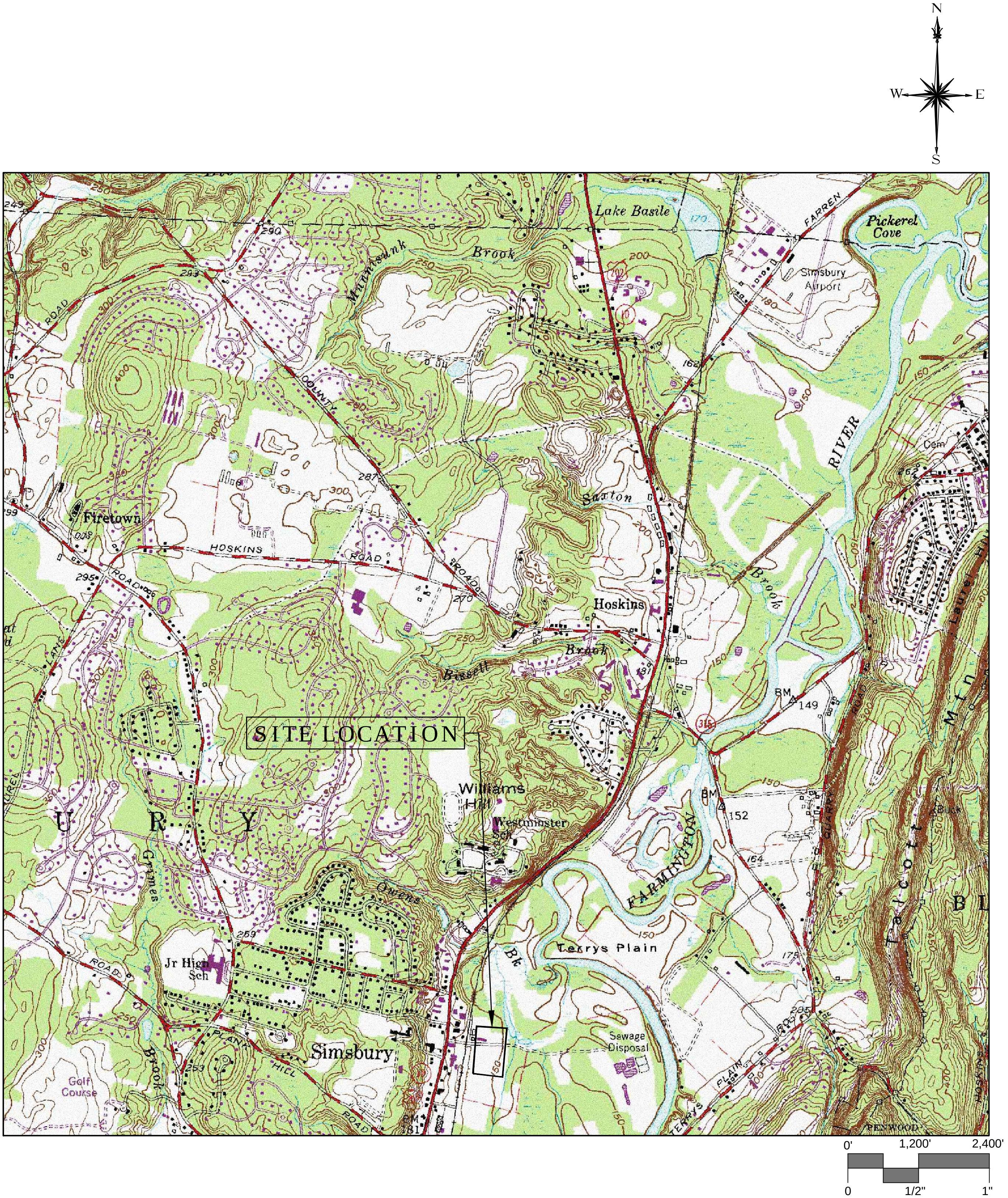
Drainage Report

Barber Cove Development

32 and 36 Iron Horse Boulevard

Simsbury, Connecticut

May 28, 2021



99 REALTY DRIVE
CHESHIRE, CT 06410
203.271.1773
SLRCONSULTING.COM

USGS QUADRANGLE MAP, QUAD NO. 65

BARBER COVE DEVELOPMENT

32 AND 36 IRON HORSE BOULEVARD
SIMSBURY, CONNECTICUT

PROJECT PHASE:

REV: ---

DATE **MAY 14, 2021**

SCALE **1"=2,400'**

PROJ. NO. **7126-01**

DESIGNED	DRAWN	CHECKED
---	**MCB**	---

DRAWING NAME:

LOC

ATTACHMENT B

FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA) FLOOD INSURANCE RATE MAP

Drainage Report

Barber Cove Development

32 and 36 Iron Horse Boulevard

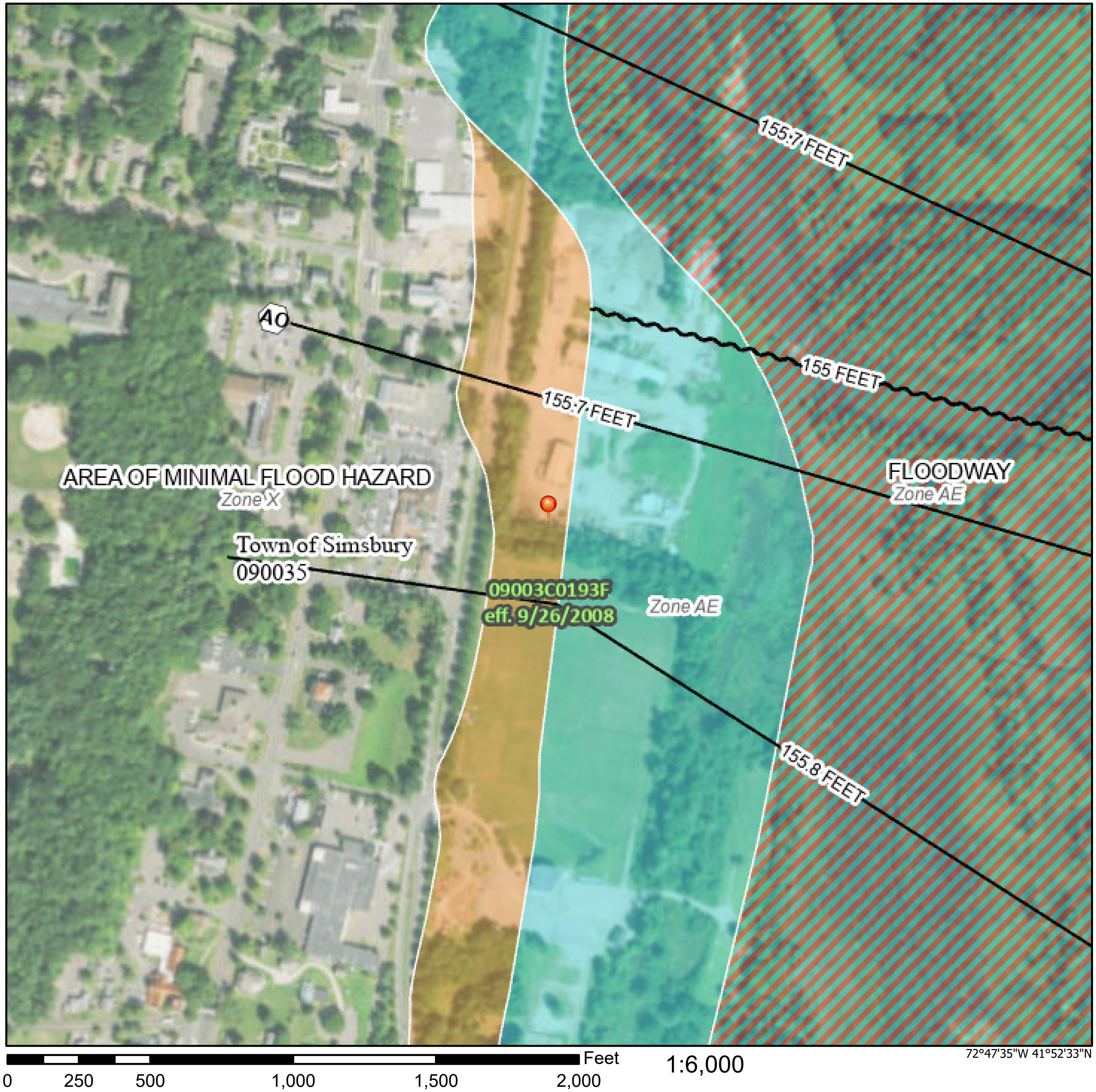
Simsbury, Connecticut

May 28, 2021

National Flood Hazard Layer FIRMette

FEMA

72°48'12"W 41°52'59"N



1:6,000

72°47'35"W 41°52'33"N

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

Legend

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

SPECIAL FLOOD HAZARD AREAS	🟦	Without Base Flood Elevation (BFE) *Zone A, V, A99* With BFE or Depth *Zone AE, AO, AH, VE, AR*
	▨	Regulatory Floodway
OTHER AREAS OF FLOOD HAZARD	🟧	0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
	▨	Future Conditions 1% Annual Chance Flood Hazard *Zone X*
	▨	Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
	▨	Area with Flood Risk due to Levee *Zone D*
OTHER AREAS	NO SCREEN	Area of Minimal Flood Hazard *Zone X*
	☐	Effective LOMRs
	🟧	Area of Undetermined Flood Hazard *Zone D*
GENERAL STRUCTURES	— — —	Channel, Culvert, or Storm Sewer
	IIIIIII	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 3/19/2021 at 1:29 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.

Follows Conditional Case No.: 15-01-1643R

Federal Emergency Management Agency
Washington, D.C. 20472

LETTER OF MAP REVISION
DETERMINATION DOCUMENT

COMMUNITY AND REVISION INFORMATION		PROJECT DESCRIPTION	BASIS OF REQUEST
COMMUNITY	**Town of Simsbury** **Hartford County** **Connecticut**	**FILL**	**FLOODWAY** **HYDRAULIC ANALYSIS** **UPDATED TOPOGRAPHIC DATA**
	COMMUNITY NO.: 090035		
IDENTIFIER	32 Iron Horse Boulevard	**APPROXIMATE LATITUDE AND LONGITUDE: 41.881, -72.797** **SOURCE:** USGS QUADRANGLE **DATUM:** NAD 83	

ANNOTATED MAPPING ENCLOSURES

TYPE: FIRM* NO.: 09003C0193F DATE: September 26, 2008
TYPE: FIRM NO.: 09003C0331F DATE: September 26, 2008

ANNOTATED STUDY ENCLOSURES

DATE OF EFFECTIVE FLOOD INSURANCE STUDY: May 16, 2017

PROFILE: 116P
FLOODWAY DATA TABLE: 24

Enclosures reflect changes to flooding sources affected by this revision.
* FIRM - Flood Insurance Rate Map

FLOODING SOURCE AND REVISED REACH

Farmington River - from approximately 5,670 feet downstream of Drake Hill Road to approximately 3,600 feet downstream of Drake Hill Road

SUMMARY OF REVISIONS

Flooding Source	**Effective Flooding**	**Revised Flooding**	**Increases**	**Decreases**
Farmington River	BFEs*	BFEs	YES	YES
	Floodway	Floodway	NONE	YES
	Zone AE	Zone AE	NONE	YES
	Zone X (shaded)	Zone X (shaded)	NONE	YES

* BFEs - Base Flood Elevations

DETERMINATION

This document provides the determination from the Department of Homeland Security's Federal Emergency Management Agency (FEMA) regarding a request for a Letter of Map Revision (LOMR) for the area described above. Using the information submitted, we have determined that a revision to the flood hazards depicted in the Flood Insurance Study (FIS) report and/or National Flood Insurance Program (NFIP) map is warranted. This document revises the effective NFIP map, as indicated in the attached documentation. Please use the enclosed annotated map panels revised by this LOMR for floodplain management purposes and for all flood insurance policies and renewals in your community.

This determination is based on the flood data presently available. The enclosed documents provide additional information regarding this determination. If you have any questions about this document, please contact the FEMA Mapping and Insurance eXchange toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMC Clearinghouse, 3601 Eisenhower Avenue, Suite 500, Alexandria, VA 22304-6426. Additional Information about the NFIP is available on our website at https://www.fema.gov/flood-insurance.

Patrick "Rick" F. Sacbibit, P.E., Branch Chief
Engineering Services Branch
Federal Insurance and Mitigation Administration

Federal Emergency Management Agency
Washington, D.C. 20472

LETTER OF MAP REVISION DETERMINATION DOCUMENT (CONTINUED)

COMMUNITY INFORMATION

APPLICABLE NFIP REGULATIONS/COMMUNITY OBLIGATION

We have made this determination pursuant to Section 206 of the Flood Disaster Protection Act of 1973 (P.L. 93-234) and in accordance with the National Flood Insurance Act of 1968, as amended (Title XIII of the Housing and Urban Development Act of 1968, P.L. 90-448), 42 U.S.C. 4001-4128, and 44 CFR Part 65. Pursuant to Section 1361 of the National Flood Insurance Act of 1968, as amended, communities participating in the NFIP are required to adopt and enforce floodplain management regulations that meet or exceed NFIP criteria. These criteria, including adoption of the FIS report and FIRM, and the modifications made by this LOMR, are the minimum requirements for continued NFIP participation and do not supersede more stringent State/Commonwealth or local requirements to which the regulations apply.

We provide the floodway designation to your community as a tool to regulate floodplain development. Therefore, the floodway revision we have described in this letter, while acceptable to us, must also be acceptable to your community and adopted by appropriate community action, as specified in Paragraph 60.3(d) of the NFIP regulations.

COMMUNITY REMINDERS

We based this determination on the 1-percent-annual-chance flood discharges computed in the FIS for your community without considering subsequent changes in watershed characteristics that could increase flood discharges. Future development of projects upstream could cause increased flood discharges, which could cause increased flood hazards. A comprehensive restudy of your community’s flood hazards would consider the cumulative effects of development on flood discharges subsequent to the publication of the FIS report for your community and could, therefore, establish greater flood hazards in this area.

Your community must regulate all proposed floodplain development and ensure that permits required by Federal and/or State/Commonwealth law have been obtained. State/Commonwealth or community officials, based on knowledge of local conditions and in the interest of safety, may set higher standards for construction or may limit development in floodplain areas. If your State/Commonwealth or community has adopted more restrictive or comprehensive floodplain management criteria, those criteria take precedence over the minimum NFIP requirements.

We will not print and distribute this LOMR to primary users, such as local insurance agents or mortgage lenders; instead, the community will serve as a repository for the new data. We encourage you to disseminate the information in this LOMR by preparing a news release for publication in your community's newspaper that describes the revision and explains how your community will provide the data and help interpret the NFIP maps. In that way, interested persons, such as property owners, insurance agents, and mortgage lenders, can benefit from the information.

This revision has met our criteria for removing an area from the 1-percent-annual-chance floodplain to reflect the placement of fill. However, we encourage you to require that the lowest adjacent grade and lowest floor (including basement) of any structure placed within the subject area be elevated to or above the Base (1-percent-annual-chance) Flood Elevation.

This determination is based on the flood data presently available. The enclosed documents provide additional information regarding this determination. If you have any questions about this document, please contact the FEMA Mapping and Insurance eXchange toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMC Clearinghouse, 3601 Eisenhower Avenue, Suite 500, Alexandria, VA 22304-6426. Additional Information about the NFIP is available on our website at https://www.fema.gov/flood-insurance.

Patrick “Rick” F. Sacbibit, P.E., Branch Chief
Engineering Services Branch
Federal Insurance and Mitigation Administration

Federal Emergency Management Agency
Washington, D.C. 20472

LETTER OF MAP REVISION
DETERMINATION DOCUMENT (CONTINUED)

We have designated a Consultation Coordination Officer (CCO) to assist your community. The CCO will be the primary liaison between your community and FEMA. For information regarding your CCO, please contact:

Ms. Kerry Bogdan
Chief, Risk Analysis Branch
U.S. Department of Homeland Security
Federal Emergency Management Agency, Region I
99 High Street, Sixth Floor
Boston, MA 02110
(617) 956-7576

STATUS OF THE COMMUNITY NFIP MAPS

We will not physically revise and republish the FIRM and FIS report for your community to reflect the modifications made by this LOMR at this time. When changes to the previously cited FIRM panels and FIS report warrant physical revision and republication in the future, we will incorporate the modifications made by this LOMR at that time.

This determination is based on the flood data presently available. The enclosed documents provide additional information regarding this determination. If you have any questions about this document, please contact the FEMA Mapping and Insurance eXchange toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMC Clearinghouse, 3601 Eisenhower Avenue, Suite 500, Alexandria, VA 22304-6426. Additional Information about the NFIP is available on our website at https://www.fema.gov/flood-insurance.

Patrick “Rick” F. Sacbibit, P.E., Branch Chief
Engineering Services Branch
Federal Insurance and Mitigation Administration

LETTER OF MAP REVISION
DETERMINATION DOCUMENT (CONTINUED)

PUBLIC NOTIFICATION OF REVISION

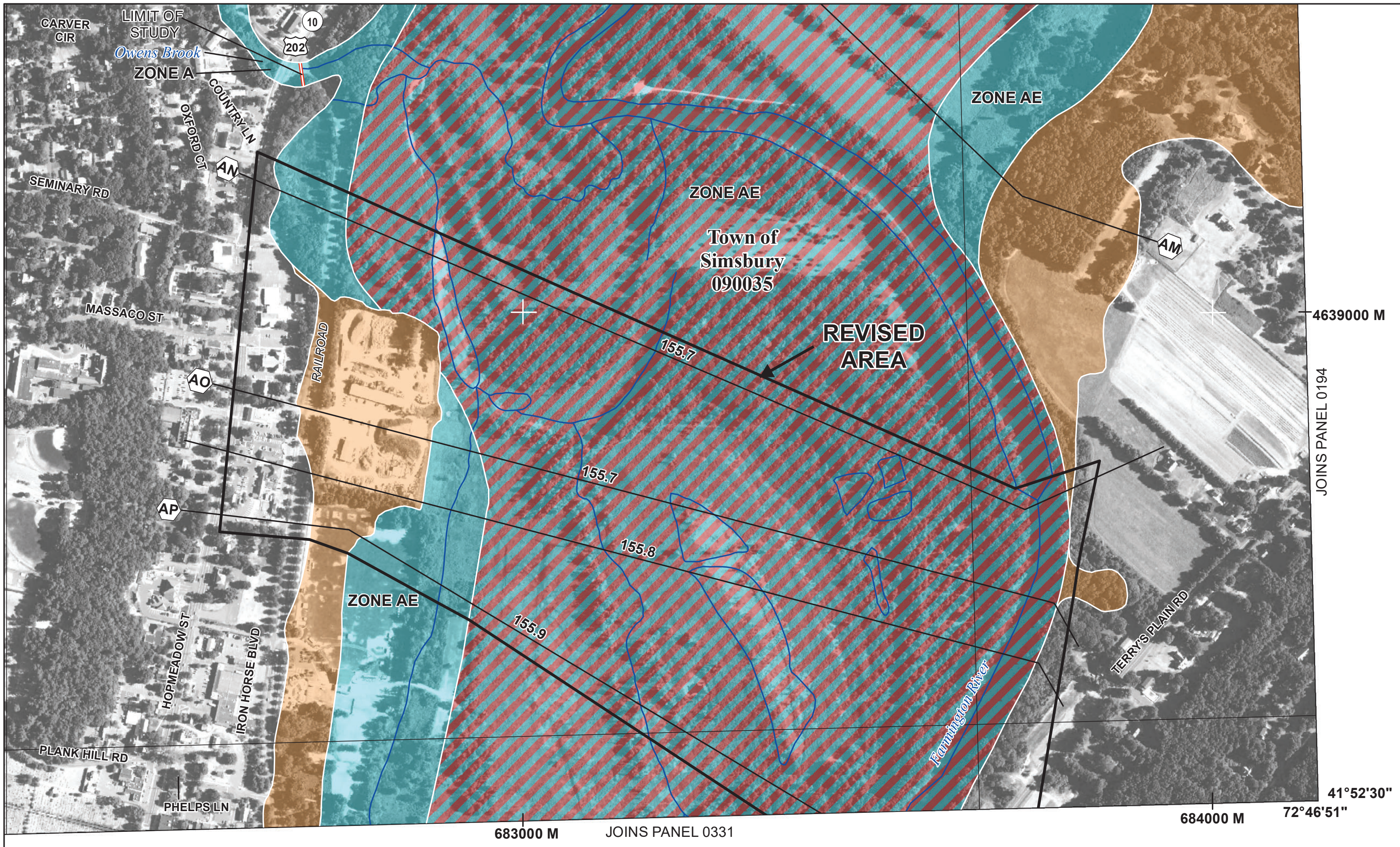
A notice of changes will be published in the *Federal Register*. This information also will be published in your local newspaper on or about the dates listed below, and through FEMA's Flood Hazard Mapping website at https://www.floodmaps.fema.gov/fhm/bfe_status/bfe_main.asp

LOCAL NEWSPAPER
Name: *Hartford Courant*
Dates: January 27, 2021 and February 3, 2021

Within 90 days of the second publication in the local newspaper, any interested party may request that we reconsider this determination. Any request for reconsideration must be based on scientific or technical data. Therefore, this letter will be effective only after the 90-day appeal period has elapsed and we have resolved any appeals that we receive during this appeal period. Until this LOMR is effective, the revised flood hazard determination presented in this LOMR may be changed.

This determination is based on the flood data presently available. The enclosed documents provide additional information regarding this determination. If you have any questions about this document, please contact the FEMA Mapping and Insurance eXchange toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMC Clearinghouse, 3601 Eisenhower Avenue, Suite 500, Alexandria, VA 22304-6426. Additional Information about the NFIP is available on our website at https://www.fema.gov/flood-insurance.

Patrick "Rick" F. Sacbibit, P.E., Branch Chief
Engineering Services Branch
Federal Insurance and Mitigation Administration



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*

Imagery Source: NAIP 2016

SCALE

N

Map Projection:
Universal Transverse MercatorNAD 1983 UTM Zone 18N
Western Hemisphere; Vertical Datum: NAVD 88

1 inch = 500 feet 1:6,000

0 250 500 1,000 Feet

0 62.5 125 250 Meters

FEMA

National Flood Insurance Program

NATIONAL FLOOD INSURANCE PROGRAM

FLOOD INSURANCE RATE MAP

HARTFORD COUNTY, CONNECTICUT

(ALL JURISDICTIONS)

PANEL 193 OF 675

FEMA

Panel Contains:

COMMUNITY	NUMBER	PANEL	SUFFIX
SIMSBURY, TOWN OF	090035	0193	F

REVISED TO
REFLECT LOMR
EFFECTIVE: June 3, 2021

VERSION NUMBER
2.3.3.2

MAP NUMBER
09003C0193F

EFFECTIVE DATE
SEPTEMBER 26, 2008

ATTACHMENT C

NATURAL RESOURCES CONSERVATION SERVICE (NRCS) HYDROLOGIC SOIL GROUP MAP

Drainage Report

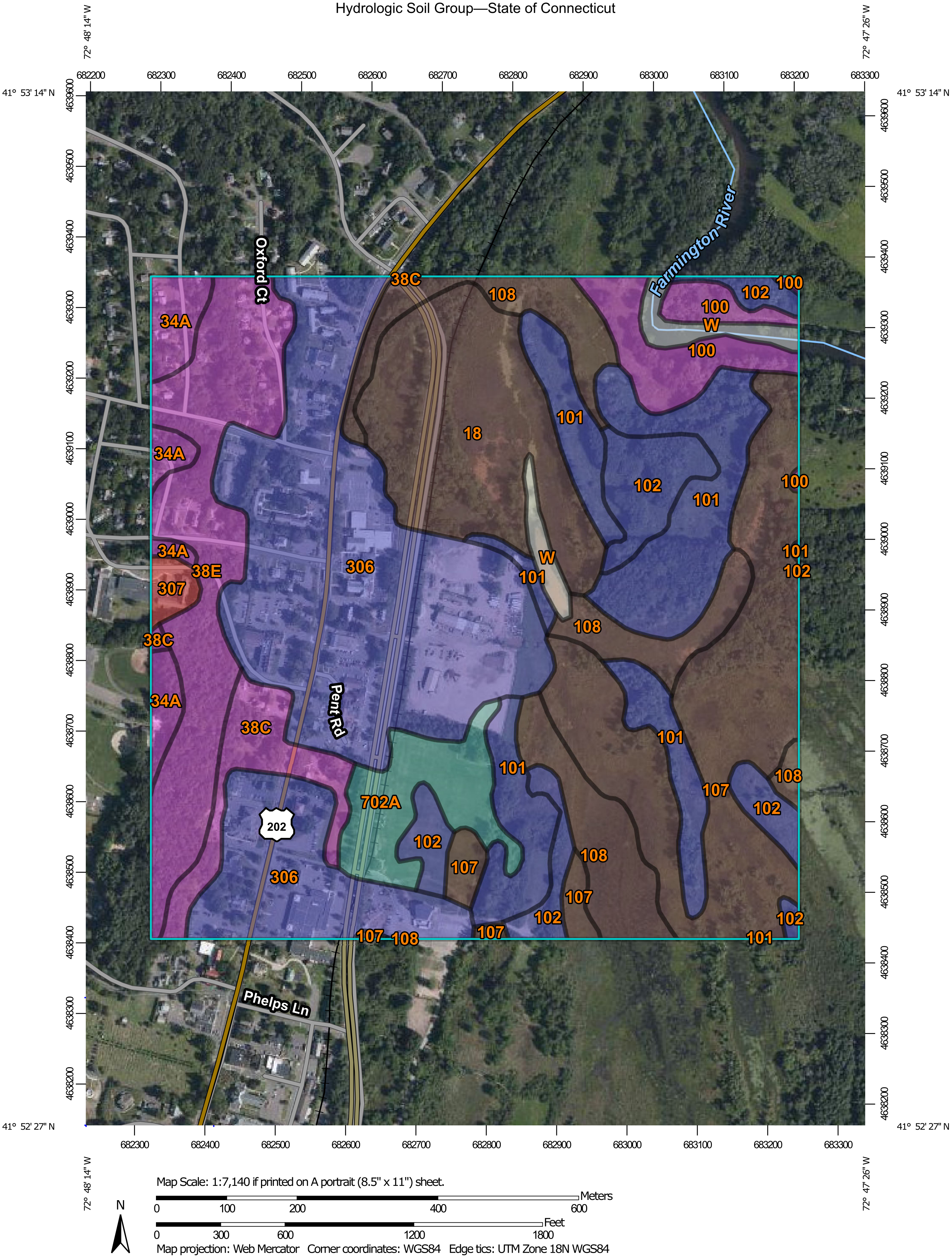
Barber Cove Development

32 and 36 Iron Horse Boulevard

Simsbury, Connecticut

May 28, 2021

Hydrologic Soil Group—State of Connecticut



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 1:12,000.

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

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

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

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

Soil Survey Area: State of Connecticut
Survey Area Data: Version 20, Jun 9, 2020

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

Date(s) aerial images were photographed: Aug 24, 2019—Oct 24, 2019

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

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
18	Catden and Freetown soils, 0 to 2 percent slopes	B/D	21.3	9.9%
34A	Merrimac fine sandy loam, 0 to 3 percent slopes	A	5.2	2.4%
38C	Hinckley loamy sand, 3 to 15 percent slopes	A	6.3	2.9%
38E	Hinckley loamy sand, 15 to 45 percent slopes	A	20.3	9.5%
100	Suncook loamy fine sand	A	7.5	3.5%
101	Occum fine sandy loam	B	25.3	11.8%
102	Pootatuck fine sandy loam	B	11.8	5.5%
107	Limerick and Lim soils	B/D	30.9	14.4%
108	Saco silt loam	B/D	17.3	8.1%
306	Udorthents-Urban land complex	B	55.8	26.0%
307	Urban land	D	1.3	0.6%
702A	Tisbury silt loam, 0 to 3 percent slopes	C	8.1	3.8%
W	Water		3.4	1.6%
Totals for Area of Interest			**214.4**	**100.0%**

Description

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.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

ATTACHMENT D

SIMSBURY STORMWATER ARTICLE COMPUTATIONS

Drainage Report

Barber Cove Development

32 and 36 Iron Horse Boulevard

Simsbury, Connecticut

May 28, 2021

JOB Barber Cove SLR # 141.17126.00
SHEET NO. 1 OF 4 SCALE
CALCULATED BY FAB DATE 5/14/21
CHECKED BY DATE

- Stormwater Management Design following the Performance Standards as described in the Simsbury Stormwater Article, Revision-2, dated September 28, 2011, and Simsbury Center Code

⇒ Stormwater Quantity and Quality Requirements

- Location - Based Adjustment

Barber Cove site is subject to the requirements of Simsbury Center SC-5 zone.

Table 1.1 from Simsbury Stormwater Article:

- Peak Rate : Peak rate reduction not required for the 100-year storm event. Provide safe overflow conveyance.

- Water Quality : 100% ◄
- Recharge Volume : 50% ◄

- Performance Standards

1) Redevelopment

Site area = 590,642 ft^2 ≈ 13.56 acres
Existing impervious area = 383,035 ft^2 ≈ 8.79 acres
(on site) (buildings, compacted graveled roads, bituminous, paved)

$8.79 / 13.56 = 64.8\% > 50\%$

Redevelopment credit = 50% ◄

(Water Quality and Recharge Volume requirements for at least 50% of the post-development effective impervious area)

2) Peak Rate

The post-development peak rates of runoff for the 2-, 10-, 25-, 50-, and 100-year, 24-hr design storm events will be less than the pre-development peak runoff rates due to the proposed site improvements. Refer to the Hydrologic Analysis section in the Drainage Report

3) Recharge Volume

Recharge Depth per Table 1.2 from Stormwater Article :

- B soils ⇒ 0.35 inches (conservatively and most predominant soils on site)

- Post-Development Impervious Area = 324,910 ft^2 ≈ 7.46 acres
  (includes impervious area on the site and some offsite along Iron Horse Blvd)

- Effective Impervious Area (EIA) ⇒ 168 planted trees ⇒ 25% of 168 = 42 trees
  42 x 100 $ft^2/tree$ = 4,200 ft^2 ⇒ 324,910 ft^2 − 4,200 ft^2 = 320,710 ft^2

Recharge Volume = EIA x Recharge Depth x Redevelopment Credit x Location-Based Credit

= 320,710 ft^2 x 0.35 in x 0.5 x 0.5

= 2,339 ft^3 ◄ (required per Simsbury SW Article)

Based on Table 1.3 (Site BMP Selection Matrix), Underground Infiltration Galleries were chosen as the Recharge Volume BMP:

<u>United Concrete Galleries (24" profile)</u> ⇒ volume = 340 gallons / chamber
≈ 45.45 ft^3 / chamber

Concrete galleries total volume/unit :

- galley volume = 340 gallons $\simeq$ 45.45 ft^3

- stone base and surrounding stone / galley :

  4' × 8' = 32 ft^2 × 12" thick base = 32 ft^3 (base)

  $$\left.\begin{array}{l}(3'\text{-}2" \times 8') \times 12" \text{ wide} = 25.33\ ft^3 \\ (3'\text{-}2" \times 8') \times 6" \text{ wide} = \underline{12.67}\ ft^3 \\ \qquad\qquad\qquad\qquad\qquad\quad 38.0\ ft^3\end{array}\right\rangle \text{(sides)}$$

  (32 + 38) ft^3 × 40% voids = 28 ft^3

- total volume / unit = (45.45 + 28) ft^3 = 73.45 ft^3

⇒ total number of galleries provided = 160

160 × 73.45 ft^3 = 11,752 ft^3 > 2,339 ft^3
(provided) (required per Simsbury SW Article)

$\underline{\underline{\text{OK}}}$

4) Water Quality

- 1 inch of rainfall
- Post-Development Impervious Area = 324,910 ft^2 ≃ 7.46 acres
- Effective Impervious Area (EIA) = 320,710 ft^2

Water Quality Volume = EIA × 1 inch × Redevelopment Credit × Location-Based Credit

= 320,710 ft^2 × 1 inch × 0.5 × 1.0
= 13,362 ft^3 ◄ (required per Simsbury SW Article)

Water Quality Swale Volume = 15,438 ft^3 @ overflow elevation

15,438 ft^3 (provided) > 13,362 ft^3 (required per Simsbury SW Article) OK ◄

5) Pipe Conveyance

Drainage conveyance systems were designed to adequately convey the 25-year storm. Safe overflow conveyance is provided by the final 36in pipes and the overflow structures at the water quality swale.

6) Offsite Mitigation and Stormwater Mitigation Bank

Not applicable

7) Site BMP Incentive Credits

Self-Treating Areas, Self-Retaining Areas, Permeable Pavement and Green Roofs not used in the project

Tree planting ⇒ 168 trees total
25% = 42 trees used toward tree impervious area credit

100 ft^2 reduction of actual post development impervious area per planted tree

$42 \times 100\ ft^2 = 4{,}200\ ft^2$

Actual postdevelopment impervious area = 324,910 ft^2

⇒ $324{,}910\ ft^2 - 4{,}200\ ft^2 = 320{,}710\ ft^2$ (Effective Impervious Area - EIA)

ATTACHMENT E

ON-SITE SOIL TESTING RESULTS

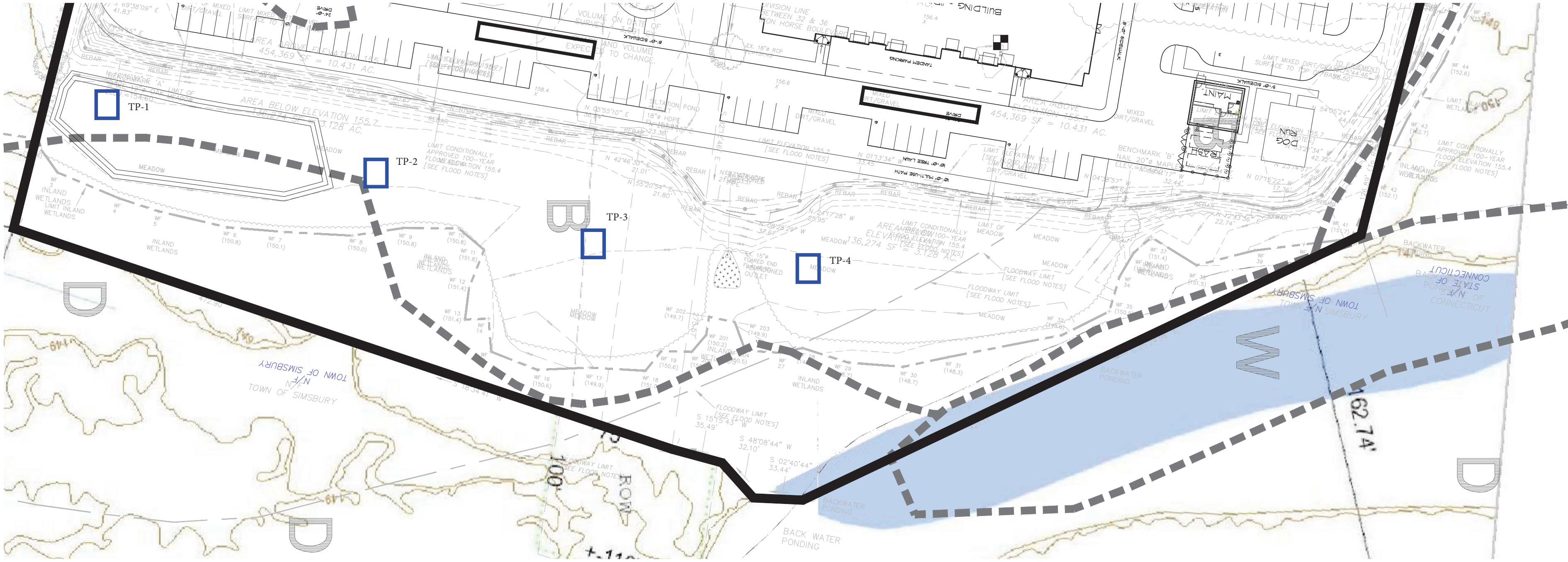
Drainage Report

Barber Cove Development

32 and 36 Iron Horse Boulevard

Simsbury, Connecticut

May 28, 2021



TP-1
TP-2
TP-3
TP-4
B
D
D
D
W
162.74'
100'
ROW
BUILDING
TANDEM PARKING
MAINT
DOG RUN
AREA ABOVE ELEVATION 155.7
454,369 SF = 10.431 AC.
AREA BELOW ELEVATION 155.7
136,274 SF = 3.128 AC.
LIMIT CONDITIONALLY APPROVED 100-YEAR FLOOD ELEVATION 155.4 [SEE FLOOD NOTES]
FLOODWAY LIMIT [SEE FLOOD NOTES]
MEADOW
INLAND WETLANDS
BENCHMARK 'B'
REBAR
MIXED DIRT/GRAVEL
BACKWATER PONDING
BACK WATER PONDING
N/F TOWN OF SIMSBURY
N/F STATE OF CONNECTICUT
S 15°15'43" W 35.49'
S 48°08'44" W 32.10'
S 02°40'44" 33.44'

TEST PIT DATA RECORD

Project: Barber Cove
Date: 3/31/21
Inspector: Peter Shea
Elev. Of Ground Surface: 151.5 (approx.)

Job No.: 17126.00001
Weather: Overcast 60F
Test Pit No.: TP-1

SOIL STRATUM ENCOUNTERED

From (inches)	To (inches)	Description of Soils
0	3	Organic, roots, brown f-m Sand, some Silt (Fill)
3	21	Dark Brown m-c SAND, little Silt, trace gravel (Fill)
21	29	Reddish Brown f-m SAND, little Silt (Fill)
29	41	Brown m SAND, little Silt (moist)
41	48	Orange Brown m-c SAND, little Silt (Wet)
48	58	Brown f-c SAND, trace Silt (Wet)

Depth to Ledge: NA
Water Encountered at Depth: 47” at 8:45; 37” at 10:02; 37” at 10:23
Installed Observation Well at Depth:

Comments: Permeability cores collected at 35” below grade (2 cores, TP-1 C-1 and TP-1 C-2)

Test Pit 1 at 8:45 am on March 31, 2021

Test Pit 1 at 10:23 am on March 31, 2021

SLR

TEST PIT DATA RECORD

Project: Barber Cove
Date: 3/31/21
Inspector: Peter Shea
Elev. Of Ground Surface: 151.5 (approx.)

Job No.: 17126.00001
Weather: Overcast 60F
Test Pit No.: TP-2

SOIL STRATUM ENCOUNTERED

From (inches)	To (inches)	Description of Soils
0	7	Organic, roots, brown f-m Sand, some Silt (Fill)
7	25	Dark Brown f-m SAND little Silt, some gravel, trace brick/asphalt (Fill)
25	32	Orange Brown m-c SAND little Silt, trace cobble (Fill/Wet)
32	42	Brown m-c SAND, little Silt (Wet)

Depth to Ledge:	NA
Water Encountered at Depth:	42.5” at 9:21, 40.8” at 10:04, 41” at 10:22
Installed Observation Well at Depth:	NA

Comments: Permeability cores collected at 28” below grade (2 cores, TP-2 C-1 and TP-1 C-2)

Test Pit 2 at 9:21 am on March 31, 2021

Test Pit 2 at 9:25 am on March 31, 2021

TEST PIT DATA RECORD

Project: Barber Cove

Date: 3/31/21

Inspector: Peter Shea

Elev. Of Ground Surface: 151 (approx.)

Job No.: 17126.00001

Weather: Overcast 60F

Test Pit No.: TP-3

SOIL STRATUM ENCOUNTERED

From (inches)	To (inches)	Description of Soils
0	11	Organic, roots, brown f-m Sand, some Silt (Fill)
11	31	Dark Brown f-m SAND, little Silt, some gravel, trace brick/asphalt (Fill/wet)
31	43	Orange Brown m-c SAND, little Silt, trace cobble (Fill/Wet)

Depth to Ledge:	NA
Water Encountered at Depth:	39” at 9:33, 35.52” at 9:40, 36” at 10:06
Installed Observation Well at Depth:	NA

Comments: Permeability core collected at 36” below grade (TP-3 C-1)

Test Pit 3 at 9:33 am on March 31, 2021

Test Pit 3 at 9:35 am on March 31, 2021

TEST PIT DATA RECORD

Project: Barber Cove
Date: 3/31/21
Inspector: Peter Shea
Elev. Of Ground Surface: 150.5 (approx.)
Job No.: 17126.00001
Weather: Overcast 60F
Test Pit No.: TP-4

SOIL STRATUM ENCOUNTERED

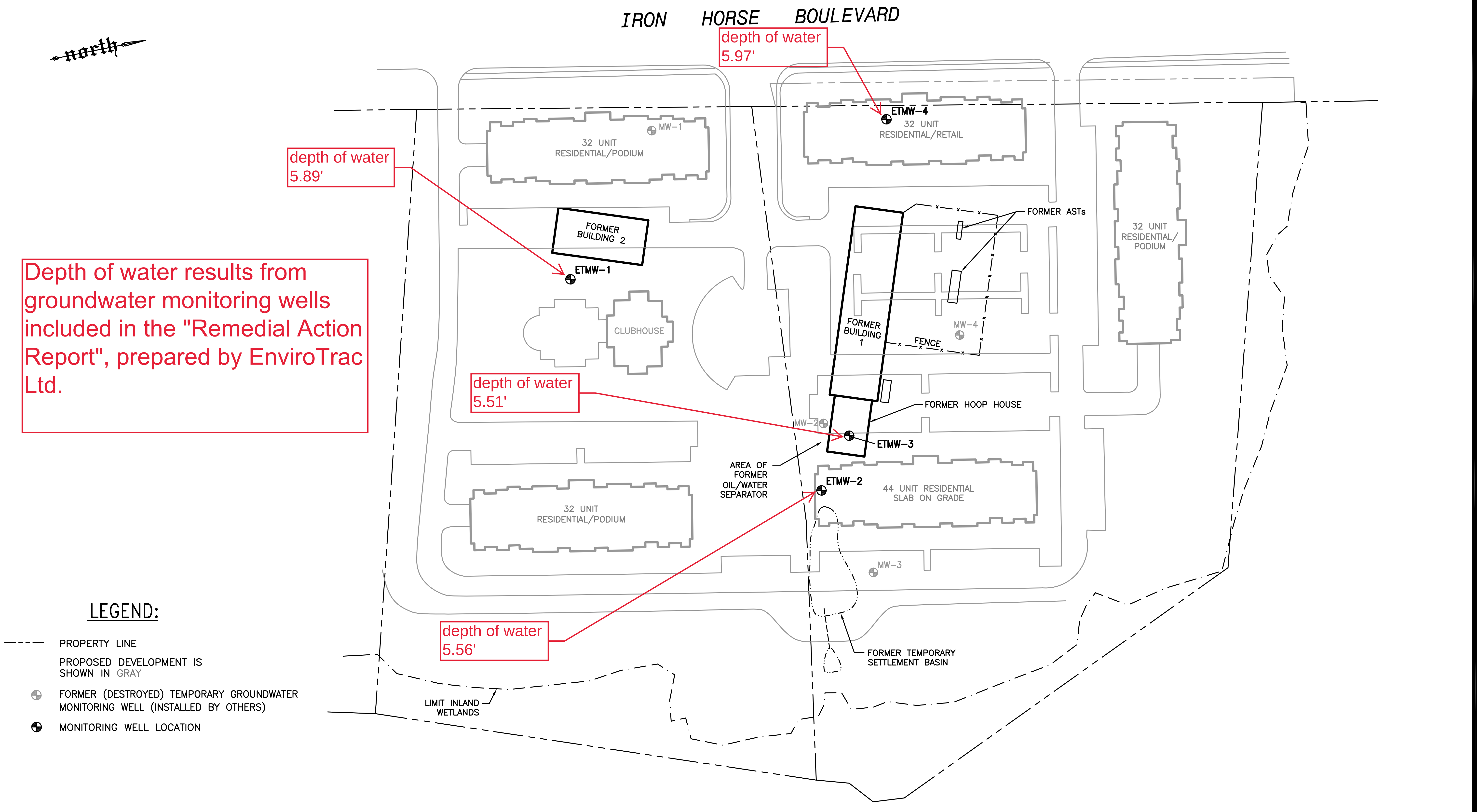
From (inches)	To (inches)	Description of Soils
0	9	Organic, roots, brown f-m Sand, some Silt (Fill)
9	13	Dark Brown f-m SAND little Silt, some gravel, trace brick/asphalt (Fill/Moist)
13	18	Black Silty Sand little organics (wood debris), trace brick/asphalt (Fill/Wet)
18	27	Red Brown f-m SAND, some Silt, little Gravel, little Cobbles (Fill/Wet)
27	42	Brown f-m SAND, some Silt, little organics (wood debris), trace fill (metal, brick, glass) (Wet)

Depth to Ledge:	NA
Water Encountered at Depth:	40” at 9:46, 40” at 9:55, 40” at 10:15
Installed Observation Well at Depth:	NA

Comments: Permeability core collected at 18” below grade (TP-4 C-1)

Test Pit 4 at 9:46 am on March 31, 2021

Test Pit 4 at 9:47 am on March 31, 2021



Depth of water results from groundwater monitoring wells included in the "Remedial Action Report", prepared by EnviroTrac Ltd.

LEGEND:

- - - PROPERTY LINE

PROPOSED DEVELOPMENT IS SHOWN IN GRAY

◍ FORMER (DESTROYED) TEMPORARY GROUNDWATER MONITORING WELL (INSTALLED BY OTHERS)

⊕ MONITORING WELL LOCATION

EnviroTrac
ENVIRONMENTAL SERVICES
5 OLD DOCK ROAD, YAPHANK, NEW YORK 11980
PHONE: (631)924-3001 FAX: (631)924-5001

0 100
SCALE IN FEET

REVISION DATE: 3/29/2021

REVISED BY: BS

32-36 IRON HORSE ROAD
SIMSBURY, CONNECTICUT

SITE PLAN

FIGURE #
2

ATTACHMENT F

STORM DRAINAGE COMPUTATIONS

Drainage Report

Barber Cove Development

32 and 36 Iron Horse Boulevard

Simsbury, Connecticut

May 28, 2021

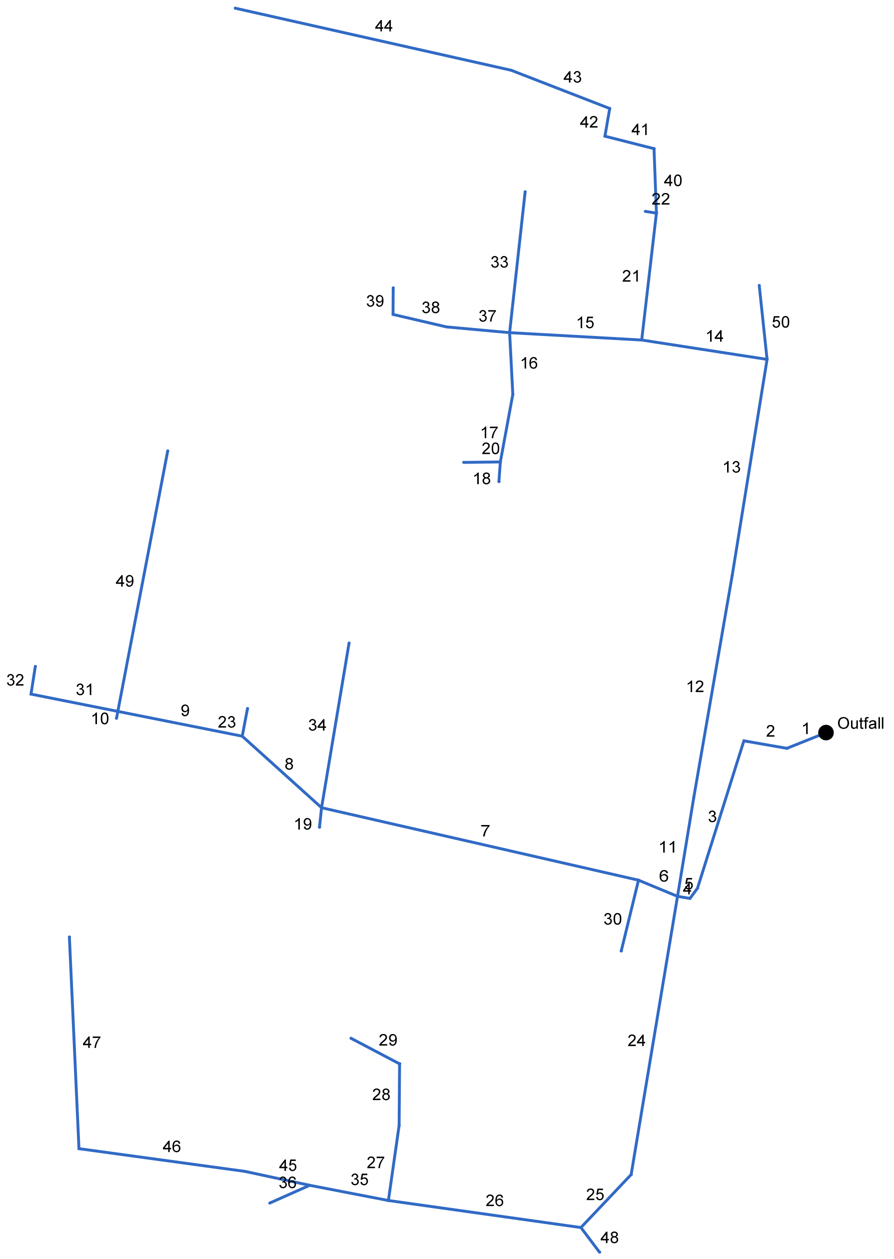
Rational Method Individual Basin Calculations

Project: Barber Cove By: AWG Date: 5/13/21

Location: 32 & 36 Iron Horse Boulevard, Simsbury, CT Checked: Date:

Basin Name	Impervious Area C=0.9 (sf)	Grassed Area C=0.3 (sf)	Wooded Area C=0.2 (sf)	Total Area (sf)	Total Area (ac)	Weighted C	Tc (min)
System 110							
CCB 8	13995	14445	0	28440	0.65	0.60	5.0
CCB 9	1188	51	0	1238	0.03	0.88	5.0
CCB 10	6770	266	0	7036	0.16	0.88	5.0
CCB 11	10964	4418	0	15382	0.35	0.73	5.0
CLCB 13	3503	1338	0	4841	0.11	0.73	5.0
BLD TO MH 13A	17242	0	0	17242	0.40	0.90	5.0
CCB 15	765	398	0	1163	0.03	0.69	5.0
CCB 16	1011	0	0	1011	0.02	0.90	5.0
CCB 17	4963	1001	0	5964	0.14	0.80	5.0
CCB 18	7370	10891	0	18261	0.42	0.54	5.0
CLCB 19A	4742	1839	0	6581	0.15	0.73	5.0
CCB 20	3885	2598	0	6483	0.15	0.66	5.0
CCB 21	2286	448	0	2733	0.06	0.80	5.0
CCB 22	7107	3417	0	10525	0.24	0.71	5.0
CCB 23	10313	10364	0	20676	0.47	0.60	5.0
BLD TO MH 24A	34531	0	0	34531	0.79	0.90	5.0
CCB 25	8130	2901	0	11031	0.25	0.74	5.0
CCB 26	6957	563	0	7520	0.17	0.86	5.0
BLD TO MH 27	5768	0	0	5768	0.13	0.90	6.0
BLD TO MH 27A	17311	0	0	17311	0.40	0.90	7.0
BLD TO MH 28B	8566	0	0	8566	0.20	0.90	8.0
CCB 28	12891	8507	0	21398	0.49	0.66	9.0
CCB 29	16303	6467	0	22770	0.52	0.73	10.0
CCB 30	2765	2412	0	5177	0.12	0.62	11.0
CCB 31	2773	2567	0	5340	0.12	0.61	12.0
BLD TO MH 32A	8673	0	0	8673	0.20	0.90	13.0
CCB 33	14802	20936	0	35738	0.82	0.55	14.0
CCB 34	3258	1346	0	4603	0.11	0.72	15.0
CCB 35	6892	5082	0	11974	0.27	0.65	16.0
CCB 36	4479	111	0	4590	0.11	0.89	17.0
CCB 37	3352	2773	0	6125	0.14	0.63	18.0
CCB 38	3949	1662	0	5611	0.13	0.72	19.0
CCB 38B	6797	2985	0	9782	0.22	0.72	20.0
CCB 38D	6271	1495	0	7766	0.18	0.78	21.0
CCB 39	3947	610	0	4557	0.10	0.82	22.0
CCB 40	2809	4881	0	7691	0.18	0.52	23.0
CCB 41	8158	3542	0	11700	0.18	0.52	20.0
CCB 43	13567	14295	0	27861	0.27	0.72	21.0

Hydraflow Storm Sewers Extension for Autodesk® AutoCAD® Civil 3D® Plan



Project File: System 110.stm	Number of lines: 50	Date: 5/14/2021

Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr Line No.	Line Length (ft)	Defl angle (deg)	Junc Type	Known Q (cfs)	Drng Area (ac)	Runoff Coeff (C)	Inlet Time (min)	Invert El Dn (ft)	Line Slope (%)	Invert El Up (ft)	Line Size (in)	Line Shape	N Value (n)	J-Loss Coeff (K)	Inlet/ Rim El (ft)	
1	End	30.000	157.950	MH	0.00	0.00	0.00	5.0	149.00	1.33	149.40	36	Cir	0.012	0.58	157.00	FES 1-MH 2
2	1	31.000	32.003	MH	0.00	0.00	0.00	5.0	149.40	1.29	149.80	36	Cir	0.012	0.99	159.20	MH 2-MH 3
3	2	110.000	-82.502	MH	0.00	0.00	0.00	5.0	149.80	1.09	151.00	36	Cir	0.012	0.37	159.50	MH 2A-MH 6
4	3	9.000	18.500	MH	0.00	0.00	0.00	5.0	151.00	1.11	151.10	36	Cir	0.012	0.91	159.30	MH 6-MH 7
5	4	9.000	63.110	Comb	0.00	0.17	0.86	5.0	151.10	1.11	151.20	36	Cir	0.012	2.25	159.10	MH 7-CB 26
6	5	30.000	13.597	MH	0.00	0.13	0.90	5.0	151.20	1.33	151.60	24	Cir	0.012	1.00	159.90	CB 26-MH 27
7	6	231.000	-9.745	Comb	0.00	0.49	0.66	5.0	151.60	0.74	153.30	24	Cir	0.012	2.25	160.00	MH 27-CB 28
8	7	76.000	29.258	Comb	0.00	0.12	0.62	5.0	153.30	0.53	153.70	24	Cir	0.012	1.32	160.00	CB 28-CB 30
9	8	90.000	-30.888	MH	0.00	0.00	0.00	5.0	154.00	0.78	154.70	18	Cir	0.012	1.00	160.90	CB 30-MH 32
10	9	5.000	-89.212	MH	0.00	0.20	0.90	5.0	157.00	4.00	157.20	12	Cir	0.012	1.00	160.80	MH 32-MH 32A
11	5	71.000	90.251	Comb	0.00	0.65	0.60	5.0	151.20	0.56	151.60	30	Cir	0.012	0.50	158.10	CB 26-CB 8
12	11	161.000	0.452	Comb	0.00	0.03	0.88	5.0	151.60	0.50	152.40	30	Cir	0.012	0.50	160.70	CB 8-CB 9
13	12	156.000	-0.632	Comb	0.00	0.16	0.88	5.0	152.40	0.51	153.20	30	Cir	0.012	1.50	159.20	CB 9-CB 10
14	13	90.000	-90.336	MH	0.00	0.00	0.00	5.0	153.20	0.56	153.70	30	Cir	0.012	1.00	159.90	CB 10-MH 12
15	14	94.000	-5.607	MH	0.00	0.00	0.00	5.0	153.70	0.85	154.50	24	Cir	0.012	1.00	160.30	MH 12-MH 19
16	15	44.000	-96.107	Grate	0.00	0.15	0.73	5.0	154.80	2.05	155.70	15	Cir	0.012	0.50	160.00	MH 19-CB 19A
17	16	49.000	13.314	MH	0.00	0.00	0.00	5.0	155.70	1.43	156.40	15	Cir	0.012	0.98	160.30	CB 19A-MH 24
18	17	14.000	-6.272	MH	0.00	0.79	0.90	5.0	156.80	2.86	157.20	15	Cir	0.012	1.00	160.40	MH 24-MH 24A
19	7	14.000	-97.189	MH	0.00	0.20	0.90	5.0	156.80	2.86	157.20	12	Cir	0.012	1.00	160.10	CB 28-MH 28B
20	17	26.000	78.966	Comb	0.00	0.25	0.74	5.0	156.70	0.38	156.80	12	Cir	0.012	1.00	160.00	MH 24-CB 25
21	14	91.000	87.807	Grate	0.00	0.11	0.73	5.0	153.70	0.55	154.20	18	Cir	0.012	2.10	159.90	MH 12-CB 13
22	21	8.000	-87.857	MH	0.00	0.40	0.90	5.0	156.70	6.25	157.20	12	Cir	0.012	1.00	160.20	CB 13-MH 13A
23	8	20.000	58.642	Comb	0.00	0.12	0.61	5.0	156.60	1.00	156.80	12	Cir	0.012	1.00	160.00	CB 30-CB 31

Project File: System 110.stm	Number of lines: 50	Date: 5/14/2021

Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr Line No.	Line Length (ft)	Defl angle (deg)	Junc Type	Known Q (cfs)	Drng Area (ac)	Runoff Coeff (C)	Inlet Time (min)	Invert El Dn (ft)	Line Slope (%)	Invert El Up (ft)	Line Size (in)	Line Shape	N Value (n)	J-Loss Coeff (K)	Inlet/ Rim El (ft)	
24	5	201.000	-89.650	Grate	0.00	0.11	0.89	5.0	151.20	0.60	152.40	18	Cir	0.012	0.92	159.70	CB 26-CB 36
25	24	52.000	34.066	Comb	0.00	0.14	0.63	5.0	152.40	0.58	152.70	18	Cir	0.012	1.48	158.60	CB 36-CB 37
26	25	138.000	54.537	MH	0.00	0.00	0.00	5.0	152.70	0.51	153.40	18	Cir	0.012	1.00	160.40	CB 37-MH 38A
27	26	54.000	90.057	Grate	0.00	0.22	0.72	5.0	155.70	1.11	156.30	12	Cir	0.012	0.50	160.00	MH 38A-CB 38B
28	27	44.000	-7.614	MH	0.00	0.00	0.00	5.0	156.30	0.68	156.60	12	Cir	0.012	0.91	160.70	CB 38B-MH 38C
29	28	39.000	-62.686	Comb	0.00	0.18	0.78	5.0	156.60	0.77	156.90	12	Cir	0.012	1.00	160.10	MH 38C-CB 38D
30	6	52.000	-98.979	MH	0.00	0.40	0.90	5.0	156.60	4.42	158.90	12	Cir	0.012	1.00	161.40	MH 27-MH 27A
31	9	63.000	0.000	Comb	0.00	0.11	0.72	5.0	155.70	1.11	156.40	12	Cir	0.012	1.50	159.80	MH 32-CB 34
32	31	20.000	87.486	Comb	0.00	0.27	0.65	5.0	156.40	1.00	156.60	12	Cir	0.012	1.00	159.80	CB 34-CB 35
33	15	101.000	93.052	Comb	0.00	0.15	0.66	5.0	156.00	0.69	156.70	12	Cir	0.012	1.00	159.90	MH 19-CB 20
34	7	119.000	86.550	Comb	0.00	0.52	0.73	5.0	155.50	1.09	156.80	12	Cir	0.012	1.00	160.00	CB 28-CB 29
35	26	57.000	2.967	Comb	0.00	0.10	0.82	5.0	153.60	0.53	153.90	15	Cir	0.012	0.94	159.40	MH 38A-CB 39
36	35	31.000	-35.082	Comb	0.00	0.18	0.52	5.0	155.80	0.65	156.00	12	Cir	0.012	1.00	159.20	CB 39-CB 40
37	15	45.000	2.056	Comb	0.00	0.06	0.80	5.0	155.00	0.67	155.30	15	Cir	0.012	0.50	159.80	MH 19-CB 21
38	37	39.000	7.904	Comb	0.00	0.24	0.71	5.0	155.30	0.51	155.50	15	Cir	0.012	1.47	159.10	CB 21-CB 22
39	38	19.000	77.284	Grate	0.00	0.47	0.60	5.0	155.50	0.53	155.60	15	Cir	0.012	1.00	159.10	CB 22-CB 23
40	21	46.000	-8.703	MH	0.00	0.00	0.00	5.0	154.20	0.65	154.50	15	Cir	0.012	0.97	160.40	CB 13-MH 14
41	40	36.000	-73.638	Comb	0.00	0.03	0.69	5.0	154.50	0.56	154.70	15	Cir	0.012	1.50	159.90	MH 14-CB 15
42	41	20.000	85.142	Comb	0.00	0.02	0.90	5.0	154.70	1.00	154.90	12	Cir	0.012	1.47	159.90	CB 15-CB 16
43	42	75.000	-78.016	Comb	0.00	0.14	0.80	5.0	154.90	0.53	155.30	12	Cir	0.012	0.50	159.70	CB 15-CB 17
44	43	201.000	-8.694	Comb	0.00	0.42	0.54	5.0	155.30	0.50	156.30	12	Cir	0.012	1.00	159.50	CB 17-CB 18
45	35	47.000	1.235	Comb	0.00	0.18	0.52	5.0	153.90	0.64	154.20	15	Cir	0.012	0.50	159.40	CB 39-CB 41
46	45	119.000	-4.384	MH	0.00	0.00	0.00	5.0	154.50	0.59	155.20	12	Cir	0.012	0.99	161.00	CB 41-MH 42

Project File: System 110.stm

Number of lines: 50

Date: 5/14/2021

Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr Line No.	Line Length (ft)	Defl angle (deg)	Junc Type	Known Q (cfs)	Drng Area (ac)	Runoff Coeff (C)	Inlet Time (min)	Invert El Dn (ft)	Line Slope (%)	Invert El Up (ft)	Line Size (in)	Line Shape	N Value (n)	J-Loss Coeff (K)	Inlet/ Rim El (ft)	
47	46	151.000	79.572	Comb	0.00	0.27	0.72	5.0	155.20	0.53	156.00	12	Cir	0.012	1.00	159.20	MH 42-CB 43
48	25	22.000	-80.490	Comb	0.00	0.13	0.72	5.0	155.20	0.91	155.40	12	Cir	0.012	1.00	158.60	CB 37-CB 38
49	9	189.000	89.494	Comb	0.00	0.82	0.55	5.0	154.70	0.53	155.70	15	Cir	0.012	1.00	159.00	MH 32-CB 33
50	13	53.000	-15.183	Comb	0.00	0.35	0.73	5.0	154.70	0.75	155.10	12	Cir	0.012	1.00	158.30	CB 10-CB 11

Project File: System 110.stm | Number of lines: 50 | Date: 5/14/2021

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr	Total		Incr	Total	Inlet	Syst					Size	Slope	Dn	Up	Dn	Up	Dn	Up	
		(ft)	(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(ft/s)	(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	
1	End	30.000	0.00	9.48	0.00	0.00	6.82	5.0	9.6	6.6	45.16	83.43	6.67	36	1.33	149.00	149.40	152.00	152.00	151.71	157.00	FES 1-MH 2
2	1	31.000	0.00	9.48	0.00	0.00	6.82	5.0	9.5	6.7	45.35	82.07	6.63	36	1.29	149.40	149.80	152.43	152.46	157.00	159.20	MH 2-MH 3
3	2	110.000	0.00	9.48	0.00	0.00	6.82	5.0	9.3	6.7	46.00	75.46	7.04	36	1.09	149.80	151.00	153.18	153.40	159.20	159.50	MH 2A-MH 6
4	3	9.000	0.00	9.48	0.00	0.00	6.82	5.0	9.3	6.8	46.05	76.16	7.53	36	1.11	151.00	151.10	153.73	153.31	159.50	159.30	MH 6-MH 7
5	4	9.000	0.17	9.48	0.86	0.15	6.82	5.0	9.2	6.8	46.09	76.16	8.26	36	1.11	151.10	151.20	153.31	153.41	159.30	159.10	MH 7-CB 26
6	5	30.000	0.13	3.38	0.90	0.12	2.39	5.0	7.5	7.5	17.92	28.29	5.72	24	1.33	151.20	151.60	153.41	153.56	159.10	159.90	CB 26-MH 27
7	6	231.000	0.49	2.85	0.66	0.32	1.92	5.0	6.8	7.9	15.05	21.02	5.31	24	0.74	151.60	153.30	154.07	154.83	159.90	160.00	MH 27-CB 28
8	7	76.000	0.12	1.64	0.62	0.07	1.03	5.0	6.3	8.1	8.39	17.78	2.67	24	0.53	153.30	153.70	156.02	156.11	160.00	160.00	CB 28-CB 30
9	8	90.000	0.00	1.40	0.00	0.00	0.89	5.0	6.0	8.3	7.38	10.03	4.18	18	0.78	154.00	154.70	156.26	156.64	160.00	160.90	CB 30-MH 32
10	9	5.000	0.20	0.20	0.90	0.18	0.18	5.0	5.0	9.0	1.61	7.72	5.75	12	4.00	157.00	157.20	157.31	157.74	160.90	160.80	MH 32-MH 32A
11	5	71.000	0.65	4.42	0.60	0.39	3.24	5.0	8.7	7.0	22.52	33.35	5.81	30	0.56	151.20	151.60	153.41	153.21	159.10	158.10	CB 26-CB 8
12	11	161.000	0.03	3.77	0.88	0.03	2.85	5.0	8.3	7.1	20.30	31.32	6.26	30	0.50	151.60	152.40	153.21	153.93	158.10	160.70	CB 8-CB 9
13	12	156.000	0.16	3.74	0.88	0.14	2.82	5.0	7.9	7.3	20.59	31.82	6.52	30	0.51	152.40	153.20	153.93	154.74	160.70	159.20	CB 9-CB 10
14	13	90.000	0.00	3.23	0.00	0.00	2.42	5.0	7.7	7.4	17.97	33.12	5.92	30	0.56	153.20	153.70	154.74	155.13	159.20	159.90	CB 10-MH 12
15	14	94.000	0.00	2.11	0.00	0.00	1.60	5.0	5.5	8.6	13.82	22.60	5.96	24	0.85	153.70	154.50	155.13	155.84	159.90	160.30	MH 12-MH 19
16	15	44.000	0.15	1.19	0.73	0.11	1.01	5.0	5.3	8.8	8.81	10.01	7.78	15	2.05	154.80	155.70	155.84	156.85	160.30	160.00	MH 19-CB 19A
17	16	49.000	0.00	1.04	0.00	0.00	0.90	5.0	5.2	8.8	7.93	8.36	6.80	15	1.43	155.70	156.40	156.85	157.51	160.00	160.30	CB 19A-MH 24
18	17	14.000	0.79	0.79	0.90	0.71	0.71	5.0	5.0	9.0	6.38	11.82	7.41	15	2.86	156.80	157.20	157.51	158.22	160.30	160.40	MH 24-MH 24A
19	7	14.000	0.20	0.20	0.90	0.18	0.18	5.0	5.0	9.0	1.61	6.52	5.31	12	2.86	156.80	157.20	157.14	157.74	160.00	160.10	CB 28-MH 28B
20	17	26.000	0.25	0.25	0.74	0.19	0.19	5.0	5.0	9.0	1.66	2.39	2.53	12	0.38	156.70	156.80	157.51	157.55	160.30	160.00	MH 24-CB 25
21	14	91.000	0.11	1.12	0.73	0.08	0.82	5.0	7.3	7.6	6.21	8.43	4.38	18	0.55	153.70	154.20	155.13	155.16	159.90	159.90	MH 12-CB 13
22	21	8.000	0.40	0.40	0.90	0.36	0.36	5.0	5.0	9.0	3.23	9.65	8.02	12	6.25	156.70	157.20	157.10	157.97	159.90	160.20	CB 13-MH 13A

Project File: System 110.stm

Number of lines: 50

Run Date: 5/14/2021

NOTES:Intensity = 42.82 / (Inlet time + 3.80) ^ 0.72; Return period =Yrs. 25 ; c = cir e = ellip b = box

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr	Total		Incr	Total	Inlet	Syst					Size	Slope	Dn	Up	Dn	Up	Dn	Up	
		(ft)	(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(ft/s)	(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	
23	8	20.000	0.12	0.12	0.61	0.07	0.07	5.0	5.0	9.0	0.66	3.86	3.24	12	1.00	156.60	156.80	156.88	157.14	160.00	160.00	CB 30-CB 31
24	5	201.000	0.11	1.51	0.89	0.10	1.04	5.0	8.4	7.1	7.38	8.79	4.17	18	0.60	151.20	152.40	153.41	154.25	159.10	159.70	CB 26-CB 36
25	24	52.000	0.14	1.40	0.63	0.09	0.94	5.0	8.2	7.2	6.77	8.64	3.83	18	0.58	152.40	152.70	154.50	154.69	159.70	158.60	CB 36-CB 37
26	25	138.000	0.00	1.13	0.00	0.00	0.76	5.0	7.5	7.5	5.71	8.10	3.23	18	0.51	152.70	153.40	155.03	155.37	158.60	160.40	CB 37-MH 38A
27	26	54.000	0.22	0.40	0.72	0.16	0.30	5.0	5.5	8.7	2.59	4.07	4.98	12	1.11	155.70	156.30	156.28	156.99	160.40	160.00	MH 38A-CB 38B
28	27	44.000	0.00	0.18	0.00	0.00	0.14	5.0	5.2	8.8	1.24	3.19	2.79	12	0.68	156.30	156.60	156.99	157.07	160.00	160.70	CB 38B-MH 38C
29	28	39.000	0.18	0.18	0.78	0.14	0.14	5.0	5.0	9.0	1.26	3.38	3.46	12	0.77	156.60	156.90	157.07	157.37	160.70	160.10	MH 38C-CB 38D
30	6	52.000	0.40	0.40	0.90	0.36	0.36	5.0	5.0	9.0	3.23	8.11	7.36	12	4.42	156.60	158.90	157.04	159.67	159.90	161.40	MH 27-MH 27A
31	9	63.000	0.11	0.38	0.72	0.08	0.25	5.0	5.2	8.9	2.26	4.07	3.48	12	1.11	155.70	156.40	156.91	157.06	160.90	159.80	MH 32-CB 34
32	31	20.000	0.27	0.27	0.65	0.18	0.18	5.0	5.0	9.0	1.57	3.86	2.08	12	1.00	156.40	156.60	157.45	157.47	159.80	159.80	CB 34-CB 35
33	15	101.000	0.15	0.15	0.66	0.10	0.10	5.0	5.0	9.0	0.89	3.21	3.29	12	0.69	156.00	156.70	156.36	157.09	160.30	159.90	MH 19-CB 20
34	7	119.000	0.52	0.52	0.73	0.38	0.38	5.0	5.0	9.0	3.41	4.03	5.44	12	1.09	155.50	156.80	156.20	157.59	160.00	160.00	CB 28-CB 29
35	26	57.000	0.10	0.73	0.82	0.08	0.46	5.0	7.2	7.7	3.55	5.08	2.89	15	0.53	153.60	153.90	155.54	155.68	160.40	159.40	MH 38A-CB 39
36	35	31.000	0.18	0.18	0.52	0.09	0.09	5.0	5.0	9.0	0.84	3.10	3.19	12	0.65	155.80	156.00	156.16	156.38	159.40	159.20	CB 39-CB 40
37	15	45.000	0.06	0.77	0.80	0.05	0.50	5.0	5.3	8.8	4.38	5.71	4.98	15	0.67	155.00	155.30	155.84	156.15	160.30	159.80	MH 19-CB 21
38	37	39.000	0.24	0.71	0.71	0.17	0.45	5.0	5.2	8.9	4.01	5.01	4.53	15	0.51	155.30	155.50	156.15	156.35	159.80	159.10	CB 21-CB 22
39	38	19.000	0.47	0.47	0.60	0.28	0.28	5.0	5.0	9.0	2.53	5.08	2.06	15	0.53	155.50	155.60	156.82	156.84	159.10	159.10	CB 22-CB 23
40	21	46.000	0.00	0.61	0.00	0.00	0.38	5.0	7.0	7.8	2.93	5.65	3.56	15	0.65	154.20	154.50	155.16	155.19	159.90	160.40	CB 13-MH 14
41	40	36.000	0.03	0.61	0.69	0.02	0.38	5.0	6.7	7.9	2.98	5.21	4.28	15	0.56	154.50	154.70	155.19	155.39	160.40	159.90	MH 14-CB 15
42	41	20.000	0.02	0.58	0.90	0.02	0.36	5.0	6.6	7.9	2.83	3.86	4.77	12	1.00	154.70	154.90	155.39	155.62	159.90	159.90	CB 15-CB 16
43	42	75.000	0.14	0.56	0.80	0.11	0.34	5.0	6.3	8.1	2.75	2.82	4.09	12	0.53	154.90	155.30	155.70	156.10	159.90	159.70	CB 15-CB 17
44	43	201.000	0.42	0.42	0.54	0.23	0.23	5.0	5.0	9.0	2.03	2.72	3.35	12	0.50	155.30	156.30	156.23	156.91	159.70	159.50	CB 17-CB 18

Project File: System 110.stm

Number of lines: 50

Run Date: 5/14/2021

NOTES:Intensity = 42.82 / (Inlet time + 3.80) ^ 0.72; Return period =Yrs. 25 ; c = cir e = ellip b = box

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
45	35	47.000	0.18	0.45	0.52	0.09	0.29	5.0	6.7	7.9	2.27	5.59	1.85	15	0.64	153.90	154.20	155.81	155.86	159.40	159.40	CB 39-CB 41
46	45	119.000	0.00	0.27	0.00	0.00	0.19	5.0	5.8	8.4	1.63	2.96	2.16	12	0.59	154.50	155.20	155.88	156.08	159.40	161.00	CB 41-MH 42
47	46	151.000	0.27	0.27	0.72	0.19	0.19	5.0	5.0	9.0	1.74	2.81	3.04	12	0.53	155.20	156.00	156.15	156.56	161.00	159.20	MH 42-CB 43
48	25	22.000	0.13	0.13	0.72	0.09	0.09	5.0	5.0	9.0	0.84	3.68	3.41	12	0.91	155.20	155.40	155.52	155.78	158.60	158.60	CB 37-CB 38
49	9	189.000	0.82	0.82	0.55	0.45	0.45	5.0	5.0	9.0	4.05	5.09	3.30	15	0.53	154.70	155.70	156.91	157.54	160.90	159.00	MH 32-CB 33
50	13	53.000	0.35	0.35	0.73	0.26	0.26	5.0	5.0	9.0	2.29	3.35	4.43	12	0.75	154.70	155.10	155.31	155.75	159.20	158.30	CB 10-CB 11

Project File: System 110.stm

Number of lines: 50

Run Date: 5/14/2021

NOTES:Intensity = 42.82 / (Inlet time + 3.80) ^ 0.72; Return period =Yrs. 25 ; c = cir e = ellip b = box

Hydraulic Grade Line Computations

Line	Size	Q	Downstream								Len	Upstream								Check		JL coeff	Minor loss
	(in)	(cfs)	Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)	(ft)	Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)	Ave Sf (%)	Enrgy loss (ft)	(K)	(ft)
1	36	45.16	149.00	152.00	3.00	7.07	6.39	0.63	152.63	0.391	30.000	149.40	152.00	2.60	6.50	6.94	0.75	152.75	0.358	0.375	0.112	0.58	0.43
2	36	45.35	149.40	152.43	3.00	7.07	6.42	0.64	153.07	0.394	31.000	149.80	152.46	2.66	6.63	6.84	0.73	153.19	0.352	0.373	0.116	0.99	0.72
3	36	46.00	149.80	153.18	3.00	7.07	6.51	0.66	153.84	0.405	110.000	151.00	153.40	2.40	6.07	7.58	0.89	154.30	0.423	0.414	0.456	0.37	0.33
4	36	46.05	151.00	153.73	2.73	5.58	6.81	1.06	154.79	0.000	9.000	151.10	153.31	2.21**	5.58	8.25	1.06	154.37	0.000	0.000	n/a	0.91	n/a
5	36	46.09	151.10	153.31	2.21	5.58	8.26	1.06	154.37	0.000	9.000	151.20	153.41	2.21**	5.58	8.26	1.06	154.47	0.000	0.000	n/a	2.25	2.39
6	24	17.92	151.20	153.41	2.00	3.14	5.71	0.51	153.92	0.535	30.000	151.60	153.56	1.96	3.12	5.74	0.51	154.07	0.477	0.506	0.152	1.00	0.51
7	24	15.05	151.60	154.07	2.00	3.14	4.79	0.36	154.42	0.377	231.000	153.30	154.83	1.53	2.58	5.84	0.53	155.36	0.434	0.406	0.937	2.25	1.19
8	24	8.39	153.30	156.02	2.00	3.14	2.67	0.11	156.13	0.117	76.000	153.70	156.11	2.00	3.14	2.67	0.11	156.22	0.117	0.117	0.089	1.32	0.15
9	18	7.38	154.00	156.26	1.50	1.77	4.18	0.27	156.53	0.421	90.000	154.70	156.64	1.50	1.77	4.17	0.27	156.91	0.421	0.421	0.379	1.00	0.27
10	12	1.61	157.00	157.31	0.31*	0.21	7.76	0.22	157.53	0.000	5.000	157.20	157.74	0.54**	0.43	3.74	0.22	157.96	0.000	0.000	n/a	1.00	n/a
11	30	22.52	151.20	153.41	2.21	3.35	4.90	0.70	154.11	0.000	71.000	151.60	153.21	1.61**	3.35	6.72	0.70	153.92	0.000	0.000	n/a	0.50	0.35
12	30	20.30	151.60	153.21	1.61	3.14	6.06	0.65	153.86	0.000	161.000	152.40	153.93 j	1.53**	3.14	6.45	0.65	154.58	0.000	0.000	n/a	0.50	n/a
13	30	20.59	152.40	153.93	1.53	3.14	6.55	0.65	154.58	0.000	156.000	153.20	154.74	1.54**	3.17	6.49	0.65	155.39	0.000	0.000	n/a	1.50	0.98
14	30	17.97	153.20	154.74	1.54	2.91	5.66	0.59	155.33	0.000	90.000	153.70	155.13 j	1.43**	2.91	6.17	0.59	155.73	0.000	0.000	n/a	1.00	0.59
15	24	13.82	153.70	155.13	1.43	2.23	5.73	0.60	155.73	0.000	94.000	154.50	155.84 j	1.34**	2.23	6.19	0.60	156.43	0.000	0.000	n/a	1.00	0.60
16	15	8.81	154.80	155.84	1.04	1.09	8.09	0.87	156.70	0.000	44.000	155.70	156.85	1.15**	1.18	7.47	0.87	157.72	0.000	0.000	n/a	0.50	0.43
17	15	7.93	155.70	156.85	1.15	1.15	6.72	0.74	157.58	0.000	49.000	156.40	157.51 j	1.11**	1.15	6.88	0.74	158.25	0.000	0.000	n/a	0.98	0.72
18	15	6.38	156.80	157.51	0.71	0.72	8.85	0.55	158.06	0.000	14.000	157.20	158.22	1.02**	1.07	5.96	0.55	158.77	0.000	0.000	n/a	1.00	0.55
19	12	1.61	156.80	157.14	0.34*	0.23	6.88	0.22	157.36	0.000	14.000	157.20	157.74	0.54**	0.43	3.74	0.22	157.96	0.000	0.000	n/a	1.00	n/a
20	12	1.66	156.70	157.51	0.81	0.68	2.43	0.09	157.60	0.189	26.000	156.80	157.55	0.75	0.63	2.63	0.11	157.66	0.224	0.206	0.054	1.00	0.11
21	18	6.21	153.70	155.13	1.43	1.20	3.57	0.42	155.55	0.285	91.000	154.20	155.16	0.96**	1.20	5.19	0.42	155.58	0.356	0.321	n/a	2.10	n/a
22	12	3.23	156.70	157.10	0.40*	0.29	11.05	0.39	157.48	0.000	8.000	157.20	157.97	0.77**	0.65	4.98	0.39	158.36	0.000	0.000	n/a	1.00	n/a

Project File: System 110.stm	Number of lines: 50	Run Date: 5/14/2021

Notes: * depth assumed; ** Critical depth.; j-Line contains hyd. jump ; c = cir e = ellip b = box

Hydraulic Grade Line Computations

Line	Size (in)	Q (cfs)	Downstream								Len (ft)	Upstream								Check		JL coeff (K)	Minor loss (ft)
			Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)		Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)	Ave Sf (%)	Enrgy loss (ft)		
23	12	0.66	156.60	156.88	0.28*	0.18	3.66	0.12	157.00	0.000	20.000	156.80	157.14	0.34**	0.23	2.82	0.12	157.26	0.000	0.000	n/a	1.00	0.12
24	18	7.38	151.20	153.41	1.50	1.77	4.17	0.27	153.68	0.421	201.000	152.40	154.25	1.50	1.77	4.17	0.27	154.53	0.420	0.420	0.845	0.92	0.25
25	18	6.77	152.40	154.50	1.50	1.77	3.83	0.23	154.73	0.355	52.000	152.70	154.69	1.50	1.77	3.83	0.23	154.92	0.354	0.355	0.184	1.48	0.34
26	18	5.71	152.70	155.03	1.50	1.77	3.23	0.16	155.19	0.252	138.000	153.40	155.37	1.50	1.77	3.23	0.16	155.54	0.252	0.252	0.348	1.00	0.16
27	12	2.59	155.70	156.28	0.58*	0.47	5.48	0.31	156.59	0.000	54.000	156.30	156.99	0.69**	0.58	4.48	0.31	157.30	0.000	0.000	n/a	0.50	n/a
28	12	1.24	156.30	156.99	0.69	0.36	2.15	0.18	157.17	0.000	44.000	156.60	157.07 j	0.47**	0.36	3.42	0.18	157.25	0.000	0.000	n/a	0.91	n/a
29	12	1.26	156.60	157.07	0.47	0.36	3.48	0.18	157.25	0.000	39.000	156.90	157.37	0.47**	0.37	3.44	0.18	157.56	0.000	0.000	n/a	1.00	0.18
30	12	3.23	156.60	157.04	0.44*	0.33	9.74	0.39	157.42	0.000	52.000	158.90	159.67	0.77**	0.65	4.98	0.39	160.06	0.000	0.000	n/a	1.00	n/a
31	12	2.26	155.70	156.91	1.00	0.79	2.87	0.13	157.03	0.342	63.000	156.40	157.06	0.66	0.55	4.09	0.26	157.32	0.570	0.456	0.287	1.50	0.39
32	12	1.57	156.40	157.45	1.00	0.79	2.00	0.06	157.51	0.167	20.000	156.60	157.47	0.87	0.73	2.16	0.07	157.55	0.151	0.159	0.032	1.00	0.07
33	12	0.89	156.00	156.36	0.36*	0.25	3.50	0.15	156.51	0.000	101.000	156.70	157.09	0.39**	0.29	3.08	0.15	157.24	0.000	0.000	n/a	1.00	n/a
34	12	3.41	155.50	156.20	0.70*	0.59	5.76	0.41	156.61	0.000	119.000	156.80	157.59	0.79**	0.66	5.13	0.41	158.00	0.000	0.000	n/a	1.00	n/a
35	15	3.55	153.60	155.54	1.25	1.23	2.89	0.13	155.67	0.258	57.000	153.90	155.68	1.25	1.23	2.89	0.13	155.81	0.257	0.258	0.147	0.94	0.12
36	12	0.84	155.80	156.16	0.36*	0.25	3.35	0.14	156.30	0.000	31.000	156.00	156.38	0.38**	0.28	3.03	0.14	156.53	0.000	0.000	n/a	1.00	0.14
37	15	4.38	155.00	155.84	0.84	0.87	5.01	0.38	156.22	0.000	45.000	155.30	156.15	0.85**	0.89	4.95	0.38	156.53	0.000	0.000	n/a	0.50	n/a
38	15	4.01	155.30	156.15	0.85	0.89	4.52	0.32	156.47	0.510	39.000	155.50	156.35	0.84	0.88	4.54	0.32	156.67	0.514	0.512	0.200	1.47	0.47
39	15	2.53	155.50	156.82	1.25	1.23	2.06	0.07	156.88	0.131	19.000	155.60	156.84	1.24	1.23	2.06	0.07	156.91	0.121	0.126	0.024	1.00	0.07
40	15	2.93	154.20	155.16	0.96	0.69	2.89	0.28	155.44	0.186	46.000	154.50	155.19 j	0.69**	0.69	4.24	0.28	155.47	0.186	0.186	n/a	0.97	0.27
41	15	2.98	154.50	155.19	0.69	0.69	4.31	0.28	155.47	0.190	36.000	154.70	155.39	0.69**	0.70	4.26	0.28	155.68	0.190	0.190	n/a	1.50	0.42
42	12	2.83	154.70	155.39	0.69	0.58	4.87	0.34	155.73	0.564	20.000	154.90	155.62	0.72**	0.61	4.67	0.34	155.96	0.564	0.564	n/a	1.47	n/a
43	12	2.75	154.90	155.70	0.80*	0.67	4.09	0.26	155.96	0.533	75.000	155.30	156.10	0.80	0.67	4.09	0.26	156.36	0.532	0.533	0.400	0.50	0.13
44	12	2.03	155.30	156.23	0.93	0.50	2.67	0.11	156.34	0.241	201.000	156.30	156.91	0.61**	0.50	4.03	0.25	157.17	0.577	0.409	0.822	1.00	0.25

Project File: System 110.stm

Number of lines: 50

Run Date: 5/14/2021

Notes: * depth assumed; ** Critical depth.; j-Line contains hyd. jump ; c = cir e = ellip b = box

Hydraulic Grade Line Computations

Line	Size (in)	Q (cfs)	Downstream								Len (ft)	Upstream								Check		JL coeff (K)	Minor loss (ft)
			Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)		Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)	Ave Sf (%)	Enrgy loss (ft)		
45	15	2.27	153.90	155.81	1.25	1.23	1.85	0.05	155.86	0.105	47.000	154.20	155.86	1.25	1.23	1.85	0.05	155.91	0.105	0.105	0.049	0.50	0.03
46	12	1.63	154.50	155.88	1.00	0.79	2.08	0.07	155.95	0.180	119.000	155.20	156.08	0.88	0.73	2.24	0.08	156.15	0.162	0.171	0.204	0.99	0.08
47	12	1.74	155.20	156.15	0.95	0.45	2.26	0.08	156.23	0.177	151.000	156.00	156.56 j	0.56**	0.46	3.82	0.23	156.79	0.550	0.364	0.549	1.00	0.23
48	12	0.84	155.20	155.52	0.32*	0.22	3.80	0.14	155.67	0.000	22.000	155.40	155.78	0.38**	0.28	3.03	0.14	155.93	0.000	0.000	n/a	1.00	0.14
49	15	4.05	154.70	156.91	1.25	1.23	3.30	0.17	157.08	0.335	189.000	155.70	157.54	1.25	1.23	3.30	0.17	157.71	0.334	0.335	0.632	1.00	0.17
50	12	2.29	154.70	155.31	0.61*	0.50	4.59	0.28	155.59	0.000	53.000	155.10	155.75	0.65**	0.54	4.26	0.28	156.03	0.000	0.000	n/a	1.00	0.28

Project File: System 110.stm | Number of lines: 50 | Run Date: 5/14/2021

Notes: * depth assumed; ** Critical depth.; j-Line contains hyd. jump ; c = cir e = ellip b = box

Outlet Protection Calculations

Project: Cutler Elementary School By: AWG Date: 5/13/2021
Location: 160 Fishtown Road Checked: Date:
Outlet I.D. **FES 1**

*Based on Connecticut DOT Drainage Manual, Section 11.13

Description:

Riprap Energy Dissipator at FES 1

Design Criteria (25yr Storm Event):

Q (cfs) =	45.16	R_p (ft)=	3
D (in) =	36	S_p (ft) =	3
V (fps) =	6.67	Tw (ft)=	3 (in full condition)

Q= Flow rate at discharge point in cubic feet per second (cfs)
D= Outlet pipe diameter (in)
V= Flow velocity at discharge point (ft/s)
R_p= Maximum inside pipe rise (ft)
S_p= inside diametere for circular sections of maximum inside pipe span for non-circular sections (ft)
T_w= Tailwater depth (ft)

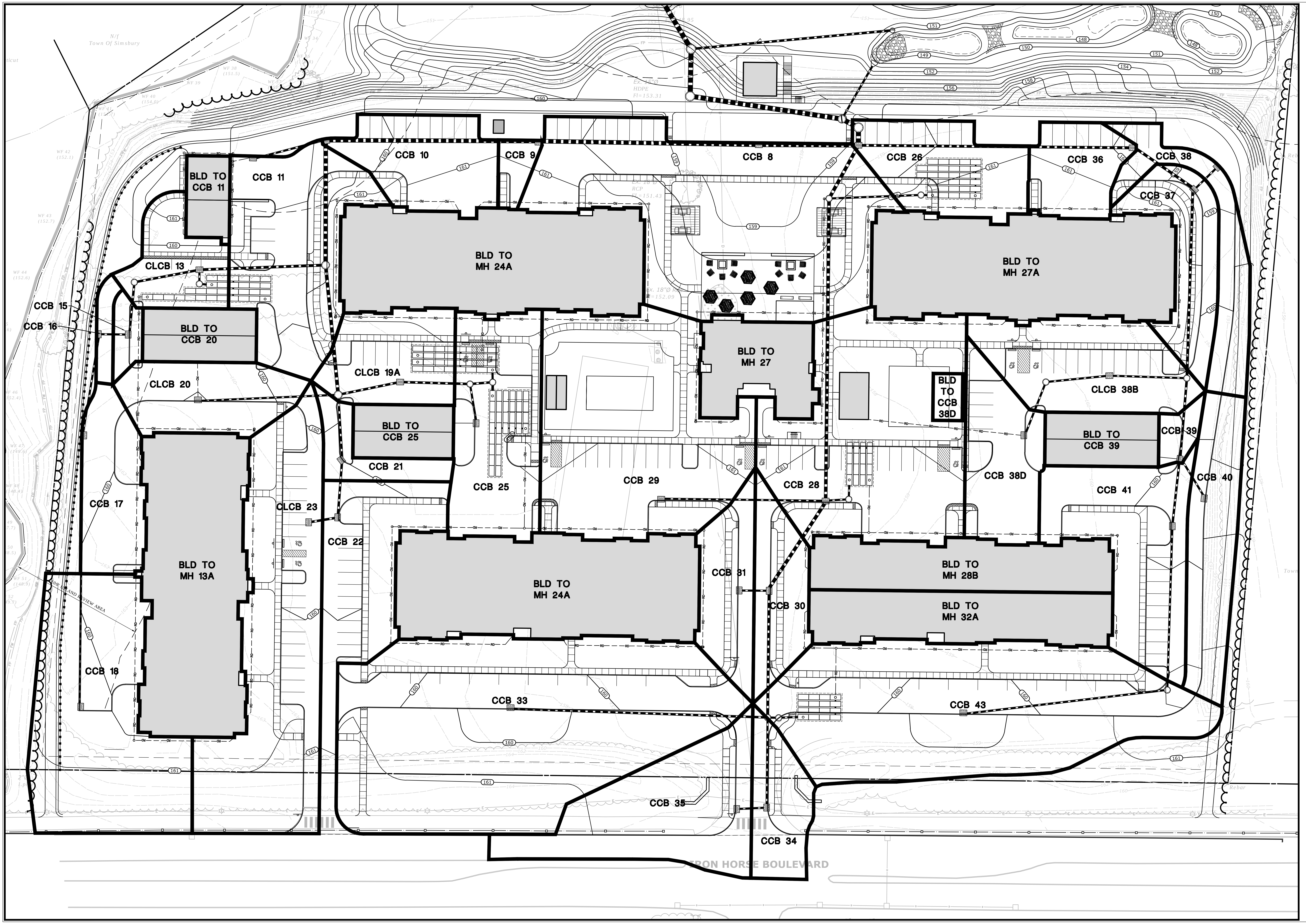
Based on **Table 11.13.1,** A *Preformed Scour Hole* is used *One Half Pipe Rise Depression (Type I)*

Rip Rap Stone Size:

D_{50} Computed (ft)	Rip Rap Specification	D_{50} Stone Size Required
0.15	Modified	5 inches

Preformed Scour Hole Dimensions:

F = 0.5(R_p) = 1.5 ft
C = 3.0(S_p)+6.0(F) = 18ft
B = 2.0(S_p)+6.0(F) = 15ft
d (Depth of Stone) = 12 inches



N
E
S
W
0' 15' 30'
0 1/2" 1"

SLR
99 REALTY DRIVE
CHESHIRE, CT 06410
203.271.1773
SLRCONSULTING.COM

DESCRIPTION	DATE	BY

DRAINAGE AREA MAP - STORM DRAINAGE SYSTEM

BARBER COVE

32 & 36 IRON HORSE BOULEVARD
SIMSBURY, CONNECTICUT

AWG	AWG	FAB
DESIGNED	DRAWN	CHECKED

1"=30'
SCALE

MAY 13, 2021
DATE

17126.00001
PROJECT NO.

SHEET NO.

CB
SHEET NAME

MILONE & MACBROOM

Engineering
Planning
Landscape Architecture
Environmental Science & Services

JOB Barber Cove SLR # 141.17126.00001
SHEET NO. 1 OF 2 SCALE
CALCULATED BY FAB DATE 5/14/21
CHECKED BY DATE

Weir sizing comps:

1) MH6 w/ diverter weir and 12" pipe to bioretention basin

- invert at MH6 = 151.0'
- two pressure treated weir boards to elev. 1.75' above invert

⇒ weir crest elevation = 152.75'

see attached nomograph

5.35' head

- Lowest TF in storm drainage system = 158.1' (CCB 8)
- Peak Discharge from WS 11 (from Hydrographs model results)

$Q_{25\,yr}$ = 45.78 cfs

$Q_{100\,yr}$ = 63.00 cfs

- Head over weir crest:

$Q = CLH^{3/2}$

$C = 3.0$

$L = 5.0$ ft

(Maximum allowable head = 5.35 ft)

Q_{25} = 45.78 cfs = 3 × 5' × $H^{3/2}$

H = 2.11 ft < 5.35 ft OK

Q_{100} = 63.00 cfs = 3 × 5' × $H^{3/2}$

H = 2.62 ft < 5.35 ft OK

2) Emergency Overflow Spillway (south end of wet swale)

- Spillway @ 150.5'
- width (b) = 30'
- H = 0.5'
- trapezoidal shape
- coefficient of discharge = 0.63

$$Q = \frac{2}{3} Cb\sqrt{2g}\ H^{3/2}$$

$$Q = \frac{2}{3} \times 0.63 \times 30 \sqrt{2 \times 32.2} \times 0.5^{3/2}$$

$$Q = 63.86 \text{ cfs}$$ //

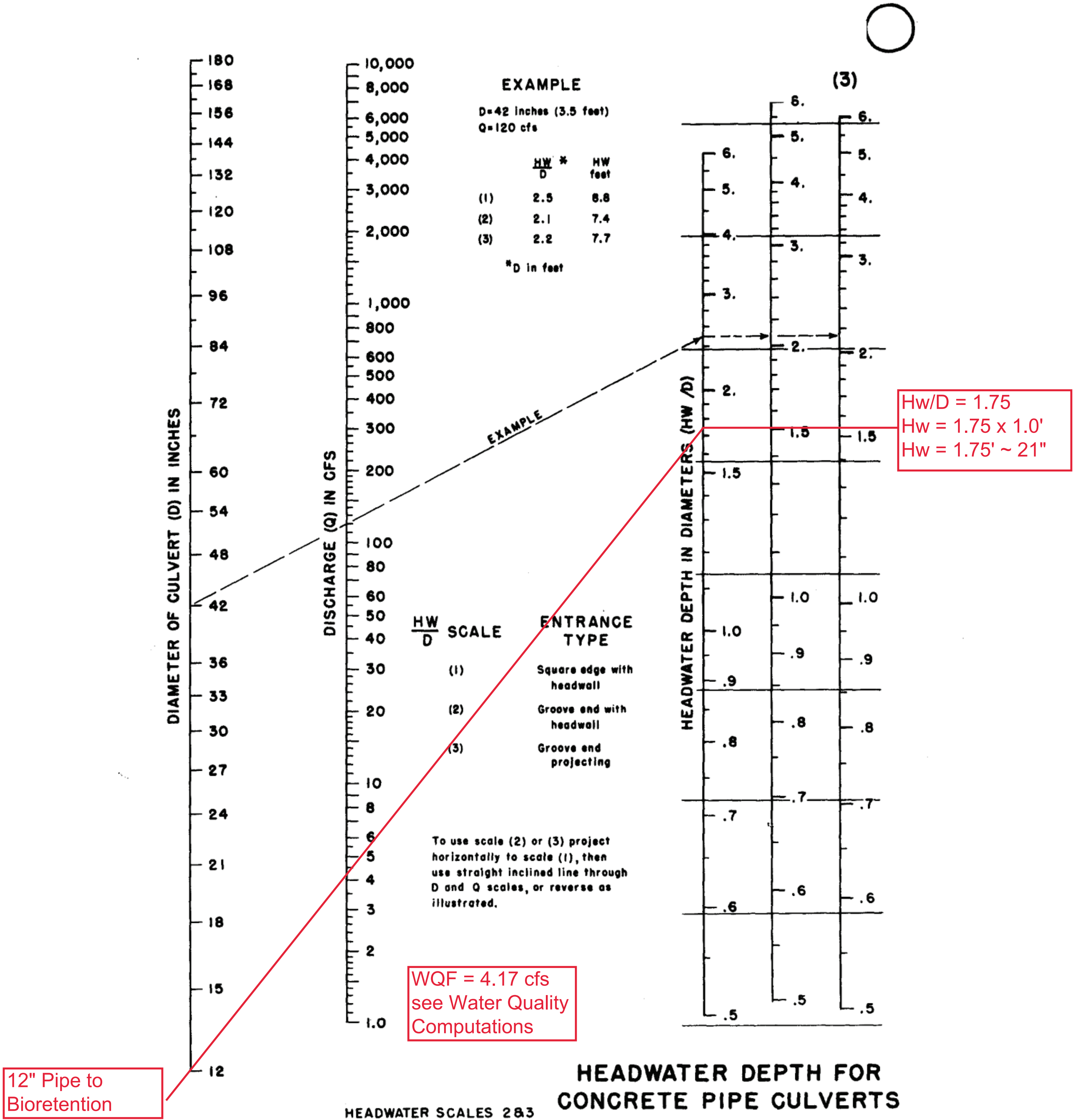
3) Dome Grate (north end of wet swale)

$Q_{capacity} = 6.2$ cfs (see chart)

$Q_{total} > Q_{100\,yr}$

$63.86 + 6.2 = 70.06$ cfs > 63.0 cfs OK//

CHART 1B



Hw/D = 1.75
Hw = 1.75 x 1.0'
Hw = 1.75' ~ 21"

WQF = 4.17 cfs
see Water Quality
Computations

12" Pipe to
Bioretention

HEADWATER DEPTH FOR
CONCRETE PIPE CULVERTS
WITH INLET CONTROL

HEADWATER SCALES 2&3
REVISED MAY 1964

BUREAU OF PUBLIC ROADS JAN. 1963

Channel Report

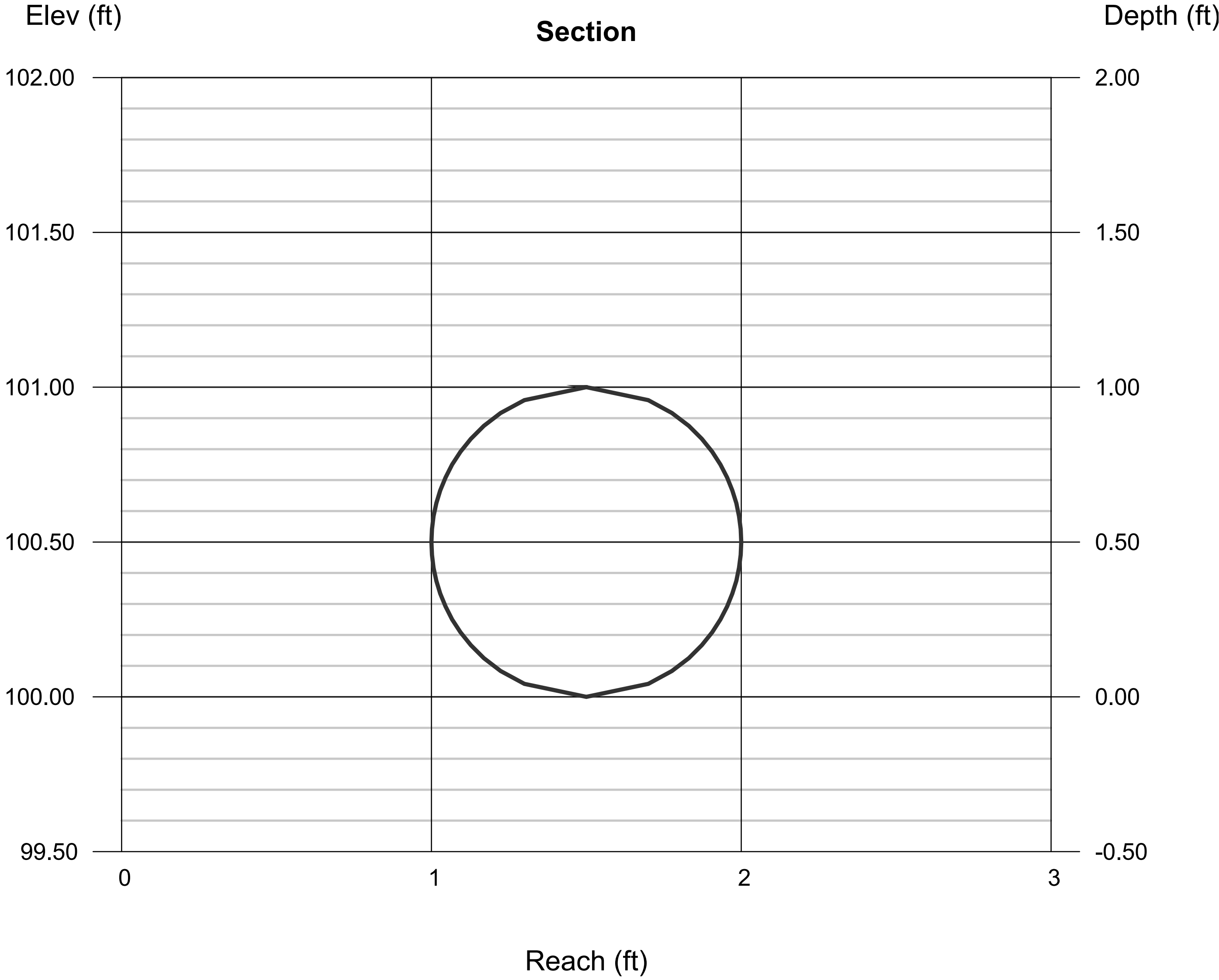
<Name> Capacity of 12" pipe into WQ Swale

Circular
Diameter (ft) = 1.00

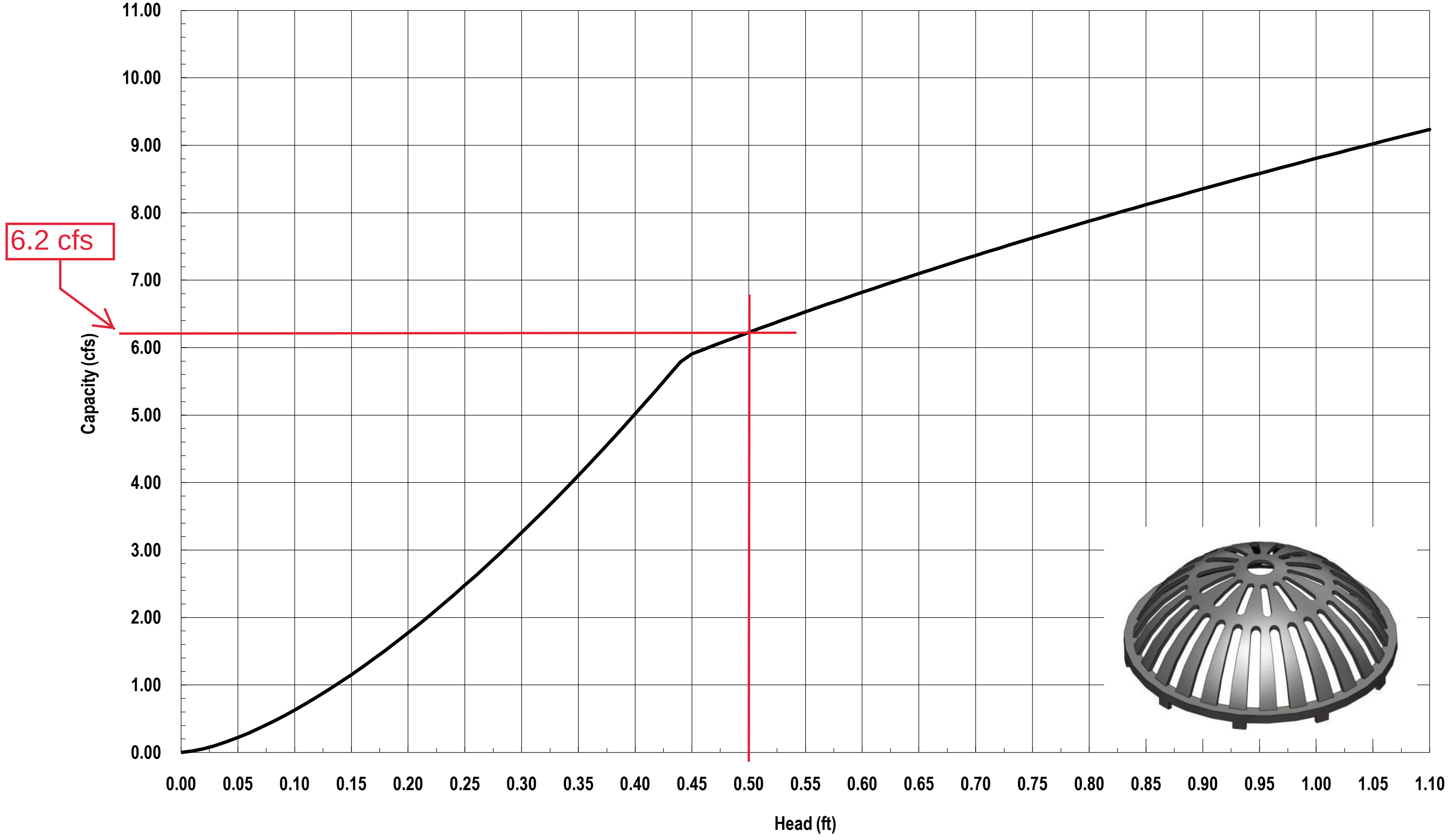
Invert Elev (ft) = 100.00
Slope (%) = 1.59
N-Value = 0.012

Calculations
Compute by: Q vs Depth
No. Increments = 5

Highlighted
Depth (ft) = 1.00
Q (cfs) = 4.865
Area (sqft) = 0.79
Velocity (ft/s) = 6.19
Wetted Perim (ft) = 3.14
Crit Depth, Yc (ft) = 0.91
Top Width (ft) = 0.00
EGL (ft) = 1.60

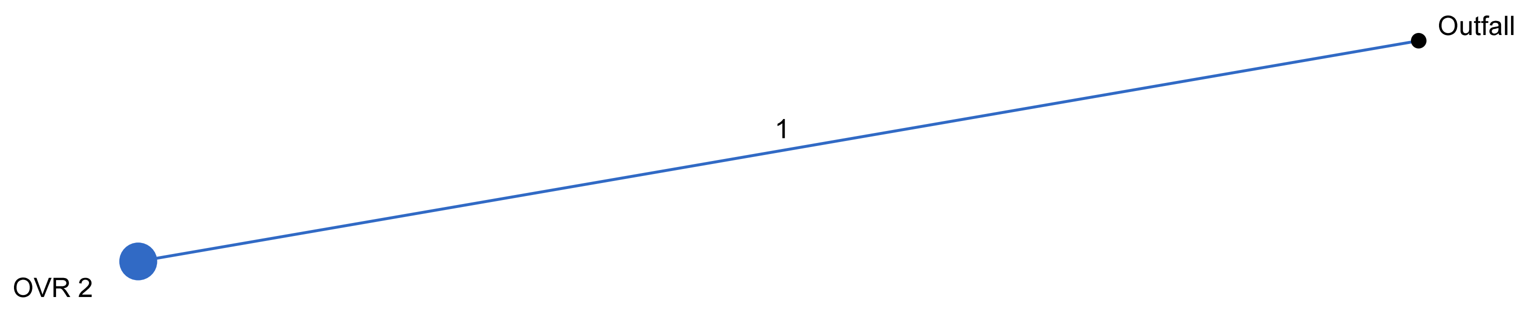


Nyloplast 24" Dome Grate Inlet Capacity Chart



Nyloplast®
3130 Verona Avenue • Buford, GA 30518
(866) 888-8479 / (770) 932-2443 • Fax: (770) 932-2490

Hydraflow Storm Sewers Extension for Autodesk® AutoCAD® Civil 3D® Plan



Project File: New.stm	Number of lines: 1	Date: 5/14/2021

Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr Line No.	Line Length (ft)	Defl angle (deg)	Junc Type	Known Q (cfs)	Drng Area (ac)	Runoff Coeff (C)	Inlet Time (min)	Invert El Dn (ft)	Line Slope (%)	Invert El Up (ft)	Line Size (in)	Line Shape	N Value (n)	J-Loss Coeff (K)	Inlet/ Rim El (ft)	
1	End	148.000	170.172	MH	4.17	0.00	0.00	0.0	146.70	0.54	147.50	15	Cir	0.012	1.00	150.50	OVR 4 - MH 2

Project File: New.stm	Number of lines: 1	Date: 5/14/2021

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr	Total		Incr	Total	Inlet	Syst					Size	Slope	Dn	Up	Dn	Up	Dn	Up	
		(ft)	(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(ft/s)	(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	
1	End	148.000	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	4.17	5.14	3.40	15	0.54	146.70	147.50	149.40	149.93	152.60	150.50	OVR 4 - MH 2

Project File: New.stm

Number of lines: 1

Run Date: 5/14/2021

NOTES:Known Qs only ; c = cir e = ellip b = box

Channel Report

<Name>

Circular
Diameter (ft) = 0.50

Invert Elev (ft) = 100.00
Slope (%) = 0.50
N-Value = 0.012

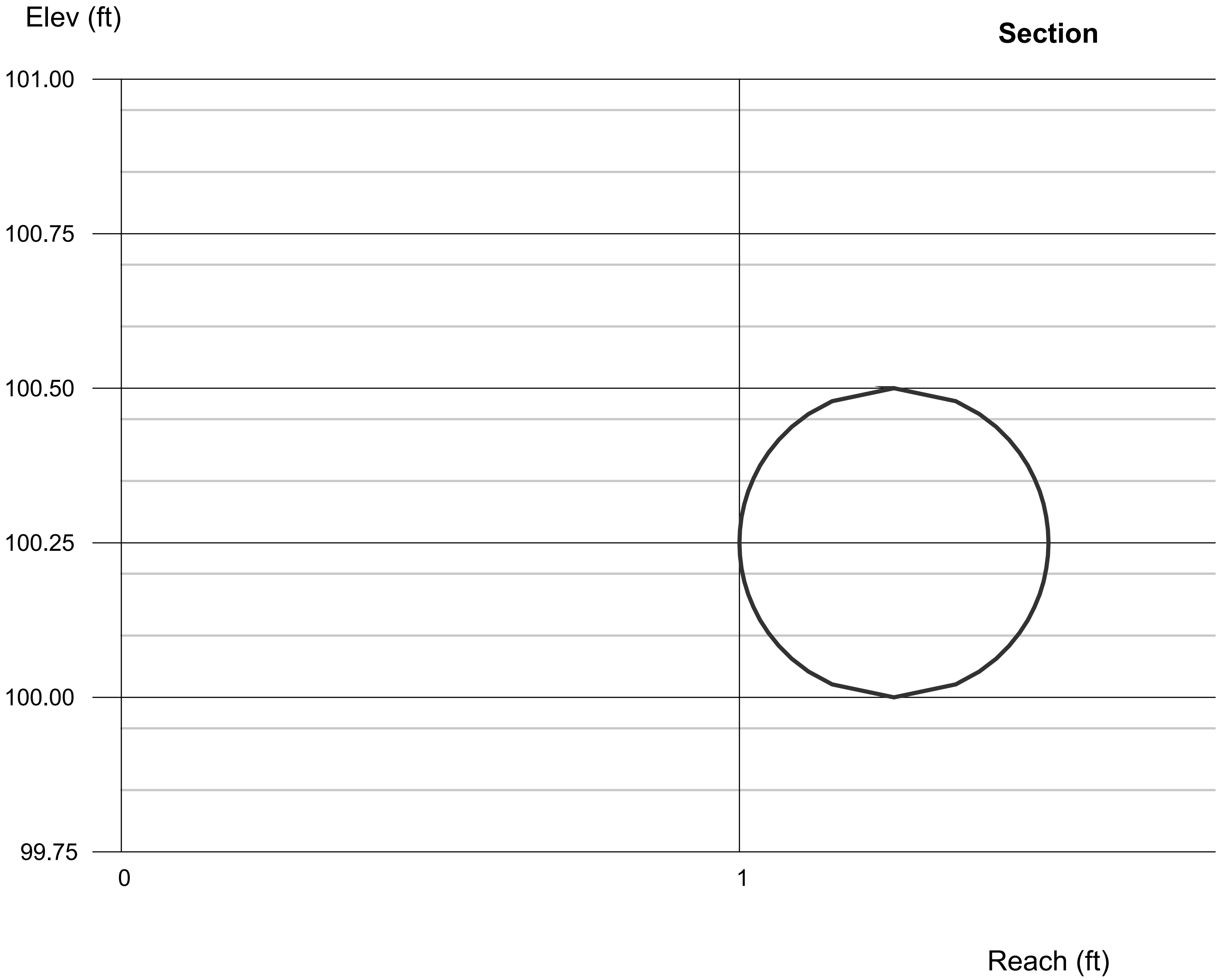
Calculations
Compute by: Q vs Depth
No. Increments = 4

Highlighted
Depth (ft) = 0.50
Q (cfs) = 0.430
Area (sqft) = 0.20
Velocity (ft/s) = 2.19
Wetted Perim (ft) = 1.57
Crit Depth, Yc (ft) = 0.34
Top Width (ft) = 0.00
EGL (ft) = 0.57

Rooftop area (maint. bld) = 2,012 ft2 = 0.046 acres
Q (25yr) = 0.046 ac x 0.9 x 9.0 in/hr = 0.37cfs

Capacity of 6" HDPE, 0.5% slope = 0.43cfs

0.43 cfs> 0.37 cfs <u>OK</u>



Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Friday, May 7 2021

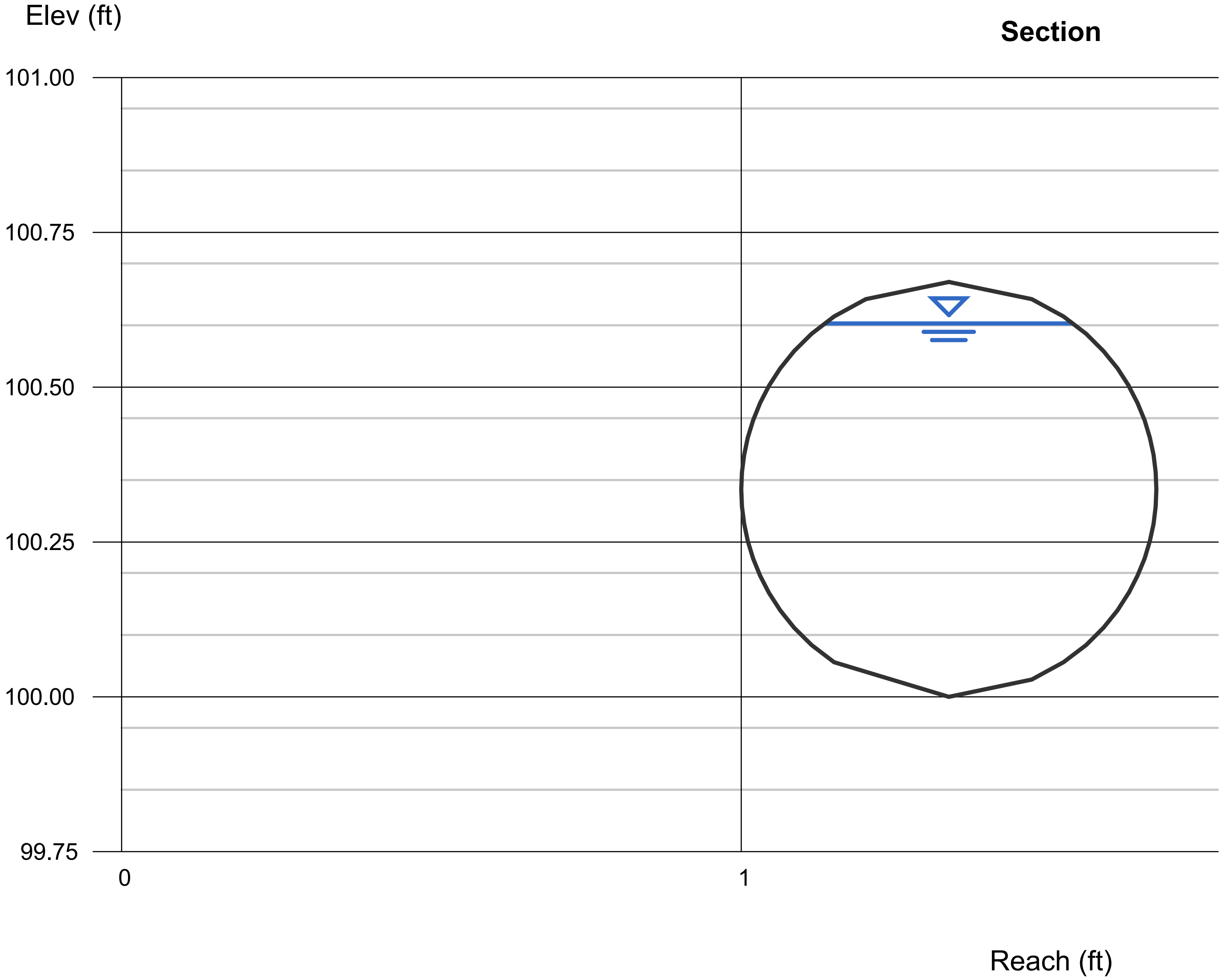
<Name>

Circular		**Highlighted**	
Diameter (ft)	= 0.67	Depth (ft)	= 0.60
		Q (cfs)	= 1.000
		Area (sqft)	= 0.33
Invert Elev (ft)	= 100.00	Velocity (ft/s)	= 2.99
Slope (%)	= 0.50	Wetted Perim (ft)	= 1.68
N-Value	= 0.012	Crit Depth, Yc (ft)	= 0.48
		Top Width (ft)	= 0.40
Calculations		EGL (ft)	= 0.74
Compute by:	Q vs Depth		
No. Increments	= 10		

Rooftop area (garage blds) = 3,400 ft2 = 0.078 acres
Q (25yr) = 0.078 ac x 0.9 x 9.0 in/hr = 0.63cfs

Capacity of 8" HDPE, 0.5% slope = 1.0cfs

1.0 cfs> 0.63 cfs OK



Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc.   Friday, May 7 2021

<Name>

Circular
Diameter (ft) = 0.83

Invert Elev (ft) = 100.00
Slope (%) = 0.50
N-Value = 0.012

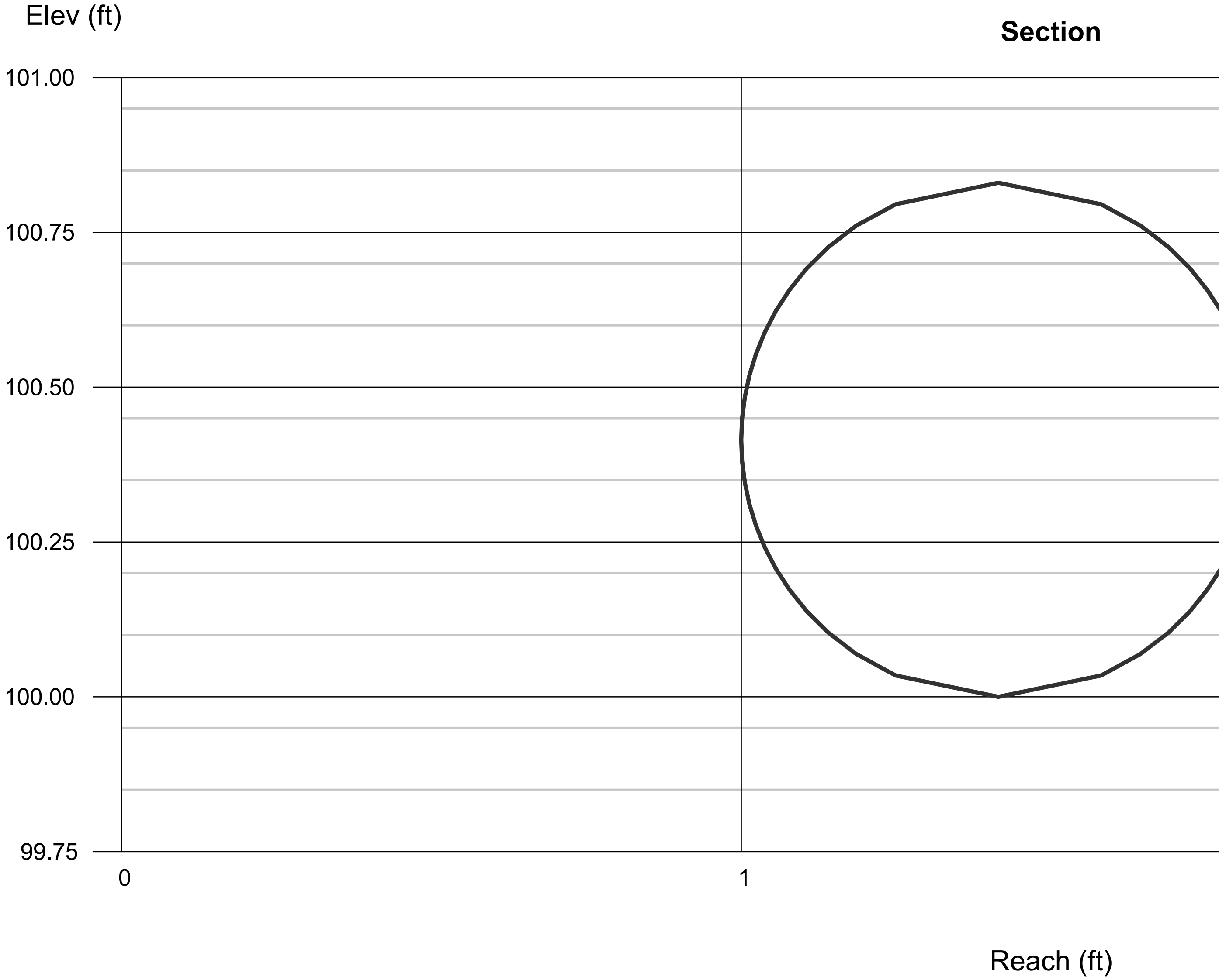
Calculations
Compute by: Q vs Depth
No. Increments = 4

Highlighted
Depth (ft) = 0.83
Q (cfs) = 1.660
Area (sqft) = 0.54
Velocity (ft/s) = 3.07
Wetted Perim (ft) = 2.61
Crit Depth, Yc (ft) = 0.58
Top Width (ft) = 0.00
EGL (ft) = 0.98

Rooftop area (club house) = 6,120 ft2 = 0.14 acres
Q (25yr) = 0.14 ac x 0.9 x 9.0 in/hr = 1.14 cfs

Capacity of 10" HDPE, 0.5% slope = 1.66 cfs

1.66 cfs> 1.14 cfs OK



Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Friday, May 7 2021

<Name>

Circular

Diameter (ft) = 1.00

Invert Elev (ft) = 100.00
Slope (%) = 0.50
N-Value = 0.012

Calculations

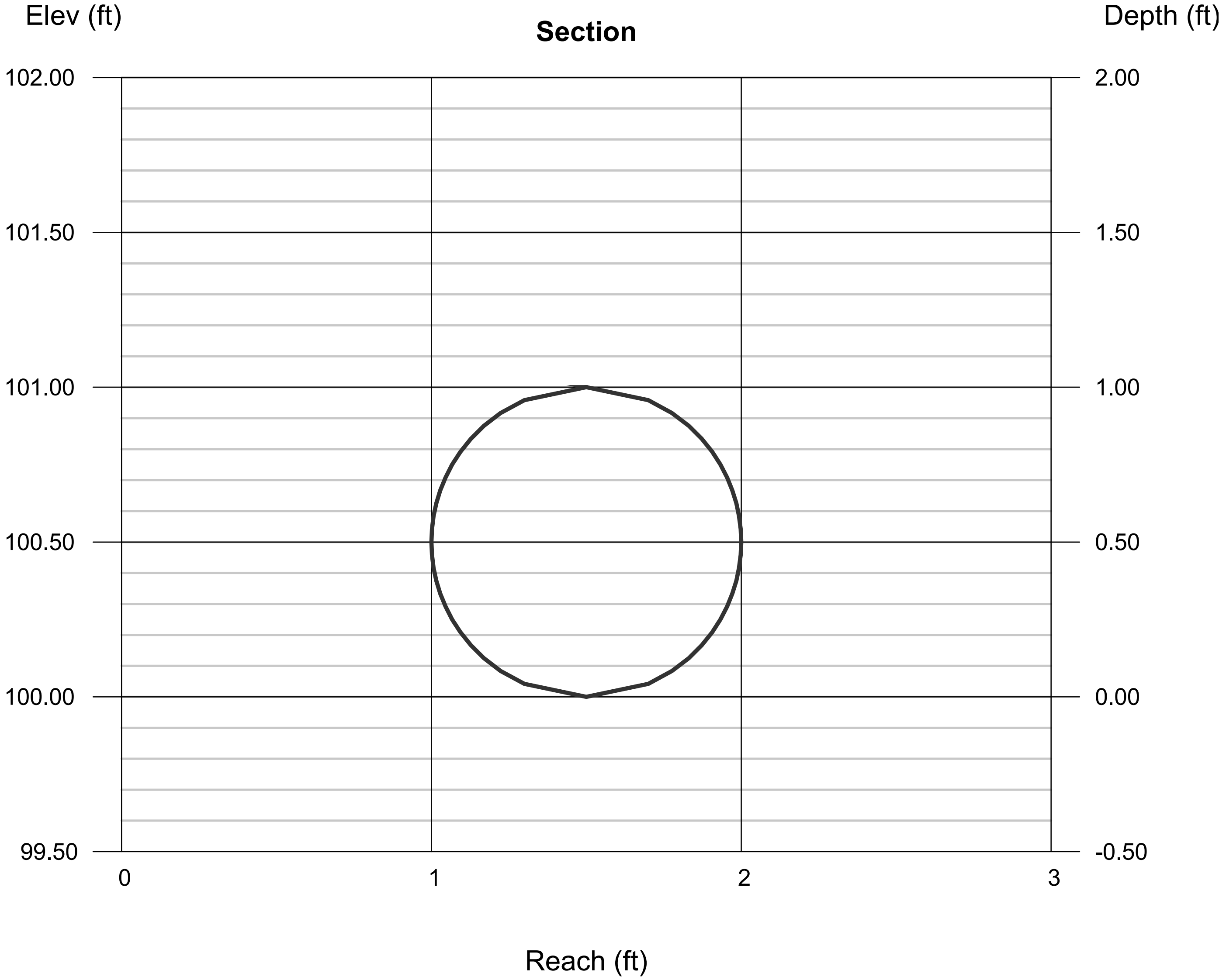
Compute by: Q vs Depth
No. Increments = 4

Highlighted

Depth (ft) = 1.00
Q (cfs) = 2.728
Area (sqft) = 0.79
Velocity (ft/s) = 3.47
Wetted Perim (ft) = 3.14
Crit Depth, Yc (ft) = 0.71
Top Width (ft) = 0.00
EGL (ft) = 1.19

Rooftop area (main building) = 17,250 ft2 = 0.4 acres
Q (25yr) = 0.4 ac x 0.9 x 9.0 in/hr = 3.24 cfs
1/2 rooftop discharge = 1.62 cfs
Capacity of 12" HDPE, 0.5% slope = 2.73 cfs

2.73 cfs> 1.62 cfs OK



Channel Report

<Name>

Circular
Diameter (ft) = 1.00

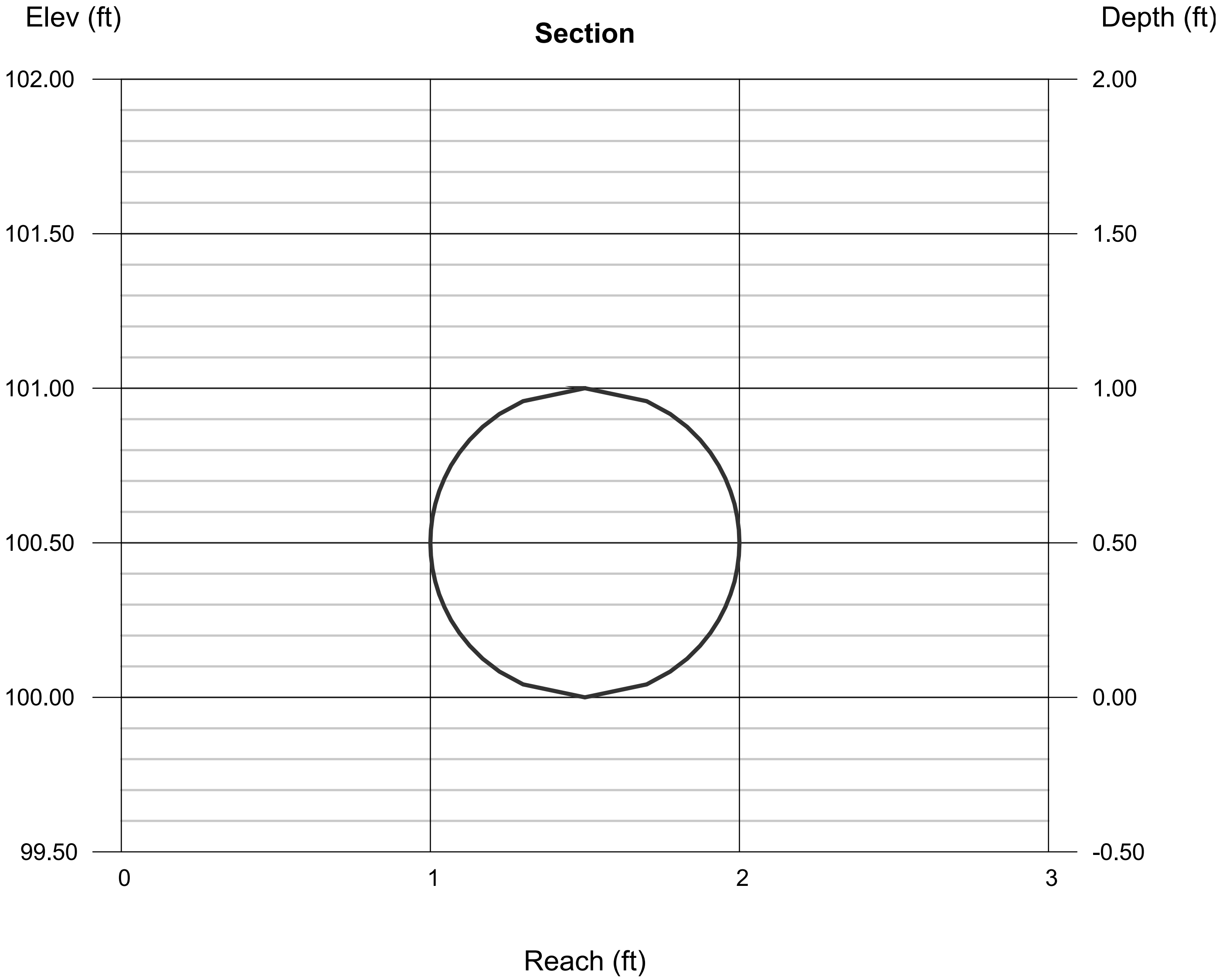
Invert Elev (ft) = 100.00
Slope (%) = 1.00
N-Value = 0.012

Calculations
Compute by: Q vs Depth
No. Increments = 4

Highlighted
Depth (ft) = 1.00
Q (cfs) = 3.858
Area (sqft) = 0.79
Velocity (ft/s) = 4.91
Wetted Perim (ft) = 3.14
Crit Depth, Yc (ft) = 0.84
Top Width (ft) = 0.00
EGL (ft) = 1.38

Rooftop area (main building) = 17,250 ft2 = 0.4 acres
Q (25yr) = 0.4 ac x 0.9 x 9.0 in/hr = 3.24 cfs
Capacity of 12" HDPE, 1% slope = 3.86 cfs

3.86 cfs> 3.24 cfs OK



ATTACHMENT G

WATER QUALITY COMPUTATIONS

Drainage Report

Barber Cove Development

32 and 36 Iron Horse Boulevard

Simsbury, Connecticut

May 28, 2021

MILONE & MACBROOM

Engineering
Planning
Landscape Architecture
Environmental Science & Services

JOB Barber Cove SLR#141.17126.00001
SHEET NO. 1 OF 1 SCALE
CALCULATED BY FAB DATE 5/14/21
CHECKED BY DATE

- Total Water Quality Volume (WQV) provided by the two stormwater management practices in order to meet CT DEEP Stormwater Quality Manual requirements
  - WQV required = 0.591 ac-ft ≈ 25,744 ft³ (entire project area)
  - WQV provided:
    - Water Quality Swale = 15,438 ft³
    - Infiltration galleries (24" Concrete chambers from United Concrete, Inc.)

$$160 \text{ chambers} \times 73.45\ \text{ft}^3/\text{chamber} = 11,752\ \text{ft}^3$$

$$(15,438 + 11,752)\ \text{ft}^3 = 27,190\ \text{ft}^3$$

$$\underset{\text{(provided)}}{27,190\ \text{ft}^3} > \underset{\text{(required)}}{25,744\ \text{ft}^3} \qquad \underline{\text{OK}}$$

STORMWATER QUALITY CALCULATIONS:
Water Quality & Groundwater Recharge Volume

Basin ID	Post-Development Impervious Area	Percent Impervious	Volumetric Runoff Coeff., R	Recharge Depth[1.], D (in.)	WQV (ac-ft)	GRV (ac-ft)	Total Volume Required [2.] (ac-ft)
Overall Development	7.46	100%	0.95	0.25	0.591	0.155	0.591

[1.] - Depth of Runoff to be Recharged or Recharge Depth taken from Table 7-4 found on page 7-6 of the CT DEEP Stormwater Quality Manual.

[2.] - GRV is considered as part of the total WQV required.

$$\textbf{WQV =} \frac{(1.0 \text{ inches}) \times A \times R}{12}$$

Where: WQV = Water Quality Volume in acre-feet

A = Contributing Area in acres

R = 0.05 + 0.009 (I)

I = Site Imperviousness as percent

$$\textbf{GRV =} \frac{D \times A \times I}{12}$$

Where: GRV = Groundwater Recharge Volume in acre-feet

D = Depth of Runoff to be Recharged in inches

A = Contributing Area in acres

I = Site Imperviousness as decimal

STORMWATER QUALITY CALCULATIONS
Water Quality Volume Provided

Water Quality Swale - Wet Swale:

Northern Bay:

Elevation (ft)	Surface Area (ft2)	Volume (ft3)	Volume (ac-ft)	Cumulative Volume (ft3)	Cumulative Volume (ac-ft)
147.5	1,400	0.0	0.000	**0.0**	**0.000**
148.0	2,225	906.3	0.021	**906**	**0.021**
149.0	3,925	3,075.0	0.071	**3,981**	**0.091**
149.25	4,300	1,028.1	0.024	**5,009**	**0.115**
149.5	4,675	1,121.9	0.026	**6,131**	**0.141**
150.0	5,425	2,525.0	0.058	**8,656**	**0.199**

Southern Bay:

Elevation (ft)	Surface Area (ft2)	Volume (ft3)	Volume (ac-ft)	Cumulative Volume (ft3)	Cumulative Volume (ac-ft)
147.8	550	0.0	0.000	**0.0**	**0.000**
148.0	700	125.0	0.003	**125**	**0.003**
149.0	1,250	975.0	0.022	**1,100**	**0.025**
149.5	1,525	693.8	0.016	**1,794**	**0.041**
150.0	1,775	825.0	0.019	**2,619**	**0.060**

Top Storage Volume (Above Elev. 150.0 ft):

Elevation (ft)	Surface Area (ft2)	Volume (ft3)	Volume (ac-ft)	Cumulative Volume (ft3)	Cumulative Volume (ac-ft)	
150.0	7,200	0.0	0.000	**0.0**	**0.000**	
150.5	9,450	4,162.5	0.096	**4,163**	**0.096**	**Overflow Elev.**
151.0	11,125	5,143.8	0.118	**9,306**	**0.214**	

Total Volume Provided at Overflow Elevation (151.7 ft) = 8,656 + 2,619 + 4,163
= 15,438 ft3

MILONE & MACBROOM

Engineering
Planning
Landscape Architecture
Environmental Science & Services

JOB Barber Cove - SLR # 17126.00001

SHEET NO. 1 OF 1 SCALE

CALCULATED BY FAB DATE 5/14/21

CHECKED BY DATE

- Pre-treatment requirements for proposed Water Quality Swale:

  - post development impervious area = 7.46 acres

  - remove from the calculations the impervious area from the rooftops draining to the infiltration chambers

    7.46 acres - 1.98 acres = 5.48 acres

  - $WQV = \frac{1'' \times A \times R}{12} = 1'' \times 5.48 \text{ ac} \times 0.95 / 12 = 0.434 \text{ ac-ft} \approx 18,905 \text{ ft}^3$

    R = 0.95 (100% impervious)

  - 25% of $18,905 \text{ ft}^3 = 4,726 \text{ ft}^3$

  - volume provided in northern bay @ elev. 149.25 ft:

    $5,009 \text{ ft}^3 > 4,726 \text{ ft}^3$ OK //

160 chambers

Volume / chamber = 45.45 ft3 + 28 ft3 = 73.45 ft3
(chamber) (stone)

160 x 73.45 ft3 = 11,752 ft3

24" LOW PROFILE HS–20 LEACHING GALLEY

GALLEY DESIGN SPECIFICATIONS
CONFORMS TO LATEST:
ASTM DESIGNATION C913

NOTES:

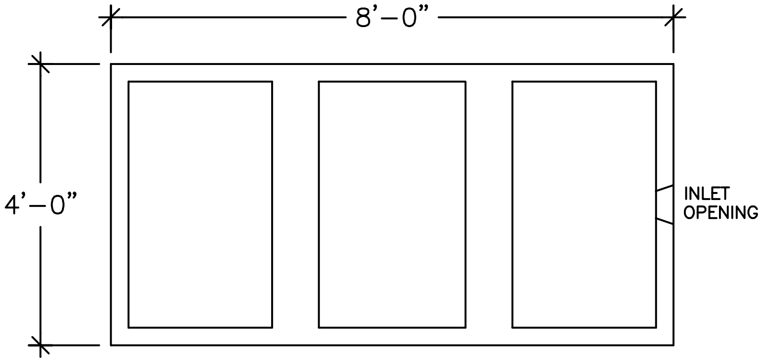
1. PIPE INLET AND OUTLET LOCATIONS HAVE POLYLOK II PIPE SEALS, TYPICAL. CUSTOM KNOCKOUTS CAN BE CAST ON REQUEST.
2. REINFORCING STEEL DEFORMED BARS CONFORM TO LATEST ASTM SPECIFICATION A615.
3. CONCRETE COMPRESSIVE STRENGTH– 4000 PSI AT 28 DAYS.
4. METHOD OF MANUFACTURE: WET CAST.
5. SECTION IS MONOLITHIC.
6. THE GALLEY IS DESIGNED FOR HS–20 LOADING w/18" OF SOIL COVER.

WEIGHT CHART

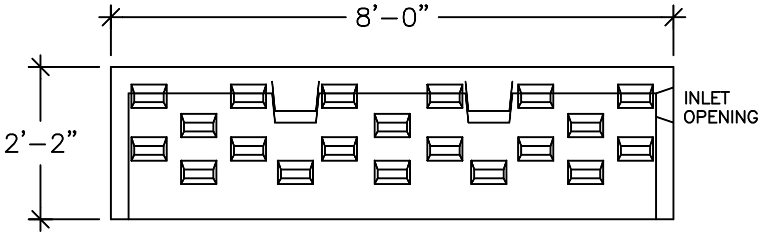
PRODUCT	APPROX WEIGHT
24" GALLEY	3500 LBS.

LEACHING DATA

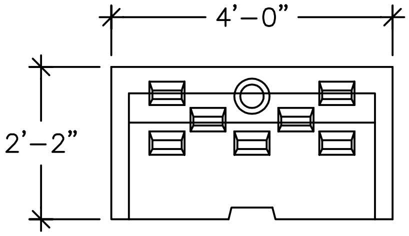
FLOW LINE (INCHES)	LEACHING (Gall/LF)	LEACHING (FT^2/UNIT)	INSIDE CAPACITY (GALLONS)
19	6.8	54.4	340



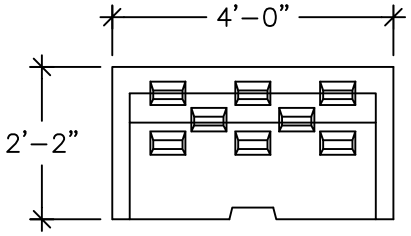
TOP VIEW
(ROOF SLAB THICKNESS IS 5")



SIDE VIEW
(WALL THICKNESS IS 3")
(ROOF THICKNESS IS 5 1/2",7 1/2" @ BEAMS)



END VIEW (END SECTION)
(WALL THICKNESS IS 3")
(ROOF THICKNESS IS 5 1/2",7 1/2" @ BEAMS)



END VIEW (CENTER SECTION)
(WALL THICKNESS IS 3")
(ROOF THICKNESS IS 5 1/2",7 1/2" @ BEAMS)

UNITED CONCRETE PRODUCTS INC.

173 CHURCH STREET
YALESVILLE, CT 06492

TEL. 800 234–3119
(203) 269–3119

FAX. (203) 265–4941

	SLR CONSULTING	Project	**17126.00001**
	COMPUTATION SHEET - WATER QUALITY FLOW (WQF)	Made By:	FAB
Subject:	**Barber Cove** **32 and 36 Iron Horse Boulevard, Simsbury, CT**	Date:	5/14/2021
		Chkd by:	
		Date:	

Contech CDS Unit

Contributing Basin	Imperv. Area (acres) *	Total Area (acres)
WS 11	5.05	10.82

* 1.98 acre of impervious area from rooftops draining to infiltration galleries not used in the calculations

Table 4.1: WQV = (P)(R_v)(A)/12 = 0.424 acre-feet

Where:

I = % of Impervious Cover = 47%

R_v = volumetric runoff coeff. 0.05 + 0.009(I) = 0.470

P = design precipitation (1.0" for water quality storm) = 1 inch

A = site area (acres) = 10.82 acres = 0.0169 miles^2

Q = runoff depth (in watershed inches) = [WQV(acrefeet)]*[12(inches/foot)]/drainage area (acres)

Q = 0.470

CN = 1000 / [10+ 5P + 10Q -10(Q^2 + 1.25QP)$^{0.5}$] = 93

Where:

Q = runoff depth (in watershed inches)

t_c = 0.21 hours

Type III Rainfall Distribution:

From Table 4-1, Ia = 0.151 Ia/P = 0.151

(TR-55)

From Exhibit 4-III, q_u = 525 csm/in.

(TR-55)

WQF = (qu)(A)(Q) = 4.17 cfs

2. Compute the time of concentration (t_c) based on the methods described in Chapter 3 of TR-55. A minimum value of 0.167 hours (10 minutes) should be used. For sheet flow, the flow path should not be longer than 300 feet.

3. Using the computed CN, t_c, and drainage area (A) in acres, compute the peak discharge for the water quality storm (i.e., the water quality flow [WQF]), based on the procedures described in Chapter 4 of TR-55.

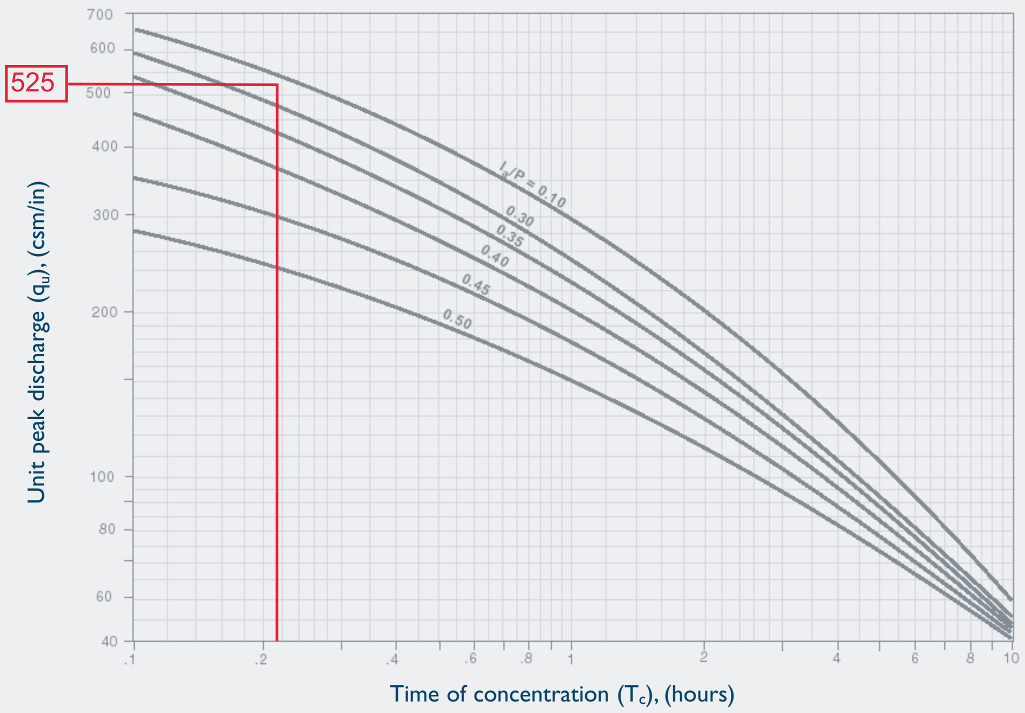
    ❍ *Read initial abstraction (I_a) from Table 4-1 in Chapter 4 of TR-55 (reproduced below); compute I_a/P*

Table 4-1 I_a values for runoff curve numbers

Curve number	I_a (in)	Curve number	I_a (in)	Curve number	I_a (in)	Curve number	I_a (in)
40	3.000	55	1.636	70	0.857	85	0.353
41	2.878	56	1.571	71	0.817	86	0.326
42	2.762	57	1.509	72	0.778	87	0.299
43	2.651	58	1.448	73	0.740	88	0.273
44	2.545	59	1.390	74	0.703	89	0.247
45	2.444	60	1.333	75	0.667	90	0.222
46	2.348	61	1.279	76	0.632	91	0.198
47	2.255	62	1.226	77	0.597	92	0.174
48	2.167	63	1.175	78	0.564	93	0.151
49	2.082	64	1.125	79	0.532	94	0.128
50	2.000	65	1.077	80	0.500	95	0.105
51	1.922	66	1.030	81	0.469	96	0.083
52	1.846	67	0.985	82	0.439	97	0.062
53	1.774	68	0.941	83	0.410	98	0.041
54	1.704	69	0.899	84	0.381		

❍ *Read the unit peak discharge (q_u) from Exhibit 4-III in Chapter 4 of TR-55 (reproduced below) for appropriate t_c*

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



Product Flow Rates

CASCADE

Model	Treatment Rate (cfs)	Sediment Capacity[1] (CF)
CS-4	2.00	19
CS-5	3.50	29
CS-6	5.60	42
CS-8	12.00	75
CS-10	18.00	118

CDS

Model	Treatment Rate[2] (cfs)	Sediment Capacity[1] (CF)
1515-3	1.00	14
2015-4	1.40	25
2015-5	1.40	39
2015-6	1.40	57
2020-5	2.20	39
2020-6	2.20	57
2025-5	3.20	39
2025-6	3.20	57
3020-6	3.90	57
3025-6	5.00	57
3030-6	5.70	57
3035-6	6.50	57
4030-8	7.50	151
4040-8	9.50	151

VORTECHS

Model	Treatment Rate (cfs)	Sediment Capacity[3] (CF)
1000	1.60	16
2000	2.80	32
3000	4.50	49
4000	6.00	65
5000	8.50	86
7000	11.00	108
9000	14.00	130
11000	17.5	151
16000	25	192

STORMCEPTOR STC

Model	Treatment Rate (cfs)	Sediment Capacity[1] (CF)
STC 450i	0.40	46
STC 900	0.89	89
STC 2400	1.58	205
STC 4800	2.47	543
STC 7200	3.56	839
STC 11000	4.94	1086
STC 16000	7.12	1677

[1] *Additional sediment storage capacity available – Check with your local representative for information.*

[2] *Treatment Capacity is based on laboratory testing using OK-110 (average D50 particle size of approximately 100 microns) and a 2400 micron screen.*

[3] *Maintenance recommended when sediment depth has accumulated to within 12-18 inches of the dry weather water surface elevation.*

STORMWATER SOLUTIONS

PIPE SOLUTIONS

STRUCTURES SOLUTIONS

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ENGINEERED SOLUTIONS

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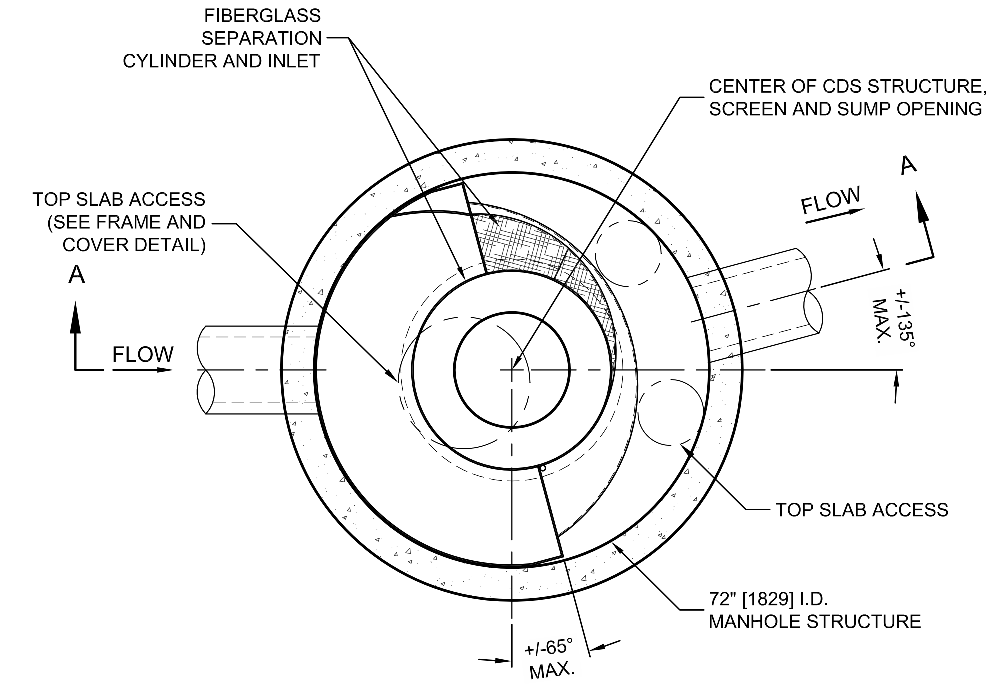
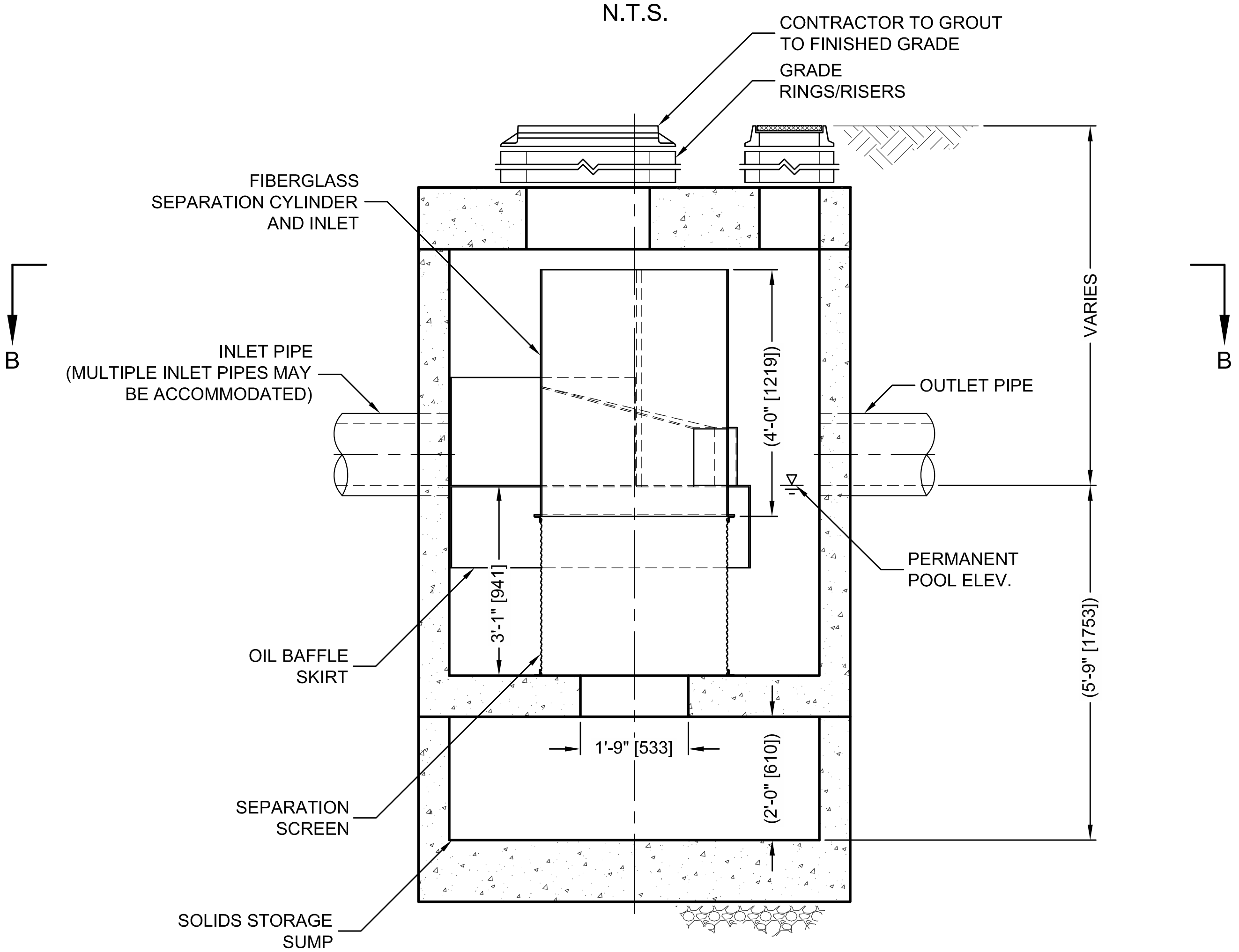


PLAN VIEW B-B
N.T.S.



ELEVATION A-A
N.T.S.

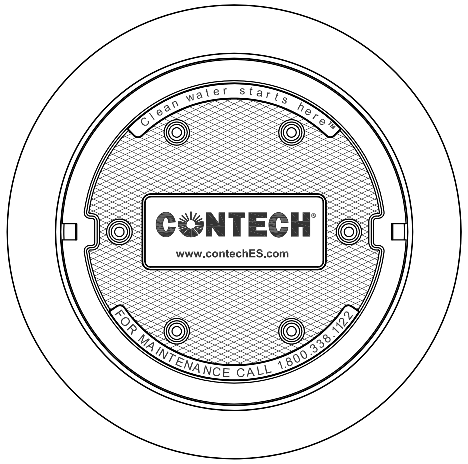
THIS PRODUCT MAY BE PROTECTED BY ONE OR MORE OF THE FOLLOWING U.S. PATENTS: 5,788,848; 6,641,720; 6,511,595; 6,581,783; RELATED FOREIGN PATENTS, OR OTHER PATENTS PENDING.

C:\USERS\SCHLACHTERH\DESKTOP\CDS DETAILS 180 MICRON SIZING\ACAD\CDS3025-6-C-DTL.DWG 5/19/2014 5:26 PM

CDS3025-6-C DESIGN NOTES

THE STANDARD CDS3025-6-C CONFIGURATION IS SHOWN. ALTERNATE CONFIGURATIONS ARE AVAILABLE AND ARE LISTED BELOW. SOME CONFIGURATIONS MAY BE COMBINED TO SUIT SITE REQUIREMENTS.

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



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

SITE SPECIFIC DATA REQUIREMENTS

STRUCTURE ID			
WATER QUALITY FLOW RATE (CFS OR L/s)			*
PEAK FLOW RATE (CFS OR L/s)			*
RETURN PERIOD OF PEAK FLOW (YRS)			*
SCREEN APERTURE (2400 OR 4700)			*
PIPE DATA:	I.E.	MATERIAL	DIAMETER
INLET PIPE 1	*	*	*
INLET PIPE 2	*	*	*
OUTLET PIPE	*	*	*
RIM ELEVATION			*
ANTI-FLOTATION BALLAST		WIDTH	HEIGHT
		*	*

NOTES/SPECIAL REQUIREMENTS:

* PER ENGINEER OF RECORD

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

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

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

CDS3025-6-C
INLINE CDS
STANDARD DETAIL

CDS Guide
Operation, Design, Performance and Maintenance

CDS®

Using patented continuous deflective separation technology, the CDS system screens, separates and traps debris, sediment, and oil and grease from stormwater runoff. The indirect screening capability of the system allows for 100% removal of floatables and neutrally buoyant material without blinding. Flow and screening controls physically separate captured solids, and minimize the re-suspension and release of previously trapped pollutants. Inline units can treat up to 6 cfs, and internally bypass flows in excess of 50 cfs (1416 L/s). Available precast or cast-in-place, offline units can treat flows from 1 to 300 cfs (28.3 to 8495 L/s). The pollutant removal capacity of the CDS system has been proven in lab and field testing.

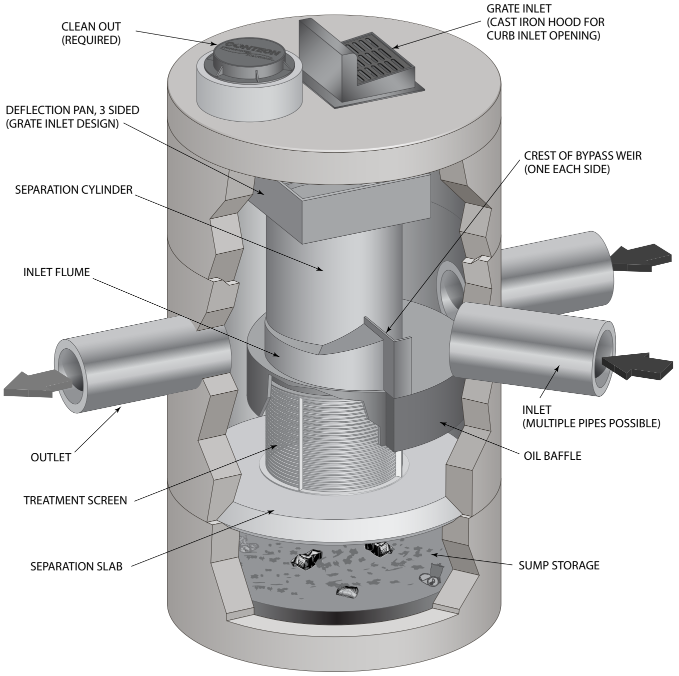
Operation Overview

Stormwater enters the diversion chamber where the diversion weir guides the flow into the unit's separation chamber and pollutants are removed from the flow. All flows up to the system's treatment design capacity enter the separation chamber and are treated.

Swirl concentration and screen deflection force floatables and solids to the center of the separation chamber where 100% of floatables and neutrally buoyant debris larger than the screen apertures are trapped.

Stormwater then moves through the separation screen, under the oil baffle and exits the system. The separation screen remains clog free due to continuous deflection.

During the flow events exceeding the treatment design capacity, the diversion weir bypasses excessive flows around the separation chamber, so captured pollutants are retained in the separation cylinder.



Design Basics

There are three primary methods of sizing a CDS system. The Water Quality Flow Rate Method determines which model size provides the desired removal efficiency at a given flow rate for a defined particle size. The Rational Rainfall Method™ or the and Probabilistic Method is used when a specific removal efficiency of the net annual sediment load is required.

Typically in the Unites States, CDS systems are designed to achieve an 80% annual solids load reduction based on lab generated performance curves for a gradation with an average particle size (d50) of 125 microns (μm). For some regulatory environments, CDS systems can also be designed to achieve an 80% annual solids load reduction based on an average particle size (d50) of 75 microns (μm) or 50 microns (μm).

Water Quality Flow Rate Method

In some cases, regulations require that a specific treatment rate, often referred to as the water quality design flow (WQQ), be treated. This WQQ represents the peak flow rate from either an event with a specific recurrence interval, e.g. the six-month storm, or a water quality depth, e.g. 1/2-inch (13 mm) of rainfall.

The CDS is designed to treat all flows up to the WQQ. At influent rates higher than the WQQ, the diversion weir will direct most flow exceeding the WQQ around the separation chamber. This allows removal efficiency to remain relatively constant in the separation chamber and eliminates the risk of washout during bypass flows regardless of influent flow rates.

Treatment flow rates are defined as the rate at which the CDS will remove a specific gradation of sediment at a specific removal efficiency. Therefore the treatment flow rate is variable, based on the gradation and removal efficiency specified by the design engineer.

Rational Rainfall Method™

Differences in local climate, topography and scale make every site hydraulically unique. It is important to take these factors into consideration when estimating the long-term performance of any stormwater treatment system. The Rational Rainfall Method combines site-specific information with laboratory generated performance data, and local historical precipitation records to estimate removal efficiencies as accurately as possible.

Short duration rain gauge records from across the United States and Canada were analyzed to determine the percent of the total annual rainfall that fell at a range of intensities. US stations' depths were totaled every 15 minutes, or hourly, and recorded in 0.01-inch increments. Depths were recorded hourly with 1-mm resolution at Canadian stations. One trend was consistent at all sites; the vast majority of precipitation fell at low intensities and high intensity storms contributed relatively little to the total annual depth.

These intensities, along with the total drainage area and runoff coefficient for each specific site, are translated into flow rates using the Rational Rainfall Method. Since most sites are relatively small and highly impervious, the Rational Rainfall Method is appropriate. Based on the runoff flow rates calculated for each intensity, operating rates within a proposed CDS system are determined. Performance efficiency curve determined from full scale laboratory tests on defined sediment PSDs is applied to calculate solids removal efficiency. The relative removal efficiency at each operating rate is added to produce a net annual pollutant removal efficiency estimate.

Probabilistic Rational Method

The Probabilistic Rational Method is a sizing program Contech developed to estimate a net annual sediment load reduction for a particular CDS model based on site size, site runoff coefficient, regional rainfall intensity distribution, and anticipated pollutant characteristics.

The Probabilistic Method is an extension of the Rational Method used to estimate peak discharge rates generated by storm events of varying statistical return frequencies (e.g. 2-year storm event). Under the Rational Method, an adjustment factor is used to adjust the runoff coefficient estimated for the 10-year event, correlating a known hydrologic parameter with the target storm event. The rainfall intensities vary depending on the return frequency of the storm event under consideration. In general, these two frequency dependent parameters (rainfall intensity and runoff coefficient) increase as the return frequency increases while the drainage area remains constant.

These intensities, along with the total drainage area and runoff coefficient for each specific site, are translated into flow rates using the Rational Method. Since most sites are relatively small and highly impervious, the Rational Method is appropriate. Based on the runoff flow rates calculated for each intensity, operating rates within a proposed CDS are determined. Performance efficiency curve on defined sediment PSDs is applied to calculate solids removal efficiency. The relative removal efficiency at each operating rate is added to produce a net annual pollutant removal efficiency estimate.

Treatment Flow Rate

The inlet throat area is sized to ensure that the WQQ passes through the separation chamber at a water surface elevation equal to the crest of the diversion weir. The diversion weir bypasses excessive flows around the separation chamber, thus preventing re-suspension or re-entrainment of previously captured particles.

Hydraulic Capacity

The hydraulic capacity of a CDS system is determined by the length and height of the diversion weir and by the maximum allowable head in the system. Typical configurations allow hydraulic capacities of up to ten times the treatment flow rate. The crest of the diversion weir may be lowered and the inlet throat may be widened to increase the capacity of the system at a given water surface elevation. The unit is designed to meet project specific hydraulic requirements.

Performance

Full-Scale Laboratory Test Results

A full-scale CDS system (Model CDS2020-5B) was tested at the facility of University of Florida, Gainesville, FL. This CDS unit was evaluated under controlled laboratory conditions of influent flow rate and addition of sediment.

Two different gradations of silica sand material (UF Sediment & OK-110) were used in the CDS performance evaluation. The particle size distributions (PSDs) of the test materials were analyzed using standard method "Gradation ASTM D-422 "Standard Test Method for Particle-Size Analysis of Soils" by a certified laboratory.

UF Sediment is a mixture of three different products produced by the U.S. Silica Company: "Sil-Co-Sil 106", "#1 DRY" and "20/40 Oil Frac". Particle size distribution analysis shows that the UF Sediment has a very fine gradation (d50 = 20 to 30 μm) covering a wide size range (Coefficient of Uniformity, C averaged at 10.6). In comparison with the hypothetical TSS gradation specified in the NJDEP (New Jersey Department of Environmental Protection) and NJCAT (New Jersey Corporation for Advanced Technology) protocol for lab testing, the UF Sediment covers a similar range of particle size but with a finer d50 (d50 for NJDEP is approximately 50 μm) (NJDEP, 2003).

The OK-110 silica sand is a commercial product of U.S. Silica Sand. The particle size distribution analysis of this material, also included in Figure 1, shows that 99.9% of the OK-110 sand is finer than 250 microns, with a mean particle size (d50) of 106 microns. The PSDs for the test material are shown in Figure 1.

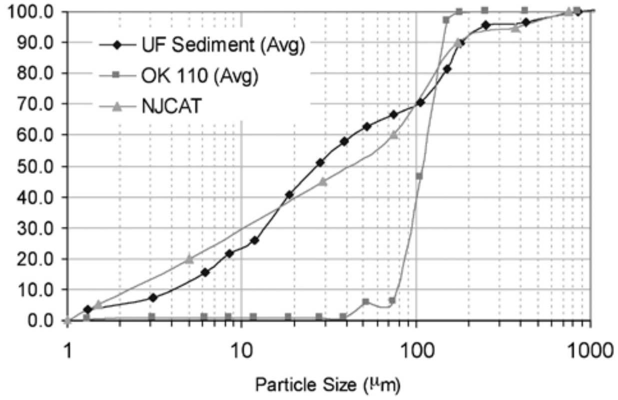


Figure 1. Particle size distributions

Tests were conducted to quantify the performance of a specific CDS unit (1.1 cfs (31.3-L/s) design capacity) at various flow rates, ranging from 1% up to 125% of the treatment design capacity of the unit, using the 2400 micron screen. All tests were conducted with controlled influent concentrations of approximately 200 mg/L. Effluent samples were taken at equal time intervals across the entire duration of each test run. These samples were then processed with a Dekaport Cone sample splitter to obtain representative sub-samples for Suspended Sediment Concentration (SSC) testing using ASTM D3977-97 "Standard Test Methods for Determining Sediment Concentration in Water Samples", and particle size distribution analysis.

Results and Modeling

Based on the data from the University of Florida, a performance model was developed for the CDS system. A regression analysis was used to develop a fitting curve representative of the scattered data points at various design flow rates. This model, which demonstrated good agreement with the laboratory data, can then be used to predict CDS system performance with respect to SSC removal for any particle size gradation, assuming the particles are inorganic sandy-silt. Figure 2 shows CDS predictive performance for two typical particle size gradations (NJCAT gradation and OK-110 sand) as a function of operating rate.

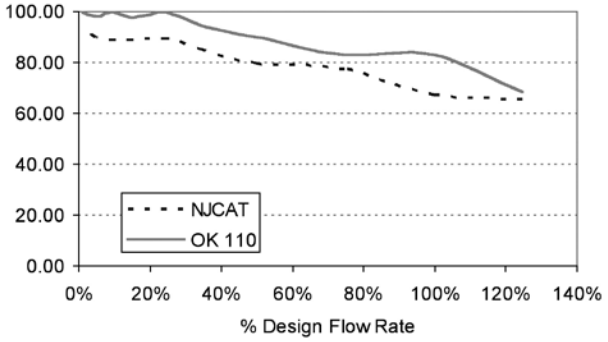


Figure 2. CDS stormwater treatment predictive performance for various particle gradations as a function of operating rate.

Many regulatory jurisdictions set a performance standard for hydrodynamic devices by stating that the devices shall be capable of achieving an 80% removal efficiency for particles having a mean particle size (d50) of 125 microns (e.g. Washington State Department of Ecology — WASDOE - 2008). The model can be used to calculate the expected performance of such a PSD (shown in Figure 3). The model indicates (Figure 4) that the CDS system with 2400 micron screen achieves approximately 80% removal at the design (100%) flow rate, for this particle size distribution (d50 = 125 μm).

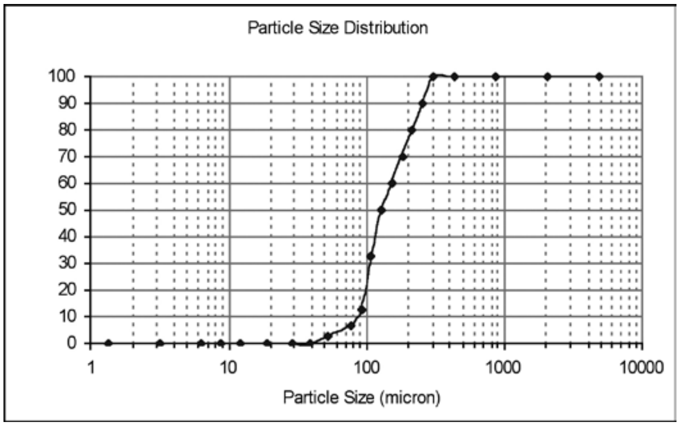


Figure 3. WASDOE PSD

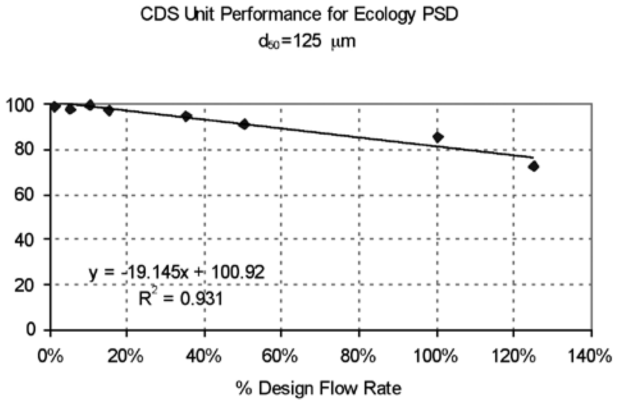


Figure 4. Modeled performance for WASDOE PSD.

Maintenance

The CDS system should be inspected at regular intervals and maintained when necessary to ensure optimum performance. The rate at which the system collects pollutants will depend more heavily on site activities than the size of the unit. For example, unstable soils or heavy winter sanding will cause the grit chamber to fill more quickly but regular sweeping of paved surfaces will slow accumulation.

Inspection

Inspection is the key to effective maintenance and is easily performed. Pollutant transport and deposition may vary from year to year and regular inspections will help ensure that the system is cleaned out at the appropriate time. At a minimum, inspections should be performed twice per year (e.g. spring and fall) however more frequent inspections may be necessary in climates where winter sanding operations may lead to rapid accumulations, or in equipment washdown areas. Installations should also be inspected more frequently where excessive amounts of trash are expected.

The visual inspection should ascertain that the system components are in working order and that there are no blockages or obstructions in the inlet and separation screen. The inspection should also quantify the accumulation of hydrocarbons, trash, and sediment in the system. Measuring pollutant accumulation can be done with a calibrated dipstick, tape measure or other measuring instrument. If absorbent material is used for enhanced removal of hydrocarbons, the level of discoloration of the sorbent material should also be identified

during inspection. It is useful and often required as part of an operating permit to keep a record of each inspection. A simple form for doing so is provided.

Access to the CDS unit is typically achieved through two manhole access covers. One opening allows for inspection and cleanout of the separation chamber (cylinder and screen) and isolated sump. The other allows for inspection and cleanout of sediment captured and retained outside the screen. For deep units, a single manhole access point would allows both sump cleanout and access outside the screen.

The CDS system should be cleaned when the level of sediment has reached 75% of capacity in the isolated sump or when an appreciable level of hydrocarbons and trash has accumulated. If absorbent material is used, it should be replaced when significant discoloration has occurred. Performance will not be impacted until 100% of the sump capacity is exceeded however it is recommended that the system be cleaned prior to that for easier removal of sediment. The level of sediment is easily determined by measuring from finished grade down to the top of the sediment pile. To avoid underestimating the level of sediment in the chamber, the measuring device must be lowered to the top of the sediment pile carefully. Particles at the top of the pile typically offer less resistance to the end of the rod than consolidated particles toward the bottom of the pile. Once this measurement is recorded, it should be compared to the as-built drawing for the unit to determine weather the height of the sediment pile off the bottom of the sump floor exceeds 75% of the total height of isolated sump.

Cleaning

Cleaning of a CDS systems should be done during dry weather conditions when no flow is entering the system. The use of a vacuum truck is generally the most effective and convenient method of removing pollutants from the system. Simply remove the manhole covers and insert the vacuum hose into the sump. The system should be completely drained down and the sump fully evacuated of sediment. The area outside the screen should also be cleaned out if pollutant build-up exists in this area.

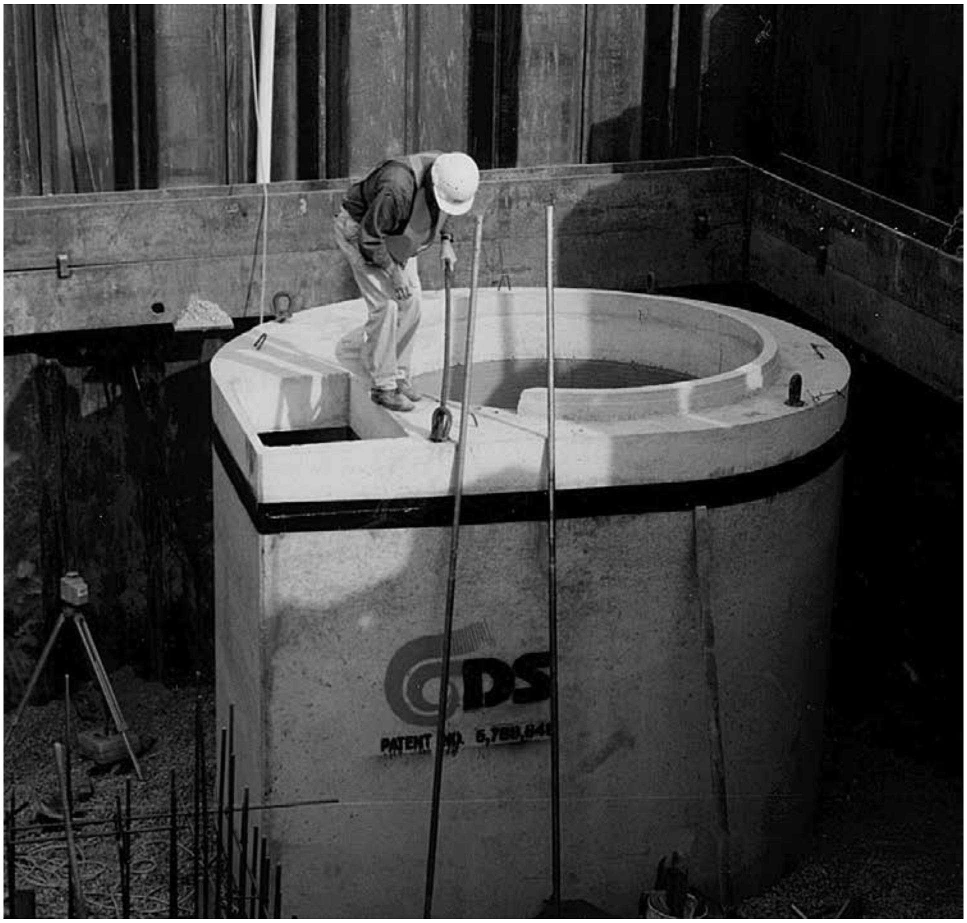
In installations where the risk of petroleum spills is small, liquid contaminants may not accumulate as quickly as sediment. However, the system should be cleaned out immediately in the event of an oil or gasoline spill. Motor oil and other hydrocarbons that accumulate on a more routine basis should be removed when an appreciable layer has been captured. To remove these pollutants, it may be preferable to use absorbent pads since they are usually less expensive to dispose than the oil/water emulsion that may be created by vacuuming the oily layer. Trash and debris can be netted out to separate it from the other pollutants. The screen should be cleaned to ensure it is free of trash and debris.

Manhole covers should be securely seated following cleaning activities to prevent leakage of runoff into the system from above and also to ensure that proper safety precautions have been followed. Confined space entry procedures need to be followed if physical access is required. Disposal of all material removed from the CDS system should be done in accordance with local regulations. In many jurisdictions, disposal of the sediments may be handled in the same manner as the disposal of sediments removed from catch basins or deep sump manholes. Check your local regulations for specific requirements on disposal.

CDS Model	Diameter		Distance from Water Surface to Top of Sediment Pile		Sediment Storage Capacity	
	ft	m	ft	m	y³	m³
CDS1515	3	0.9	3.0	0.9	0.5	0.4
CDS2015	4	1.2	3.0	0.9	0.9	0.7
CDS2015	5	1.5	3.0	0.9	1.3	1.0
CDS2020	5	1.5	3.5	1.1	1.3	1.0
CDS2025	5	1.5	4.0	1.2	1.3	1.0
CDS3020	6	1.8	4.0	1.2	2.1	1.6
CDS3025	6	1.8	4.0	1.2	2.1	1.6
CDS3030	6	1.8	4.6	1.4	2.1	1.6
CDS3035	6	1.8	5.0	1.5	2.1	1.6
CDS4030	8	2.4	4.6	1.4	5.6	4.3
CDS4040	8	2.4	5.7	1.7	5.6	4.3
CDS4045	8	2.4	6.2	1.9	5.6	4.3
CDS5640	10	3.0	6.3	1.9	8.7	6.7
CDS5653	10	3.0	7.7	2.3	8.7	6.7
CDS5668	10	3.0	9.3	2.8	8.7	6.7
CDS5678	10	3.0	10.3	3.1	8.7	6.7

Table 1: CDS Maintenance Indicators and Sediment Storage Capacities

Note: To avoid underestimating the volume of sediment in the chamber, carefully lower the measuring device to the top of the sediment pile. Finer silty particles at the top of the pile may be more difficult to feel with a measuring stick. These finer particles typically offer less resistance to the end of the rod than larger particles toward the bottom of the pile.



CDS Inspection & Maintenance Log

CDS Model: ______________________ Location: ______________________

Date	Water depth to sediment[1]	Floatable Layer Thickness[2]	Describe Maintenance Performed	Maintenance Personnel	Comments

1. The water depth to sediment is determined by taking two measurements with a stadia rod: one measurement from the manhole opening to the top of the sediment pile and the other from the manhole opening to the water surface. If the difference between these measurements is less than the values listed in table 1 the system should be cleaned out. **Note: to avoid underestimating the volume of sediment in the chamber, the measuring device must be carefully lowered to the top of the sediment pile**.

2. For optimum performance, the system should be cleaned out when the floating hydrocarbon layer accumulates to an appreciable thickness. In the event of an oil spill, the system should be cleaned immediately.

SUPPORT

- Drawings and specifications are available at www.ContechES.com.
- Site-specific design support is available from our engineers.

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The product(s) described may be protected by one or more of the following US patents: 5,322,629; 5,624,576; 5,707,527; 5,759,415; 5,788,848; 5,985,157; 6,027,639; 6,350,374; 6,406,218; 6,641,720; 6,511,595; 6,649,048; 6,991,114; 6,998,038; 7,186,058; 7,296,692; 7,297,266; related foreign patents or other patents pending.

cds_manual 3/17 PDF

ATTACHMENT H

HYDROLOGIC ANALYSIS – INPUT COMPUTATIONS

Curve Number Calculations

Project: Barber Cove Development
Location: 32 & 36 Iron Horse Boulevard, Simsbury, CT
SLR #17126.00001
By: FAB Date: 5/14/21 Checked: Date:
Circle one: [✓ Present] Developed Watershed: EXWS-10

Soil Name and Hydrologic Group (appendix A)	Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value [1.]			Area [✓ Acres] Sq. Ft. %	Product of CN x Area
		Table 2-2	Figure 2-3	Figure 2-4		
B Soil	Woods - Good Condition	55			0.58	31.70
B Soil	Meadow - Good Condition	58			2.21	128.18
B Soil	Open Space - Good Condition	61			0.08	5.02
B Soil	Open Space - Poor Condition	79			0.48	37.86
B Soil	Graveled Roads	85			3.98	338.09
C Soil	Open Space - Poor Condition	86			0.02	1.35
C Soil	Graveled Roads	89			0.26	23.04
D Soil	Woods - Good Condition	77			0.01	0.85
D Soil	Meadow - Good Condition	78			0.90	70.19
D Soil	Graveled Roads	91			0.02	1.58
N/A	Impervious (buildings)	98			0.40	38.77
N/A	Impervious (drives, sidewalks, parking, patios)	98			4.22	413.26
N/A	Water	98			0.1	8.51
				Totals =	13.23	1098.41
				(	0.02067	sq mi)

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{1098.41}{13.23}$$

Use CN = 83.0

Curve Number Calculations

Project: Barber Cove Development
Location: 32 & 36 Iron Horse Boulevard, Simsbury, CT
SLR #17126.00001
By: FAB Date: 5/14/21 Checked: Date:
Circle one: [✓ ***Present***] Developed Watershed: EXWS-20

Soil Name and Hydrologic Group (appendix A)	**Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)**	**CN Value [1.]**			**Area** [✓ **Acres**] Sq. Ft. %	**Product of CN x Area**
		Table 2-2	**Figure 2-3**	**Figure 2-4**		
B Soil	Woods - Good Condition	55			0.05	2.63
B Soil	Meadow - Good Condition	58			0.02	1.16
B Soil	Open Space - Poor Condition	79			0.04	3.03
B Soil	Graveled Roads	85			0.01	0.95
D Soil	Woods - Good Condition	77			0.09	6.66
D Soil	Meadow - Good Condition	78			0.01	0.39
D Soil	Open Space - Poor Condition	89			0.04	3.12
D Soil	Graveled Roads	91			0.01	0.56
N/A	Impervious (drives, sidewalks, parking, patios)	98			0.12	12.00
				Totals =	0.37	30.50

(0.00058 sq mi)

CN (weighted) = $\frac{\text{total product}}{\text{total area}}$ = $\frac{30.50}{0.37}$ Use CN = $\boxed{81.9}$

Curve Number Calculations

Project: Barber Cove Development
Location: 32 & 36 Iron Horse Boulevard, Simsbury, CT
SLR #17126.00001
By: FAB Date: 5/14/21 Checked: Date:
Circle one: [✓ ***Present***] Developed Watershed: EXWS-30

Soil Name and Hydrologic Group (appendix A)	**Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)**	**CN Value [1.]**			**Area** [✓ **Acres**] Sq. Ft. %	**Product of CN x Area**
		Table 2-2	**Figure 2-3**	**Figure 2-4**		
B Soil	Woods - Good Condition	55			0.17	9.58
B Soil	Open Space - Good Condition	61			0.06	3.96
D Soil	Woods - Good Condition	77			0.01	0.39
D Soil	Open Space - Good Condition	80			0.01	0.40
N/A	Impervious (drives, sidewalks, parking, patios)	98			0.08	7.58
				Totals =	0.33	21.91
					(0.00051	sq mi)

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{21.91}{0.33}$$

Use CN = 67.1

Curve Number Calculations

Project: Barber Cove Development
Location: 32 & 36 Iron Horse Boulevard, Simsbury, CT
SLR #17126.00001
By: FAB Date: 5/14/21 Checked: Date:
Circle one: [✓ Present] Developed Watershed: EXWS-40

Soil Name and Hydrologic Group (appendix A)	Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value [1]			Area [✓ Acres] Sq. Ft. %	Product of CN x Area
		Table 2-2	Figure 2-3	Figure 2-4		
B Soil	Open Space - Good Condition	61			0.02	1.34
N/A	Impervious (drives, sidewalks, parking, patios)	98			0.07	6.65
				Totals =	0.09	7.99
					(0.00014	sq mi)

CN (weighted) = $\frac{\text{total product}}{\text{total area}}$ = $\frac{7.99}{0.09}$ Use CN = $\boxed{89.0}$

Curve Number Calculations

Project: Barber Cove Development
Location: 32 & 36 Iron Horse Boulevard, Simsbury, CT
SLR #17126.00001
By: FAB Date: 5/14/21 Checked: Date:
Circle one: [✓ Present] Developed Watershed: EXWS-50

Soil Name and Hydrologic Group (appendix A)	**Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)**	**CN Value [1.]**			**Area** [✓ **Acres**] Sq. Ft. %	**Product of CN x Area**
		Table 2-2	**Figure 2-3**	**Figure 2-4**		
B Soil	Woods - Good Condition	55			0.42	22.93
B Soil	Meadow - Good Condition	58			0.01	0.62
B Soil	Open Space - Good Condition	61			0.05	3.33
B Soil	Open Space - Poor Condition	79			0.02	1.55
C Soil	Woods - Good Condition	70			0.05	3.45
N/A	Impervious (drives, sidewalks, parking, patios)	98			0.01	0.88
				Totals =	0.56	32.76
					(0.00088	sq mi)

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{32.76}{0.56}$$

Use CN = $\boxed{58.5}$

Curve Number Calculations

Project: Barber Cove Development
Location: 32 & 36 Iron Horse Boulevard, Simsbury, CT
SLR #17126.00001
By: FAB Date: 5/14/21 Checked: Date:
Circle one: Present [✓ ***Developed***] Watershed: PRWS-10

Soil Name and Hydrologic Group (appendix A)	Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value $^{1.}$			Area	Product of CN x Area
		Table 2-2	Figure 2-3	Figure 2-4	[✓ Acres] Sq. Ft. %	
B Soil	Woods - Good Condition	55			0.11	5.81
B Soil	Meadow - Good Condition	58			1.33	77.36
B Soil	Open Space - Good Condition	61			0.33	20.26
D Soil	Woods - Good Condition	77			0.01	0.85
D Soil	Meadow - Good Condition	78			0.76	59.38
D Soil	Open Space - Good Condition	80			0.01	0.78
N/A	Impervious (Buildings)	98			0.01	1.41
N/A	Impervious (drives, sidewalks, parking, patios)	98			0.25	24.29
N/A	Water	98			0.1	8.51
				Totals =	2.90	198.65

(0.00454 sq mi)

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{198.65}{2.90} \qquad \text{Use CN} = \boxed{68.4}$$

Curve Number Calculations

Project: Barber Cove Development
Location: 32 & 36 Iron Horse Boulevard, Simsbury, CT
SLR #17126.00001
By: FAB Date: 5/14/21 Checked: Date:
Circle one: Present [✓ ***Developed***] Watershed: PRWS-11

Soil Name and Hydrologic Group (appendix A)	**Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)**	**CN Value $^{1.}$**			**Area** [✓ **Acres**] Sq. Ft. %	**Product of CN x Area**
		Table 2-2	**Figure 2-3**	**Figure 2-4**		
B Soil	Woods - Good Condition	55			0.02	1.02
B Soil	Meadow - Good Condition	58			0.35	20.33
B Soil	Open Space - Good Condition	61			3.13	190.84
C Soil	Open Space - Good Condition	74			0.11	8.33
D Soil	Woods - Good Condition	77			0.01	0.42
D Soil	Meadow - Good Condition	78			0.08	6.39
D Soil	Open Space - Good Condition	80			0.10	7.76
N/A	Impervious (Buildings w/ Infiltration Galleries)	86			1.98	170.10
N/A	Impervious (Buildings)	98			0.44	42.93
N/A	Impervious (drives, sidewalks, parking, patios)	98			4.61	451.77
				Totals =	10.82	899.89

(0.01691 sq mi)

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{899.89}{10.82}$$

Use CN = $\boxed{83.2}$

Curve Number Calculations

Project: Barber Cove Development
Location: 32 & 36 Iron Horse Boulevard, Simsbury, CT
SLR #17126.00001
By: FAB Date: 5/14/21 Checked: Date:
Circle one: Present [✓ ***Developed***] Watershed: PRWS-20

Soil Name and Hydrologic Group (appendix A)	**Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)**	**CN Value [1.]**			**Area**	**Product of CN x Area**
		Table 2-2	**Figure 2-3**	**Figure 2-4**	[✓ **Acres**] Sq. Ft. %	
B Soil	Woods - Good Condition	55			0.01	0.56
B Soil	Meadow - Good Condition	58			0.01	0.67
B Soil	Open Space - Good Condition	61			0.07	4.04
D Soil	Woods - Good Condition	77			0.03	2.12
D Soil	Meadow - Good Condition	78			0.01	0.39
D Soil	Open Space - Good Condition	80			0.01	1.11
N/A	Impervious (drives, sidewalks, parking, patios)	98			0.08	7.64
				Totals =	0.21	16.53

(0.00033 sq mi)

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{16.53}{0.21} \quad \text{Use CN} = \boxed{77.8}$$

Curve Number Calculations

Project: Barber Cove Development
Location: 32 & 36 Iron Horse Boulevard, Simsbury, CT
SLR #17126.00001
By: FAB Date: 5/14/21 Checked: Date:
Circle one: Present [✓ ***Developed***] Watershed: PRWS-30

Soil Name and Hydrologic Group (appendix A)	**Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)**	**CN Value [1.]**			**Area**	**Product of CN x Area**
		Table 2-2	**Figure 2-3**	**Figure 2-4**	[✓ **Acres**] Sq. Ft. %	
B Soil	Woods - Good Condition	55			0.01	0.52
B Soil	Open Space - Good Condition	61			0.04	2.18
D Soil	Woods - Good Condition	77			0.01	1.14
D Soil	Open Space - Good Condition	80			0.01	0.40
N/A	Impervious (drives, sidewalks, parking, patios)	98			0.03	3.32
				Totals =	0.10	7.58

(0.00015 sq mi)

CN (weighted) = total product / total area = 7.58 / 0.10 Use CN = 76.4

Curve Number Calculations

Project: Barber Cove Development
Location: 32 & 36 Iron Horse Boulevard, Simsbury, CT
SLR #17126.00001
By: FAB Date: 5/14/21 Checked: Date:
Circle one: Present [✓ ***Developed***] Watershed: PRWS-40

Soil Name and Hydrologic Group **(appendix A)**	**Cover Description** **(cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)**	**CN Value [1.]**			**Area** [✓ **Acres**] Sq. Ft. %	**Product of CN x Area**
		Table 2-2	**Figure 2-3**	**Figure 2-4**		
B Soil	Open Space - Good Condition	61			0.04	2.18
N/A	Impervious (drives, sidewalks, parking, patios)	98			0.05	5.29
				Totals =	0.09	7.47

(0.00014 sq mi)

CN (weighted) = $\frac{\text{total product}}{\text{total area}}$ = $\frac{7.47}{0.09}$ Use CN = $\boxed{83.3}$

Curve Number Calculations

Project: Barber Cove Development
Location: 32 & 36 Iron Horse Boulevard, Simsbury, CT
SLR #17126.00001
By: FAB Date: 5/14/21 Checked: Date:
Circle one: Present [✓ ***Developed***] Watershed: PRWS-50

Soil Name and Hydrologic Group **(appendix A)**	**Cover Description** **(cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)**	**CN Value [1.]**			**Area** [✓ **Acres**] Sq. Ft. %	**Product of CN x Area**
		Table 2-2	**Figure 2-3**	**Figure 2-4**		
B Soil	Woods - Good Condition	55			0.18	9.87
B Soil	Meadow - Good Condition	58			0.01	0.86
B Soil	Open Space - Good Condition	61			0.22	13.58
C Soil	Woods - Good Condition	70			0.02	1.63
C Soil	Open Space - Good Condition	74			0.01	0.65
N/A	Impervious (drives, sidewalks, parking, patios)	98			0.01	0.49
				Totals =	0.45	27.09
					(0.00071	sq mi)

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{27.09}{0.45}$$

Use CN = $\boxed{59.7}$

JOB Barber Cove SIR 141.17126.00001
SHEET NO. 1 OF 4 SCALE
CALCULATED BY FAB DATE 5/14/21
CHECKED BY DATE

Adjusted CN-Value from Rooftops (Buildings A thru E)

- The purpose of this calculation is to adjust the CN-value applied to the rooftops of the 5 main buidings in order to account for infiltration galleries that will be provided for each of these buildings.

- Standard Runoff Curve Number:

  Rooftop → 98

- Each main building will be fitted with 32 infiltration chambers to collect runoff from the rooftops. The chambers are designed to store a volume equal to 1.5 inches of runoff from each of the rooftop area.

  Rooftop area = ± 17,250 ft^2

  $$V_{design} = (1.5 \text{ in})\left(\frac{1 \text{ ft}}{12 \text{ in}}\right)(17,250 \text{ ft}^2) = 2,156 \text{ ft}^3 \text{ of runoff / building}$$

- Gallery volume (24" United Concrete Leaching Chambers + stone)

  $$V = 32 \text{ chambers} \times 73.45 \text{ ft}^3 = 2,350 \text{ ft}^3 / \text{building}$$

  $$V_{provided} = 2,350 \text{ ft}^3 > 2,156 \text{ ft}^3 \quad \text{OK}//$$

- Due to the volume provided in the chambers, 1.5 inches of runoff can be subtracted from the total runoff from each of the rooftop area for each storm event. This will effectively reduce the applied CN-value used for each of the main rooftop areas in order to account for the loss of runoff stored in the chambers.

JOB
SHEET NO. 2 OF 4 SCALE
CALCULATED BY DATE
CHECKED BY DATE

- Adjusted CN values for Rooftops :

Using Table 2-1 and Figure 2-1 of the NRCS TR-55 Manual, the following computations were prepared :

Storm Event	NOAA Rainfall (in)	Runoff Depth (CN = 98)	Runoff Depth minus 1.5 in	Adjusted CN-value
2-yr	3.31	3.08	1.58	82
10-yr	5.32	5.08	3.58	85
25-yr	6.58	6.34	4.84	86
50-yr	7.50	7.26	5.76	86
100-yr	8.52	8.28	6.78	86

- Use an adjusted CN-value of 86 for the 5 main proposed buildings

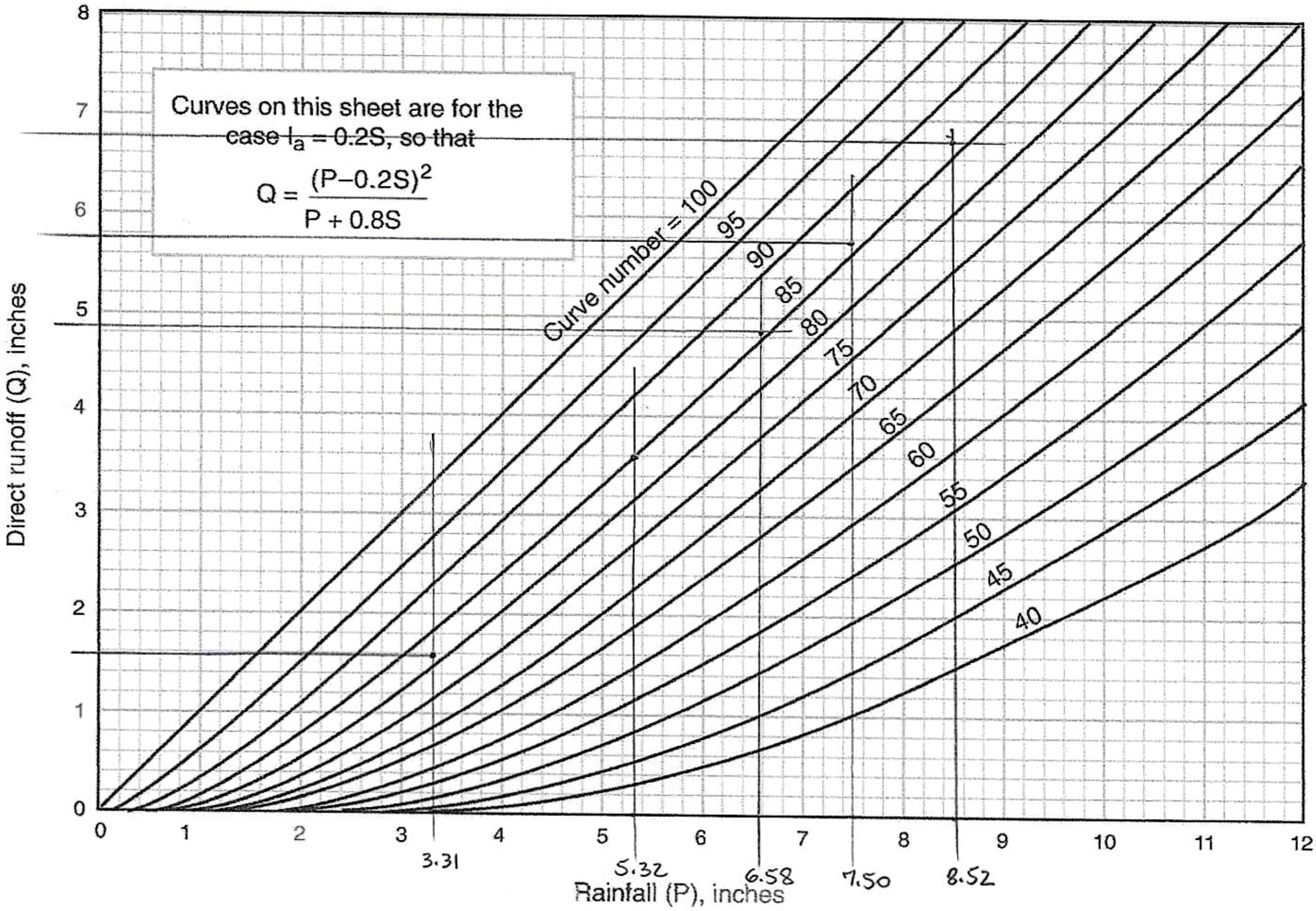
3/4

Table 2-1 Runoff depth for selected CN's and rainfall amounts [1]

	Runoff depth for curve number of—												
Rainfall	40	45	50	55	60	65	70	75	80	85	90	95	98
							inches						
1.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.08	0.17	0.32	0.56	0.79
1.2	.00	.00	.00	.00	.00	.00	.03	.07	.15	.27	.46	.74	.99
1.4	.00	.00	.00	.00	.00	.02	.06	.13	.24	.39	.61	.92	1.18
1.6	.00	.00	.00	.00	.01	.05	.11	.20	.34	.52	.76	1.11	1.38
1.8	.00	.00	.00	.00	.03	.09	.17	.29	.44	.65	.93	1.29	1.58
2.0	.00	.00	.00	.02	.06	.14	.24	.38	.56	.80	1.09	1.48	1.77
2.5	.00	.00	.02	.08	.17	.30	.46	.65	.89	1.18	1.53	1.96	2.27
3.0	.00	.02	.09	.19	.33	.51	.71	.96	1.25	1.59	1.98	2.45	2.77
3.5	.02	.08	.20	.35	.53	.75	1.01	1.30	1.64	2.02	2.45	2.94	3.27
4.0	.06	.18	.33	.53	.76	1.03	1.33	1.67	2.04	2.46	2.92	3.43	3.77
4.5	.14	.30	.50	.74	1.02	1.33	1.67	2.05	2.46	2.91	3.40	3.92	4.26
5.0	.24	.44	.69	.98	1.30	1.65	2.04	2.45	2.89	3.37	3.88	4.42	4.76
6.0	.50	.80	1.14	1.52	1.92	2.35	2.81	3.28	3.78	4.30	4.85	5.41	5.76
7.0	.84	1.24	1.68	2.12	2.60	3.10	3.62	4.15	4.69	5.25	5.82	6.41	6.76
8.0	1.25	1.74	2.25	2.78	3.33	3.89	4.46	5.04	5.63	6.21	6.81	7.40	7.76
9.0	1.71	2.29	2.88	3.49	4.10	4.72	5.33	5.95	6.57	7.18	7.79	8.40	8.76
10.0	2.23	2.89	3.56	4.23	4.90	5.56	6.22	6.88	7.52	8.16	8.78	9.40	9.76
11.0	2.78	3.52	4.26	5.00	5.72	6.43	7.13	7.81	8.48	9.13	9.77	10.39	10.76
12.0	3.38	4.19	5.00	5.79	6.56	7.32	8.05	8.76	9.45	10.11	10.76	11.39	11.76
13.0	4.00	4.89	5.76	6.61	7.42	8.21	8.98	9.71	10.42	11.10	11.76	12.39	12.76
14.0	4.65	5.62	6.55	7.44	8.30	9.12	9.91	10.67	11.39	12.08	12.75	13.39	13.76
15.0	5.33	6.36	7.35	8.29	9.19	10.04	10.85	11.63	12.37	13.07	13.74	14.39	14.76

[1] Interpolate the values shown to obtain runoff depths for CN's or rainfall amounts not shown.

Figure 2-1 Solution of runoff equation.



Cover type

Table 2-2 addresses most cover types, such as vegetation, bare soil, and impervious surfaces. There are a number of methods for determining cover type. The most common are field reconnaissance, aerial photographs, and land use maps.

Treatment

Treatment is a cover type modifier (used only in table 2-2b) to describe the management of cultivated agricultural lands. It includes mechanical practices, such as contouring and terracing, and management practices, such as crop rotations and reduced or no tillage.

Hydrologic condition

Hydrologic condition indicates the effects of cover type and treatment on infiltration and runoff and is generally estimated from density of plant and residue cover on sample areas. *Good* hydrologic condition indicates that the soil usually has a low runoff potential for that specific hydrologic soil group, cover type, and treatment. Some factors to consider in estimating the effect of cover on infiltration and runoff are (a) canopy or density of lawns, crops, or other vegetative areas; (b) amount of year-round cover; (c) amount of grass or close-seeded legumes in rotations; (d) percent of residue cover; and (e) degree of surface roughness.

Time of Concentration (T_c) or Travel Time (T_t) Worksheet

Project: Barber Cove Development By: FAB Date: 05/14/21
Location: 32 & 36 Iron Horse Blvd, Simsbury, CT Checked: Date:
Circle one: [✓ ***Present***] Developed Watershed: WS - 10 Existing Conditions
Circle one: [✓ T_c] T_t Subwatershed:

Sheet flow (applicable to T_c only)

Segment ID		**A-B**		
1. Surface description (Table 3-1)		WOODS		
2. Manning's roughness coeff. for sheet flow, n (Table 3-1)		0.400		
3. Flow Length, L (< 300ft)	ft.	35.0		
4. Two-year 24-hr rainfall, P_2	in.	3.35		
5. Land slope, s	ft./ft.	0.086		
6. $T_t = \frac{0.007(nL)^{0.8}}{P_2^{0.5}(s^{0.4})}$	hr.	0.084	=	0.084

Shallow concentrated flow (assume hyd. radius = depth of flow)

Segment ID		**B-C**		**C-D**		**D-E**				
7. Surface description		GRASS		BIT		BIT/GRAV				
8. Manning's roughness coeff., n		0.080		0.015		0.015				
9. Paved or unpaved		UNPVD		PVD		PVD				
10. Depth of flow, d (default values: d=.4 unpaved, d=.2 paved)	ft.	0.40		0.20		0.20				
11. Flow Length, L	ft.	10.0		265.0		316.0				
12. Watercourse slope, s	ft./ft.	0.086		0.023		0.006				
13. Average velocity, $V = \frac{1.49}{n}(d^{2/3})(s^{1/2})$	fps.	2.97		5.15		2.63				
14. $T_t = \frac{L}{3600 * V}$	hr.	0.001	+	0.014	+	0.033	+		=	0.049

Channel flow

Segment ID		**E-F**		**F-G**						
15. Channel Bottom width, b	ft.	18" HDPE		2.00						
16. Horizontal side slope component, z (z horiz:1 vert)	ft.	--		5.00						
17. Depth of flow, d	ft.	FULL		0.50						
18. Cross sectional flow area, A (assume trapazoidal)	$ft.^2$	1.77		5.00						
19. Wetted perimeter, P_w	ft.	4.71		7.23						
20. Hydraulic Radius, $R = \frac{A}{P_w}$	ft.	0.38		0.69						
21. Channel slope, s	ft./ft.	0.007		0.020						
22. Manning's roughness coeff., n		0.012		0.030						
23. $V = \frac{1.49}{n}(R^{2/3})(s^{1/2})$	fps.	5.41		5.49						
24. Flow length, L	ft.	166.0		290.0						
25. $T_t = \frac{L}{3600 * V}$	hr.	0.009	+	0.015	+		+		=	0.023
26. Watershed or subarea T_c or T_t (add T_t in steps 6, 14 & 25)								hr.		0.156

Time of Concentration (T_c) or Travel Time (T_t) Worksheet

Project: Barber Cove Development
By: FAB
Date: 05/14/21
Location: 32 & 36 Iron Horse Blvd, Simsbury, CT
Checked:
Date:
Circle one: [✓ Present] Developed
Watershed: WS - 20 Existing Conditions
Circle one: [✓ T_c] T_t
Subwatershed:

Sheet flow (applicable to T_c only)

Segment ID		**A-B**		
1. Surface description (Table 3-1)		GRASS		
2. Manning's roughness coeff. for sheet flow, n (Table 3-1)		0.150		
3. Flow Length, L (< 300ft)	ft.	25.0		
4. Two-year 24-hr rainfall, P_2	in.	3.35		
5. Land slope, s	ft./ft.	0.050		
6. $T_t = \frac{0.007(nL)^{0.8}}{P_2^{0.5}(s^{0.4})}$	hr.	0.036	=	0.036

Shallow concentrated flow (assume hyd. radius = depth of flow)

Segment ID		**B-C**		**C-D**						
7. Surface description		BIT/GRAV		GRASS						
8. Manning's roughness coeff., n		0.015		0.080						
9. Paved or unpaved		PVD		UNPVD						
10. Depth of flow, d (default values: d=.4 unpaved, d=.2 paved)	ft.	0.20		0.40						
11. Flow Length, L	ft.	120.0		120.0						
12. Watercourse slope, s	ft./ft.	0.050		0.020						
13. Average velocity, $V = \frac{1.49}{n}(d^{2/3})(s^{1/2})$	fps.	7.60		1.43						
14. $T_t = \frac{L}{3600 * V}$	hr.	0.004	+	0.023	+		+		=	0.028

Channel flow

Segment ID										
15. Channel Bottom width, b	ft.									
16. Horizontal side slope component, z (z horiz:1 vert)	ft.									
17. Depth of flow, d	ft.									
18. Cross sectional flow area, A (assume trapazoidal)	$ft.^2$									
19. Wetted perimeter, P_w	ft.									
20. Hydraulic Radius, $R = \frac{A}{P_w}$	ft.									
21. Channel slope, s	ft./ft.									
22. Manning's roughness coeff., n										
23. $V = \frac{1.49}{n}(R^{2/3})(s^{1/2})$	fps.									
24. Flow length, L	ft.									
25. $T_t = \frac{L}{3600 * V}$	hr.		+		+		+		=	0.000

26. Watershed or subarea T_c or T_t (add T_t in steps 6, 14 & 25) hr. ~~0.064~~

TC MIN = 5 MIN.

Time of Concentration (T_c) or Travel Time (T_t) Worksheet

Project: Barber Cove Development
By: FAB
Date: 05/14/21
Location: 32 & 36 Iron Horse Blvd, Simsbury, CT
Checked:
Date:
Circle one: [✓ ***Present***] Developed
Watershed: WS - 30 Existing Conditions
Circle one: [✓ T_c] T_t
Subwatershed:

Sheet flow (applicable to T_c only)

Segment ID		**A-B**	
1. Surface description (Table 3-1)		WOODS	
2. Manning's roughness coeff. for sheet flow, n (Table 3-1)		0.400	
3. Flow Length, L (< 300ft)	ft.	28.0	
4. Two-year 24-hr rainfall, P_2	in.	3.35	
5. Land slope, s	ft./ft.	0.107	
6. $T_t = \frac{0.007(nL)^{0.8}}{P_2^{0.5}(s^{0.4})}$	hr.	0.065	= 0.065

Shallow concentrated flow (assume hyd. radius = depth of flow)

Segment ID		**B-C**	**C-D**			
7. Surface description		GRASS	BIT			
8. Manning's roughness coeff., n		0.080	0.015			
9. Paved or unpaved		UNPVD	PVD			
10. Depth of flow, d (default values: d=.4 unpaved, d=.2 paved)	ft.	0.40	0.20			
11. Flow Length, L	ft.	7.0	20.0			
12. Watercourse slope, s	ft./ft.	0.077	0.020			
13. Average velocity, $V = \frac{1.49}{n}(d^{2/3})(s^{1/2})$	fps.	2.81	4.80			
14. $T_t = \frac{L}{3600 * V}$	hr.	0.001	0.001	+	+	= 0.002

Channel flow

Segment ID						
15. Channel Bottom width, b	ft.					
16. Horizontal side slope component, z (z horiz:1 vert)	ft.					
17. Depth of flow, d	ft.					
18. Cross sectional flow area, A (assume trapazoidal)	$ft.^2$					
19. Wetted perimeter, P_w	ft.					
20. Hydraulic Radius, $R = \frac{A}{P_w}$	ft.					
21. Channel slope, s	ft./ft.					
22. Manning's roughness coeff., n						
23. $V = \frac{1.49}{n}(R^{2/3})(s^{1/2})$	fps.					
24. Flow length, L	ft.					
25. $T_t = \frac{L}{3600 * V}$	hr.		+	+	+	= 0.000
26. Watershed or subarea T_c or T_t (add T_t in steps 6, 14 & 25)	hr.					~~0.066~~

TC MIN = 5 MIN.

Time of Concentration (T_c) or Travel Time (T_t) Worksheet

Project: Barber Cove Development
By: FAB
Date: 05/14/21
Location: 32 & 36 Iron Horse Blvd, Simsbury, CT
Checked:
Date:
Circle one: [✓ Present] Developed
Watershed: WS - 40 Existing Conditions
Circle one: [✓ T_c] T_t
Subwatershed:

Sheet flow (applicable to T_c only)

Segment ID		**A-B**		
1. Surface description (Table 3-1)		BIT		
2. Manning's roughness coeff. for sheet flow, n (Table 3-1)		0.011		
3. Flow Length, L (< 300ft)	ft.	20.0		
4. Two-year 24-hr rainfall, P_2	in.	3.35		
5. Land slope, s	ft./ft.	0.020		
6. $T_t = \frac{0.007(nL)^{0.8}}{P_2^{0.5}(s^{0.4})}$	hr.	0.005	=	0.005

Shallow concentrated flow (assume hyd. radius = depth of flow)

Segment ID										
7. Surface description										
8. Manning's roughness coeff., n										
9. Paved or unpaved										
10. Depth of flow, d (default values: d=.4 unpaved, d=.2 paved)	ft.									
11. Flow Length, L	ft.									
12. Watercourse slope, s	ft./ft.									
13. Average velocity, $V = \frac{1.49}{n}(d^{2/3})(s^{1/2})$	fps.									
14. $T_t = \frac{L}{3600 * V}$	hr.				+		+		=	0.000

Channel flow

Segment ID										
15. Channel Bottom width, b	ft.									
16. Horizontal side slope component, z (z horiz:1 vert)	ft.									
17. Depth of flow, d	ft.									
18. Cross sectional flow area, A (assume trapazoidal)	$ft.^2$									
19. Wetted perimeter, P_w	ft.									
20. Hydraulic Radius, $R = \frac{A}{P_w}$	ft.									
21. Channel slope, s	ft./ft.									
22. Manning's roughness coeff., n										
23. $V = \frac{1.49}{n}(R^{2/3})(s^{1/2})$	fps.									
24. Flow length, L	ft.									
25. $T_t = \frac{L}{3600 * V}$	hr.		+		+		+		=	0.000

26. Watershed or subarea T_c or T_t (add T_t in steps 6, 14 & 25) hr. ~~0.005~~

TC MIN = 5 MIN.

Time of Concentration (T_c) or Travel Time (T_t) Worksheet

Project: Barber Cove Development
By: FAB
Date: 05/14/21
Location: 32 & 36 Iron Horse Blvd, Simsbury, CT
Checked:
Date:
Circle one: [✓ Present] Developed
Watershed: WS - 50 Existing Conditions
Circle one: [✓ T_c] T_t
Subwatershed:

Sheet flow (applicable to T_c only)

Segment ID		**A-B**		
1. Surface description (Table 3-1)		GRASS		
2. Manning's roughness coeff. for sheet flow, n (Table 3-1)		0.240		
3. Flow Length, L (< 300ft)	ft.	65.0		
4. Two-year 24-hr rainfall, P_2	in.	3.35		
5. Land slope, s	ft./ft.	0.005		
6. $T_t = \frac{0.007(nL)^{0.8}}{P_2^{0.5}(s^{0.4})}$	hr.	0.287	=	0.287

Shallow concentrated flow (assume hyd. radius = depth of flow)

Segment ID		**B-C**								
7. Surface description		WOODS								
8. Manning's roughness coeff., n		0.100								
9. Paved or unpaved		UNPVD								
10. Depth of flow, d (default values: d=.4 unpaved, d=.2 paved)	ft.	0.40								
11. Flow Length, L	ft.	245.0								
12. Watercourse slope, s	ft./ft.	0.005								
13. Average velocity, $V = \frac{1.49}{n}(d^{2/3})(s^{1/2})$	fps.	0.57								
14. $T_t = \frac{L}{3600 * V}$	hr.	0.119	+		+		+		=	0.119

Channel flow

Segment ID										
15. Channel Bottom width, b	ft.									
16. Horizontal side slope component, z (z horiz:1 vert)	ft.									
17. Depth of flow, d	ft.									
18. Cross sectional flow area, A (assume trapazoidal)	$ft.^2$									
19. Wetted perimeter, P_w	ft.									
20. Hydraulic Radius, $R = \frac{A}{P_w}$	ft.									
21. Channel slope, s	ft./ft.									
22. Manning's roughness coeff., n										
23. $V = \frac{1.49}{n}(R^{2/3})(s^{1/2})$	fps.									
24. Flow length, L	ft.									
25. $T_t = \frac{L}{3600 * V}$	hr.		+		+		+		=	0.000

26. Watershed or subarea T_c or T_t (add T_t in steps 6, 14 & 25) hr. 0.406

SLR

Time of Concentration (T_c) or Travel Time (T_t) Worksheet

Project: Barber Cove Development
By: FAB
Date: 05/14/21
Location: 32 & 36 Iron Horse Blvd, Simsbury, CT
Checked:
Date:
Circle one: Present [✓ Developed]
Watershed: WS - 10 Proposed Conditions
Circle one: [✓ T_c] T_t
Subwatershed:

Sheet flow (applicable to T_c only)

	Segment ID	**A-B**		
1. Surface description (Table 3-1)		GRASS		
2. Manning's roughness coeff. for sheet flow, n (Table 3-1)		0.240		
3. Flow Length, L (< 300ft)	ft.	20.0		
4. Two-year 24-hr rainfall, P_2	in.	3.35		
5. Land slope, s	ft./ft.	0.010		
6. $T_t = \frac{0.007(nL)^{0.8}}{P_2^{0.5}(s^{0.4})}$	hr.	0.085	=	0.085

Shallow concentrated flow (assume hyd. radius = depth of flow)

	Segment ID	**B-C**		**C-D**		**D-E**				
7. Surface description		BIT		GRASS		WOODS				
8. Manning's roughness coeff., n		0.015		0.080		0.100				
9. Paved or unpaved		PVD		UNPVD		UNPVD				
10. Depth of flow, d (default values: d=.4 unpaved, d=.2 paved)	ft.	0.20		0.40		0.40				
11. Flow Length, L	ft.	10.0		30.0		60.0				
12. Watercourse slope, s	ft./ft.	0.020		0.200		0.020				
13. Average velocity, $V = \frac{1.49}{n}(d^{2/3})(s^{1/2})$	fps.	4.80		4.52		1.14				
14. $T_t = \frac{L}{3600 * V}$	hr.	0.001	+	0.002	+	0.015	+		=	0.017

Channel flow

	Segment ID									
15. Channel Bottom width, b	ft.									
16. Horizontal side slope component, z (z horiz:1 vert)	ft.									
17. Depth of flow, d	ft.									
18. Cross sectional flow area, A (assume trapazoidal)	$ft.^2$									
19. Wetted perimeter, P_w	ft.									
20. Hydraulic Radius, $R = \frac{A}{P_w}$	ft.									
21. Channel slope, s	ft./ft.									
22. Manning's roughness coeff., n										
23. $V = \frac{1.49}{n}(R^{2/3})(s^{1/2})$	fps.									
24. Flow length, L	ft.									
25. $T_t = \frac{L}{3600 * V}$	hr.		+		+		+		=	0.000
26. Watershed or subarea T_c or T_t (add T_t in steps 6, 14 & 25)	hr.									0.102

Time of Concentration (T_c) or Travel Time (T_t) Worksheet

Project: Barber Cove Development
By: FAB
Date: 05/14/21
Location: 32 & 36 Iron Horse Blvd, Simsbury, CT
Checked:
Date:
Circle one: Present [✓ Developed]
Watershed: WS - 11 Proposed Conditions
Circle one: [✓ T_c] T_t
Subwatershed:

Sheet flow (applicable to T_c only)

Segment ID		**A-B**		
1. Surface description (Table 3-1)		GRASS		
2. Manning's roughness coeff. for sheet flow, n (Table 3-1)		0.240		
3. Flow Length, L (< 300ft)	ft.	65.0		
4. Two-year 24-hr rainfall, P_2	in.	3.35		
5. Land slope, s	ft./ft.	0.020		
6. $T_t = \frac{0.007(nL)^{0.8}}{P_2^{0.5}(s^{0.4})}$	hr.	0.165	=	0.165

Shallow concentrated flow (assume hyd. radius = depth of flow)

Segment ID										
7. Surface description										
8. Manning's roughness coeff., n										
9. Paved or unpaved										
10. Depth of flow, d (default values: d=.4 unpaved, d=.2 paved)	ft.									
11. Flow Length, L	ft.									
12. Watercourse slope, s	ft./ft.									
13. Average velocity, $V = \frac{1.49}{n}(d^{2/3})(s^{1/2})$	fps.									
14. $T_t = \frac{L}{3600 * V}$	hr.		+		+		+		=	0.000

Channel flow

Segment ID		**B-C**								
15. Channel Bottom width, b	ft.	15" HDPE								
16. Horizontal side slope component, z (z horiz:1 vert)	ft.	--								
17. Depth of flow, d	ft.	FULL								
18. Cross sectional flow area, A (assume trapazoidal)	ft.^{2}	1.23								
19. Wetted perimeter, P_w	ft.	3.92								
20. Hydraulic Radius, $R = \frac{A}{P_w}$	ft.	0.31								
21. Channel slope, s	ft./ft.	0.010								
22. Manning's roughness coeff., n		0.012								
23. $V = \frac{1.49}{n}(R^{2/3})(s^{1/2})$	fps.	5.73								
24. Flow length, L	ft.	1000.0								
25. $T_t = \frac{L}{3600 * V}$	hr.	0.048	+		+		+		=	0.048

26. Watershed or subarea T_c or T_t (add T_t in steps 6, 14 & 25) hr. 0.213

Time of Concentration (T_c) or Travel Time (T_t) Worksheet

Project: Barber Cove Development
By: FAB
Date: 05/14/21
Location: 32 & 36 Iron Horse Blvd, Simsbury, CT
Checked:
Date:
Circle one: Present [✓ Developed]
Watershed: WS - 20 Proposed Conditions
Circle one: [✓ T_c] T_t
Subwatershed:

Sheet flow (applicable to T_c only)

Segment ID		**A-B**		
1. Surface description (Table 3-1)		GRASS		
2. Manning's roughness coeff. for sheet flow, n (Table 3-1)		0.240		
3. Flow Length, L (< 300ft)	ft.	25.0		
4. Two-year 24-hr rainfall, P_2	in.	3.35		
5. Land slope, s	ft./ft.	0.010		
6. $T_t = \frac{0.007(nL)^{0.8}}{P_2^{0.5}(s^{0.4})}$	hr.	0.101	=	0.101

Shallow concentrated flow (assume hyd. radius = depth of flow)

Segment ID		**B-C**		**C-D**		**D-E**				
7. Surface description		BIT		GRASS		WOODS				
8. Manning's roughness coeff., n		0.015		0.080		0.100				
9. Paved or unpaved		PVD		UNPVD		UNPVD				
10. Depth of flow, d (default values: d=.4 unpaved, d=.2 paved)	ft.	0.20		0.40		0.40				
11. Flow Length, L	ft.	10.0		5.0		10.0				
12. Watercourse slope, s	ft./ft.	0.020		0.100		0.100				
13. Average velocity, $V = \frac{1.49}{n}(d^{2/3})(s^{1/2})$	fps.	4.80		3.20		2.56				
14. $T_t = \frac{L}{3600 * V}$	hr.	0.001	+	0.000	+	0.001	+		=	0.002

Channel flow

Segment ID										
15. Channel Bottom width, b	ft.									
16. Horizontal side slope component, z (z horiz:1 vert)	ft.									
17. Depth of flow, d	ft.									
18. Cross sectional flow area, A (assume trapazoidal)	$ft.^2$									
19. Wetted perimeter, P_w	ft.									
20. Hydraulic Radius, $R = \frac{A}{P_w}$	ft.									
21. Channel slope, s	ft./ft.									
22. Manning's roughness coeff., n										
23. $V = \frac{1.49}{n}(R^{2/3})(s^{1/2})$	fps.									
24. Flow length, L	ft.									
25. $T_t = \frac{L}{3600 * V}$	hr.		+		+		+		=	0.000
26. Watershed or subarea T_c or T_t (add T_t in steps 6, 14 & 25)	hr.									0.103

Time of Concentration (T_c) or Travel Time (T_t) Worksheet

Project: Barber Cove Development
By: FAB
Date: 05/14/21
Location: 32 & 36 Iron Horse Blvd, Simsbury, CT
Checked:
Date:
Circle one: Present [✓ ***Developed***]
Watershed: WS - 30 Proposed Conditions
Circle one: [✓ ***T_c***] T_t
Subwatershed:

Sheet flow (applicable to T_c only)

Segment ID		**A-B**		
1. Surface description (Table 3-1)		GRASS		
2. Manning's roughness coeff. for sheet flow, n (Table 3-1)		0.240		
3. Flow Length, L (< 300ft)	ft.	10.0		
4. Two-year 24-hr rainfall, P_2	in.	3.35		
5. Land slope, s	ft./ft.	0.020		
6. $T_t = \frac{0.007(nL)^{0.8}}{P_2^{0.5}(s^{0.4})}$	hr.	0.037	=	0.037

Shallow concentrated flow (assume hyd. radius = depth of flow)

Segment ID		**B-C**		**C-D**						
7. Surface description		BIT		GRASS						
8. Manning's roughness coeff., n		0.015		0.080						
9. Paved or unpaved		PVD		UNPVD						
10. Depth of flow, d (default values: d=.4 unpaved, d=.2 paved)	ft.	0.20		0.40						
11. Flow Length, L	ft.	10.0		10.0						
12. Watercourse slope, s	ft./ft.	0.020		0.020						
13. Average velocity, $V = \frac{1.49}{n}(d^{2/3})(s^{1/2})$	fps.	4.80		1.43						
14. $T_t = \frac{L}{3600 * V}$	hr.	0.001	+	0.002	+		+		=	0.003

Channel flow

Segment ID										
15. Channel Bottom width, b	ft.									
16. Horizontal side slope component, z (z horiz:1 vert)	ft.									
17. Depth of flow, d	ft.									
18. Cross sectional flow area, A (assume trapazoidal)	$ft.^2$									
19. Wetted perimeter, P_w	ft.									
20. Hydraulic Radius, $R = \frac{A}{P_w}$	ft.									
21. Channel slope, s	ft./ft.									
22. Manning's roughness coeff., n										
23. $V = \frac{1.49}{n}(R^{2/3})(s^{1/2})$	fps.									
24. Flow length, L	ft.									
25. $T_t = \frac{L}{3600 * V}$	hr.		+		+		+		=	0.000

26. Watershed or subarea T_c or T_t (add T_t in steps 6, 14 & 25) hr. ~~0.039~~

TC MIN = 5 MIN.

Time of Concentration (T_c) or Travel Time (T_t) Worksheet

Project: Barber Cove Development
By: FAB
Date: 05/14/21
Location: 32 & 36 Iron Horse Blvd, Simsbury, CT
Checked:
Date:
Circle one: Present [✓ **Developed**]
Watershed: WS - 40 Proposed Conditions
Circle one: [✓ **T_c**] T_t
Subwatershed:

Sheet flow (applicable to T_c only)

Segment ID		**A-B**		
1. Surface description (Table 3-1)		BIT		
2. Manning's roughness coeff. for sheet flow, n (Table 3-1)		0.011		
3. Flow Length, L (< 300ft)	ft.	20.0		
4. Two-year 24-hr rainfall, P_2	in.	3.35		
5. Land slope, s	ft./ft.	0.020		
6. $T_t = \frac{0.007(nL)^{0.8}}{P_2^{0.5}(s^{0.4})}$	hr.	0.005	=	0.005

Shallow concentrated flow (assume hyd. radius = depth of flow)

Segment ID										
7. Surface description										
8. Manning's roughness coeff., n										
9. Paved or unpaved										
10. Depth of flow, d (default values: d=.4 unpaved, d=.2 paved)	ft.									
11. Flow Length, L	ft.									
12. Watercourse slope, s	ft./ft.									
13. Average velocity, $V = \frac{1.49}{n}(d^{2/3})(s^{1/2})$	fps.									
14. $T_t = \frac{L}{3600 * V}$	hr.				+		+		=	0.000

Channel flow

Segment ID										
15. Channel Bottom width, b	ft.									
16. Horizontal side slope component, z (z horiz:1 vert)	ft.									
17. Depth of flow, d	ft.									
18. Cross sectional flow area, A (assume trapazoidal)	$ft.^2$									
19. Wetted perimeter, P_w	ft.									
20. Hydraulic Radius, $R = \frac{A}{P_w}$	ft.									
21. Channel slope, s	ft./ft.									
22. Manning's roughness coeff., n										
23. $V = \frac{1.49}{n}(R^{2/3})(s^{1/2})$	fps.									
24. Flow length, L	ft.									
25. $T_t = \frac{L}{3600 * V}$	hr.		+		+		+		=	0.000

26. Watershed or subarea T_c or T_t (add T_t in steps 6, 14 & 25) hr. ~~0.005~~

TC MIN = 5 MIN.

Time of Concentration (T_c) or Travel Time (T_t) Worksheet

Project: Barber Cove Development
By: FAB
Date: 05/14/21
Location: 32 & 36 Iron Horse Blvd, Simsbury, CT
Checked:
Date:
Circle one: Present [✓ Developed]
Watershed: WS - 50 Proposed Conditions
Circle one: [✓ T_c] T_t
Subwatershed:

Sheet flow (applicable to T_c only)

Segment ID		**A-B**		
1. Surface description (Table 3-1)		GRASS		
2. Manning's roughness coeff. for sheet flow, n (Table 3-1)		0.240		
3. Flow Length, L (< 300ft)	ft.	65.0		
4. Two-year 24-hr rainfall, P_2	in.	3.35		
5. Land slope, s	ft./ft.	0.005		
6. $T_t = \frac{0.007(nL)^{0.8}}{P_2^{0.5}(s^{0.4})}$	hr.	0.287	=	0.287

Shallow concentrated flow (assume hyd. radius = depth of flow)

Segment ID		**B-C**								
7. Surface description		WOODS								
8. Manning's roughness coeff., n		0.100								
9. Paved or unpaved		UNPVD								
10. Depth of flow, d (default values: d=.4 unpaved, d=.2 paved)	ft.	0.40								
11. Flow Length, L	ft.	245.0								
12. Watercourse slope, s	ft./ft.	0.005								
13. Average velocity, $V = \frac{1.49}{n}(d^{2/3})(s^{1/2})$	fps.	0.57								
14. $T_t = \frac{L}{3600 * V}$	hr.	0.119	+		+		+		=	0.119

Channel flow

Segment ID										
15. Channel Bottom width, b	ft.									
16. Horizontal side slope component, z (z horiz:1 vert)	ft.									
17. Depth of flow, d	ft.									
18. Cross sectional flow area, A (assume trapazoidal)	$ft.^2$									
19. Wetted perimeter, P_w	ft.									
20. Hydraulic Radius, $R = \frac{A}{P_w}$	ft.									
21. Channel slope, s	ft./ft.									
22. Manning's roughness coeff., n										
23. $V = \frac{1.49}{n}(R^{2/3})(s^{1/2})$	fps.									
24. Flow length, L	ft.									
25. $T_t = \frac{L}{3600 * V}$	hr.		+		+		+		=	0.000
26. Watershed or subarea T_c or T_t (add T_t in steps 6, 14 & 25)	hr.									0.406

ATTACHMENT I

HYDROLOGIC ANALYSIS – COMPUTER MODEL RESULTS

Drainage Report

Barber Cove Development

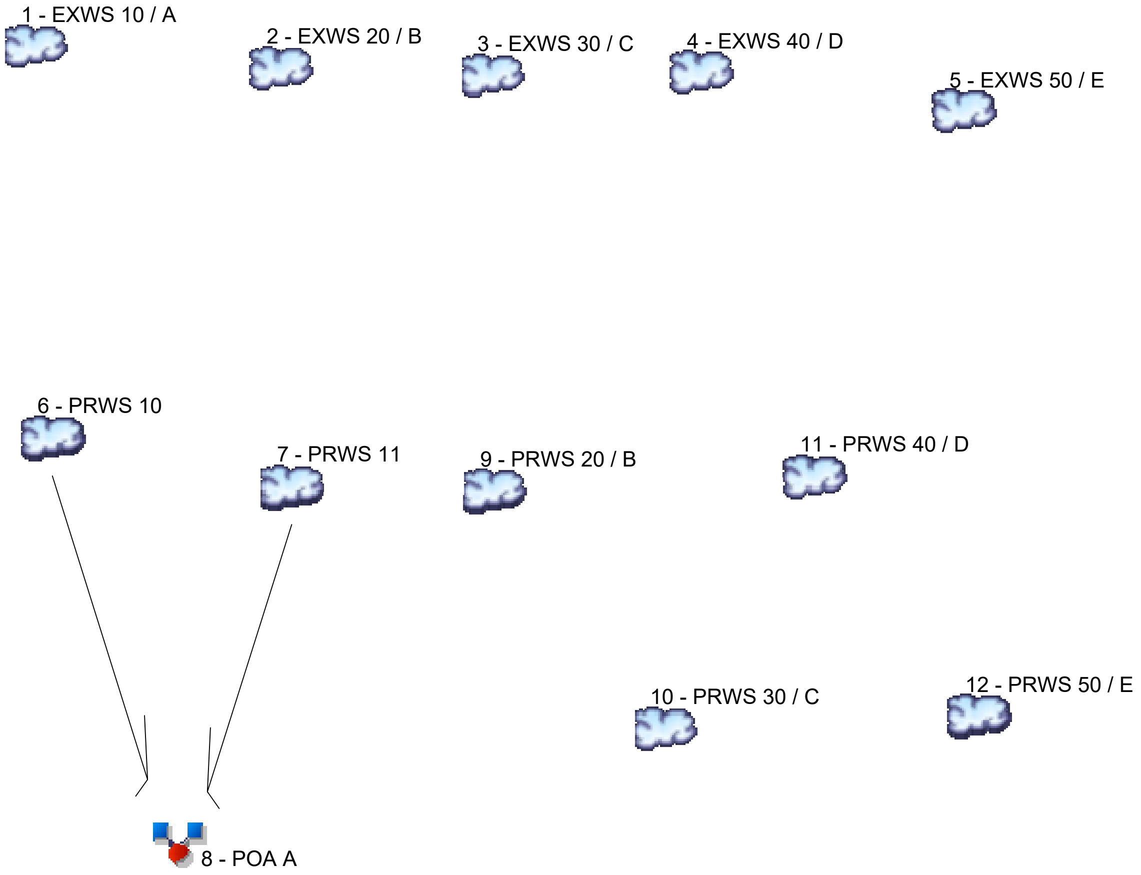
32 and 36 Iron Horse Boulevard

Simsbury, Connecticut

May 28, 2021

Watershed Model Schematic

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020



Legend

Hyd.	Origin	Description
1	SCS Runoff	EXWS 10 / A
2	SCS Runoff	EXWS 20 / B
3	SCS Runoff	EXWS 30 / C
4	SCS Runoff	EXWS 40 / D
5	SCS Runoff	EXWS 50 / E
6	SCS Runoff	PRWS 10
7	SCS Runoff	PRWS 11
8	Combine	POA A
9	SCS Runoff	PRWS 20 / B
10	SCS Runoff	PRWS 30 / C
11	SCS Runoff	PRWS 40 / D
12	SCS Runoff	PRWS 50 / E

Project: BC-Hydro01.gpw

Tuesday, 05 / 11 / 2021

Hydraflow Table of Contents

Hydrograph Return Period Recap

Hyd. No.	Hydrograph type (origin)	Inflow hyd(s)	Peak Outflow (cfs)								Hydrograph Description
			1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr	
1	SCS Runoff	------	-------	23.01	-------	-------	46.47	61.47	72.43	84.55	EXWS 10 / A
2	SCS Runoff	------	-------	0.612	-------	-------	1.263	1.682	1.988	2.328	EXWS 20 / B
3	SCS Runoff	------	-------	0.216	-------	-------	0.672	1.002	1.255	1.543	EXWS 30 / C
4	SCS Runoff	------	-------	0.199	-------	-------	0.362	0.463	0.536	0.617	EXWS 40 / D
5	SCS Runoff	------	-------	0.105	-------	-------	0.516	0.858	1.129	1.446	EXWS 50 / E
6	SCS Runoff	------	-------	2.123	-------	-------	6.256	9.209	11.46	14.02	PRWS 10
7	SCS Runoff	------	-------	17.10	-------	-------	34.59	45.78	53.95	63.00	PRWS 11
8	Combine	6, 7	-------	19.09	-------	-------	40.18	53.90	64.01	75.24	POA A
9	SCS Runoff	------	-------	0.284	-------	-------	0.637	0.871	1.044	1.237	PRWS 20 / B
10	SCS Runoff	------	-------	0.186	-------	-------	0.428	0.589	0.709	0.843	PRWS 30 / C
11	SCS Runoff	------	-------	0.159	-------	-------	0.319	0.421	0.495	0.578	PRWS 40 / D
12	SCS Runoff	------	-------	0.099	-------	-------	0.448	0.730	0.953	1.212	PRWS 50 / E

Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	23.01	3	726	76,536	------	------	------	EXWS 10 / A
2	SCS Runoff	0.612	3	726	2,040	------	------	------	EXWS 20 / B
3	SCS Runoff	0.216	3	726	843	------	------	------	EXWS 30 / C
4	SCS Runoff	0.199	3	726	668	------	------	------	EXWS 40 / D
5	SCS Runoff	0.105	3	747	788	------	------	------	EXWS 50 / E
6	SCS Runoff	2.123	3	726	8,020	------	------	------	PRWS 10
7	SCS Runoff	17.10	3	729	67,349	------	------	------	PRWS 11
8	Combine	19.09	3	729	75,369	6, 7	------	------	POA A
9	SCS Runoff	0.284	3	726	959	------	------	------	PRWS 20 / B
10	SCS Runoff	0.186	3	720	427	------	------	------	PRWS 30 / C
11	SCS Runoff	0.159	3	726	527	------	------	------	PRWS 40 / D
12	SCS Runoff	0.099	3	747	702	------	------	------	PRWS 50 / E

BC-Hydro01.gpw	Return Period: 2 Year	Tuesday, 05 / 11 / 2021

Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	46.47	3	726	156,008	------	------	------	EXWS 10 / A
2	SCS Runoff	1.263	3	726	4,227	------	------	------	EXWS 20 / B
3	SCS Runoff	0.672	3	726	2,288	------	------	------	EXWS 30 / C
4	SCS Runoff	0.362	3	726	1,249	------	------	------	EXWS 40 / D
5	SCS Runoff	0.516	3	738	2,743	------	------	------	EXWS 50 / E
6	SCS Runoff	6.256	3	726	21,154	------	------	------	PRWS 10
7	SCS Runoff	34.59	3	729	136,872	------	------	------	PRWS 11
8	Combine	40.18	3	729	158,025	6, 7	------	------	POA A
9	SCS Runoff	0.637	3	726	2,120	------	------	------	PRWS 20 / B
10	SCS Runoff	0.428	3	717	966	------	------	------	PRWS 30 / C
11	SCS Runoff	0.319	3	726	1,070	------	------	------	PRWS 40 / D
12	SCS Runoff	0.448	3	738	2,341	------	------	------	PRWS 50 / E

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	61.47	3	726	208,576	------	------	------	EXWS 10 / A
2	SCS Runoff	1.682	3	726	5,683	------	------	------	EXWS 20 / B
3	SCS Runoff	1.002	3	726	3,353	------	------	------	EXWS 30 / C
4	SCS Runoff	0.463	3	726	1,623	------	------	------	EXWS 40 / D
5	SCS Runoff	0.858	3	738	4,308	------	------	------	EXWS 50 / E
6	SCS Runoff	9.209	3	726	30,724	------	------	------	PRWS 10
7	SCS Runoff	45.78	3	729	182,810	------	------	------	PRWS 11
8	Combine	53.90	3	729	213,534	6, 7	------	------	POA A
9	SCS Runoff	0.871	3	726	2,912	------	------	------	PRWS 20 / B
10	SCS Runoff	0.589	3	717	1,337	------	------	------	PRWS 30 / C
11	SCS Runoff	0.421	3	726	1,429	------	------	------	PRWS 40 / D
12	SCS Runoff	0.730	3	738	3,636	------	------	------	PRWS 50 / E

BC-Hydro01.gpw | Return Period: 25 Year | Tuesday, 05 / 11 / 2021

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	72.43	3	726	247,684	------	------	------	EXWS 10 / A
2	SCS Runoff	1.988	3	726	6,768	------	------	------	EXWS 20 / B
3	SCS Runoff	1.255	3	726	4,179	------	------	------	EXWS 30 / C
4	SCS Runoff	0.536	3	726	1,898	------	------	------	EXWS 40 / D
5	SCS Runoff	1.129	3	738	5,563	------	------	------	EXWS 50 / E
6	SCS Runoff	11.46	3	726	38,119	------	------	------	PRWS 10
7	SCS Runoff	53.95	3	729	216,973	------	------	------	PRWS 11
8	Combine	64.01	3	729	255,092	6, 7	------	------	POA A
9	SCS Runoff	1.044	3	726	3,508	------	------	------	PRWS 20 / B
10	SCS Runoff	0.709	3	717	1,617	------	------	------	PRWS 30 / C
11	SCS Runoff	0.495	3	726	1,695	------	------	------	PRWS 40 / D
12	SCS Runoff	0.953	3	738	4,669	------	------	------	PRWS 50 / E

BC-Hydro01.gpw	Return Period: 50 Year	Tuesday, 05 / 11 / 2021

Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	84.55	3	726	291,532	------	------	------	EXWS 10 / A
2	SCS Runoff	2.328	3	726	7,986	------	------	------	EXWS 20 / B
3	SCS Runoff	1.543	3	726	5,130	------	------	------	EXWS 30 / C
4	SCS Runoff	0.617	3	726	2,204	------	------	------	EXWS 40 / D
5	SCS Runoff	1.446	3	738	7,041	------	------	------	EXWS 50 / E
6	SCS Runoff	14.02	3	726	46,615	------	------	------	PRWS 10
7	SCS Runoff	63.00	3	729	255,267	------	------	------	PRWS 11
8	Combine	75.24	3	729	301,881	6, 7	------	------	POA A
9	SCS Runoff	1.237	3	726	4,180	------	------	------	PRWS 20 / B
10	SCS Runoff	0.843	3	717	1,933	------	------	------	PRWS 30 / C
11	SCS Runoff	0.578	3	726	1,994	------	------	------	PRWS 40 / D
12	SCS Runoff	1.212	3	738	5,882	------	------	------	PRWS 50 / E

BC-Hydro01.gpw	Return Period: 100 Year	Tuesday, 05 / 11 / 2021

ATTACHMENT J

WATERSHED MAPS

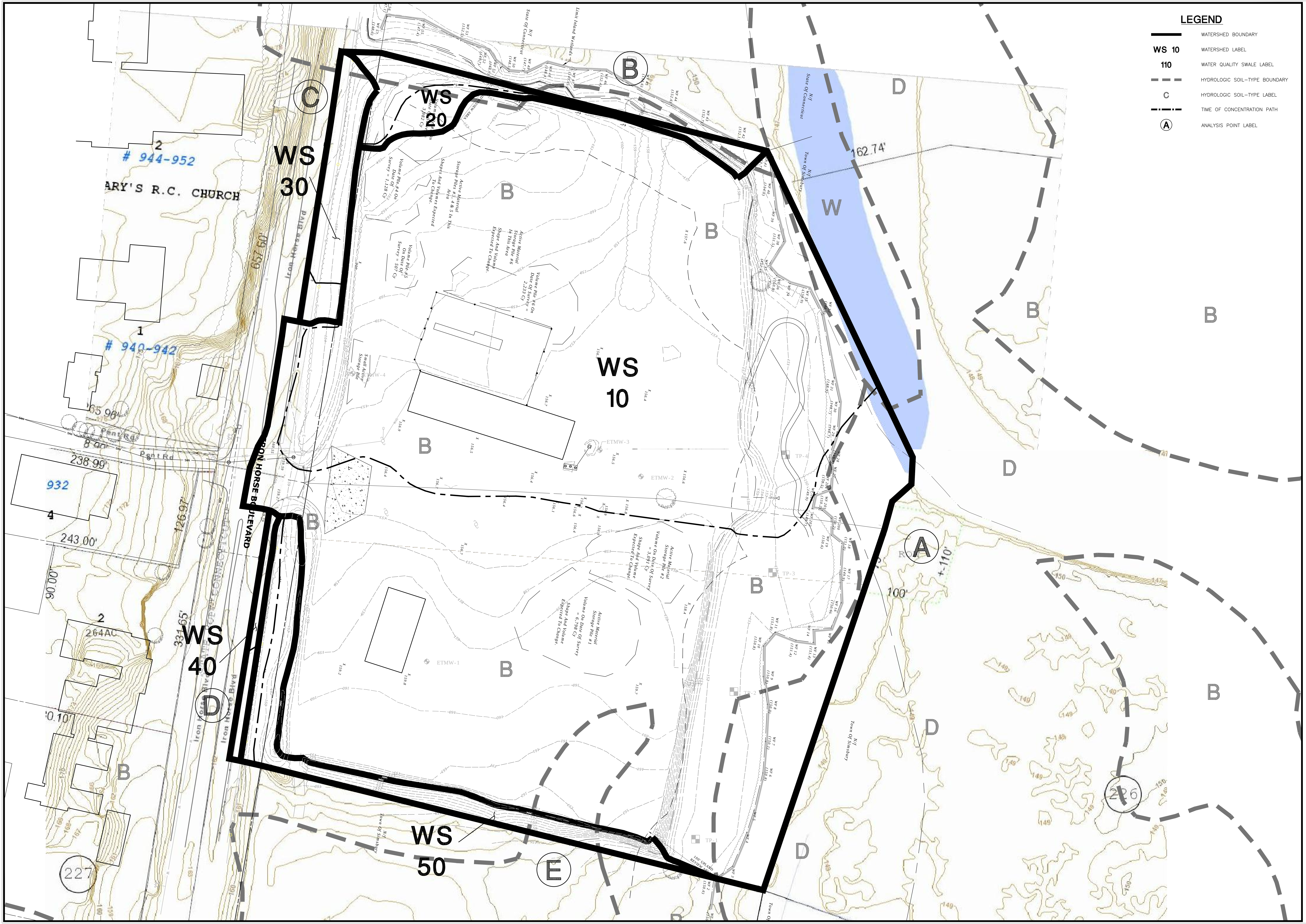
Drainage Report

Barber Cove Development

32 and 36 Iron Horse Boulevard

Simsbury, Connecticut

May 28, 2021



N
W E
S

0' 25' 50'
0 1/2" 1"

SLR

99 REALTY DRIVE
CHESHIRE, CT 06410
203.271.1773
SLRCONSULTING.COM

DESCRIPTION	DATE	BY

EXISTING CONDITIONS WATERSHED MAP

BARBER COVE DEVELOPMENT

32 & 36 IRON HORSE BOULEVARD
SIMSBURY, CONNECTICUT

DESIGNED	DRAWN	CHECKED
FAB	FAB	TD

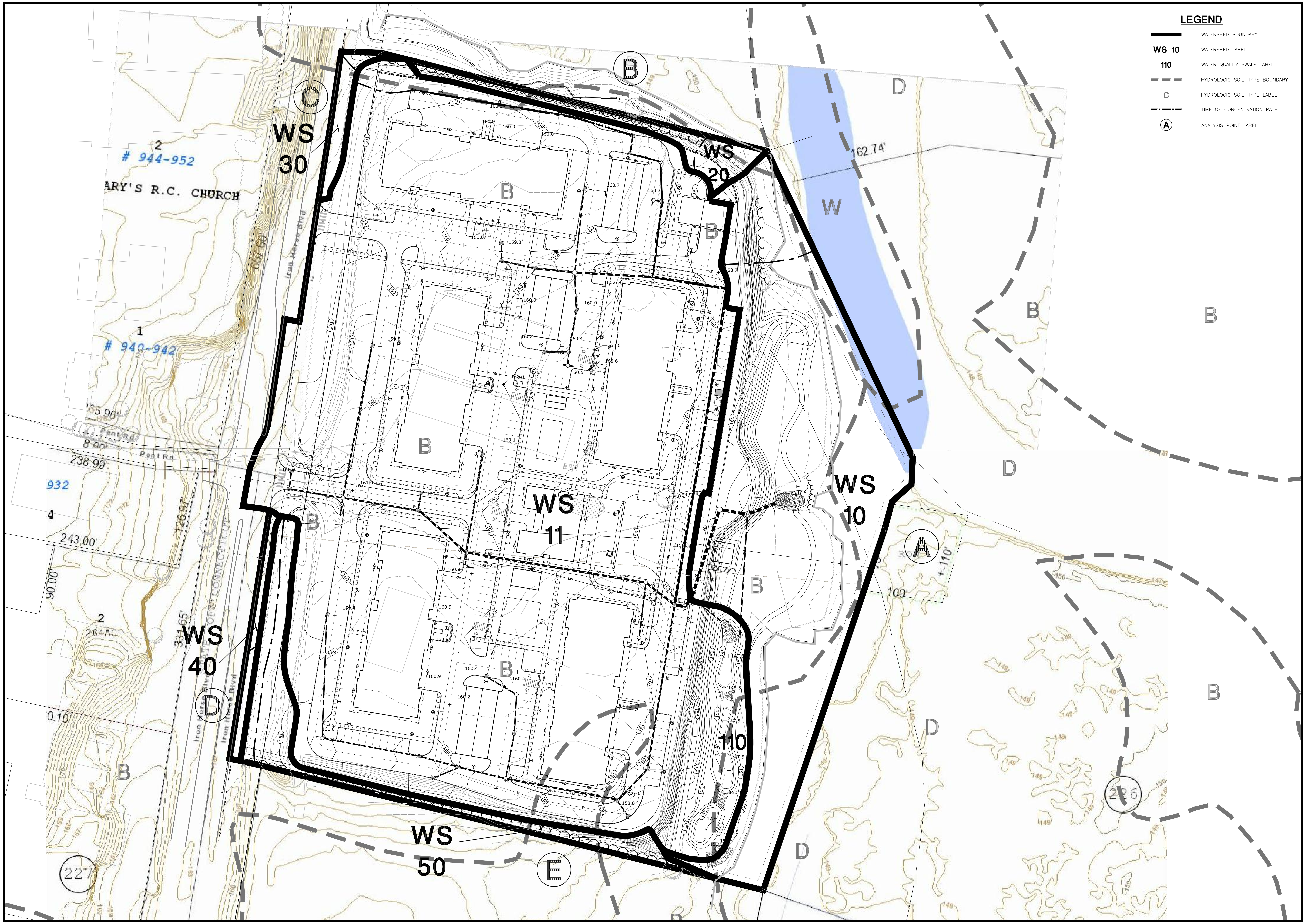
SCALE 1"=50'

DATE MAY 14, 2021

PROJECT NO. 17126.00001

SHEET NO. 1 OF 2

SHEET NAME EXWS



LEGEND

▬	WATERSHED BOUNDARY
WS 10	WATERSHED LABEL
110	WATER QUALITY SWALE LABEL
▬ ▬ ▬	HYDROLOGIC SOIL–TYPE BOUNDARY
C	HYDROLOGIC SOIL–TYPE LABEL
▬ · ▬ · ▬	TIME OF CONCENTRATION PATH
Ⓐ	ANALYSIS POINT LABEL

0' 25' 50'
0 1/2" 1"

SLR
99 REALTY DRIVE
CHESHIRE, CT 06410
203.271.1773
SLRCONSULTING.COM

DESCRIPTION	DATE	BY

PROPOSED CONDITIONS WATERSHED MAP

BARBER COVE DEVELOPMENT

32 & 36 IRON HORSE BOULEVARD
SIMSBURY, CONNECTICUT

FAB	FAB	TD
DESIGNED	DRAWN	CHECKED

SCALE 1"=50'

DATE MAY 14, 2021

PROJECT NO. 17126.00001

SHEET NO. 2 OF 2

SHEET NAME PRWS