LATIMER LANE SCHOOL RENOVATIONS

Drainage Report

Prepared for:
Town of Simsbury
933 Hopmeadow Street
Simsbury, Connecticut 06089

141.14885.00037.0020

January 13, 2022
Revised: February 14, 2022

Drainage Report

Latimer Lane School Renovations
33 Mountain View Drive
Weatogue, Connecticut
January 13, 2022
Revised: February 14, 2022
141.14885.00037.0020

This Drainage Report has been prepared in support of the Latimer Lane School Renovations located at 33 Mountain View Drive in the town of Simsbury, Connecticut. The site is currently active as Latimer Lane Elementary School, with the existing school building, parking areas, sidewalks, and playgrounds. The site is proposed to be renovated with an expansion to the existing building, new parking, circulation improvements, accessible sidewalks, and general landscape improvements.

Figure 1 – 33 Mountain View Drive

Table 1 Stormwater Data

Parcel Size Total	20.2 acres
Existing Impervious Area (Watershed Area)	3.69 acres
Proposed Impervious Area (Watershed Area)	4.62 acres
Soil Types (Hydrologic Soil Group)	"A," "B," "C," and "D"
Existing Land Use	Woods, open space, concrete walks, bituminous pavement, and building
Proposed Land Use	Woods, open space, bituminous pavement, sidewalks, parking, and building
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, hydrodynamic separators, retention storage, isolator rows within underground chamber systems
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 to 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 & 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

3. Design and Construction Requirements

1. Planning and Site Design Criteria Checklist

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 BMPs. An improvement in site runoff conditions is expected based on the proposed stormwater improvements planned for the project. There is currently no stormwater water quality infrastructure on the site. The proposed project will introduce a new stormwater treatment train consisting of catch basins with 2-foot sumps, a hydrodynamic separator, and underground infiltration chambers.

2. Stormwater Quantity and Quality Requirements

2.1 Redevelopment

Projects with more than 50 percent predevelopment 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 percent of the postdevelopment effective impervious area.

Based on visual investigation of existing land use, soil subsurface testing, and aerial photogrammetry, the site's land use consists mostly of the existing school building, paved parking lots and drives, sidewalks, paved basketball courts, playground areas, grassed areas, and some woods.

Table 2 Existing Impervious Area Chart

Types of Impervious Areas	Area (acres)
Buildings	1.05
Paved	2.45
Playground Area	0.34
Total Impervious Area	3.84
Project Limits	7.50
% Impervious =	51.2%

Per the definition of impervious area in the Simsbury Zoning Regulations, the existing land use was delineated. The project limits was determined to contain approximately 51.2 percent of impervious area. Therefore, the adjustment factor of 50 percent was applied to the water quality standard requirements.

2.2 Peak Rate

The postdevelopment impervious area will be increased compared to the predevelopment conditions' impervious coverage. The proposed development will include two underground detention systems that are designed to mitigate the increase in stormwater runoff from the site due to the new impervious surfaces. Therefore, the peak-rate requirements from the *Simsbury Stormwater Article* for the 2-, 10-, 25-, 50-, 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 site is predominantly located within Hydrologic Soil Groups "B" and "C." Therefore, the groundwater recharge depth used in the computations was 0.35 as a conservative calculation, per Table 1.2 of the *Simsbury Stormwater Article*.

The required Recharge Volume was calculated to be 0.093 acre-feet (ac-ft). The provided volume achieved by the proposed underground chamber systems is 0.142 ac-ft, thus meeting Simsbury's Recharge Volume requirements. The volume provided is also used toward meeting the CTDEEP Water Quality Volume (WQV) and Simsbury Groundwater Recharge Volume (GRV) requirements, which are 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 50 percent redevelopment factor, for a total of 0.126 ac-ft required water quality volume.

The underground storage chambers have approximately 0.142 ac-ft of storage volume below the lower orifice elevations. Therefore, the volume provided meets Simsbury's WQV requirements. The underground storage chambers will each include an isolator row and will be preceded by a pretreatment proprietary hydrodynamic separator. These units were 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 discharge capacity of the outlet pipes from both underground storage chamber systems are sized to provide adequate capacity for the 100-year storm event.

The computer program titled *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 Offsite Mitigation and Stormwater Mitigation Bank

Offsite mitigation and stormwater mitigation bank are not applicable to this 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). The project site does not take credit for any of the Site BMP Incentives listed in the *Simsbury Stormwater Article*.

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.*

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 separators selected are a CDS® unit and a Cascade unit, both manufactured by Contech Engineered Solutions. These units will be installed in the storm drainage systems prior to discharging runoff into the proposed underground storage chambers. These units will further remove suspended solids before discharging downgradient; this will in turn remove other pollutants that tend to attach to suspended solids and will 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 volume requirements associated with the CTDEEP WQV and GRV were achieved by the combined retention volume provided in the two underground storage chamber systems. 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 groundwater 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 groundwater 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. Four 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 offsite 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 21.2 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	Russell Brook (subwatersheds numbered in the 10s)
B	Drainage System in Mountain View Road (subwatersheds numbered in the 20s)
C	Drainage System in Latimer Lane and Mountain View Road Intersection (Subwatersheds numbered in the 30s)
D	Drainage System to Valley View Road (subwatersheds numbered in the 40s)

The method of predicting the surface water runoff rates utilized in this analysis is a computer program titled *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	3.36
10-year	5.41
25-year	6.69
50-year	7.62
100-year	8.66

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, grassed or open space, building, and impervious (drives, sidewalks, parking). 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 "A," "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 – Russell Brook

	Peak Runoff Rate (cubic feet per second)				
Storm Frequency (years)	**2**	**10**	**25**	**50**	**100**
Existing Conditions	8.3	19.1	26.3	31.7	37.7
Proposed Conditions	8.3	18.9	25.7	31.2	37.6

Underground Detention System 110*

	Water Surface Elevation (feet)				
Storm Frequency (years)	**2**	**10**	**25**	**50**	**100**
Proposed Conditions	185.7	186.5	187.1	187.6	188.1

*Top Elevation of Stone Above Chambers = 188.2 feet

Analysis Point B – Drainage System in Mountain View Road

	Peak Runoff Rate (cubic feet per second)				
Storm Frequency (years)	**2**	**10**	**25**	**50**	**100**
Existing Conditions	8.5	20.0	27.7	33.4	39.8
Proposed Conditions	8.5	19.6	27.5	33.2	39.7

Underground Detention System 210**

	Water Surface Elevation (feet)				
Storm Frequency (years)	**2**	**10**	**25**	**50**	**100**
Proposed Conditions	180.0	181.3	182.0	182.6	183.4

**Top Elevation of Stone Above Chambers = 183.7 feet

Analysis Point C – Drainage System in Latimer Lane and Mountain View Intersection

	Peak Runoff Rate (cubic feet per second)				
Storm Frequency (years)	**2**	**10**	**25**	**50**	**100**
Existing Conditions	3.4	7.7	10.5	12.5	14.8
Proposed Conditions	3.3	7.3	9.9	11.8	13.9

Analysis Point D – Drainage System to Valley View Road

	Peak Runoff Rate (cubic feet per second)				
Storm Frequency (years)	**2**	**10**	**25**	**50**	**100**
Existing Conditions	2.2	5.5	7.8	9.5	11.5
Proposed Conditions	2.2	5.5	7.8	9.5	11.5

CONCLUSION

The results of the hydrologic analysis demonstrate that there will be no increases in peak-flow rates from the project site. The proposed project will introduce a new stormwater treatment train consisting of catch basins with 2-foot sumps, hydrodynamic separators, and retention storage and an isolator row in each of the underground storage chamber systems.

The proposed stormwater management design was planned in accordance with the Town of Simsbury Stormwater regulations and the CTDEEP *2004 Stormwater Manual.* The design meets Simsbury's stormwater requirements for redevelopment, peak rate, recharge volume, water quality, and conveyance.

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 – Storm Drainage Computations
Attachment E – Water Quality Computations
Attachment F – Hydrologic Analysis – Input Computations
Attachment G – Hydrologic Analysis – Computer Model Results
Attachment H – Watershed Maps

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APPENDIX A

UNITED STATES GEOLOGICAL SURVEY (USGS) LOCATION MAP

Drainage Report

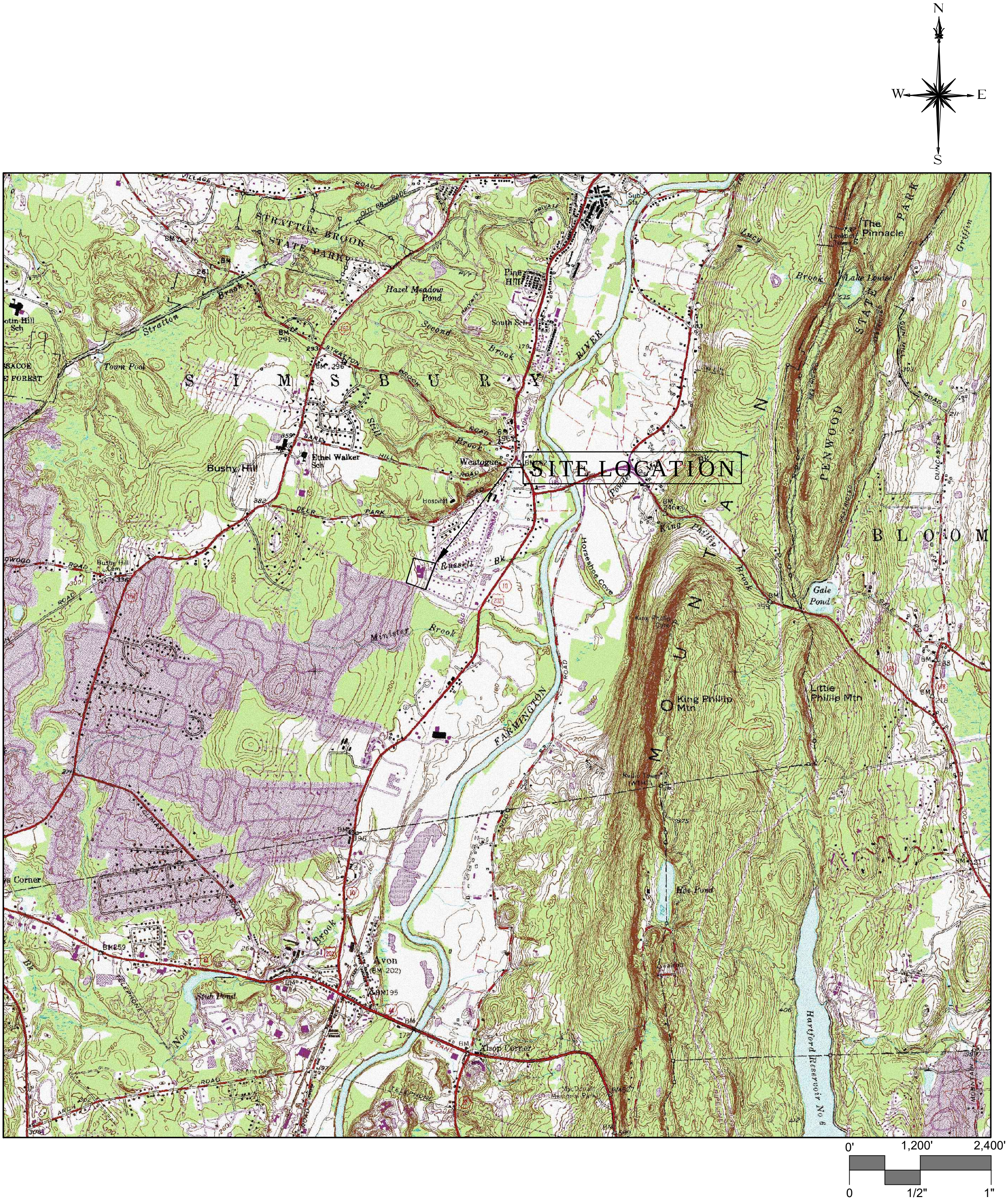
Latimer Lane School Renovations

33 Mountain View Drive

Simsbury, Connecticut

January 13, 2022

Revised: February 14, 2022



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

USGS QUADRANGLE MAP, QUAD NO. 36

RENOVATIONS OF LATIMER LANE SCHOOL

33 MOUNTAIN VIEW DRIVE
WEATOGUE, SIMSBURY, CONNECTICUT

PROJECT PHASE:

REV: ---

DATE **JANUARY 13, 2022**

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

PROJ. NO. **14885.00037**

DESIGNED	DRAWN	CHECKED
---	**AES**	---

DRAWING NAME:

LOC

APPENDIX B

FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA) FLOOD INSURANCE RATE MAP

Drainage Report

Latimer Lane School Renovations

33 Mountain View Drive

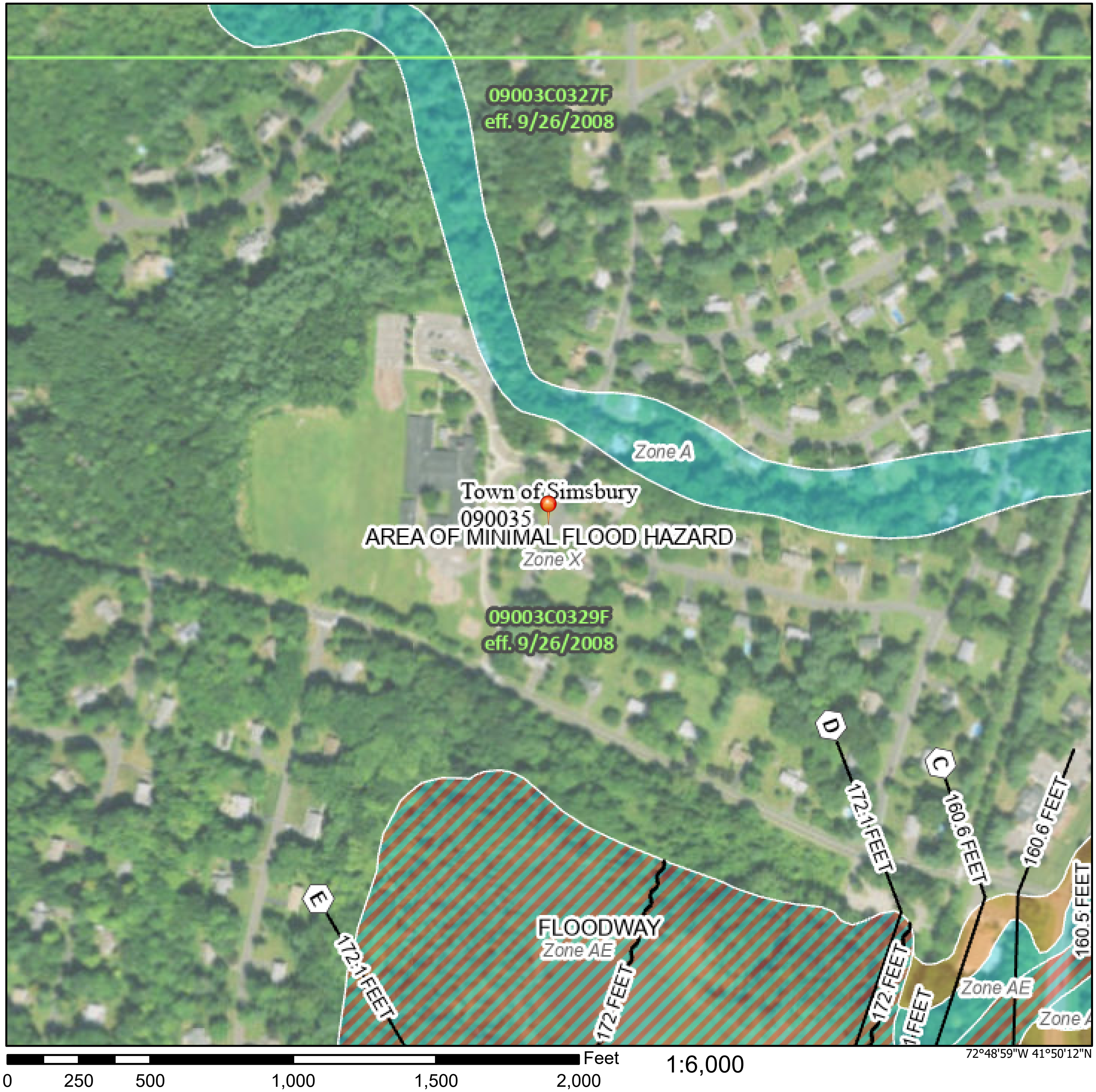
Simsbury, Connecticut

January 13, 2022

Revised: February 14, 2022

National Flood Hazard Layer FIRMette

72°49'36"W 41°50'39"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
	ııııııı	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
	📍	The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

N

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 11/2/2021 at 1:28 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

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

APPENDIX C

NATURAL RESOURCES CONSERVATION SERVICE (NRCS) HYDROLOGIC SOIL GROUP MAP

Drainage Report

Latimer Lane School Renovations

33 Mountain View Drive

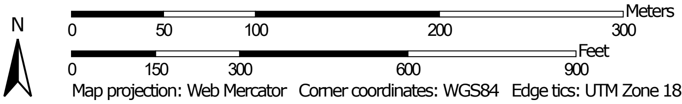
Simsbury, Connecticut

January 13, 2022

Revised: February 14, 2022

Hydrologic Soil Group—State of Connecticut

Map Scale: 1:4,110 if printed on A portrait (8.5" x 11") sheet.



Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)

⬜ Area of Interest (AOI)

Soils

Soil Rating Polygons

🟪 A

🟩 A/D

🟦 B

🟫 B/D

🟦 C

🟨 C/D

🟥 D

⬜ Not rated or not available

Soil Rating Lines

~ A

~ A/D

~ B

~ B/D

~ C

~ C/D

~ D

~ Not rated or not available

Soil Rating Points

■ A

■ A/D

■ B

■ B/D

■ C

■ C/D

■ D

□ Not rated or not available

Water Features

~ Streams and Canals

Transportation

┼┼┼ Rails

~ Interstate Highways

~ US Routes

~ Major Roads

~ Local Roads

Background

▨ Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

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

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

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

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

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

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

Soil Survey Area: State of Connecticut
Survey Area Data: Version 21, Sep 7, 2021

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
34A	Merrimac fine sandy loam, 0 to 3 percent slopes	A	5.2	12.6%
34B	Merrimac fine sandy loam, 3 to 8 percent slopes	A	0.0	0.0%
38C	Hinckley loamy sand, 3 to 15 percent slopes	A	0.7	1.7%
42C	Ludlow silt loam, 2 to 15 percent slopes, extremely stony	C	4.4	10.7%
43B	Rainbow silt loam, 3 to 8 percent slopes	C	5.4	13.1%
78C	Holyoke-Rock outcrop complex, 3 to 15 percent slopes	D	9.6	23.2%
103	Rippowam fine sandy loam	B/D	5.7	13.8%
306	Udorthents-Urban land complex	B	4.7	11.4%
308	Udorthents, smoothed	C	5.5	13.4%
Totals for Area of Interest			**41.2**	**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

APPENDIX D

STORM DRAINAGE COMPUTATIONS

Rational Method Individual Basin Calculations

Project: Latimer Lane School
By: AES
Date: 1/11/22
Location: Simsbury, Connecticut
Checked: MCB
Date: 1/11/22

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 200							
YD 6	3340	6890	0	10230	0.23	0.50	6.9
YD 7	2013	4853	0	6866	0.16	0.48	5.0
YD 8	1321	128872	143825	274018	6.29	0.25	19.6
AD 10	972	1107	0	2079	0.05	0.58	5.0
AD 11	853	875	0	1728	0.04	0.60	5.0
System 210							
CCB 15	8558	9576	0	18134	0.42	0.58	5.0
CCB 16	5257	2654	0	7911	0.18	0.70	5.0
CCB 17	5495	561	0	6056	0.14	0.84	5.0
CCB 18	3672	204	0	3876	0.09	0.87	5.0
CCB 19	2280	872	0	3152	0.07	0.73	5.0
System 110							
CCB 20	1574	676	0	2250	0.05	0.72	5.0
CCB 24	1714	283	0	1997	0.05	0.81	5.0
CCB 26	25561	6056	68819	100436	2.31	0.38	15.9
CCB 27	14181	3086	0	17267	0.40	0.79	5.0
CCB 28	4953	2110	0	7063	0.16	0.72	5.0
CLCB 29	546	1591	0	2137	0.05	0.45	5.0
AD 30	417	333	0	750	0.02	0.63	5.0
AD 30A	225	140	0	365	0.01	0.67	5.0
AD 31	757	435	0	1192	0.03	0.68	5.0
AD 32	613	414	0	1027	0.02	0.66	5.0
AD 33	9263	4141	1341	14745	0.34	0.67	13.7
YD 35	956	11303	0	12259	0.28	0.35	8.1
CCB 109	5288	1809	0	7097	0.16	0.75	5.0
System 300							
CCB 37	13	57	0	70	0.00	0.41	5.0
CCB 38	4723	3317	0	8040	0.18	0.65	5.0
AD 39	5214	1486	0	6700	0.15	0.77	5.0
AD 40	4828	738	0	5566	0.13	0.82	5.0
AD 41	3586	2355	0	5941	0.14	0.66	5.0
AD 42	80	16251	283	16614	0.38	0.30	8.0

Rational Method Roof Drain System Calculations

Project: Latimer Lane School
By: MCB
Date: Rev. 2/14/22

Location: Simsbury, Connecticut
Checked:
Date:

Total Roof Runoff to Proposed Storm Drainage System (In Hydraflow Model)

	BYPASS PIPE SYSTEM 200 (25-YR)	BYPASS PIPE SYSTEM 200 (100-YR)	BLDG to CCB 20	BLDG to MH 5	BLDG to MH 34		
C	0.32	0.32	0.90	0.90	0.90		
I	4.54	5.74	9.06	9.06	9.06		
A	7.44	7.44	0.37	0.58	0.61		
Q	10.81	13.67	2.98	4.73	5.01		

NOAA Atlas 14, Volume 10, Version 3
Location name: Weatogue, Connecticut, USA*
Latitude: 41.8404°, Longitude: -72.8216°
Elevation: 180.88 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sandra Pavlovic, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Orlan Wilhite

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.350 (0.269-0.450)	0.419 (0.322-0.540)	0.532 (0.407-0.688)	0.626 (0.477-0.814)	0.755 (0.558-1.03)	0.852 (0.618-1.19)	0.953 (0.673-1.38)	1.07 (0.715-1.59)	1.23 (0.794-1.90)	1.36 (0.859-2.14)
10-min	0.496 (0.381-0.638)	0.593 (0.456-0.765)	0.753 (0.577-0.975)	0.886 (0.675-1.15)	1.07 (0.790-1.46)	1.21 (0.875-1.68)	1.35 (0.953-1.96)	1.51 (1.01-2.25)	1.74 (1.13-2.69)	1.92 (1.22-3.04)
15-min	0.583 (0.448-0.751)	0.698 (0.536-0.900)	0.886 (0.679-1.15)	1.04 (0.794-1.36)	1.26 (0.930-1.72)	1.42 (1.03-1.98)	1.59 (1.12-2.30)	1.78 (1.19-2.65)	2.04 (1.32-3.16)	2.26 (1.43-3.57)
30-min	0.789 (0.607-1.02)	0.947 (0.728-1.22)	1.21 (0.923-1.56)	1.42 (1.08-1.85)	1.71 (1.27-2.34)	1.94 (1.40-2.70)	2.17 (1.53-3.15)	2.43 (1.63-3.61)	2.79 (1.81-4.32)	3.09 (1.96-4.88)
60-min	0.995 (0.765-1.28)	1.20 (0.919-1.54)	1.52 (1.17-1.97)	1.80 (1.37-2.34)	2.17 (1.61-2.96)	2.45 (1.78-3.42)	2.75 (1.94-3.99)	3.08 (2.07-4.58)	3.54 (2.29-5.48)	3.92 (2.48-6.20)
2-hr	1.28 (0.994-1.64)	1.54 (1.19-1.97)	1.95 (1.51-2.51)	2.30 (1.76-2.97)	2.77 (2.07-3.77)	3.13 (2.29-4.36)	3.50 (2.50-5.10)	3.95 (2.66-5.86)	4.61 (2.99-7.10)	5.17 (3.28-8.14)
3-hr	1.48 (1.15-1.89)	1.78 (1.38-2.27)	2.26 (1.75-2.89)	2.66 (2.05-3.43)	3.21 (2.41-4.36)	3.62 (2.66-5.04)	4.06 (2.92-5.92)	4.60 (3.10-6.81)	5.42 (3.52-8.32)	6.12 (3.89-9.60)
6-hr	1.86 (1.46-2.36)	2.26 (1.76-2.86)	2.90 (2.26-3.69)	3.43 (2.66-4.39)	4.17 (3.14-5.64)	4.71 (3.49-6.54)	5.30 (3.84-7.72)	6.04 (4.09-8.90)	7.19 (4.69-11.0)	8.19 (5.23-12.8)
12-hr	2.29 (1.80-2.88)	2.82 (2.22-3.55)	3.68 (2.89-4.66)	4.40 (3.43-5.60)	5.39 (4.09-7.26)	6.12 (4.57-8.47)	6.92 (5.05-10.1)	7.93 (5.39-11.6)	9.52 (6.23-14.5)	10.9 (6.99-17.0)
24-hr	2.67 (2.12-3.34)	3.36 (2.66-4.20)	4.48 (3.54-5.62)	5.41 (4.25-6.83)	6.69 (5.12-8.99)	7.62 (5.74-10.5)	8.66 (6.39-12.6)	10.0 (6.83-14.6)	12.2 (8.00-18.5)	14.1 (9.07-21.9)
2-day	2.99 (2.39-3.71)	3.83 (3.06-4.76)	5.20 (4.14-6.49)	6.34 (5.01-7.96)	7.91 (6.10-10.6)	9.04 (6.87-12.5)	10.3 (7.71-15.1)	12.1 (8.25-17.5)	15.0 (9.84-22.6)	17.6 (11.3-27.1)
3-day	3.26 (2.62-4.03)	4.18 (3.35-5.18)	5.70 (4.55-7.08)	6.95 (5.51-8.69)	8.67 (6.72-11.6)	9.92 (7.57-13.7)	11.3 (8.51-16.6)	13.3 (9.10-19.3)	16.5 (10.9-24.9)	19.5 (12.6-30.0)
4-day	3.51 (2.82-4.32)	4.49 (3.61-5.54)	6.11 (4.89-7.57)	7.44 (5.93-9.28)	9.29 (7.22-12.4)	10.6 (8.12-14.6)	12.1 (9.13-17.7)	14.2 (9.75-20.6)	17.7 (11.7-26.6)	20.8 (13.5-32.0)
7-day	4.20 (3.39-5.14)	5.31 (4.29-6.51)	7.12 (5.74-8.78)	8.63 (6.91-10.7)	10.7 (8.35-14.2)	12.2 (9.37-16.7)	13.9 (10.5-20.1)	16.2 (11.2-23.4)	20.0 (13.3-30.0)	23.5 (15.2-35.9)
10-day	4.88 (3.97-5.96)	6.06 (4.91-7.40)	7.97 (6.44-9.79)	9.56 (7.68-11.8)	11.8 (9.19-15.5)	13.3 (10.3-18.1)	15.1 (11.4-21.7)	17.5 (12.1-25.2)	21.4 (14.2-32.0)	25.0 (16.2-38.1)
20-day	7.04 (5.76-8.54)	8.27 (6.75-10.0)	10.3 (8.35-12.5)	11.9 (9.64-14.6)	14.2 (11.1-18.5)	15.9 (12.2-21.2)	17.7 (13.3-25.0)	20.1 (14.0-28.6)	23.8 (15.9-35.4)	27.1 (17.6-41.2)
30-day	8.86 (7.28-10.7)	10.1 (8.29-12.2)	12.1 (9.91-14.7)	13.8 (11.2-16.9)	16.1 (12.7-20.8)	17.8 (13.7-23.6)	19.7 (14.7-27.3)	21.9 (15.3-31.1)	25.3 (16.9-37.5)	28.2 (18.4-42.8)
45-day	11.1 (9.17-13.4)	12.4 (10.2-14.9)	14.5 (11.9-17.5)	16.2 (13.2-19.7)	18.6 (14.6-23.7)	20.4 (15.6-26.7)	22.2 (16.5-30.4)	24.3 (17.0-34.3)	27.2 (18.3-40.1)	29.5 (19.3-44.7)
60-day	13.0 (10.8-15.6)	14.3 (11.8-17.2)	16.5 (13.6-19.9)	18.3 (14.9-22.2)	20.7 (16.3-26.3)	22.7 (17.4-29.4)	24.6 (18.1-33.1)	26.4 (18.6-37.2)	28.9 (19.5-42.5)	30.7 (20.1-46.4)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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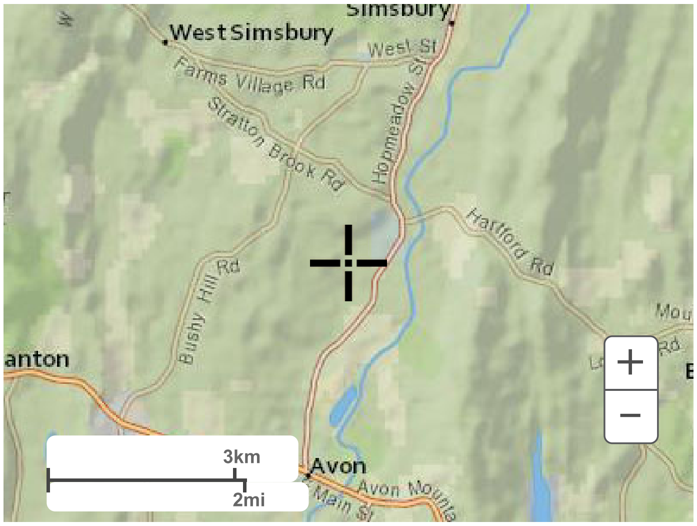
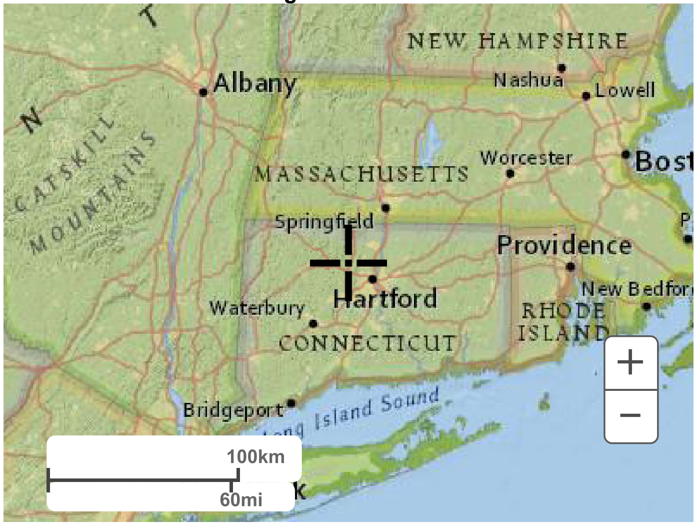
PF graphical



Large scale terrain

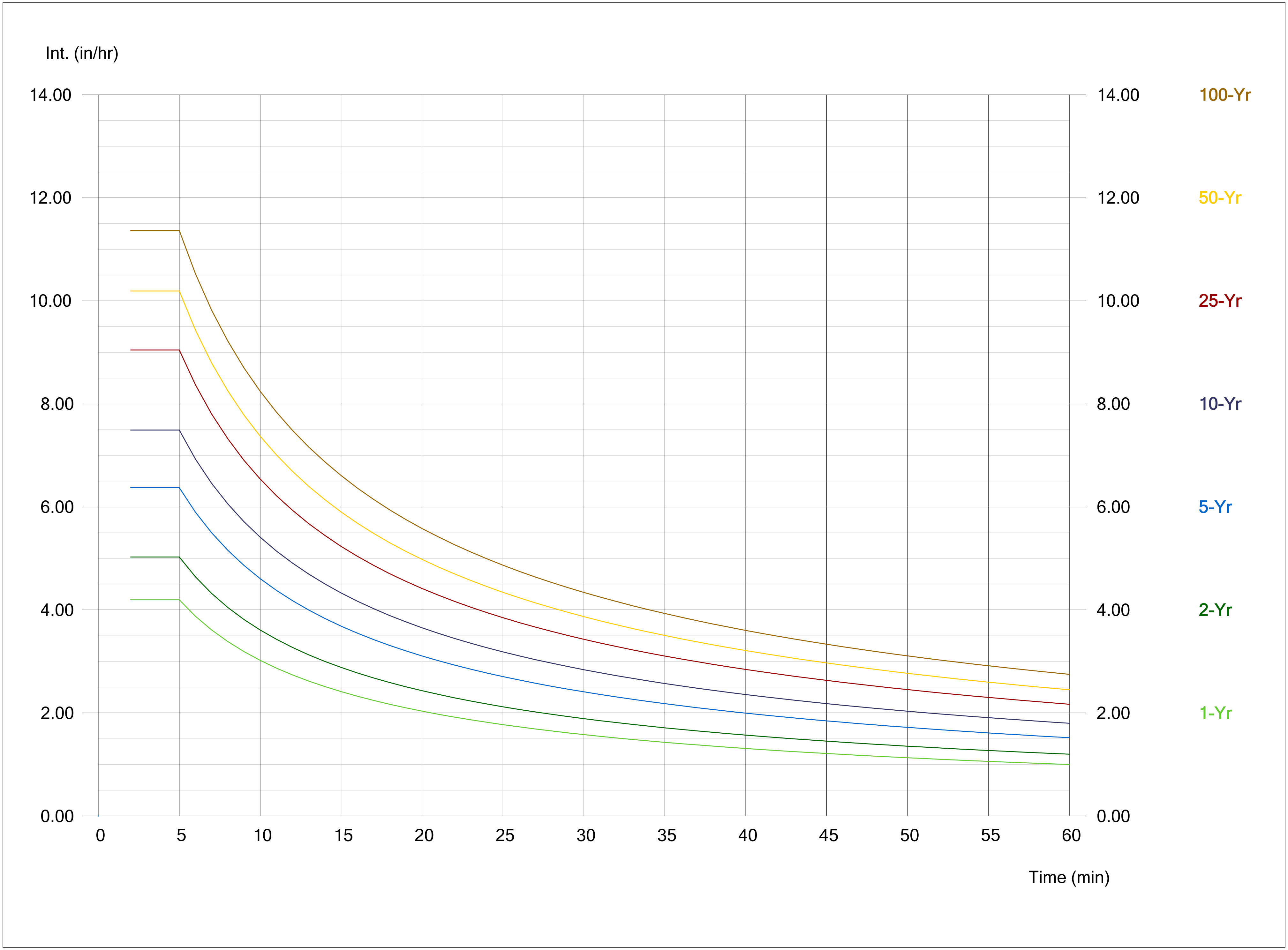


Large scale map

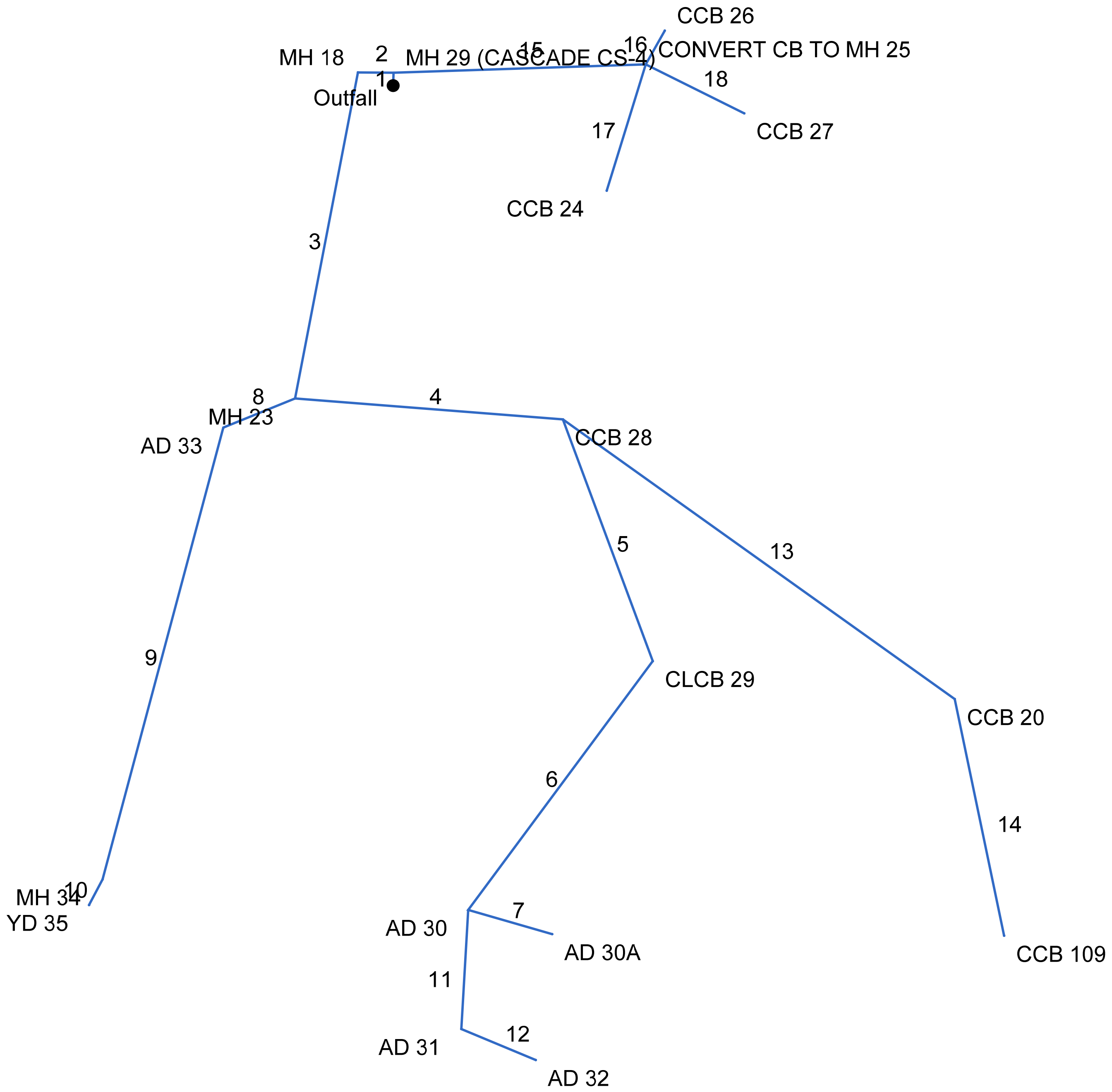
Large scale aerial

Storm Sewer IDF Curves

IDF file: Simsbury.IDF



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



Project File: System 110-01.stm

Number of lines: 18

Date: 1/26/2022

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	4.000	-88.486	MH	0.00	0.00	0.00	0.0	183.70	2.50	183.80	24	Cir	0.012	1.00	190.60	MH 30 - MH 29
2	1	11.000	-91.237	MH	0.00	0.00	0.00	0.0	184.20	2.73	184.50	18	Cir	0.012	0.99	191.00	MH 29 - MH 18
3	2	103.000	-79.402	MH	0.00	0.00	0.00	0.0	184.50	1.46	186.00	18	Cir	0.012	1.00	193.30	MH 18 - MH 23
4	3	83.000	-96.419	Comb	0.00	0.16	0.72	5.0	186.00	1.20	187.00	15	Cir	0.012	1.93	192.00	MH 23 - CCB 28
5	4	80.000	65.193	Comb	0.00	0.05	0.45	5.0	188.20	1.13	189.10	12	Cir	0.012	1.30	192.70	CCB 28 - CLCB 29
6	5	96.000	56.835	DrGrt	0.00	0.02	0.63	5.0	189.10	1.98	191.00	12	Cir	0.013	2.03	195.50	CLCB 29 - AD 30
7	6	27.000	-110.241	DrGrt	0.00	0.01	0.67	5.0	191.80	1.11	192.10	12	Cir	0.012	1.00	195.40	AD 30 - AD 30A
8	3	24.000	56.949	DrGrt	0.00	0.34	0.67	13.7	187.50	3.33	188.30	12	Cir	0.012	1.25	193.90	MH 23 - AD 33
9	8	145.000	-52.926	MH	5.01	0.00	0.00	0.0	188.30	2.28	191.60	12	Cir	0.012	0.27	197.00	AD 33 - MH 34
10	9	9.000	12.862	DrGrt	0.00	0.28	0.35	8.1	191.60	1.11	191.70	12	Cir	0.012	1.00	195.50	MH 34 - YD 35
11	6	37.000	-33.148	DrGrt	0.00	0.03	0.68	5.0	191.00	1.08	191.40	12	Cir	0.012	1.43	195.30	AD 30 - AD 31
12	11	25.000	-70.580	DrGrt	0.00	0.02	0.66	5.0	191.40	0.80	191.60	12	Cir	0.012	1.00	195.10	AD 31 - AD 32
13	4	149.000	31.175	Comb	2.98	0.05	0.72	5.0	187.00	0.74	188.10	15	Cir	0.012	1.08	192.00	CCB 28 - CCB 20
14	13	75.000	42.620	Comb	0.00	0.16	0.75	5.0	188.10	0.67	188.60	12	Cir	0.012	1.00	192.10	CCB 20 - CCB 109
15	1	78.000	86.597	MH	0.00	0.00	0.00	0.0	183.80	0.90	184.50	18	Cir	0.012	1.00	189.60	MH 29 - MH 25
16	15	12.000	-58.808	Comb	0.00	2.31	0.38	15.9	184.80	3.33	185.20	12	Cir	0.012	1.00	188.70	MH 25 - CCB 26
17	15	41.000	109.008	Comb	0.00	0.05	0.81	5.0	184.80	3.90	186.40	12	Cir	0.012	1.00	189.90	MH 25 - CCB 24
18	15	34.000	28.412	Comb	0.00	0.40	0.79	5.0	184.80	0.59	185.00	12	Cir	0.012	1.00	188.50	MH 25 - CCB 27

Project File: System 110-01.stm | Number of lines: 18 | Date: 1/26/2022

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	4.000	0.00	3.88	0.00	0.00	1.91	0.0	16.3	5.0	17.50	38.74	5.57	24	2.50	183.70	183.80	187.11	187.13	190.80	190.60	MH 30 - MH 29
2	1	11.000	0.00	1.12	0.00	0.00	0.67	0.0	14.0	5.4	11.65	18.79	6.59	18	2.73	184.20	184.50	187.61	187.73	190.60	191.00	MH 29 - MH 18
3	2	103.000	0.00	1.12	0.00	0.00	0.67	0.0	13.7	5.5	11.69	13.73	6.62	18	1.46	184.50	186.00	188.40	189.49	191.00	193.30	MH 18 - MH 23
4	3	83.000	0.16	0.50	0.72	0.12	0.35	5.0	8.8	7.0	5.40	7.68	4.40	15	1.20	186.00	187.00	190.17	190.66	193.30	192.00	MH 23 - CCB 28
5	4	80.000	0.05	0.13	0.45	0.02	0.08	5.0	7.0	7.8	0.59	4.09	0.75	12	1.13	188.20	189.10	191.24	191.26	192.00	192.70	CCB 28 - CLCB 2
6	5	96.000	0.02	0.08	0.63	0.01	0.05	5.0	5.7	8.6	0.45	5.01	1.23	12	1.98	189.10	191.00	191.27	191.35	192.70	195.50	CLCB 29 - AD 30
7	6	27.000	0.01	0.01	0.67	0.01	0.01	5.0	5.0	9.0	0.06	4.07	1.68	12	1.11	191.80	192.10	191.89	192.20	195.50	195.40	AD 30 - AD 30A
8	3	24.000	0.34	0.62	0.67	0.23	0.33	13.7	13.7	5.5	6.81	7.04	8.67	12	3.33	187.50	188.30	190.17	190.91	193.30	193.90	MH 23 - AD 33
9	8	145.000	0.00	0.28	0.00	0.00	0.10	0.0	8.3	7.2	5.72	5.82	7.28	12	2.28	188.30	191.60	192.37	195.56	193.90	197.00	AD 33 - MH 34
10	9	9.000	0.28	0.28	0.35	0.10	0.10	8.1	8.1	7.3	0.71	4.07	0.91	12	1.11	191.60	191.70	195.78	195.78	197.00	195.50	MH 34 - YD 35
11	6	37.000	0.03	0.05	0.68	0.02	0.03	5.0	5.3	8.8	0.30	4.01	1.55	12	1.08	191.00	191.40	191.46	191.62	195.50	195.30	AD 30 - AD 31
12	11	25.000	0.02	0.02	0.66	0.01	0.01	5.0	5.0	9.0	0.12	3.45	1.34	12	0.80	191.40	191.60	191.62	191.74	195.30	195.10	AD 31 - AD 32
13	4	149.000	0.05	0.21	0.72	0.04	0.16	5.0	5.9	8.4	4.30	6.01	3.50	15	0.74	187.00	188.10	191.24	191.80	192.00	192.00	CCB 28 - CCB 20
14	13	75.000	0.16	0.16	0.75	0.12	0.12	5.0	5.0	9.0	1.09	3.15	1.38	12	0.67	188.10	188.60	192.01	192.07	192.00	192.10	CCB 20 - CCB 10
15	1	78.000	0.00	2.76	0.00	0.00	1.23	0.0	15.9	5.1	6.24	10.78	3.53	18	0.90	183.80	184.50	187.61	187.85	190.60	189.60	MH 29 - MH 25
16	15	12.000	2.31	2.31	0.38	0.88	0.88	15.9	15.9	5.1	4.44	7.04	5.66	12	3.33	184.80	185.20	188.04	188.20	189.60	188.70	MH 25 - CCB 26
17	15	41.000	0.05	0.05	0.81	0.04	0.04	5.0	5.0	9.0	0.37	7.62	0.47	12	3.90	184.80	186.40	188.04	188.05	189.60	189.90	MH 25 - CCB 24
18	15	34.000	0.40	0.40	0.79	0.32	0.32	5.0	5.0	9.0	2.86	2.96	3.64	12	0.59	184.80	185.00	188.04	188.23	189.60	188.50	MH 25 - CCB 27

Project File: System 110-01.stm

Number of lines: 18

Run Date: 1/26/2022

NOTES:Intensity = 43.36 / (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	24	17.50	183.70	187.11	2.00	3.14	5.57	0.48	187.59	0.510	4.000	183.80	187.13	2.00	3.14	5.57	0.48	187.61	0.510	0.510	0.020	1.00	0.48
2	18	11.65	184.20	187.61	1.50	1.77	6.59	0.68	188.29	1.049	11.000	184.50	187.73	1.50	1.77	6.59	0.68	188.40	1.049	1.049	0.115	0.99	0.67
3	18	11.69	184.50	188.40	1.50	1.77	6.62	0.68	189.08	1.056	103.000	186.00	189.49	1.50	1.77	6.61	0.68	190.17	1.056	1.056	1.088	1.00	0.68
4	15	5.40	186.00	190.17	1.25	1.23	4.40	0.30	190.47	0.596	83.000	187.00	190.66	1.25	1.23	4.40	0.30	190.96	0.596	0.596	0.495	1.93	0.58
5	12	0.59	188.20	191.24	1.00	0.79	0.75	0.01	191.25	0.023	80.000	189.10	191.26	1.00	0.79	0.75	0.01	191.27	0.023	0.023	0.019	1.30	0.01
6	12	0.45	189.10	191.27	1.00	0.79	0.58	0.01	191.28	0.016	96.000	191.00	191.35	0.35	0.24	1.88	0.05	191.40	0.246	0.131	0.126	2.03	0.11
7	12	0.06	191.80	191.89	0.09*	0.03	1.87	0.03	191.92	0.000	27.000	192.10	192.20	0.10**	0.04	1.48	0.03	192.23	0.000	0.000	n/a	1.00	0.03
8	12	6.81	187.50	190.17	1.00	0.79	8.67	1.17	191.33	3.113	24.000	188.30	190.91	1.00	0.79	8.67	1.17	192.08	3.112	3.113	0.747	1.25	1.46
9	12	5.72	188.30	192.37	1.00	0.79	7.28	0.82	193.20	2.196	145.000	191.60	195.56	1.00	0.79	7.28	0.82	196.38	2.195	2.196	3.184	0.27	0.22
10	12	0.71	191.60	195.78	1.00	0.79	0.91	0.01	195.79	0.034	9.000	191.70	195.78	1.00	0.79	0.91	0.01	195.80	0.034	0.034	0.003	1.00	0.01
11	12	0.30	191.00	191.46	0.46	0.13	0.85	0.08	191.54	0.000	37.000	191.40	191.62 j	0.22**	0.13	2.26	0.08	191.70	0.000	0.000	n/a	1.43	0.11
12	12	0.12	191.40	191.62	0.22	0.07	0.91	0.05	191.67	0.000	25.000	191.60	191.74 j	0.14**	0.07	1.77	0.05	191.79	0.000	0.000	n/a	1.00	0.05
13	15	4.30	187.00	191.24	1.25	1.23	3.50	0.19	191.43	0.377	149.000	188.10	191.80	1.25	1.23	3.50	0.19	191.99	0.377	0.377	0.562	1.08	0.21
14	12	1.09	188.10	192.01	1.00	0.79	1.38	0.03	192.04	0.079	75.000	188.60	192.07	1.00	0.79	1.38	0.03	192.10	0.079	0.079	0.059	1.00	0.03
15	18	6.24	183.80	187.61	1.50	1.77	3.53	0.19	187.81	0.301	78.000	184.50	187.85	1.50	1.77	3.53	0.19	188.04	0.301	0.301	0.235	1.00	0.19
16	12	4.44	184.80	188.04	1.00	0.79	5.66	0.50	188.54	1.327	12.000	185.20	188.20	1.00	0.79	5.66	0.50	188.70	1.326	1.326	0.159	1.00	0.50
17	12	0.37	184.80	188.04	1.00	0.79	0.47	0.00	188.04	0.009	41.000	186.40	188.05	1.00	0.79	0.47	0.00	188.05	0.009	0.009	0.004	1.00	0.00
18	12	2.86	184.80	188.04	1.00	0.79	3.64	0.21	188.25	0.549	34.000	185.00	188.23	1.00	0.79	3.64	0.21	188.43	0.549	0.549	0.187	1.00	0.21

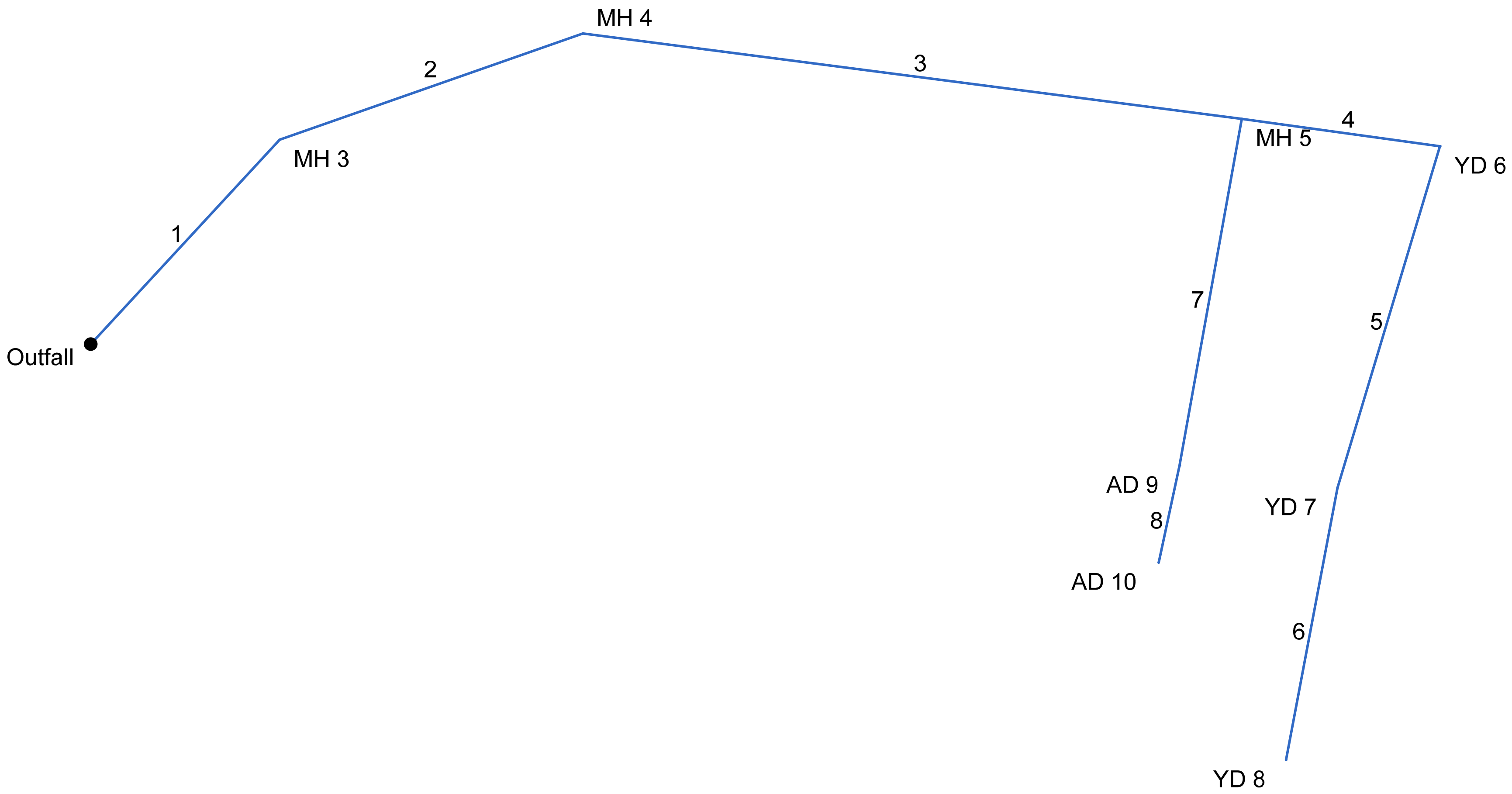
Project File: System 110-01.stm

Number of lines: 18

Run Date: 1/26/2022

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

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



Project File: System200-01.stm	Number of lines: 8	Date: 1/28/2022

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	102.000	-50.418	None	0.00	0.00	0.00	0.0	177.00	2.94	180.00	15	Cir	0.012	0.54	187.00	MH 2 - MH 3
2	1	112.000	29.045	None	0.00	0.00	0.00	0.0	180.00	2.86	183.20	15	Cir	0.012	0.55	193.10	MH 3 - MH 4
3	2	229.000	29.602	None	4.73	0.00	0.00	0.0	183.20	2.71	189.40	15	Cir	0.012	1.00	197.00	MH 4 - MH 5
4	3	69.000	0.587	DrGrt	0.00	0.23	0.50	6.9	189.40	1.30	190.30	15	Cir	0.012	1.50	196.80	MH 5 - YD 6
5	4	136.000	96.200	DrGrt	0.00	0.16	0.48	5.0	190.30	1.10	191.80	15	Cir	0.012	0.50	197.90	YD 6 - YD 7
6	5	106.000	-5.408	DrGrt	0.00	6.29	0.25	19.6	191.80	1.04	192.90	15	Cir	0.012	1.00	196.70	YD 7 - YD 8
7	3	135.000	90.890	DrGrt	0.00	0.05	0.58	5.0	189.40	1.04	190.80	15	Cir	0.013	0.50	195.00	MH 5 - AD 9
8	7	38.000	1.761	DrGrt	0.00	0.04	0.60	5.0	190.80	1.05	191.20	15	Cir	0.013	1.00	195.00	AD9 - AD 10

Project File: System200-01.stm

Number of lines: 8

Date: 1/28/2022

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)	
1	End	102.000	0.00	6.77	0.00	0.00	1.82	0.0	21.0	4.3	12.52	12.00	10.68	15	2.94	177.00	180.00	178.08	181.22	177.00	187.00	MH 2 - MH 3
2	1	112.000	0.00	6.77	0.00	0.00	1.82	0.0	20.8	4.3	12.56	11.82	10.29	15	2.86	180.00	183.20	181.22	184.42	187.00	193.10	MH 3 - MH 4
3	2	229.000	0.00	6.77	0.00	0.00	1.82	0.0	20.5	4.4	12.64	11.51	10.30	15	2.71	183.20	189.40	184.45	191.93	193.10	197.00	MH 4 - MH 5
4	3	69.000	0.23	6.68	0.50	0.12	1.76	6.9	20.3	4.4	7.72	7.99	6.30	15	1.30	189.40	190.30	193.58	194.42	197.00	196.80	MH 5 - YD 6
5	4	136.000	0.16	6.45	0.48	0.08	1.65	5.0	19.9	4.4	7.30	7.35	5.95	15	1.10	190.30	191.80	195.35	196.83	196.80	197.90	YD 6 - YD 7
6	5	106.000	6.29	6.29	0.25	1.57	1.57	19.6	19.6	4.5	7.03	7.13	5.73	15	1.04	191.80	192.90	197.11	198.18	197.90	196.70	YD 7 - YD 8
7	3	135.000	0.05	0.09	0.58	0.03	0.05	5.0	8.6	7.1	0.37	6.58	0.31	15	1.04	189.40	190.80	193.58	193.59	197.00	195.00	MH 5 - AD 9
8	7	38.000	0.04	0.04	0.60	0.02	0.02	5.0	5.0	9.0	0.22	6.63	0.18	15	1.05	190.80	191.20	193.59	193.59	195.00	195.00	AD9 - AD 10

Project File: System200-01.stm

Number of lines: 8

Run Date: 1/28/2022

NOTES:Intensity = 43.36 / (Inlet time + 3.80) ^ 0.72; Return period =Yrs. 25 ; c = cir e = ellip b = box

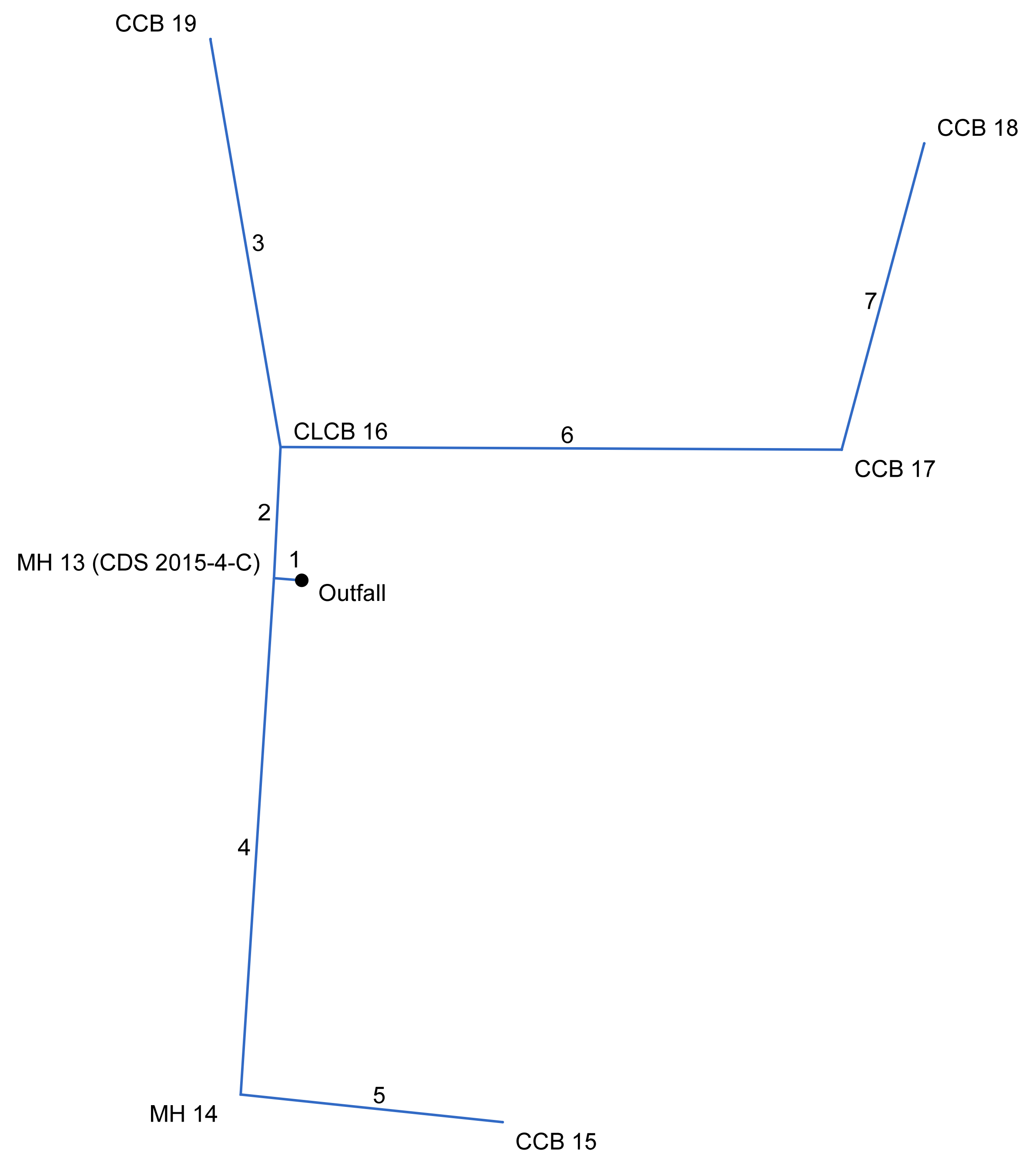
Hydraulic Grade Line Computations

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	15	12.52	177.00	178.08	1.08	1.13	11.09	1.64	179.72	0.000	102.000	180.00	181.22	1.22**	1.22	10.26	1.64	182.86	0.000	0.000	n/a	0.54	n/a
2	15	12.56	180.00	181.22	1.22	1.22	10.29	1.65	182.87	0.000	112.000	183.20	184.42	1.22**	1.22	10.29	1.65	186.07	0.000	0.000	n/a	0.55	0.91
3	15	12.64	183.20	184.45	1.25*	1.23	10.30	1.65	186.10	3.268	229.000	189.40	191.93	1.25	1.23	10.30	1.65	193.58	3.267	3.267	7.482	1.00	1.65
4	15	7.72	189.40	193.58	1.25	1.23	6.30	0.62	194.20	1.220	69.000	190.30	194.42	1.25	1.23	6.29	0.62	195.04	1.219	1.220	0.841	1.50	0.92
5	15	7.30	190.30	195.35	1.25	1.23	5.95	0.55	195.90	1.091	136.000	191.80	196.83	1.25	1.23	5.95	0.55	197.38	1.090	1.091	1.483	0.50	0.28
6	15	7.03	191.80	197.11	1.25	1.23	5.73	0.51	197.62	1.010	106.000	192.90	198.18	1.25	1.23	5.73	0.51	198.69	1.010	1.010	1.071	1.00	0.51
7	15	0.37	189.40	193.58	1.25	1.23	0.31	0.00	193.58	0.003	135.000	190.80	193.59	1.25	1.23	0.31	0.00	193.59	0.003	0.003	0.005	0.50	0.00
8	15	0.22	190.80	193.59	1.25	1.23	0.18	0.00	193.59	0.001	38.000	191.20	193.59	1.25	1.23	0.18	0.00	193.59	0.001	0.001	0.000	1.00	0.00

Project File: System200-01.stm	Number of lines: 8	Run Date: 1/28/2022

Notes: * depth assumed; ** Critical depth. ; c = cir e = ellip b = box

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



Project File: System210-01.stm	Number of lines: 7	Date: 1/26/2022

Storm Sewers v2018.30

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	4.000	-175.897	None	0.00	0.00	0.00	0.0	178.70	2.50	178.80	12	Cir	0.012	1.00	189.60	MH 12 - MH 13
2	1	19.000	88.727	Grate	0.00	0.18	0.70	5.0	178.80	1.58	179.10	12	Cir	0.012	1.50	189.80	MH 13 - CLCB 16
3	2	60.000	-12.545	Comb	0.00	0.07	0.73	5.0	186.00	1.17	186.70	12	Cir	0.012	1.00	190.00	CLCB 16 - CCB 19
4	1	75.000	-90.413	None	0.00	0.00	0.00	0.0	179.30	4.40	182.60	12	Cir	0.012	1.00	190.50	MH 13 - MH 14
5	4	38.000	-87.685	Comb	0.00	0.42	0.58	5.0	182.60	2.89	183.70	12	Cir	0.012	1.00	187.20	MH 14 - CCB 15
6	2	81.000	87.440	Comb	0.00	0.14	0.84	5.0	179.10	0.74	179.70	12	Cir	0.012	1.46	183.50	CLCB 16 - CCB 17
7	6	46.000	-75.258	Comb	0.00	0.08	0.87	5.0	179.70	0.87	180.10	12	Cir	0.012	1.00	183.60	CCB 17 - CCB 18

Project File: System210-01.stm

Number of lines: 7

Date: 1/26/2022

Storm Sewer Tabulation

Station		Len (ft)	Drng Area		Rnoff coeff (C)	Area x C		Tc		Rain (I) (in/hr)	Total flow (cfs)	Cap full (cfs)	Vel (ft/s)	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr (ac)	Total (ac)		Incr	Total	Inlet (min)	Syst (min)					Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	4.000	0.00	0.89	0.00	0.00	0.61	0.0	6.7	8.0	4.84	6.10	6.16	12	2.50	178.70	178.80	181.56	181.62	189.60	189.60	MH 12 - MH 13
2	1	19.000	0.18	0.47	0.70	0.13	0.36	5.0	6.6	8.0	2.92	4.85	3.71	12	1.58	178.80	179.10	182.21	182.32	189.60	189.80	MH 13 - CLCB 16
3	2	60.000	0.07	0.07	0.73	0.05	0.05	5.0	5.0	9.0	0.46	4.17	3.02	12	1.17	186.00	186.70	186.23	186.98	189.80	190.00	CLCB 16 - CCB 1
4	1	75.000	0.00	0.42	0.00	0.00	0.24	0.0	5.2	8.9	2.18	8.09	3.47	12	4.40	179.30	182.60	182.21	183.23	189.60	190.50	MH 13 - MH 14
5	4	38.000	0.42	0.42	0.58	0.24	0.24	5.0	5.0	9.0	2.20	6.56	4.21	12	2.89	182.60	183.70	183.23	184.33	190.50	187.20	MH 14 - CCB 15
6	2	81.000	0.14	0.22	0.84	0.12	0.19	5.0	6.0	8.4	1.57	3.32	2.00	12	0.74	179.10	179.70	182.64	182.78	189.80	183.50	CLCB 16 - CCB 1
7	6	46.000	0.08	0.08	0.87	0.07	0.07	5.0	5.0	9.0	0.63	3.60	0.80	12	0.87	179.70	180.10	182.87	182.88	183.50	183.60	CCB 17 - CCB 18

Project File: System210-01.stm

Number of lines: 7

Run Date: 1/26/2022

NOTES:Intensity = 43.36 / (Inlet time + 3.80) ^ 0.72; Return period =Yrs. 25 ; c = cir e = ellip b = box

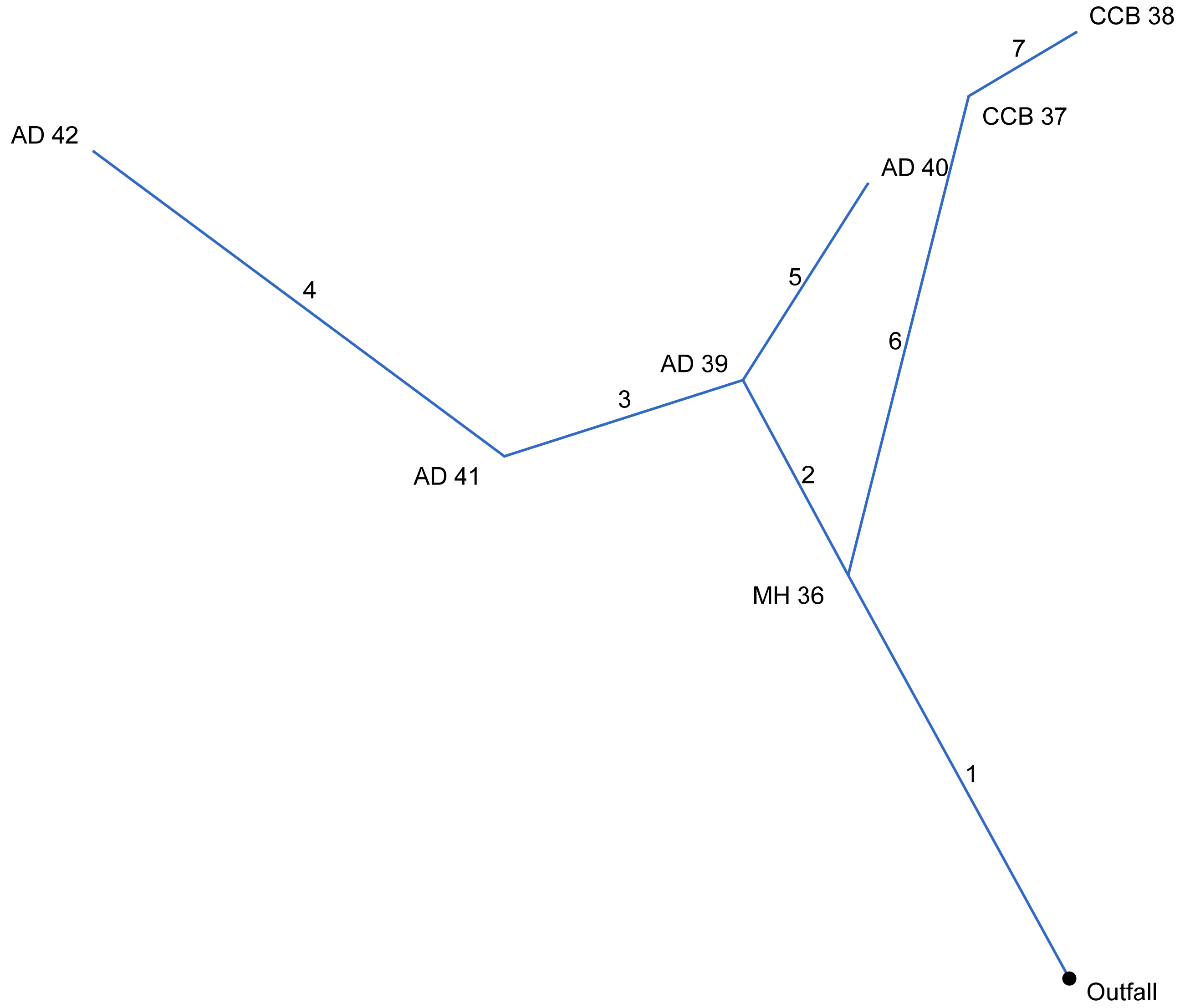
Hydraulic Grade Line Computations

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	12	4.84	178.70	181.56	1.00	0.79	6.16	0.59	182.15	1.572	4.000	178.80	181.62	1.00	0.79	6.16	0.59	182.21	1.572	1.572	0.063	1.00	0.59
2	12	2.92	178.80	182.21	1.00	0.79	3.71	0.21	182.43	0.571	19.000	179.10	182.32	1.00	0.79	3.71	0.21	182.54	0.571	0.571	0.109	1.50	0.32
3	12	0.46	186.00	186.23	0.23*	0.13	3.49	0.10	186.33	0.000	60.000	186.70	186.98	0.28**	0.18	2.55	0.10	187.08	0.000	0.000	n/a	1.00	0.10
4	12	2.18	179.30	182.21	1.00	0.52	2.77	0.12	182.33	0.319	75.000	182.60	183.23 j	0.63**	0.52	4.18	0.27	183.50	0.609	0.464	n/a	1.00	n/a
5	12	2.20	182.60	183.23	0.63	0.52	4.23	0.27	183.50	0.000	38.000	183.70	184.33	0.63**	0.53	4.20	0.27	184.61	0.000	0.000	n/a	1.00	0.27
6	12	1.57	179.10	182.64	1.00	0.79	2.00	0.06	182.71	0.166	81.000	179.70	182.78	1.00	0.79	2.00	0.06	182.84	0.166	0.166	0.135	1.46	0.09
7	12	0.63	179.70	182.87	1.00	0.79	0.80	0.01	182.88	0.027	46.000	180.10	182.88	1.00	0.79	0.80	0.01	182.89	0.027	0.027	0.012	1.00	0.01

Project File: System210-01.stm | Number of lines: 7 | Run Date: 1/26/2022

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

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



Project File: System300-01.stm	Number of lines: 7	Date: 1/12/2022

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	81.000	-118.674	None	0.00	0.00	0.00	0.0	181.20	3.46	184.00	12	Cir	0.012	0.72	192.00	EX CCB - MH 36
2	1	39.000	0.351	DrGrt	0.00	0.15	0.77	5.0	189.00	1.54	189.60	12	Cir	0.012	2.01	193.80	MH 36 - AD 39
3	2	44.000	-79.429	DrGrt	0.00	0.14	0.66	5.0	189.60	0.91	190.00	12	Cir	0.012	1.27	193.80	AD 39 - AD 41
4	3	90.000	54.392	DrGrt	0.00	0.38	0.30	8.0	190.00	0.99	190.89	12	Cir	0.012	1.00	194.70	AD 41 - AD 42
5	2	41.000	60.714	DrGrt	0.00	0.13	0.82	5.0	189.60	0.98	190.00	12	Cir	0.012	1.00	193.80	AD 39 - AD 40
6	1	87.000	42.752	Comb	0.00	0.01	0.41	5.0	184.00	1.15	185.00	12	Cir	0.012	1.13	189.00	MH 36 - CCB 37
7	6	22.000	45.255	Comb	0.00	0.18	0.65	5.0	185.00	0.91	185.20	12	Cir	0.012	1.00	189.00	CCB 37 - CCB 38

Project File: System300-01.stm

Number of lines: 7

Date: 1/12/2022

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)	
1	End	81.000	0.00	0.99	0.00	0.00	0.55	0.0	9.0	6.9	3.81	7.17	5.16	12	3.46	181.20	184.00	182.45	184.83	185.10	192.00	EX CCB - MH 36
2	1	39.000	0.15	0.80	0.77	0.12	0.43	5.0	8.8	7.0	2.99	4.79	5.61	12	1.54	189.00	189.60	189.57	190.34	192.00	193.80	MH 36 - AD 39
3	2	44.000	0.14	0.52	0.66	0.09	0.21	5.0	8.6	7.1	1.46	3.68	2.98	12	0.91	189.60	190.00	190.34	190.51	193.80	193.80	AD 39 - AD 41
4	3	90.000	0.38	0.38	0.30	0.11	0.11	8.0	8.0	7.3	0.83	3.84	2.55	12	0.99	190.00	190.89	190.51	191.27	193.80	194.70	AD 41 - AD 42
5	2	41.000	0.13	0.13	0.82	0.11	0.11	5.0	5.0	9.0	0.96	3.81	2.35	12	0.98	189.60	190.00	190.34	190.41	193.80	193.80	AD 39 - AD 40
6	1	87.000	0.01	0.19	0.41	0.00	0.12	5.0	5.1	9.0	1.09	4.14	2.42	12	1.15	184.00	185.00	184.83	185.44	192.00	189.00	MH 36 - CCB 37
7	6	22.000	0.18	0.18	0.65	0.12	0.12	5.0	5.0	9.0	1.06	3.68	3.23	12	0.91	185.00	185.20	185.44	185.63	189.00	189.00	CCB 37 - CCB 38

Project File: System300-01.stm

Number of lines: 7

Run Date: 1/12/2022

NOTES:Intensity = 43.36 / (Inlet time + 3.80) ^ 0.72; Return period =Yrs. 25 ; c = cir e = ellip b = box

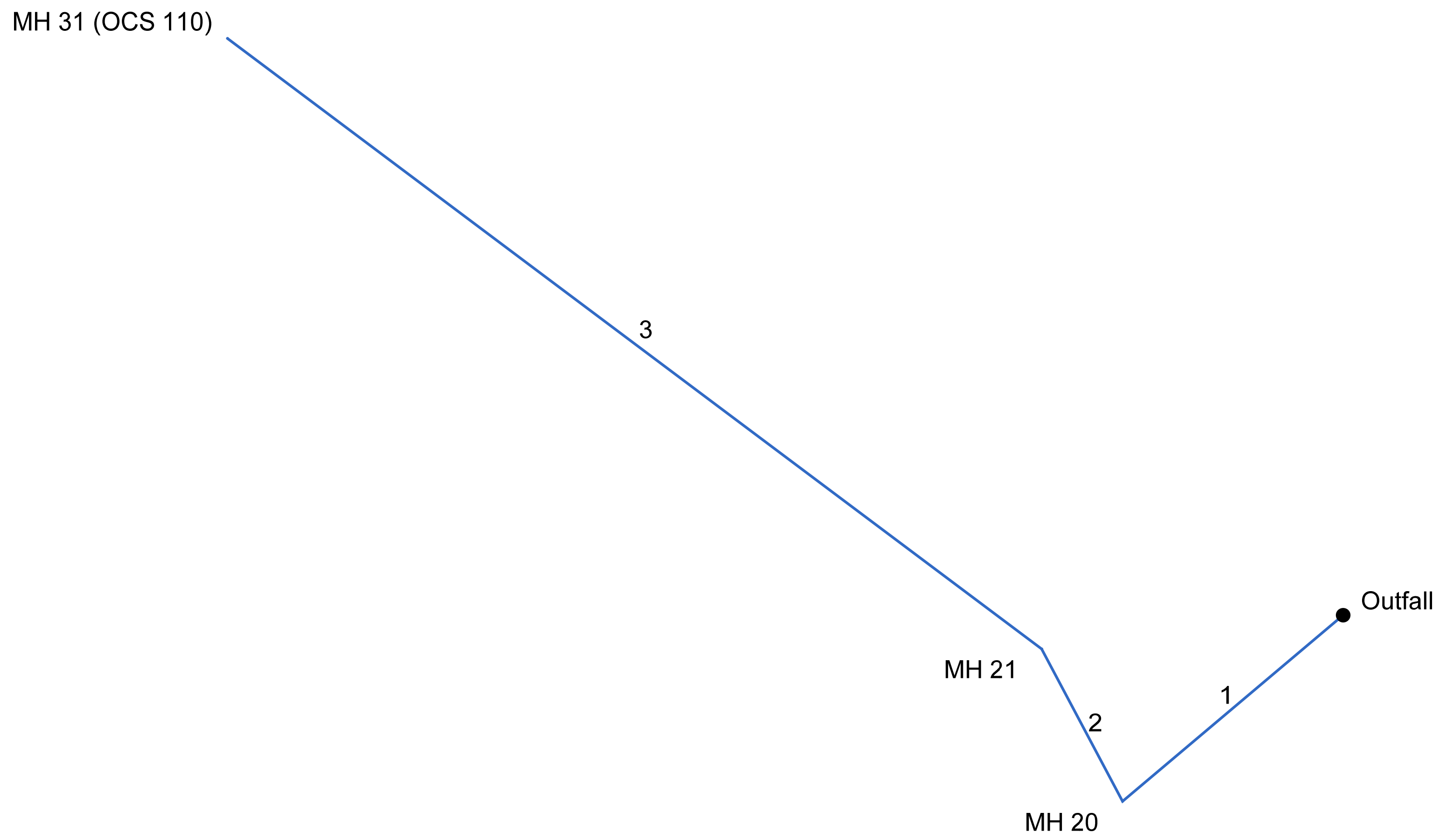
Hydraulic Grade Line Computations

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	12	3.81	181.20	182.45	1.00	0.70	4.85	0.37	182.82	0.974	81.000	184.00	184.83 j	0.83**	0.70	5.47	0.46	185.29	0.953	0.964	n/a	0.72	0.33
2	12	2.99	189.00	189.57	0.57*	0.46	6.43	0.36	189.93	0.000	39.000	189.60	190.34	0.74**	0.62	4.79	0.36	190.70	0.000	0.000	n/a	2.01	0.72
3	12	1.46	189.60	190.34	0.74	0.40	2.34	0.20	190.54	0.000	44.000	190.00	190.51 j	0.51**	0.40	3.61	0.20	190.71	0.000	0.000	n/a	1.27	n/a
4	12	0.83	190.00	190.51	0.51	0.28	2.07	0.14	190.65	0.000	90.000	190.89	191.27 j	0.38**	0.28	3.03	0.14	191.41	0.000	0.000	n/a	1.00	n/a
5	12	0.96	189.60	190.34	0.74	0.30	1.55	0.16	190.50	0.000	41.000	190.00	190.41 j	0.41**	0.30	3.16	0.16	190.57	0.000	0.000	n/a	1.00	n/a
6	12	1.09	184.00	184.83	0.83	0.33	1.56	0.17	185.00	0.000	87.000	185.00	185.44 j	0.44**	0.33	3.28	0.17	185.61	0.000	0.000	n/a	1.13	n/a
7	12	1.06	185.00	185.44	0.44	0.33	3.20	0.16	185.60	0.000	22.000	185.20	185.63 j	0.43**	0.33	3.25	0.16	185.80	0.000	0.000	n/a	1.00	n/a

Project File: System300-01.stm	Number of lines: 7	Run Date: 1/12/2022

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

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



Project File: Outlet 110-01.stm	Number of lines: 3	Date: 1/26/2022

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	40.000	139.603	None	0.00	0.00	0.00	0.0	180.20	1.25	180.70	24	Cir	0.012	1.00	191.50	EXMH - MH 20
2	1	24.000	102.611	None	0.00	0.00	0.00	0.0	180.70	1.25	181.00	24	Cir	0.012	0.48	191.30	MH 20 - MH 21
3	2	141.000	-25.208	None	25.95	0.00	0.00	0.0	181.00	1.21	182.70	24	Cir	0.012	1.00	191.30	MH 21 - MH 31

Project File: Outlet 110-01.stm	Number of lines: 3	Date: 1/26/2022

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	40.000	0.00	0.00	0.00	0.00	0.00	0.0	0.3	0.0	25.95	27.39	8.46	24	1.25	180.20	180.70	182.20	182.52	184.00	191.50	EXMH - MH 20
2	1	24.000	0.00	0.00	0.00	0.00	0.00	0.0	0.3	0.0	25.95	27.39	8.26	24	1.25	180.70	181.00	183.68	183.95	191.50	191.30	MH 20 - MH 21
3	2	141.000	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	25.95	26.90	8.26	24	1.21	181.00	182.70	184.46	186.04	191.30	191.30	MH 21 - MH 31

Project File: Outlet 110-01.stm

Number of lines: 3

Run Date: 1/26/2022

NOTES:Intensity = 54.82 / (Inlet time + 3.90) ^ 0.72; Return period =Yrs. 100 ; 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	24	25.95	180.20	182.20	2.00	3.14	8.26	1.06	183.26	1.122	40.000	180.70	182.52	1.82	3.00	8.66	1.17	183.68	0.981	1.051	0.421	1.00	1.17
2	24	25.95	180.70	183.68	2.00	3.14	8.26	1.06	184.74	1.122	24.000	181.00	183.95	2.00	3.14	8.26	1.06	185.01	1.122	1.122	0.269	0.48	0.51
3	24	25.95	181.00	184.46	2.00	3.14	8.26	1.06	185.52	1.122	141.000	182.70	186.04	2.00	3.14	8.26	1.06	187.10	1.122	1.122	1.582	1.00	1.06

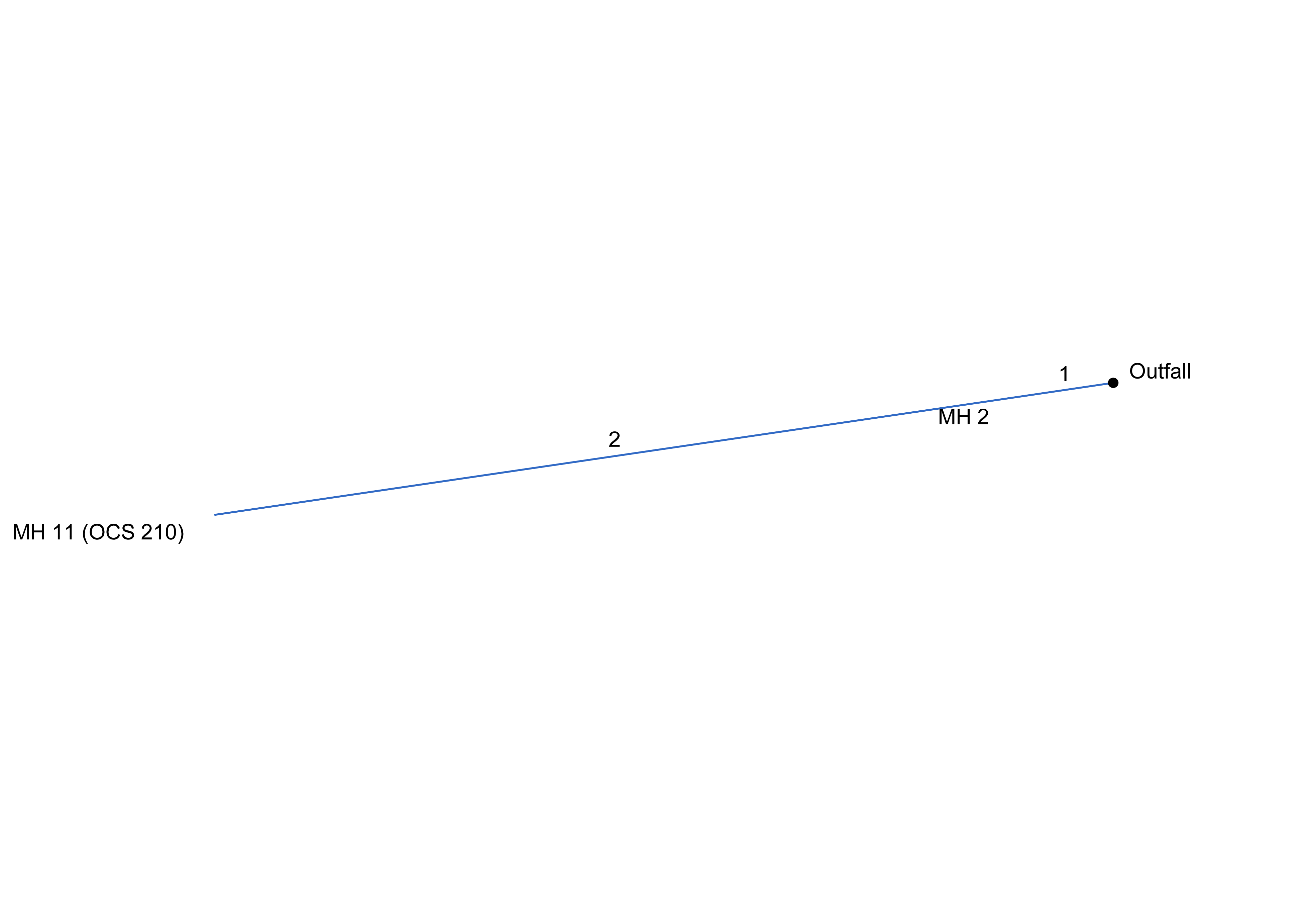
Project File: Outlet 110-01.stm

Number of lines: 3

Run Date: 1/26/2022

; c = cir e = ellip b = box

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



Project File: Outlet210-01.stm	Number of lines: 2	Date: 1/26/2022

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	7.000	171.342	None	19.62	0.00	0.00	0.0	176.60	5.71	177.00	15	Cir	0.012	0.15	183.70	MH 1 - MH 2
2	1	53.000	0.000	None	2.80	0.00	0.00	0.0	177.00	1.51	177.80	15	Cir	0.012	1.00	189.30	MH 2 - MH 11 (OCS

Project File: Outlet210-01.stm	Number of lines: 2	Date: 1/26/2022

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	7.000	0.00	0.00	0.00	0.00	0.00	0.0	0.4	0.0	22.42	16.72	18.27	15	5.71	176.60	177.00	177.85	178.57	182.80	183.70	MH 1 - MH 2
2	1	53.000	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	2.80	8.59	2.28	15	1.51	177.00	177.80	179.35	179.43	183.70	189.30	MH 2 - MH 11 (O

Project File: Outlet210-01.stm

Number of lines: 2

Run Date: 1/26/2022

NOTES:Intensity = 127.16 / (Inlet time + 17.80) ^ 0.82; Return period =Yrs. 100 ; 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	15	22.42	176.60	177.85	1.25	1.23	18.27	5.19	183.04	10.276	7.000	177.00	178.57	1.25**	1.23	18.27	5.19	183.76	10.272	10.274	0.719	0.15	0.78
2	15	2.80	177.00	179.35	1.25	1.23	2.28	0.08	179.43	0.160	53.000	177.80	179.43	1.25	1.23	2.28	0.08	179.52	0.160	0.160	0.085	1.00	0.08

Project File: Outlet210-01.stm

Number of lines: 2

Run Date: 1/26/2022

Notes: ; ** Critical depth. ; c = cir e = ellip b = box

Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Monday, Jan 10 2022

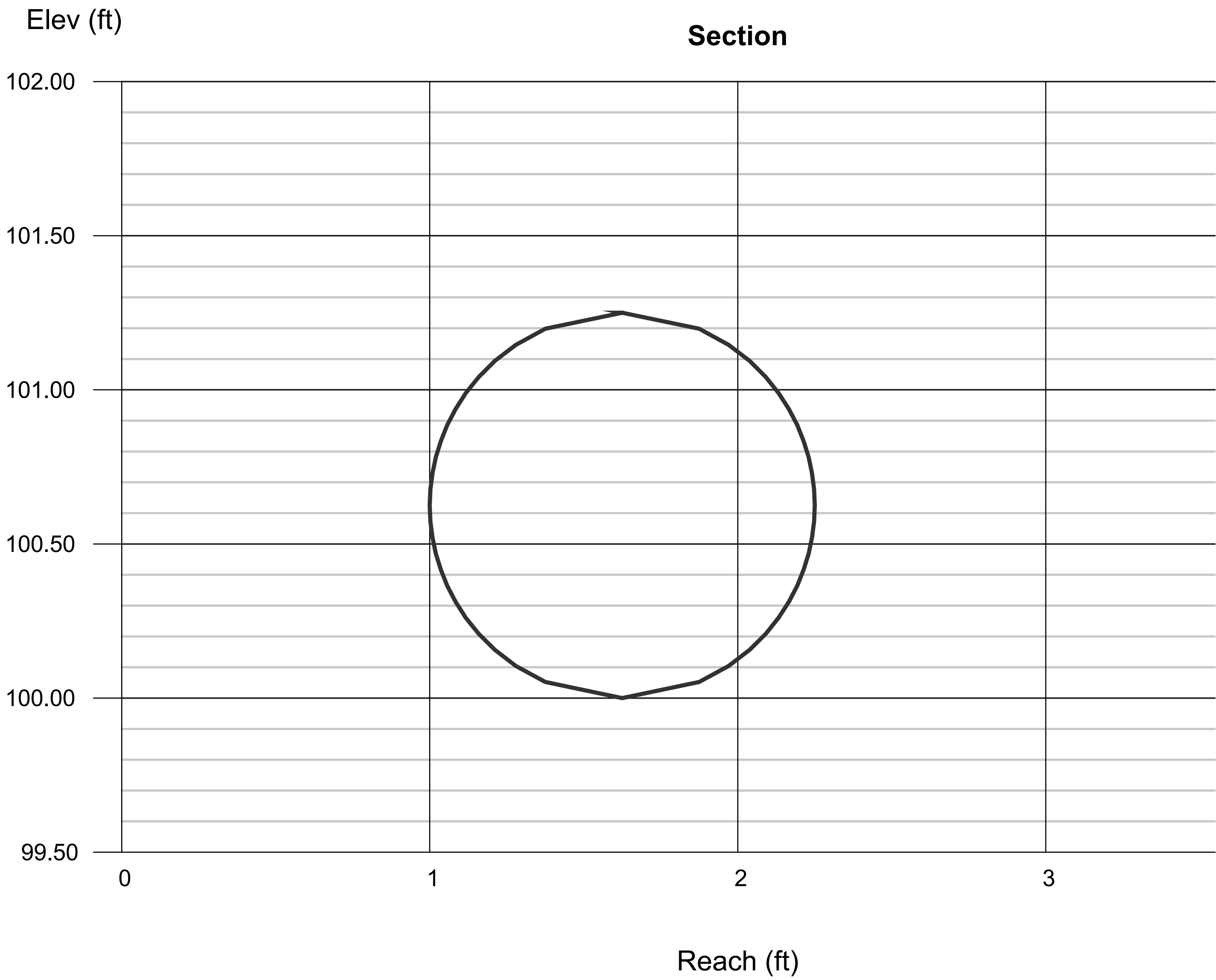
15-inch HDPE, 0.5%

Circular
Diameter (ft) = 1.25

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

Calculations
Compute by: Q vs Depth
No. Increments = 10

Highlighted
Depth (ft) = 1.25
2.98 cfs, 4.73 cfs < Q (cfs) = 4.946
Area (sqft) = 1.23
Velocity (ft/s) = 4.03
Wetted Perim (ft) = 3.93
Crit Depth, Yc (ft) = 0.91
Top Width (ft) = 0.00
EGL (ft) = 1.50



Channel Report

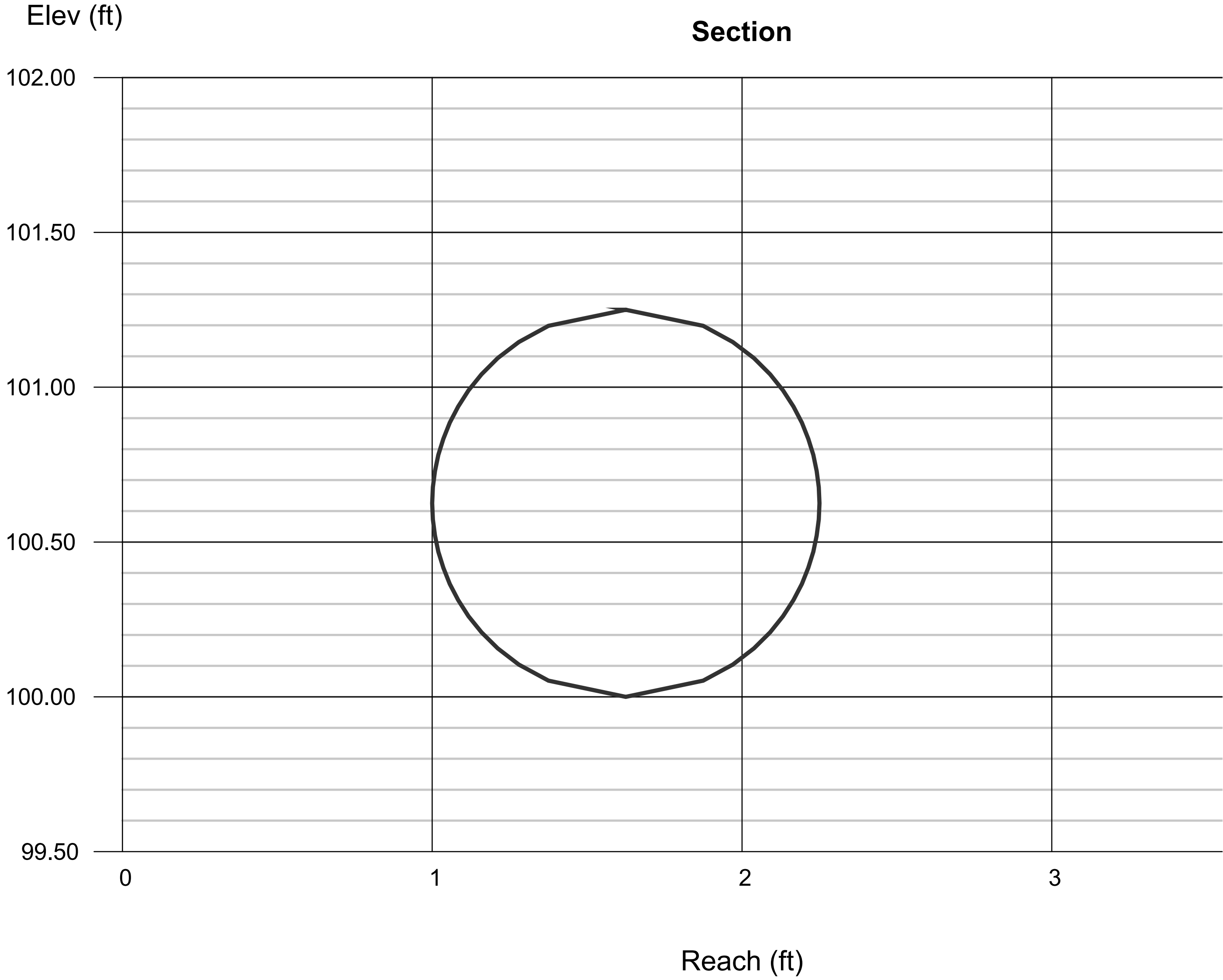
15-IN, 0.6% MIN

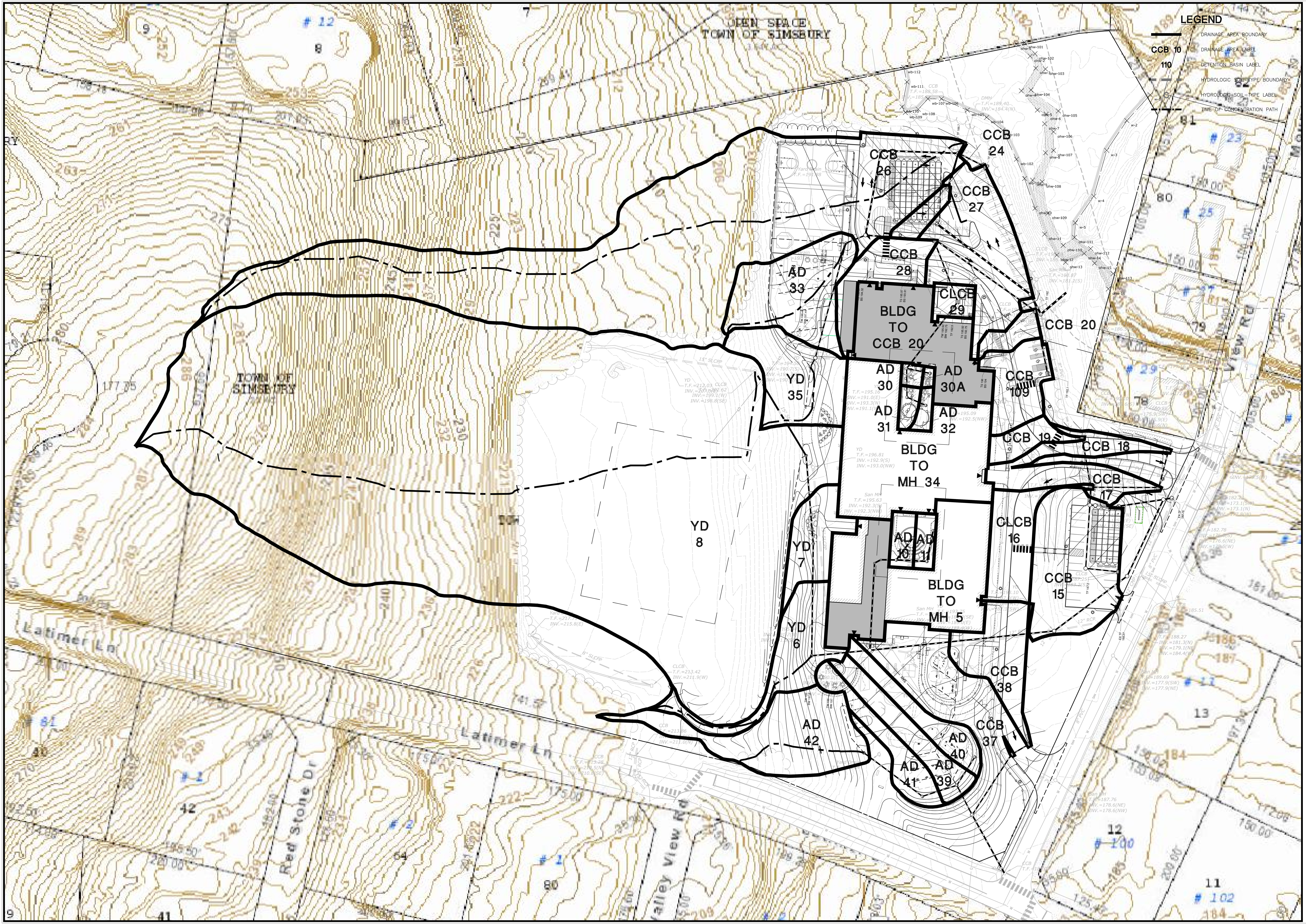
Circular
Diameter (ft) = 1.25

Invert Elev (ft) = 100.00
Slope (%) = 0.60
N-Value = 0.012

Calculations
Compute by: Q vs Depth
No. Increments = 10

Highlighted
Depth (ft) = 1.25
5.01 cfs < Q (cfs) = 5.419
Area (sqft) = 1.23
Velocity (ft/s) = 4.42
Wetted Perim (ft) = 3.93
Crit Depth, Yc (ft) = 0.95
Top Width (ft) = 0.00
EGL (ft) = 1.55





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
REVISIONS	02/14/2022	MCB

DRAINAGE AREA MAP - STORM DRAINAGE SYSTEM

LATIMER LANE SCHOOL

33 MOUNTAIN VIEW DRIVE
SIMSBURY, CONNECTICUT

MCB	AES	MCB
DESIGNED	DRAWN	CHECKED

SCALE 1"=50'

DATE JANUARY 13, 2022

PROJECT NO. 14885.00037

SHEET NO. 1 OF 1

SHEET NAME CB

APPENDIX E

WATER QUALITY COMPUTATIONS

Drainage Report

Latimer Lane School Renovations

33 Mountain View Drive

Simsbury, Connecticut

January 13, 2022

Revised: February 14, 2022

STORMWATER QUALITY CALCULATIONS
Water Quality Volume (WQV)

Basin ID	Post-Development Impervious Area[3.]	Percent Impervious	Volumetric Runoff Coeff., R	Recharge Depth[1.], D (in.)	WQV (ac-ft)	GRV (ac-ft)	Redevelopment Factor	Total Volume Required [2.] (ac-ft)	Total Volume Provided[1.] (ac-ft)
UG 110	2.59	100%	0.95	0.35	0.205	0.076	50%	0.103	***0.107***
UG 210	0.58	100%	0.95	0.35	0.046	0.017	50%	0.023	***0.035***

[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

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

[3.] - Since the site is considered a Redevelopment project under Section 1.2.B.1, water quality treatment and recharge volume is required for 50% of the post-development effective impervious area

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

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

Pond Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Tuesday, 01 / 11 / 2022

Pond No. 2 - UG DET 110

Pond Data

UG Chambers -Invert elev. = 183.45 ft, Rise x Span = 3.75 x 6.42 ft, Barrel Len = 7.17 ft, No. Barrels = 88, Slope = 0.00%, Headers = No
Encasement -Invert elev. = 182.70 ft, Width = 6.42 ft, Height = 5.50 ft, Voids = 40.00%

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (acft)	Total storage (acft)
0.00	182.70	n/a	0.000	0.000
0.55	183.25	n/a	0.020	0.020
1.10	183.80	n/a	0.040	0.060
1.65	184.35	n/a	0.051	0.111
2.20	184.90	n/a	0.050	0.161
2.75	185.45	n/a	0.048	0.208
3.30	186.00	n/a	0.045	0.253
3.85	186.55	n/a	0.041	0.294
4.40	187.10	n/a	0.033	0.327
4.95	187.65	n/a	0.021	0.349
5.50	188.20	n/a	0.020	0.369

WQV provided below rectangular weir crest = 0.107 ac-ft

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 24.00	0.00	0.00	0.00
Span (in)	= 24.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 182.70	0.00	0.00	0.00
Length (ft)	= 25.00	0.00	0.00	0.00
Slope (%)	= 2.80	0.00	0.00	n/a
N-Value	= .012	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 2.75	1.25	0.00	0.00
Crest El. (ft)	= 187.70	184.30	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Rect	Rect	---	---
Multi-Stage	= Yes	Yes	No	No

Exfil.(in/hr) = 0.000 (by Wet area)
TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

Stage / Storage / Discharge Table

Stage ft	Storage acft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0.000	182.70	0.00	---	---	---	0.00	0.00	---	---	---	---	0.000
0.55	0.020	183.25	0.00	---	---	---	0.00	0.00	---	---	---	---	0.000
1.10	0.060	183.80	0.00	---	---	---	0.00	0.00	---	---	---	---	0.000
1.65	0.111	184.35	0.05 ic	---	---	---	0.00	0.05	---	---	---	---	0.047
2.20	0.161	184.90	1.99 ic	---	---	---	0.00	1.93	---	---	---	---	1.935
2.75	0.208	185.45	5.16 ic	---	---	---	0.00	5.13	---	---	---	---	5.133
3.30	0.253	186.00	9.23 ic	---	---	---	0.00	9.23	---	---	---	---	9.226
3.85	0.294	186.55	13.90 ic	---	---	---	0.00	13.87 s	---	---	---	---	13.87
4.40	0.327	187.10	18.19 ic	---	---	---	0.00	18.19 s	---	---	---	---	18.19
4.95	0.349	187.65	22.11 ic	---	---	---	0.00	22.11 s	---	---	---	---	22.11
5.50	0.369	188.20	27.00 ic	---	---	---	3.24	23.77 s	---	---	---	---	27.00

Pond Report

Pond No. 1 - UG DET 210

Pond Data

UG Chambers -Invert elev. = 178.95 ft, Rise x Span = 3.75 x 6.42 ft, Barrel Len = 7.17 ft, No. Barrels = 45, Slope = 0.00%, Headers = No
Encasement -Invert elev. = 178.20 ft, Width = 6.42 ft, Height = 5.50 ft, Voids = 40.00%

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (acft)	Total storage (acft)
0.00	178.20	n/a	0.000	0.000
0.55	178.75	n/a	0.010	0.010
1.10	179.30	n/a	0.020	0.031
1.65	179.85	n/a	0.026	0.057
2.20	180.40	n/a	0.025	0.082
2.75	180.95	n/a	0.024	0.107
3.30	181.50	n/a	0.023	0.129
3.85	182.05	n/a	0.021	0.150
4.40	182.60	n/a	0.017	0.167
4.95	183.15	n/a	0.011	0.178
5.50	183.70	n/a	0.010	0.189

WQV provided
below low-flow
orifice = 0.035 ac-ft

Culvert / Orifice Structures

		[A]	[B]	[C]	[PrfRsr]
Rise (in)	=	15.00	4.00	6.00	0.00
Span (in)	=	15.00	4.00	6.00	0.00
No. Barrels	=	1	1	1	0
Invert El. (ft)	=	178.20	179.40	180.80	0.00
Length (ft)	=	47.00	0.00	0.00	0.00
Slope (%)	=	2.55	0.00	0.00	n/a
N-Value	=	.012	.013	.013	n/a
Orifice Coeff.	=	0.60	0.60	0.60	0.60
Multi-Stage	=	n/a	Yes	Yes	No

Weir Structures

		[A]	[B]	[C]	[D]
Crest Len (ft)	=	3.50	0.50	0.00	0.00
Crest El. (ft)	=	183.30	182.90	0.00	0.00
Weir Coeff.	=	3.33	3.33	3.33	3.33
Weir Type	=	Rect	Rect	---	---
Multi-Stage	=	Yes	Yes	No	No

Exfil.(in/hr) = 0.000 (by Wet area)
TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

Stage / Storage / Discharge Table

Stage ft	Storage acft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0.000	178.20	0.00	0.00	0.00	---	0.00	0.00	---	---	---	---	0.000
0.55	0.010	178.75	0.00	0.00	0.00	---	0.00	0.00	---	---	---	---	0.000
1.10	0.031	179.30	0.00	0.00	0.00	---	0.00	0.00	---	---	---	---	0.000
1.65	0.057	179.85	0.23 ic	0.22 ic	0.00	---	0.00	0.00	---	---	---	---	0.224
2.20	0.082	180.40	0.39 ic	0.38 ic	0.00	---	0.00	0.00	---	---	---	---	0.384
2.75	0.107	180.95	0.56 ic	0.49 ic	0.07 ic	---	0.00	0.00	---	---	---	---	0.560
3.30	0.129	181.50	1.25 ic	0.58 ic	0.63 ic	---	0.00	0.00	---	---	---	---	1.218
3.85	0.150	182.05	1.64 ic	0.66 ic	0.95 ic	---	0.00	0.00	---	---	---	---	1.607
4.40	0.167	182.60	1.92 ic	0.73 ic	1.18 ic	---	0.00	0.00	---	---	---	---	1.909
4.95	0.178	183.15	2.37 ic	0.80 ic	1.37 ic	---	0.00	0.21	---	---	---	---	2.373
5.50	0.189	183.70	6.48 ic	0.80 ic	1.54 ic	---	2.95	1.19	---	---	---	---	6.484

	SLR Consulting	Project	**14885.00037**
	COMPUTATION SHEET - WATER QUALITY FLOW (WQF)	Made By:	MCB
Subject:	**Latimer Lane School**	Date:	Rev. 2/14/2022
		Chkd by:	
		Date:	

CDS Unit - MH 29

Contributing Basins			Imperv. Area (acres)	Total Area (acres)
Total			2.59	4.85

Table 4.1: WQV = (P)(R_v)(A)/12 = 0.214 acre-feet

Where:

I = % of Impervious Cover = 53%

R_v = volumetric runoff coeff. 0.05 + 0.009(I) = 0.531

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

A = site area (acres) = 4.85 acres = 0.0076 miles^2

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

Q = 0.531

CN = 1000 / [10+ 5P + 10Q -10(Q^2 + 1.25QP)$^{0.5}$] = 94

Where:

Q = runoff depth (in watershed inches)

t_c = 0.265 hours

Type III Rainfall Distribution:

From Table 4-1, Ia = 0.128 Ia/P = 0.128

(TR-55)

From Exhibit 4-III, q_u = 480 csm/in.

(TR-55)

WQF = (qu)(A)(Q) = 1.93 cfs **Cascade CS-4 Flow = 2.0 --> OK**

	SLR Consulting	Project	**14885.00037**
	COMPUTATION SHEET - WATER QUALITY FLOW (WQF)	Made By:	MCB
Subject:	**Latimer Lane School**	Date:	1/5/2022
		Chkd by:	
		Date:	

CDS Unit - MH 3

Contributing Basins	Imperv. Area (acres)	Total Area (acres)
Total	0.58	0.97

Table 4.1: WQV = (P)(R_v)(A)/12 = 0.048 acre-feet

Where:

I = % of Impervious Cover = 60%

R_v = volumetric runoff coeff. 0.05 + 0.009(I) = 0.588

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

A = site area (acres) = 0.97 acres = 0.0015 miles^2

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

Q = 0.588

CN = 1000 / [10+ 5P + 10Q -10(Q^2 + 1.25QP)$^{0.5}$] = 95

Where:

Q = runoff depth (in watershed inches)

t_c = 0.1 hours

Type III Rainfall Distribution:

From Table 4-1, Ia = 0.105 Ia/P = 0.105

(TR-55)

From Exhibit 4-III, q_u = 650 csm/in.

(TR-55)

WQF = (qu)(A)(Q) = 0.58 cfs **CDS 2015-4-C Flow = 1.4 --> OK**

MH 29

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.

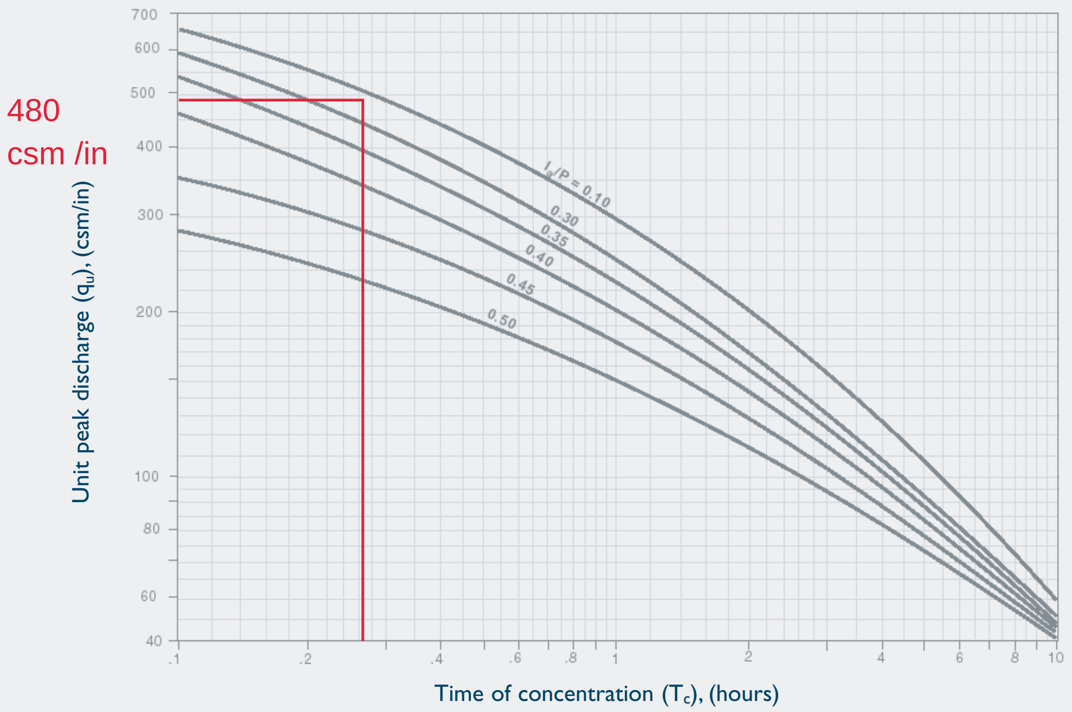
   - *Read initial abstraction (I_a) from Table 4-1 in Chapter 4 of TR-55 (reproduced below); compute I_a/P*

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



MH 3

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*

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46	2.348	61	1.279	76	0.632	91	0.198
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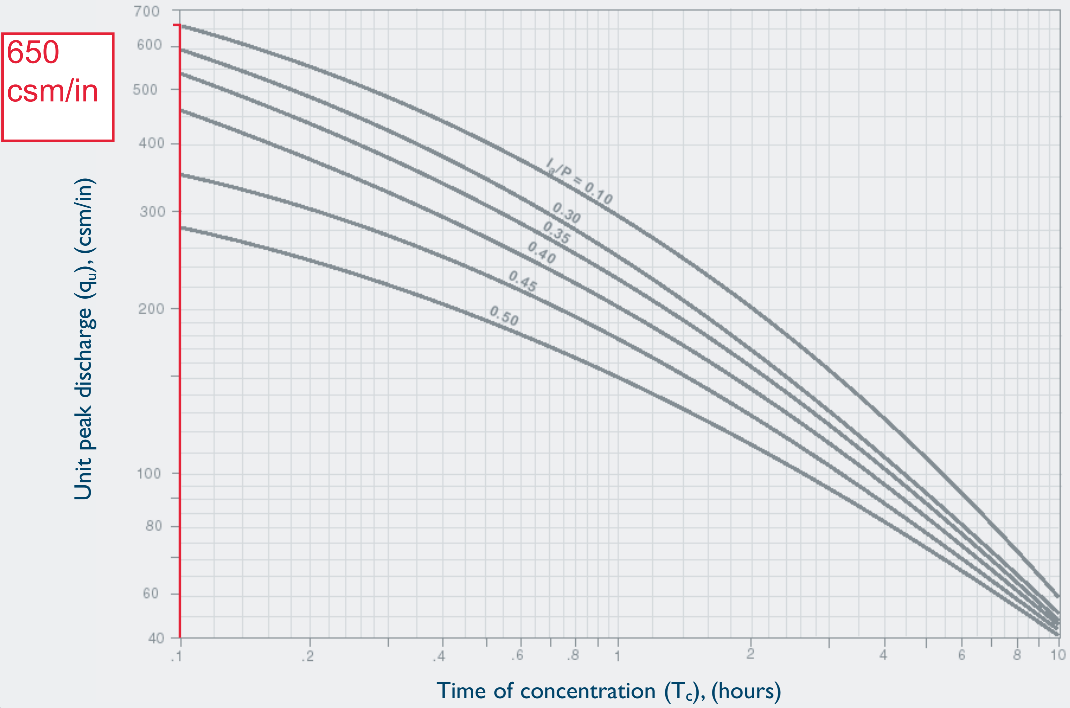
48	2.167	63	1.175	78	0.564	93	0.151
49	2.082	64	1.125	79	0.532	94	0.128
50	2.000	65	1.077	80	0.500	95	0.105
51	1.922	66	1.030	81	0.469	96	0.083
52	1.846	67	0.985	82	0.439	97	0.062
53	1.774	68	0.941	83	0.410	98	0.041
54	1.704	69	0.899	84	0.381		

   - *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



650 csm/in

Product Flow Rates

CASCADE

MH 29

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

MH 3

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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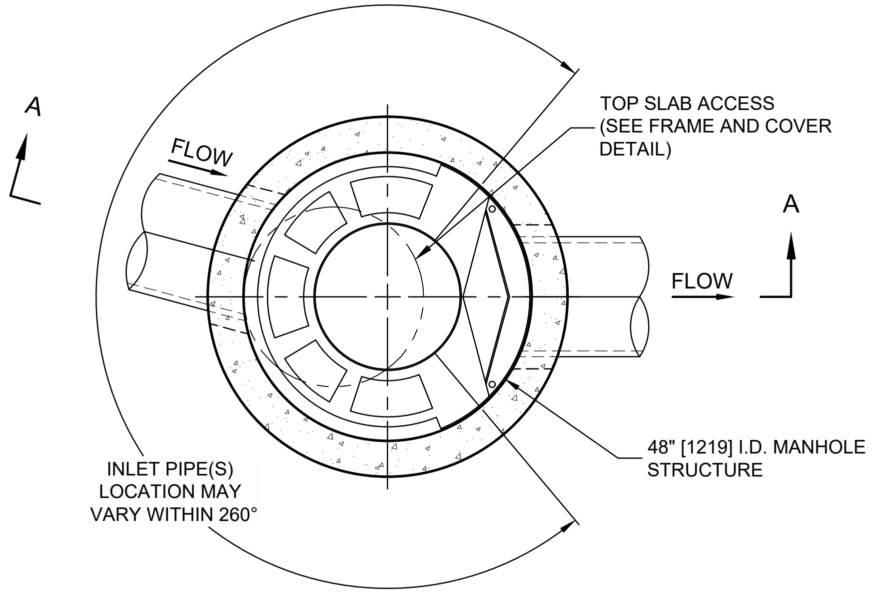
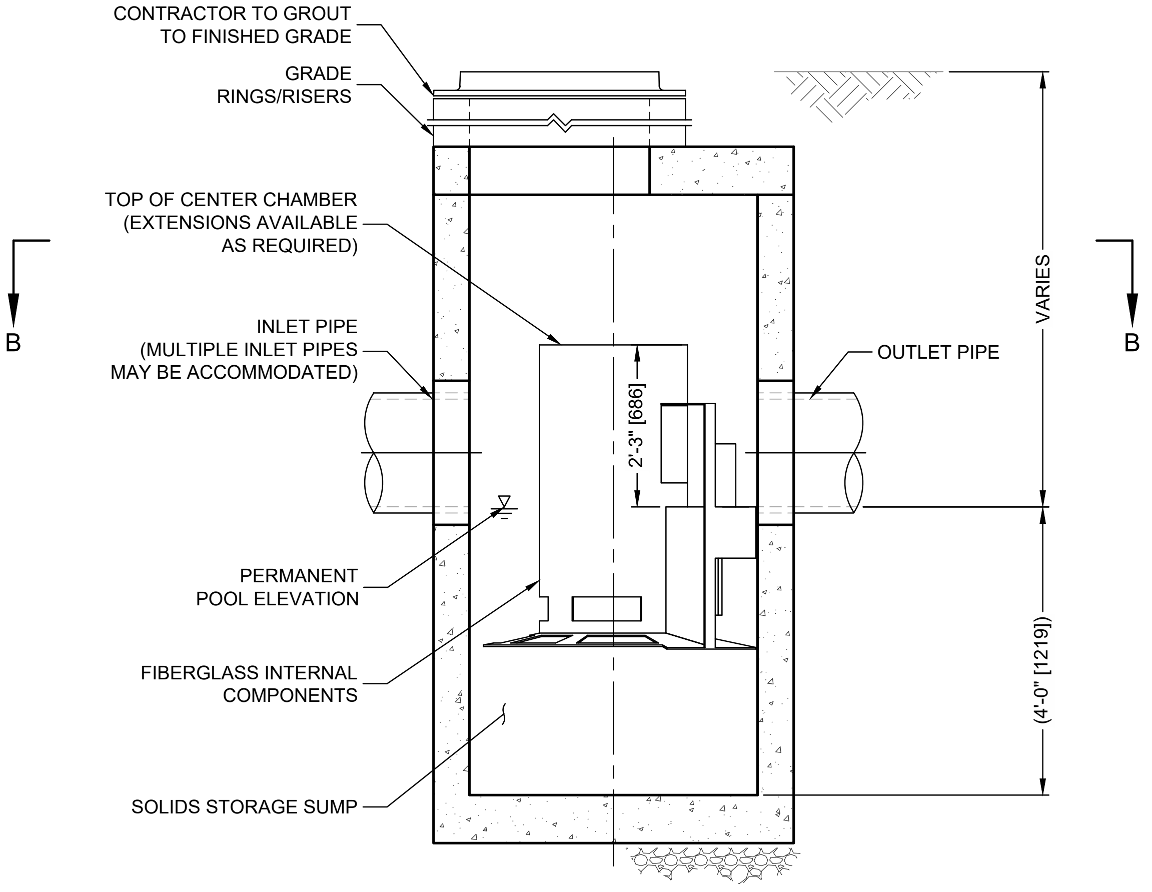
Revision 10/19



PLAN VIEW B-B

NOT TO SCALE



ELEVATION A-A

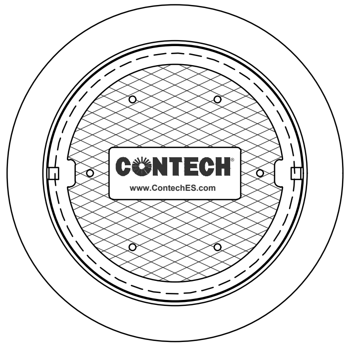
NOT TO SCALE

CASCADE
separator™

CASCADE SEPARATOR DESIGN NOTES

THE STANDARD CS-4 CONFIGURATION IS SHOWN. ALTERNATE CONFIGURATIONS ARE AVAILABLE AND ARE LISTED BELOW. SOME CONFIGURATIONS MAY BE COMBINED TO SUIT SITE REQUIREMENTS.

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



FRAME AND COVER

(DIAMETER VARIES)
NOT TO SCALE

SITE SPECIFIC DATA REQUIREMENTS

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

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

NOTES / SPECIAL REQUIREMENTS:

GENERAL NOTES

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

INSTALLATION NOTES

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

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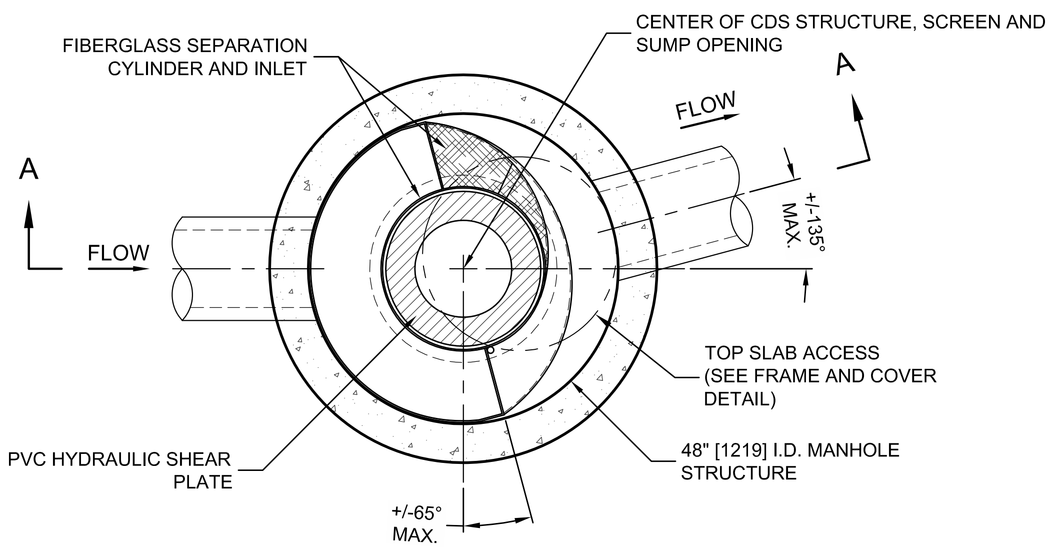
800-338-1122 513-645-7000 513-645-7993 FAX

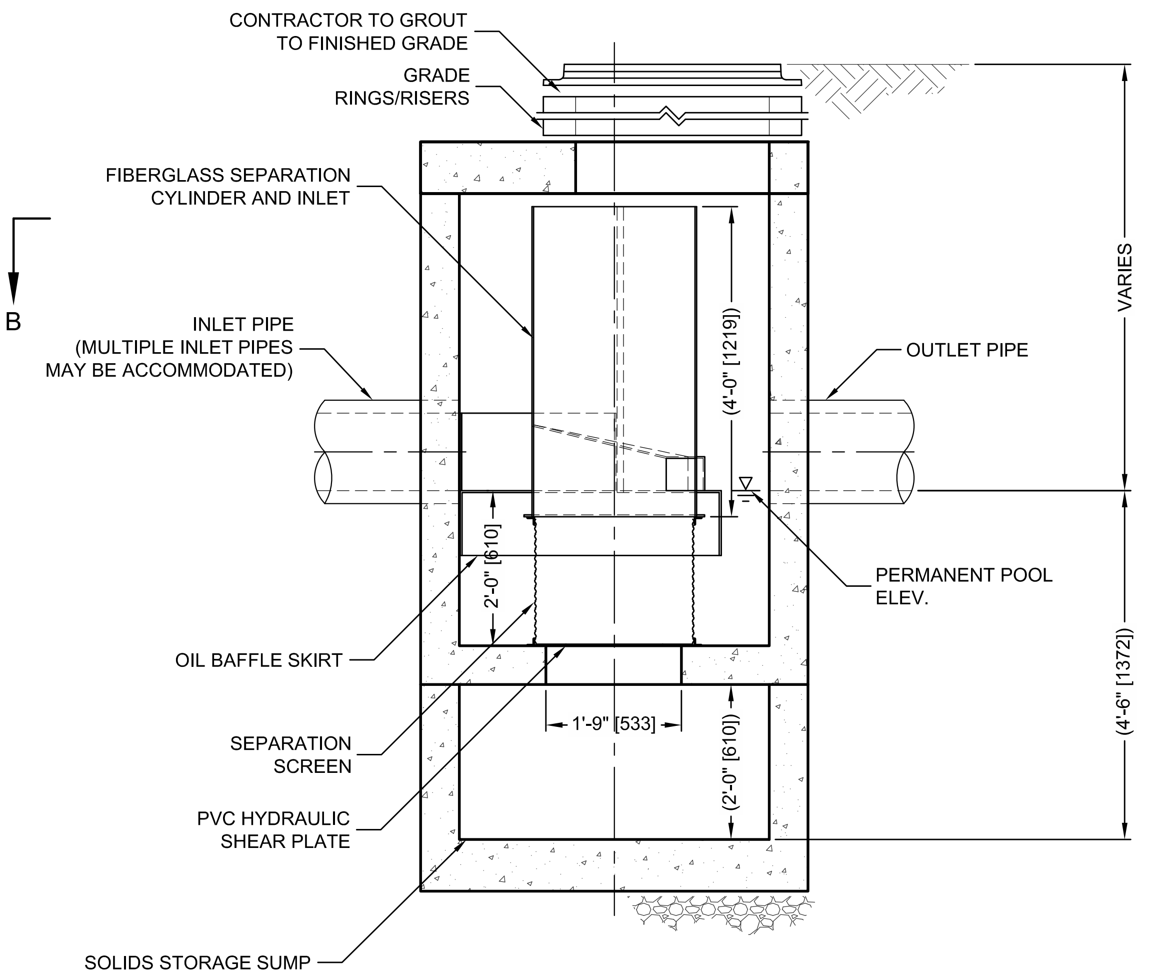
CS-4
CASCADE SEPARATOR
STANDARD DETAIL

I:\COMMON\CAD\TREATMENT\21 CASCADE\40 STANDARD DRAWINGS\DWG\CS-4-DTL.DWG 1/22/2019 9:34 AM



PLAN VIEW B-B

N.T.S.



ELEVATION A-A

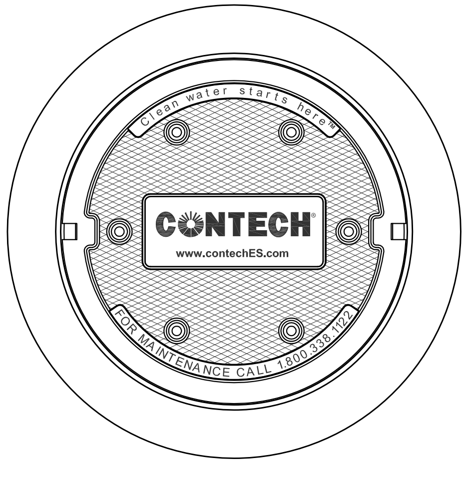
N.T.S.

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.

CDS2015-4-C DESIGN NOTES

THE STANDARD CDS2015-4-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.

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Cascade Separator™ Inspection and Maintenance Guide

CASCADE
separator™

Maintenance

The Cascade Separator™ system should be inspected at regular intervals and maintained when necessary to ensure optimum performance. The rate at which the system collects sediment and debris will depend upon on-site activities and site pollutant characteristics. For example, unstable soils or heavy winter sanding will cause the sediment storage sump 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 (i.e. spring and fall). However, more frequent inspections may be necessary in climates where winter sanding operations may lead to rapid accumulations, or in equipment wash-down areas. Installations should also be inspected more frequently where excessive amounts of trash are expected.

A visual inspection should ascertain that the system components are in working order and that there are no blockages or obstructions in the inlet chamber, flumes or outlet channel. 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 in this Inspection and Maintenance Guide.

Access to the Cascade Separator unit is typically achieved through one manhole access cover. The opening allows for inspection and cleanout of the center chamber (cylinder) and sediment storage sump, as well as inspection of the inlet chamber and slanted skirt. For large units, multiple manhole covers allow access to the chambers and sump.

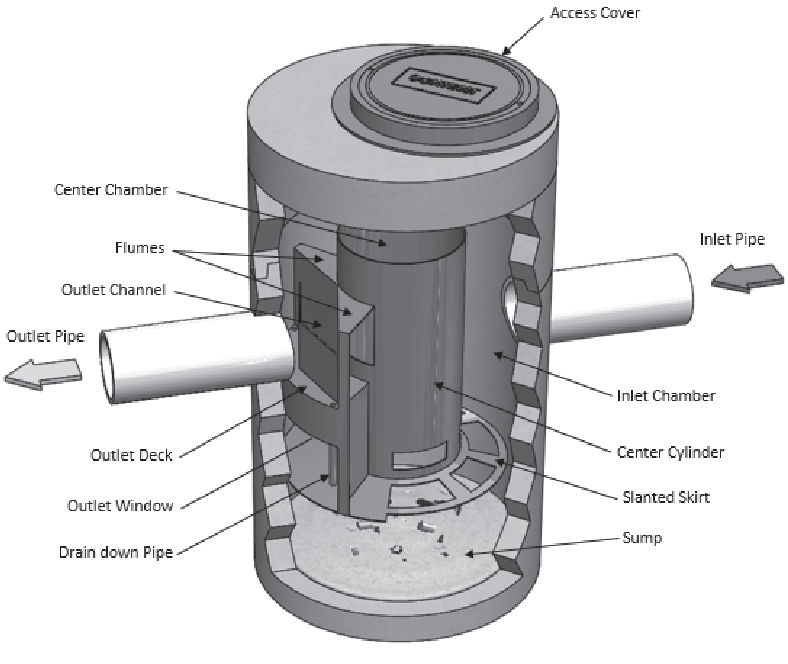
The Cascade Separator system should be cleaned before the level of sediment in the sump reaches the maximum sediment depth and/or when an appreciable level of hydrocarbons and trash has accumulated. If sorbent material is used, it must be replaced when significant discoloration has occurred. Performance may be impacted when maximum sediment storage capacity is exceeded. Contech recommends maintaining the system when sediment level reaches 50% of maximum storage volume. The level of sediment is easily determined by measuring the distance from the system outlet invert (standing water level) 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. Finer, silty particles at the top of the pile typically offer less resistance to the end of the rod than larger particles toward the bottom of the pile. Once this measurement is recorded, it should be compared to the chart in this document to determine if the height of the sediment pile off the bottom of the sump floor exceeds 50% of the maximum sediment storage.

Cleaning

Cleaning of a Cascade Separator system 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 cover and insert the vacuum tube down through the center chamber and into the sump. The system should be completely drained down and the sump fully evacuated of sediment. The areas outside the center chamber and the slanted skirt should also be washed off if pollutant build-up exists in these areas.

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. Then the system should be power washed 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 to ensure proper safety precautions. Confined space entry procedures need to be followed if physical access is required. Disposal of all material removed from the Cascade Separator system must be done in accordance with local regulations. In many locations, disposal of evacuated sediments may be handled in the same manner as disposal of sediments removed from catch basins or deep sump manholes. Check your local regulations for specific requirements on disposal. If any components are damaged, replacement parts can be ordered from the manufacturer.



Cascade Separator™ Maintenance Indicators and Sediment Storage Capacities

Model Number	Diameter		Distance from Water Surface to Top of Sediment Pile		Sediment Storage Capacity	
	ft	m	ft	m	y^3	m^3
CS-4	4	1.2	1.5	0.5	0.7	0.5
CS-5	5	1.3	1.5	0.5	1.1	0.8
CS-6	6	1.8	1.5	0.5	1.6	1.2
CS-8	8	2.4	1.5	0.5	2.8	2.1
CS-10	10	3.0	1.5	0.5	4.4	3.3
CS-12	12	3.6	1.5	0.5	6.3	4.8

Note: The information in the chart is for standard units. Units may have been designed with non-standard sediment storage depth.

A Cascade Separator unit can be easily cleaned in less than 30 minutes.

A vacuum truck excavates pollutants from the systems.

Cascade Separator™ Inspection & Maintenance Log

Cascade Model:

Location:

Date	Depth Below Invert to Top of Sediment[1]	Floatable Layer Thickness[2]	Describe Maintenance Performed	Maintenance Personnel	Comments

1. The depth to sediment is determined by taking a measurement from the manhole outlet invert (standing water level) to the top of the sediment pile. Once this measurement is recorded, it should be compared to the chart in the maintenance guide to determine if the height of the sediment pile off the bottom of the sump floor exceeds 50% of the maximum sediment storage. 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.

Contech Engineered Solutions LLC provides site solutions for the civil engineering industry. Contech's portfolio includes bridges, drainage, sanitary sewer, stormwater, and earth stabilization products. For information, visit www.ContechES.com or call 800.338.1122

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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.

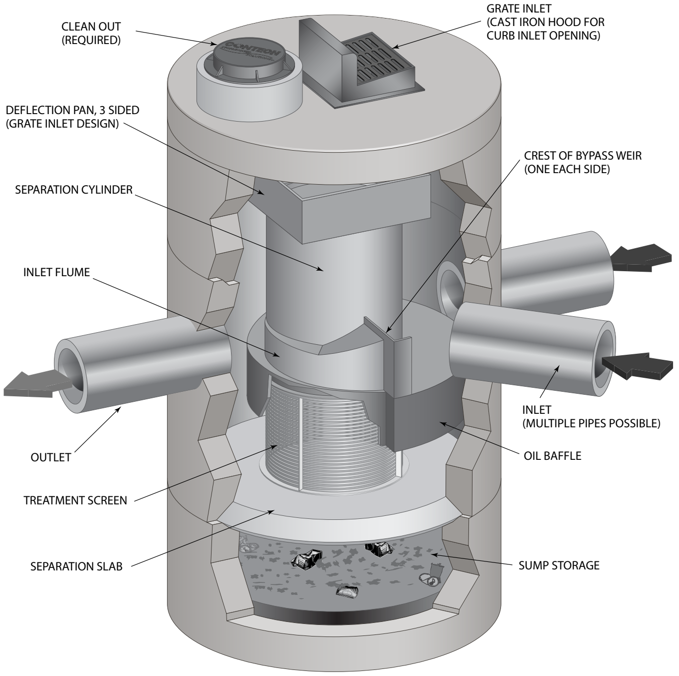
Operation Overview

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.

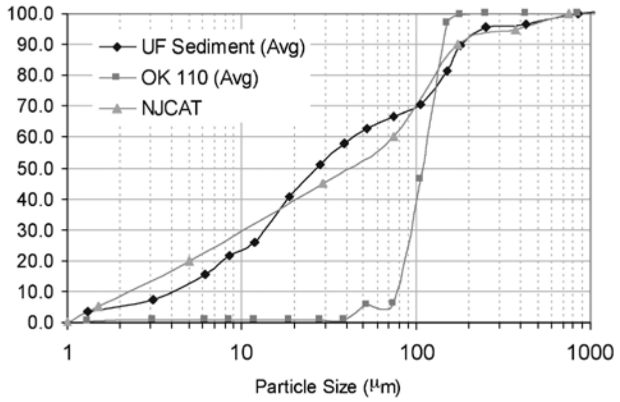


Figure 1. Particle size distributions

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.

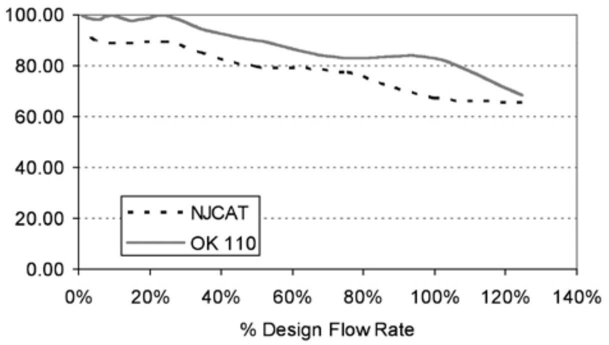


Figure 2. CDS stormwater treatment predictive performance for various particle gradations as a function of operating rate.

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).

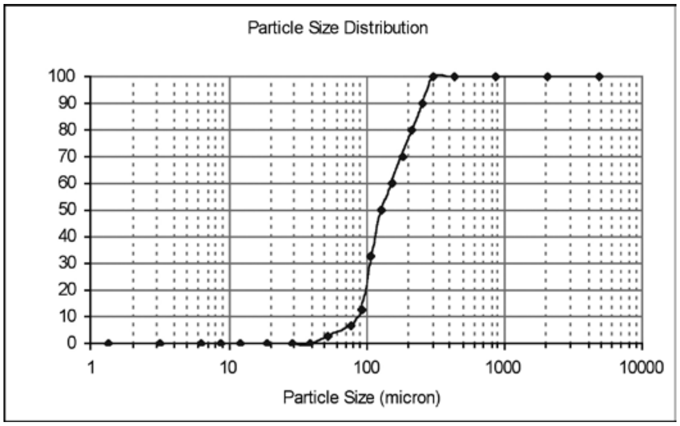


Figure 3. WASDOE PSD

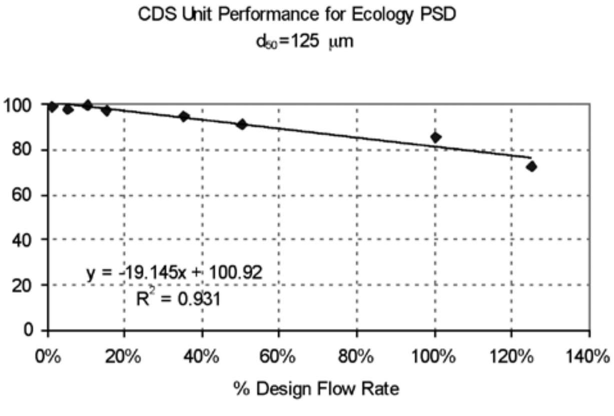


Figure 4. Modeled performance for WASDOE PSD.

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.

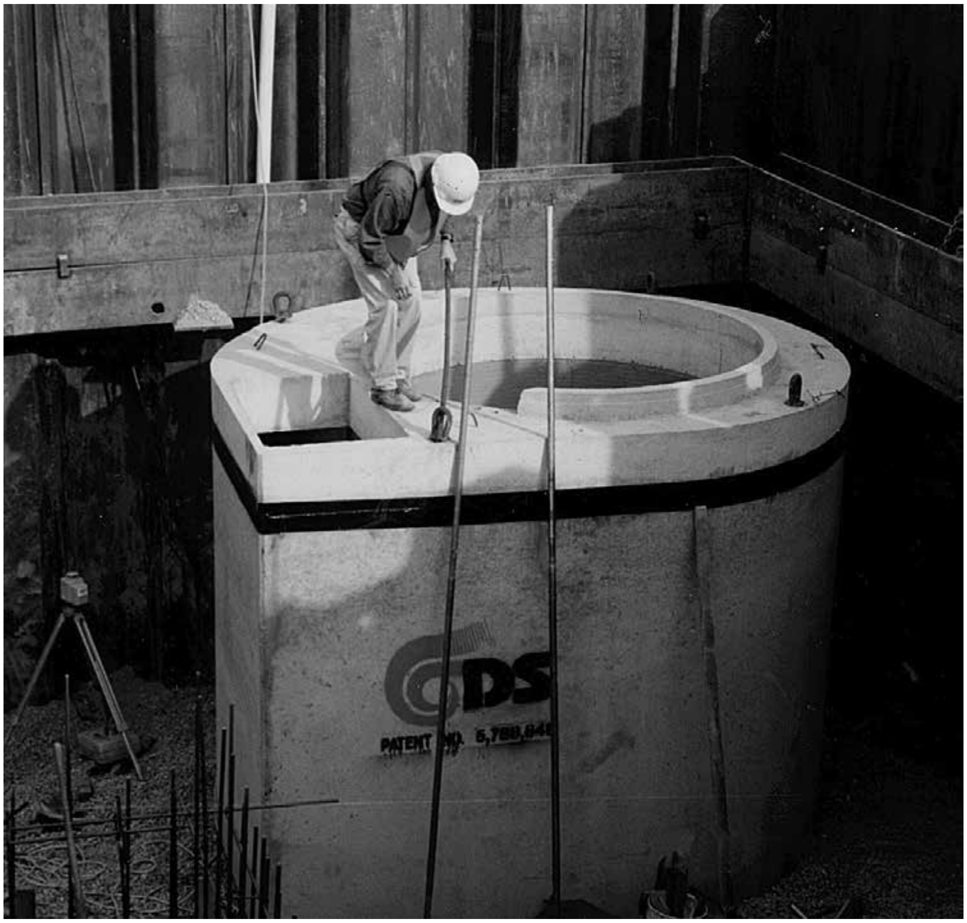
In installations where the risk of petroleum spills is small, liquid contaminants may not accumulate as quickly as sediment. However, the system should be cleaned out immediately in the event of an oil or gasoline spill. Motor oil and other hydrocarbons that accumulate on a more routine basis should 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	y^3	m^3
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

APPENDIX F

HYDROLOGIC ANALYSIS – INPUT COMPUTATIONS

Drainage Report

Latimer Lane School Renovations

33 Mountain View Drive

Simsbury, Connecticut

January 13, 2022

Revised: February 14, 2022

Curve Number Calculations

Project: Latimer Lane School
Location: 33 Mountain View Drive
Simsbury, Connecticut
By: AES Date: 11/15/21 Checked: MCB Date: 11/16/21
Circle one: [✓ Present] Developed Watershed: EX WS10

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		
A Soil	Open Space - Good Condition	39			0.31	12.00
B Soil	Open Space - Good Condition	61			0.68	41.74
C Soil	Woods - Good Condition	70			2.17	152.07
C Soil	Open Space - Good Condition	74			0.84	61.81
D Soil	Woods - Good Condition	77			1.57	120.70
D Soil	Open Space - Good Condition	80			0.19	15.57
N/A	Paved/Impervious	98			1.31	128.34
N/A	Existing Building	98			0.61	60.22
				Totals =	7.69	592.45

(0.01201 sq mi)

CN (weighted) = $\frac{\text{total product}}{\text{total area}}$ = $\frac{592.45}{7.69}$ Use CN = 77

Curve Number Calculations

Project: Latimer Lane School
Location: 33 Mountain View Drive
Simsbury, Connecticut
By: AES Date: 11/15/21 Checked: MCB Date: 11/16/21
Circle one: [✓ ***Present***] Developed Watershed: EX WS20

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	Open Space - Good Condition	61			0.92	55.93
C Soil	Woods - Good Condition	70			1.25	87.24
C Soil	Open Space - Good Condition	74			2.95	217.94
D Soil	Woods - Good Condition	77			2.05	157.78
N/A	Paved/Impervious	98			0.71	69.33
N/A	Existing Building	98			0.43	41.89
				Totals =	8.29	630.12

(0.01296 sq mi)

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{630.12}{8.29} \qquad \text{Use CN} = \boxed{76}$$

Curve Number Calculations

Project: Latimer Lane School
Location: 33 Mountain View Drive
Simsbury, Connecticut
By: AES Date: 11/15/21 Checked: MCB Date: 11/16/21
Circle one: [✓ ***Present***] Developed Watershed: EX WS30

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	Open Space - Good Condition	61			0.25	15.08
C Soil	Woods - Good Condition	70			0.02	1.64
C Soil	Open Space - Good Condition	74			1.81	134.28
N/A	Paved/Impervious	98			0.63	61.31
				Totals =	2.71	212.31

(0.00424 sq mi)

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{212.31}{2.71}$$

Use CN = 78

Curve Number Calculations

Project: Latimer Lane School
Location: 33 Mountain View Drive
Simsbury, Connecticut
By: AES Date: 11/15/21 Checked: MCB Date: 11/16/21
Circle one: [✓ ***Present***] Developed Watershed: EX WS40

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			0.15	8.10
C Soil	Woods - Good Condition	70			0.76	53.05
C Soil	Open Space - Good Condition	74			0.28	21.01
D Soil	Woods - Good Condition	77			1.35	104.01
					Totals = 2.54	186.17

(0.00397 sq mi)

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{186.17}{2.54}$$

Use CN = 73

Curve Number Calculations

Project: Latimer Lane School
Location: 33 Mountain View Drive
Simsbury, Connecticut
By: AES Date: 1/6/22 Checked: MCB Date: 1/11/22
Circle one: Present [✓ Developed] Watershed: PR WS10

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. %	
A Soil	Open Space - Good Condition	39			0.31	12.06
B Soil	Open Space - Good Condition	61			0.01	0.66
C Soil	Woods - Good Condition	70			1.00	69.87
C Soil	Open Space - Good Condition	74			0.16	11.77
D Soil	Woods - Good Condition	77			1.13	87.05
D Soil	Open Space - Good Condition	80			0.19	15.57
N/A	Paved/Impervious	98			0.01	0.54
				Totals =	2.81	197.51

(0.00439 sq mi)

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{197.51}{2.81}$$

Use CN = 70

Curve Number Calculations

Project: Latimer Lane School
Location: 33 Mountain View Drive
Simsbury, Connecticut
By: AES Date: 1/6/22 Checked: MCB Date: 1/11/22
Circle one: Present [✓ ***Developed***] Watershed: PR WS11

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**		
A Soil	Open Space - Good Condition	39			0.00	0.00
B Soil	Open Space - Good Condition	61			0.20	11.92
C Soil	Woods - Good Condition	70			1.18	82.28
C Soil	Open Space - Good Condition	74			0.46	34.08
D Soil	Woods - Good Condition	77			0.44	33.65
D Soil	Open Space - Good Condition	80			0.00	0.00
N/A	Paved/Impervious	98			1.61	157.88
N/A	Building	98			0.98	95.56
					Totals = 4.85	415.37

(0.00759 sq mi)

CN (weighted) = $\frac{\text{total product}}{\text{total area}}$ = $\frac{415.37}{4.85}$ Use CN = 86

Curve Number Calculations

Project: Latimer Lane School
Location: 33 Mountain View Drive
Simsbury, Connecticut
By: AES Date: 12/1/21 Checked: MCB Date: 1/11/22
Circle one: Present [✓ Developed] Watershed: PR WS20

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	Open Space - Good Condition	61			0.25	15.18
C Soil	Woods - Good Condition	70			1.25	87.36
C Soil	Open Space - Good Condition	74			3.18	235.15
D Soil	Woods - Good Condition	77			2.05	157.78
N/A	Paved/Impervious	98			0.32	31.30
N/A	Building	98			0.58	57.12
				Totals =	7.63	583.89
				(	0.01192	sq mi)

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{583.89}{7.63}$$

Use CN = 77

Curve Number Calculations

Project: Latimer Lane School
Location: 33 Mountain View Drive
Simsbury, Connecticut
By: AES Date: 12/1/21 Checked: MCB Date: 1/11/22
Circle one: Present [✓ ***Developed***] Watershed: PR WS21

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			0.32	19.54
N/A	Paved/Impervious	98			0.58	56.60
N/A	Building	98			0.00	0.00
					Totals = 0.90	76.14

(0.00140 sq mi)

CN (weighted) = $\frac{\text{total product}}{\text{total area}}$ = $\frac{76.14}{0.90}$ Use CN = 85

Curve Number Calculations

Project: Latimer Lane School
Location: 33 Mountain View Drive
Simsbury, Connecticut
By: AES Date: 12/1/21 Checked: MCB Date: 1/11/22
Circle one: Present [✓ Developed] Watershed: PR WS30

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			0.24	14.90
C Soil	Woods - Good Condition	70			0.02	1.66
C Soil	Open Space - Good Condition	74			1.54	114.27
N/A	Paved/Impervious	98			0.69	67.68
				Totals =	2.50	198.50

(0.00391 sq mi)

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{198.50}{2.50}$$

Use CN = 79

Curve Number Calculations

Project: Latimer Lane School
Location: 33 Mountain View Drive
Simsbury, Connecticut
By: AES Date: 12/1/21 Checked: MCB Date: 1/11/22
Circle one: Present [✓ ***Developed***] Watershed: PR WS40

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			0.15	8.10
C Soil	Woods - Good Condition	70			0.76	53.05
C Soil	Open Space - Good Condition	74			0.28	20.98
D Soil	Woods - Good Condition	77			1.35	104.01
NA	Paved/Impervious	98			0.00	0.04
				Totals =	2.54	186.18

(0.00397 sq mi)

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{186.18}{2.54}$$

Use CN = 73

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

Project: Latimer Lane School
By: AES
Date: 11/15/21
Location: Simsbury, Connecticut
Checked: MCB
Date: 11/16/21
Circle one: [✓ Present] Developed
Watershed: EX WS10
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.	100.0		
4. Two-year 24-hr rainfall, P_2	in.	3.36		
5. Land slope, s	ft./ft.	0.090		
6. $T_t = \frac{0.007(nL)^{0.8}}{P_2^{0.5}(s^{0.4})}$	hr.	0.191	=	0.191

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

Segment ID		B-C		C-D		D-E				
7. Surface description		WOODS		GRASS		BIT				
8. Manning's roughness coeff., n		0.100		0.080		0.010				
9. Paved or unpaved		UNPVD		UNPVD		PVD				
10. Depth of flow, d (default values: d=.4 unpaved, d=.2 paved)	ft.	0.40		0.40		0.20				
11. Flow Length, L	ft.	628.0		28.0		247.0				
12. Watercourse slope, s	ft./ft.	0.118		0.196		0.026				
13. Average velocity, $V = \frac{1.49}{n}(d^{\frac{2}{3}})(s^{\frac{1}{2}})$	fps.	2.78		4.48		8.27				
14. $T_t = \frac{L}{3600 * V}$	hr.	0.063	+	0.002	+	0.008	+		=	0.073

Channel flow

Segment ID		E-F								
15. Channel Bottom width, b	ft.	12" CMP								
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)	$ft.^2$	0.79								
19. Wetted perimeter, P_w	ft.	3.14								
20. Hydraulic Radius, $R = \frac{A}{P_w}$	ft.	0.25								
21. Channel slope, s	ft./ft.	0.054								
22. Manning's roughness coeff., n		0.024								
23. $V = \frac{1.49}{n}(R^{\frac{2}{3}})(s^{\frac{1}{2}})$	fps.	5.73								
24. Flow length, L	ft.	74.0								
25. $T_t = \frac{L}{3600 * V}$	hr.	0.004	+						=	0.004

26. Watershed or subarea T_c or T_t (add T_t in steps 6, 14 & 25) hr. 0.264

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

Project: Latimer Lane School
By: AES
Date: 11/15/21
Location: Simsbury, Connecticut
Checked: MCB
Date: 11/16/21
Circle one: [✓ Present] Developed
Watershed: EX WS20
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.	100.0		
4. Two-year 24-hr rainfall, P_2	in.	3.36		
5. Land slope, s	ft./ft.	0.065		
6. $T_t = \frac{0.007(nL)^{0.8}}{P_2^{0.5}(s^{0.4})}$	hr.	0.218	=	0.218

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

	Segment ID	B-C		C-D				
7. Surface description		WOODS		GRASS				
8. Manning's roughness coeff., n		0.100		0.080				
9. Paved or unpaved		UNPVD		UNPVD				
10. Depth of flow, d (default values: d=.4 unpaved, d=.2 paved)	ft.	0.40		0.40				
11. Flow Length, L	ft.	394.0		396.0				
12. Watercourse slope, s	ft./ft.	0.160		0.042				
13. Average velocity, $V = \frac{1.49}{n}(d^{2/3})(s^{1/2})$	fps.	3.23		2.06				
14. $T_t = \frac{L}{3600 * V}$	hr.	0.034	+	0.053			=	0.087

Channel flow

	Segment ID	D-E		E-F				
15. Channel Bottom width, b	ft.	15" HDPE		12" RCP				
16. Horizontal side slope component, z (z horiz:1 vert)	ft.	--		--				
17. Depth of flow, d	ft.	FULL		FULL				
18. Cross sectional flow area, A (assume trapazoidal)	ft.^{2}	1.23		0.79				
19. Wetted perimeter, P_w	ft.	3.93		4.71				
20. Hydraulic Radius, $R = \frac{A}{P_w}$	ft.	0.31		0.17				
21. Channel slope, s	ft./ft.	0.022		0.0346				
22. Manning's roughness coeff., n		0.012		0.013				
23. $V = \frac{1.49}{n}(R^{2/3})(s^{1/2})$	fps.	8.56		6.46				
24. Flow length, L	ft.	384.0		318.0				
25. $T_t = \frac{L}{3600 * V}$	hr.	0.012		0.014			=	0.026
26. Watershed or subarea T_c or T_t (add T_t in steps 6, 14 & 25)							hr.	0.331

SLR

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

Project: Latimer Lane School
By: AES
Date: 11/15/21
Location: Simsbury, Connecticut
Checked:
Date:
Circle one: [✓ Present] Developed
Watershed: EX WS30
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.	55.0	
4. Two-year 24-hr rainfall, P_2		in.	3.36	
5. Land slope, s		ft./ft.	0.045	
6. $T_t = \frac{0.007(nL)^{0.8}}{P_2^{0.5}(s^{0.4})}$		hr.	0.156	= 0.156

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

	Segment ID		**B-C**	**C-D**	**D-E**		
7. Surface description			GRASS	BIT	GRASS		
8. Manning's roughness coeff., n			0.080	0.010	0.080		
9. Paved or unpaved			UNPVD	PVD	UNPVD		
10. Depth of flow, d (default values: d=.4 unpaved, d=.2 paved)		ft.	0.40	0.20	0.40		
11. Flow Length, L		ft.	589.0	31.0	13.0		
12. Watercourse slope, s		ft./ft.	0.049	0.032	0.038		
13. Average velocity, $V = \frac{1.49}{n}(d^{2/3})(s^{1/2})$		fps.	2.24	9.15	1.98		
14. $T_t = \frac{L}{3600 * V}$		hr.	0.073	+ 0.001	+ 0.002		= 0.076

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.	0.232

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

Project: Latimer Lane School
By: AES
Date: 11/15/21
Location: Simsbury, Connecticut
Checked: MCB
Date: 11/16/21
Circle one: [✓ ***Present***] Developed
Watershed: EX WS40
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.	100.0		
4. Two-year 24-hr rainfall, P_2	in.	3.36		
5. Land slope, s	ft./ft.	0.085		
6. $T_t = \frac{0.007(nL)^{0.8}}{P_2^{0.5}(s^{0.4})}$	hr.	0.196	=	0.196

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

Segment ID		**B-C**		**C-D**				
7. Surface description		WOODS		GRASS				
8. Manning's roughness coeff., n		0.080		0.011				
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.	624.0		70.0				
12. Watercourse slope, s	ft./ft.	0.104		0.051				
13. Average velocity, $V = \frac{1.49}{n}(d^{2/3})(s^{1/2})$	fps.	3.26		10.48				
14. $T_t = \frac{L}{3600 * V}$	hr.	0.053	+	0.002			=	0.055

Channel flow

Segment ID		**D-E**					
15. Channel Bottom width, b	ft.	15" RCP					
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.	3.93					
20. Hydraulic Radius, $R = \frac{A}{P_w}$	ft.	0.31					
21. Channel slope, s	ft./ft.	0.011					
22. Manning's roughness coeff., n		0.013					
23. $V = \frac{1.49}{n}(R^{2/3})(s^{1/2})$	fps.	5.50					
24. Flow length, L	ft.	92.0					
25. $T_t = \frac{L}{3600 * V}$	hr.	0.005				=	0.005
26. Watershed or subarea T_c or T_t (add T_t in steps 6, 14 & 25)	hr.						0.255

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

Project: Latimer Lane School
By: AES
Date: 01/06/22
Location: Simsbury, Connecticut
Checked: MCB
Date: 01/06/22
Circle one: Present [✓ Developed]
Watershed: PR WS10
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.	100.0		
4. Two-year 24-hr rainfall, P_2	in.	3.36		
5. Land slope, s	ft./ft.	0.090		
6. $T_t = \frac{0.007(nL)^{0.8}}{P_2^{0.5}(s^{0.4})}$	hr.	0.191	=	0.191

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.	891.0						
12. Watercourse slope, s	ft./ft.	0.083						
13. Average velocity, $V = \frac{1.49}{n}(d^{2/3})(s^{1/2})$	fps.	2.33						
14. $T_t = \frac{L}{3600 * V}$	hr.	0.106			+		=	0.106

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.						0.298

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

Project: Latimer Lane School
By: AES
Date: Rev. 2/14/22
Location: Simsbury, Connecticut
Checked: MCB
Date: 02/14/22
Circle one: Present [✓ Developed]
Watershed: PR WS11
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.	100.0		
4. Two-year 24-hr rainfall, P_2	in.	3.36		
5. Land slope, s	ft./ft.	0.090		
6. $T_t = \frac{0.007(nL)^{0.8}}{P_2^{0.5}(s^{0.4})}$	hr.	0.191	=	0.191

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

Segment ID		B-C		C-D		D-E				
7. Surface description		WOODS		GRASS		BIT				
8. Manning's roughness coeff., n		0.100		0.080		0.010				
9. Paved or unpaved		UNPVD		UNPVD		PVD				
10. Depth of flow, d (default values: d=.4 unpaved, d=.2 paved)	ft.	0.40		0.40		0.20				
11. Flow Length, L	ft.	628.0		28.0		259.0				
12. Watercourse slope, s	ft./ft.	0.118		0.196		0.025				
13. Average velocity, $V = \frac{1.49}{n}(d^{\frac{2}{3}})(s^{\frac{1}{2}})$	fps.	2.78		4.48		8.07				
14. $T_t = \frac{L}{3600 * V}$	hr.	0.063	+	0.002	+	0.009	+		=	0.073

Channel flow

Segment ID		E-F		F-G		G-H				
15. Channel Bottom width, b	ft.	12" HDPE		18" HDPE		24" HDPE				
16. Horizontal side slope component, z (z horiz:1 vert)	ft.	--		--		--				
17. Depth of flow, d	ft.	FULL		FULL		FULL				
18. Cross sectional flow area, A (assume trapazoidal)	$ft.^2$	0.79		1.77		3.14				
19. Wetted perimeter, P_w	ft.	3.14		4.71		6.28				
20. Hydraulic Radius, $R = \frac{A}{P_w}$	ft.	0.25		0.38		0.50				
21. Channel slope, s	ft./ft.	0.033		0.009		0.025				
22. Manning's roughness coeff., n		0.012		0.012		0.012				
23. $V = \frac{1.49}{n}(R^{\frac{2}{3}})(s^{\frac{1}{2}})$	fps.	8.95		6.13		12.37				
24. Flow length, L	ft.	181.0		78.0		78.0				
25. $T_t = \frac{L}{3600 * V}$	hr.	0.006	+	0.004		0.002			=	0.011
26. Watershed or subarea T_c or T_t (add T_t in steps 6, 14 & 25)								hr.		0.265

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

Project: Latimer Lane School
By: AES
Date: 01/06/22
Location: Simsbury, Connecticut
Checked: MCB
Date:
Circle one: Present [✓ Developed]
Watershed: PR WS20
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.	100.0		
4. Two-year 24-hr rainfall, P_2	in.	3.36		
5. Land slope, s	ft./ft.	0.065		
6. $T_t = \dfrac{0.007\,(nL)^{0.8}}{P_2^{0.5}\,(s^{0.4})}$	hr.	0.218	=	0.218

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

	Segment ID	**B-C**		**C-D**					
7. Surface description		WOODS		GRASS					
8. Manning's roughness coeff., n		0.100		0.080					
9. Paved or unpaved		UNPVD		UNPVD					
10. Depth of flow, d (default values: d=.4 unpaved, d=.2 paved)	ft.	0.40		0.40					
11. Flow Length, L	ft.	394.0		396.0					
12. Watercourse slope, s	ft./ft.	0.160		0.042					
13. Average velocity, $V = \dfrac{1.49}{n}(d^{2/3})(s^{1/2})$	fps.	3.23		2.06					
14. $T_t = \dfrac{L}{3600 * V}$	hr.	0.034	+	0.053				=	0.087

Channel flow

	Segment ID	**D-E**					
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.	3.93					
20. Hydraulic Radius, $R = \dfrac{A}{P_w}$	ft.	0.31					
21. Channel slope, s	ft./ft.	0.028					
22. Manning's roughness coeff., n		0.012					
23. $V = \dfrac{1.49}{n}(R^{2/3})(s^{1/2})$	fps.	9.57					
24. Flow length, L	ft.	753.0					
25. $T_t = \dfrac{L}{3600 * V}$	hr.	0.022				=	0.022
26. Watershed or subarea T_c or T_t (add T_t in steps 6, 14 & 25)	hr.						0.327

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

Project: Latimer Lane School
By: AES
Date: 01/06/22
Location: Simsbury, Connecticut
Checked: MCB
Date: 01/06/22
Circle one: Present [✓ Developed]
Watershed: PR WS21
Circle one: [✓ T_c] T_t
Subwatershed:

Sheet flow (applicable to T_c only)

	Segment ID		**A-B**	
1. Surface description (Table 3-1)			SMOOTH	
2. Manning's roughness coeff. for sheet flow, n (Table 3-1)			0.011	
3. Flow Length, L (< 300ft)	ft.		17.0	
4. Two-year 24-hr rainfall, P_2	in.		3.36	
5. Land slope, s	ft./ft.		0.006	
6. $T_t = \frac{0.007\,(nL)^{0.8}}{P_2^{0.5}\,(s^{0.4})}$	hr.		0.008	= 0.008

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	0.010				
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.	32.0	161.0				
12. Watercourse slope, s	ft./ft.	0.063	0.056				
13. Average velocity, $V = \frac{1.49}{n}(d^{2/3})(s^{1/2})$	fps.	2.53	12.05				
14. $T_t = \frac{L}{3600 * V}$	hr.	0.004	+ 0.004			=	0.007

Channel flow

	Segment ID	**D-E**					
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.	3.93					
20. Hydraulic Radius, $R = \frac{A}{P_w}$	ft.	0.31					
21. Channel slope, s	ft./ft.	0.0105					
22. Manning's roughness coeff., n		0.012					
23. $V = \frac{1.49}{n}(R^{2/3})(s^{1/2})$	fps.	5.86					
24. Flow length, L	ft.	146.0					
25. $T_t = \frac{L}{3600 * V}$	hr.	0.007				=	0.007

26. Watershed or subarea T_c or T_t (add T_t in steps 6, 14 & 25) hr. 0.022

Min Tc = 5 min.

SLR

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

Project: Latimer Lane School
Location: Simsbury, Connecticut
Circle one: Present [✓ ***Developed***]
Circle one: [✓ T_c] T_t
By: AES
Checked:
Watershed: PR WS30
Subwatershed:
Date: 01/06/22
Date:

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.	55.0		
4. Two-year 24-hr rainfall, P_2	in.	3.36		
5. Land slope, s	ft./ft.	0.045		
6. $T_t = \frac{0.007\,(nL)^{0.8}}{P_2^{0.5}\,(s^{0.4})}$	hr.	0.156	=	0.156

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

	Segment ID	**B-C**					
7. Surface description		GRASS					
8. Manning's roughness coeff., n		0.080					
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.	270.0					
12. Watercourse slope, s	ft./ft.	0.075					
13. Average velocity, $V = \frac{1.49}{n}(d^{2/3})(s^{1/2})$	fps.	2.77					
14. $T_t = \frac{L}{3600 * V}$	hr.	0.027				=	0.027

Channel flow

	Segment ID	**C-D**					
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.	3.93					
20. Hydraulic Radius, $R = \frac{A}{P_w}$	ft.	0.31					
21. Channel slope, s	ft./ft.	0.037					
22. Manning's roughness coeff., n		0.012					
23. $V = \frac{1.49}{n}(R^{2/3})(s^{1/2})$	fps.	11.00					
24. Flow length, L	ft.	260.0					
25. $T_t = \frac{L}{3600 * V}$	hr.	0.007				=	0.007

26. Watershed or subarea T_c or T_t (add T_t in steps 6, 14 & 25) hr. 0.190

SLR

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

Project: Latimer Lane School
By: AES
Date: 01/03/22
Location: Simsbury, Connecticut
Checked: MCB
Date:
Circle one: Present [✓ Developed]
Watershed: PR WS40
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.	100.0		
4. Two-year 24-hr rainfall, P_2	in.	3.36		
5. Land slope, s	ft./ft.	0.085		
6. $T_t = \frac{0.007(nL)^{0.8}}{P_2^{0.5}(s^{0.4})}$	hr.	0.196	=	0.196

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

Segment ID		B-C	C-D				
7. Surface description		WOODS	GRASS				
8. Manning's roughness coeff., n		0.080	0.011				
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.	624.0	70.0				
12. Watercourse slope, s	ft./ft.	0.104	0.051				
13. Average velocity, $V = \frac{1.49}{n}(d^{2/3})(s^{1/2})$	fps.	3.26	10.48				
14. $T_t = \frac{L}{3600 * V}$	hr.	0.053	+ 0.002			=	0.055

Channel flow

Segment ID		D-E					
15. Channel Bottom width, b	ft.	15" RCP					
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.	3.93					
20. Hydraulic Radius, $R = \frac{A}{P_w}$	ft.	0.31					
21. Channel slope, s	ft./ft.	0.011					
22. Manning's roughness coeff., n		0.013					
23. $V = \frac{1.49}{n}(R^{2/3})(s^{1/2})$	fps.	5.50					
24. Flow length, L	ft.	92.0					
25. $T_t = \frac{L}{3600 * V}$	hr.	0.005				=	0.005

26. Watershed or subarea T_c or T_t (add T_t in steps 6, 14 & 25) hr. 0.255

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

Project: Latimer Lane School By: AES Date: 01/03/22
Location: Simsbury, Connecticut Checked: MCB Date:
Circle one: Present [✓ Developed] Watershed: YD 6
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.	46.0		
4. Two-year 24-hr rainfall, P_2	in.	3.36		
5. Land slope, s	ft./ft.	0.033		
6. $T_t = \frac{0.007(nL)^{0.8}}{P_2^{0.5}(s^{0.4})}$	hr.	0.103	=	0.103

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		0.010		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.	150.0		58.0					
12. Watercourse slope, s	ft./ft.	0.057		0.036					
13. Average velocity, $V = \frac{1.49}{n}(d^{2/3})(s^{1/2})$	fps.	12.13		1.92					
14. $T_t = \frac{L}{3600 * V}$	hr.	0.003	+	0.008				=	0.012

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. 0.114

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

Project: Latimer Lane School
By: AES
Date: 01/03/22
Location: Simsbury, Connecticut
Checked: MCB
Date:
Circle one: Present [✓ Developed]
Watershed: AD 33
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)	0.400		
3.	Flow Length, L (< 300ft) ft.	67.0		
4.	Two-year 24-hr rainfall, P_2 in.	3.36		
5.	Land slope, s ft./ft.	0.030		
6.	$T_t = \dfrac{0.007\,(nL)^{0.8}}{P_2^{0.5}\,(s^{0.4})}$ hr.	0.216	=	0.216

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	0.010		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.	116.0		17.0				
12.	Watercourse slope, s ft./ft.	0.004		0.029				
13.	Average velocity, $V = \dfrac{1.49}{n}(d^{2/3})(s^{1/2})$ fps.	3.35		1.73				
14.	$T_t = \dfrac{L}{3600 * V}$ hr.	0.010	+	0.003			=	0.012

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, $R = \dfrac{A}{P_w}$ ft.							
21.	Channel slope, s ft./ft.							
22.	Manning's roughness coeff., n							
23.	$V = \dfrac{1.49}{n}(R^{2/3})(s^{1/2})$ fps.							
24.	Flow length, L ft.							
25.	$T_t = \dfrac{L}{3600 * V}$ hr.						=	0.000

26. Watershed or subarea T_c or T_t (add T_t in steps 6, 14 & 25) hr. 0.228

SLR

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

Project: Latimer Lane School
By: AES
Date: 01/03/22
Location: Simsbury, Connecticut
Checked: MCB
Date:
Circle one: Present [✓ Developed]
Watershed: YD 35
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.	100.0		
4. Two-year 24-hr rainfall, P_2	in.	3.36		
5. Land slope, s	ft./ft.	0.090		
6. $T_t = \dfrac{0.007(nL)^{0.8}}{P_2^{0.5}(s^{0.4})}$	hr.	0.127	=	0.127

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

Segment ID		**B-C**					
7. Surface description		GRASS					
8. Manning's roughness coeff., n		0.080					
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.	46.0					
12. Watercourse slope, s	ft./ft.	0.033					
13. Average velocity, $V = \dfrac{1.49}{n}(d^{2/3})(s^{1/2})$	fps.	1.83					
14. $T_t = \dfrac{L}{3600 * V}$	hr.	0.007				=	0.007

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, $R = \dfrac{A}{P_w}$	ft.						
21. Channel slope, s	ft./ft.						
22. Manning's roughness coeff., n							
23. $V = \dfrac{1.49}{n}(R^{2/3})(s^{1/2})$	fps.						
24. Flow length, L	ft.						
25. $T_t = \dfrac{L}{3600 * V}$	hr.					=	0.000
26. Watershed or subarea T_c or T_t (add T_t in steps 6, 14 & 25)	hr.						0.134

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

Project: Latimer Lane School
By: AES
Date: 01/03/22
Location: Simsbury, Connecticut
Checked: MCB
Date:
Circle one: Present [✓ Developed]
Watershed: AD 42
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.	100.0		
4. Two-year 24-hr rainfall, P_2	in.	3.36		
5. Land slope, s	ft./ft.	0.090		
6. $T_t = \frac{0.007(nL)^{0.8}}{P_2^{0.5}(s^{0.4})}$	hr.	0.127	=	0.127

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

Segment ID		**B-C**					
7. Surface description		GRASS					
8. Manning's roughness coeff., n		0.080					
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.	63.0					
12. Watercourse slope, s	ft./ft.	0.087					
13. Average velocity, $V = \frac{1.49}{n}(d^{2/3})(s^{1/2})$	fps.	2.99					
14. $T_t = \frac{L}{3600 * V}$	hr.	0.006				=	0.006

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.						0.133

NOAA Atlas 14, Volume 10, Version 3
Location name: Weatogue, Connecticut, USA*
Latitude: 41.8404°, Longitude: -72.8216°
Elevation: 180.88 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sandra Pavlovic, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Orlan Wilhite

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**0.350** (0.269-0.450)	**0.419** (0.322-0.540)	**0.532** (0.407-0.688)	**0.626** (0.477-0.814)	**0.755** (0.558-1.03)	**0.852** (0.618-1.19)	**0.953** (0.673-1.38)	**1.07** (0.715-1.59)	**1.23** (0.794-1.90)	**1.36** (0.859-2.14)
10-min	**0.496** (0.381-0.638)	**0.593** (0.456-0.765)	**0.753** (0.577-0.975)	**0.886** (0.675-1.15)	**1.07** (0.790-1.46)	**1.21** (0.875-1.68)	**1.35** (0.953-1.96)	**1.51** (1.01-2.25)	**1.74** (1.13-2.69)	**1.92** (1.22-3.04)
15-min	**0.583** (0.448-0.751)	**0.698** (0.536-0.900)	**0.886** (0.679-1.15)	**1.04** (0.794-1.36)	**1.26** (0.930-1.72)	**1.42** (1.03-1.98)	**1.59** (1.12-2.30)	**1.78** (1.19-2.65)	**2.04** (1.32-3.16)	**2.26** (1.43-3.57)
30-min	**0.789** (0.607-1.02)	**0.947** (0.728-1.22)	**1.21** (0.923-1.56)	**1.42** (1.08-1.85)	**1.71** (1.27-2.34)	**1.94** (1.40-2.70)	**2.17** (1.53-3.15)	**2.43** (1.63-3.61)	**2.79** (1.81-4.32)	**3.09** (1.96-4.88)
60-min	**0.995** (0.765-1.28)	**1.20** (0.919-1.54)	**1.52** (1.17-1.97)	**1.80** (1.37-2.34)	**2.17** (1.61-2.96)	**2.45** (1.78-3.42)	**2.75** (1.94-3.99)	**3.08** (2.07-4.58)	**3.54** (2.29-5.48)	**3.92** (2.48-6.20)
2-hr	**1.28** (0.994-1.64)	**1.54** (1.19-1.97)	**1.95** (1.51-2.51)	**2.30** (1.76-2.97)	**2.77** (2.07-3.77)	**3.13** (2.29-4.36)	**3.50** (2.50-5.10)	**3.95** (2.66-5.86)	**4.61** (2.99-7.10)	**5.17** (3.28-8.14)
3-hr	**1.48** (1.15-1.89)	**1.78** (1.38-2.27)	**2.26** (1.75-2.89)	**2.66** (2.05-3.43)	**3.21** (2.41-4.36)	**3.62** (2.66-5.04)	**4.06** (2.92-5.92)	**4.60** (3.10-6.81)	**5.42** (3.52-8.32)	**6.12** (3.89-9.60)
6-hr	**1.86** (1.46-2.36)	**2.26** (1.76-2.86)	**2.90** (2.26-3.69)	**3.43** (2.66-4.39)	**4.17** (3.14-5.64)	**4.71** (3.49-6.54)	**5.30** (3.84-7.72)	**6.04** (4.09-8.90)	**7.19** (4.69-11.0)	**8.19** (5.23-12.8)
12-hr	**2.29** (1.80-2.88)	**2.82** (2.22-3.55)	**3.68** (2.89-4.66)	**4.40** (3.43-5.60)	**5.39** (4.09-7.26)	**6.12** (4.57-8.47)	**6.92** (5.05-10.1)	**7.93** (5.39-11.6)	**9.52** (6.23-14.5)	**10.9** (6.99-17.0)
24-hr	**2.67** (2.12-3.34)	**3.36** (2.66-4.20)	**4.48** (3.54-5.62)	**5.41** (4.25-6.83)	**6.69** (5.12-8.99)	**7.62** (5.74-10.5)	**8.66** (6.39-12.6)	**10.0** (6.83-14.6)	**12.2** (8.00-18.5)	**14.1** (9.07-21.9)
2-day	**2.99** (2.39-3.71)	**3.83** (3.06-4.76)	**5.20** (4.14-6.49)	**6.34** (5.01-7.96)	**7.91** (6.10-10.6)	**9.04** (6.87-12.5)	**10.3** (7.71-15.1)	**12.1** (8.25-17.5)	**15.0** (9.84-22.6)	**17.6** (11.3-27.1)
3-day	**3.26** (2.62-4.03)	**4.18** (3.35-5.18)	**5.70** (4.55-7.08)	**6.95** (5.51-8.69)	**8.67** (6.72-11.6)	**9.92** (7.57-13.7)	**11.3** (8.51-16.6)	**13.3** (9.10-19.3)	**16.5** (10.9-24.9)	**19.5** (12.6-30.0)
4-day	**3.51** (2.82-4.32)	**4.49** (3.61-5.54)	**6.11** (4.89-7.57)	**7.44** (5.93-9.28)	**9.29** (7.22-12.4)	**10.6** (8.12-14.6)	**12.1** (9.13-17.7)	**14.2** (9.75-20.6)	**17.7** (11.7-26.6)	**20.8** (13.5-32.0)
7-day	**4.20** (3.39-5.14)	**5.31** (4.29-6.51)	**7.12** (5.74-8.78)	**8.63** (6.91-10.7)	**10.7** (8.35-14.2)	**12.2** (9.37-16.7)	**13.9** (10.5-20.1)	**16.2** (11.2-23.4)	**20.0** (13.3-30.0)	**23.5** (15.2-35.9)
10-day	**4.88** (3.97-5.96)	**6.06** (4.91-7.40)	**7.97** (6.44-9.79)	**9.56** (7.68-11.8)	**11.8** (9.19-15.5)	**13.3** (10.3-18.1)	**15.1** (11.4-21.7)	**17.5** (12.1-25.2)	**21.4** (14.2-32.0)	**25.0** (16.2-38.1)
20-day	**7.04** (5.76-8.54)	**8.27** (6.75-10.0)	**10.3** (8.35-12.5)	**11.9** (9.64-14.6)	**14.2** (11.1-18.5)	**15.9** (12.2-21.2)	**17.7** (13.3-25.0)	**20.1** (14.0-28.6)	**23.8** (15.9-35.4)	**27.1** (17.6-41.2)
30-day	**8.86** (7.28-10.7)	**10.1** (8.29-12.2)	**12.1** (9.91-14.7)	**13.8** (11.2-16.9)	**16.1** (12.7-20.8)	**17.8** (13.7-23.6)	**19.7** (14.7-27.3)	**21.9** (15.3-31.1)	**25.3** (16.9-37.5)	**28.2** (18.4-42.8)
45-day	**11.1** (9.17-13.4)	**12.4** (10.2-14.9)	**14.5** (11.9-17.5)	**16.2** (13.2-19.7)	**18.6** (14.6-23.7)	**20.4** (15.6-26.7)	**22.2** (16.5-30.4)	**24.3** (17.0-34.3)	**27.2** (18.3-40.1)	**29.5** (19.3-44.7)
60-day	**13.0** (10.8-15.6)	**14.3** (11.8-17.2)	**16.5** (13.6-19.9)	**18.3** (14.9-22.2)	**20.7** (16.3-26.3)	**22.7** (17.4-29.4)	**24.6** (18.1-33.1)	**26.4** (18.6-37.2)	**28.9** (19.5-42.5)	**30.7** (20.1-46.4)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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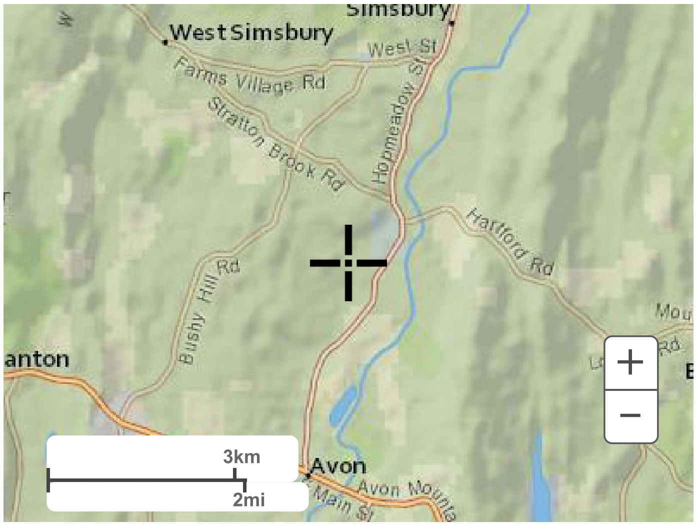
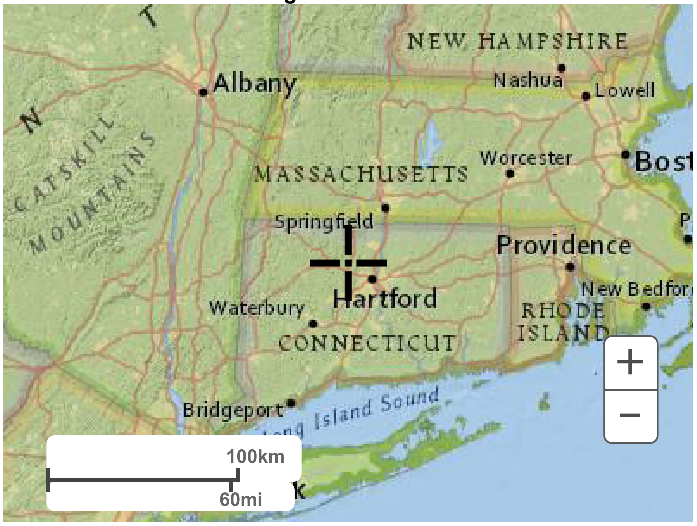
PF graphical



Large scale terrain



Large scale map

Large scale aerial

APPENDIX G

HYDROLOGIC ANALYSIS – COMPUTER MODEL RESULTS

Drainage Report

Latimer Lane School Renovations

33 Mountain View Drive

Simsbury, Connecticut

January 13, 2022

Revised: February 14, 2022

Hydrographs Peak Flowrate Summary (cfs)

Existing vs. Proposed

Storm Event	2yr		10yr		25yr		50yr		100yr	
	Exist	Prop	Exist	Prop	Exist	Prop	Exist	Prop	Exist	Prop
Analysis Point A	8.3	8.3	19.1	18.9	26.3	25.7	31.7	31.2	37.7	37.6
UG 110 W.S. Elev. (ft) Top Elev. of Stone Above Chambers = 188.2	-	185.7	-	186.5	-	187.1	-	187.6	-	188.1
Analysis Point B	8.5	8.5	20.0	19.6	27.7	27.5	33.4	33.2	39.8	39.7
UG 210 W.S. Elev. (ft) Top Elev. of Stone Above Chambers = 183.7	-	179.6	-	180.9	-	181.6	-	182.2	-	183.0
Analysis Point C	3.4	3.3	7.7	7.3	10.5	9.9	12.5	11.8	14.8	13.9
Analysis Point D	2.2	2.2	5.5	5.5	7.8	7.8	9.5	9.5	11.5	11.5

Study Area	**Description**
A	Russell Brook
B	Drainage System in Mountain View Road
C	Drainage System in Latimer Lane
D	Drainage System to Valley View Road

Hydraflow Table of Contents

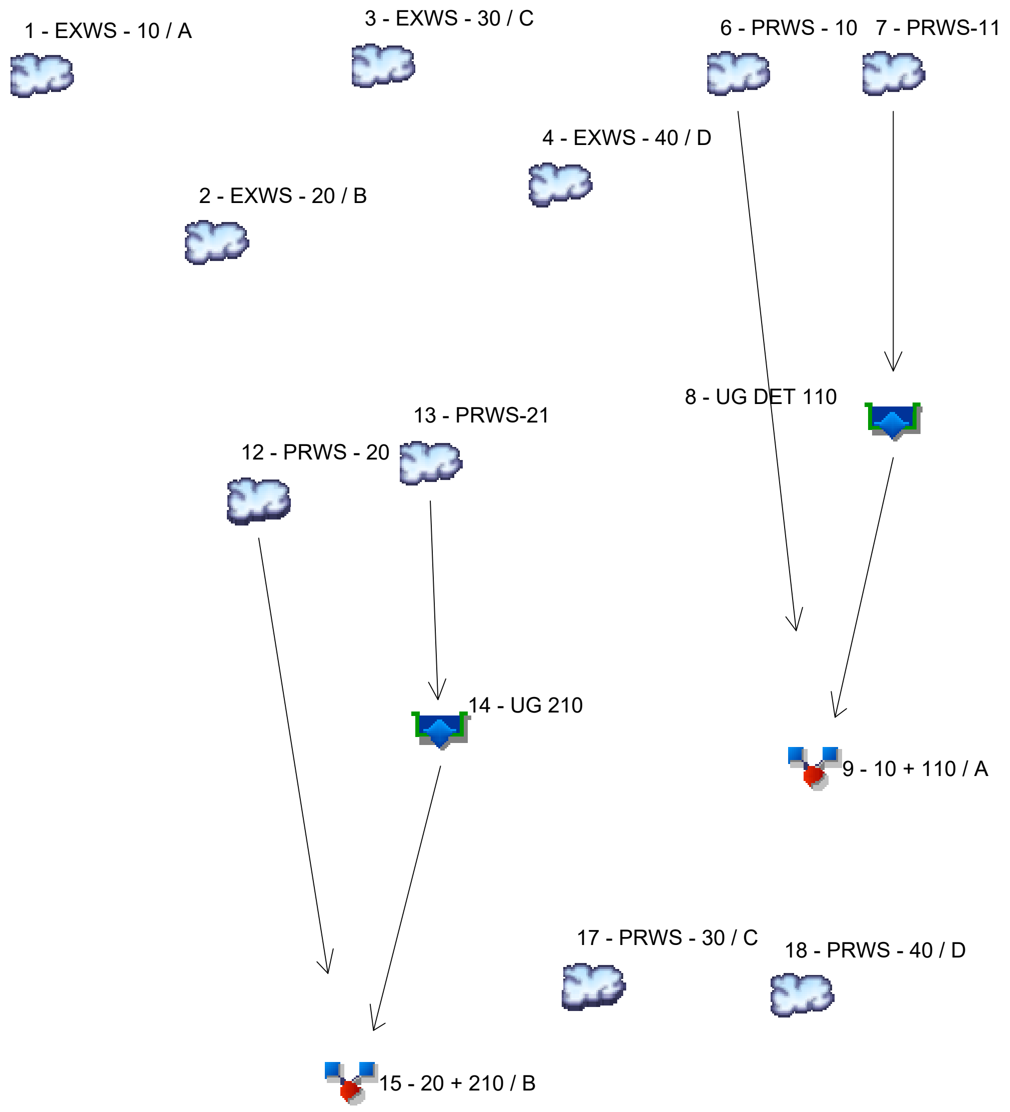
LLS-Model01.gpw

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

Wednesday, 01 / 26 / 2022

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
6	SCS Runoff	PRWS - 10
7	SCS Runoff	PRWS-11
8	Reservoir	UG DET 110
9	Combine	10 + 110 / A
12	SCS Runoff	PRWS - 20
13	SCS Runoff	PRWS-21
14	Reservoir	UG 210
15	Combine	20 + 210 / B
17	SCS Runoff	PRWS - 30 / C
18	SCS Runoff	PRWS - 40 / D

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	------	-------	8.308	-------	-------	19.12	26.33	31.65	37.65	EXWS - 10 / A
2	SCS Runoff	------	-------	8.486	-------	-------	19.95	27.66	33.38	39.82	EXWS - 20 / B
3	SCS Runoff	------	-------	3.411	-------	-------	7.662	10.46	12.52	14.83	EXWS - 30 / C
4	SCS Runoff	------	-------	2.182	-------	-------	5.500	7.803	9.525	11.48	EXWS - 40 / D
6	SCS Runoff	------	-------	1.976	-------	-------	5.414	7.876	9.736	11.86	PRWS - 10
7	SCS Runoff	------	-------	8.027	-------	-------	15.46	20.12	23.50	27.27	PRWS-11
8	Reservoir	7	-------	6.463	-------	-------	13.75	18.27	21.83	25.95	UG DET 110
9	Combine	6, 8	-------	8.311	-------	-------	18.92	25.68	31.21	37.62	10 + 110 / A
12	SCS Runoff	------	-------	8.243	-------	-------	18.97	26.12	31.41	37.35	PRWS - 20
13	SCS Runoff	------	-------	1.745	-------	-------	3.393	4.430	5.181	6.018	PRWS-21
14	Reservoir	13	-------	0.288	-------	-------	1.018	1.551	1.887	2.801	UG 210
15	Combine	12, 14	-------	8.462	-------	-------	19.61	27.53	33.15	39.71	20 + 210 / B
17	SCS Runoff	------	-------	3.315	-------	-------	7.285	9.880	11.78	13.92	PRWS - 30 / C
18	SCS Runoff	------	-------	2.182	-------	-------	5.500	7.803	9.525	11.48	PRWS - 40 / D

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 (acft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (acft)	Hydrograph Description
1	SCS Runoff	8.308	3	735	0.877	------	------	------	EXWS - 10 / A
2	SCS Runoff	8.486	3	735	0.901	------	------	------	EXWS - 20 / B
3	SCS Runoff	3.411	3	729	0.314	------	------	------	EXWS - 30 / C
4	SCS Runoff	2.182	3	735	0.237	------	------	------	EXWS - 40 / D
6	SCS Runoff	1.976	3	735	0.223	------	------	------	PRWS - 10
7	SCS Runoff	8.027	3	732	0.823	------	------	------	PRWS-11
8	Reservoir	6.463	3	744	0.717	7	185.65	0.224	UG DET 110
9	Combine	8.311	3	741	0.940	6, 8	------	------	10 + 110 / A
12	SCS Runoff	8.243	3	735	0.870	------	------	------	PRWS - 20
13	SCS Runoff	1.745	3	726	0.133	------	------	------	PRWS-21
14	Reservoir	0.288	3	756	0.097	13	179.64	0.065	UG 210
15	Combine	8.462	3	735	0.967	12, 14	------	------	20 + 210 / B
17	SCS Runoff	3.315	3	729	0.304	------	------	------	PRWS - 30 / C
18	SCS Runoff	2.182	3	735	0.237	------	------	------	PRWS - 40 / D

LLS-Model01.gpw	Return Period: 2 Year	Wednesday, 01 / 26 / 2022

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 (acft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (acft)	Hydrograph Description
1	SCS Runoff	19.12	3	732	1.962	------	------	------	EXWS - 10 / A
2	SCS Runoff	19.95	3	732	2.050	------	------	------	EXWS - 20 / B
3	SCS Runoff	7.662	3	729	0.692	------	------	------	EXWS - 30 / C
4	SCS Runoff	5.500	3	732	0.569	------	------	------	EXWS - 40 / D
6	SCS Runoff	5.414	3	732	0.566	------	------	------	PRWS - 10
7	SCS Runoff	15.46	3	732	1.605	------	------	------	PRWS-11
8	Reservoir	13.75	3	738	1.499	7	186.54	0.293	UG DET 110
9	Combine	18.92	3	738	2.065	6, 8	------	------	10 + 110 / A
12	SCS Runoff	18.97	3	732	1.947	------	------	------	PRWS - 20
13	SCS Runoff	3.393	3	726	0.264	------	------	------	PRWS-21
14	Reservoir	1.018	3	747	0.227	13	180.89	0.121	UG 210
15	Combine	19.61	3	732	2.174	12, 14	------	------	20 + 210 / B
17	SCS Runoff	7.285	3	729	0.658	------	------	------	PRWS - 30 / C
18	SCS Runoff	5.500	3	732	0.569	------	------	------	PRWS - 40 / D

LLS-Model01.gpw	Return Period: 10 Year	Wednesday, 01 / 26 / 2022

Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (acft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (acft)	Hydrograph Description
1	SCS Runoff	26.33	3	732	2.702	------	------	------	EXWS - 10 / A
2	SCS Runoff	27.66	3	732	2.837	------	------	------	EXWS - 20 / B
3	SCS Runoff	10.46	3	729	0.947	------	------	------	EXWS - 30 / C
4	SCS Runoff	7.803	3	732	0.801	------	------	------	EXWS - 40 / D
6	SCS Runoff	7.876	3	732	0.812	------	------	------	PRWS - 10
7	SCS Runoff	20.12	3	732	2.112	------	------	------	PRWS-11
8	Reservoir	18.27	3	738	2.006	7	187.11	0.328	UG DET 110
9	Combine	25.68	3	738	2.818	6, 8	------	------	10 + 110 / A
12	SCS Runoff	26.12	3	732	2.681	------	------	------	PRWS - 20
13	SCS Runoff	4.430	3	726	0.349	------	------	------	PRWS-21
14	Reservoir	1.551	3	744	0.312	13	181.56	0.147	UG 210
15	Combine	27.53	3	732	2.993	12, 14	------	------	20 + 210 / B
17	SCS Runoff	9.880	3	729	0.896	------	------	------	PRWS - 30 / C
18	SCS Runoff	7.803	3	732	0.801	------	------	------	PRWS - 40 / D

LLS-Model01.gpw	Return Period: 25 Year	Wednesday, 01 / 26 / 2022

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 (acft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (acft)	Hydrograph Description
1	SCS Runoff	31.65	3	732	3.256	------	------	------	EXWS - 10 / A
2	SCS Runoff	33.38	3	732	3.429	------	------	------	EXWS - 20 / B
3	SCS Runoff	12.52	3	729	1.138	------	------	------	EXWS - 30 / C
4	SCS Runoff	9.525	3	732	0.977	------	------	------	EXWS - 40 / D
6	SCS Runoff	9.736	3	732	1.000	------	------	------	PRWS - 10
7	SCS Runoff	23.50	3	732	2.486	------	------	------	PRWS-11
8	Reservoir	21.83	3	738	2.379	7	187.64	0.347	UG DET 110
9	Combine	31.21	3	735	3.379	6, 8	------	------	10 + 110 / A
12	SCS Runoff	31.41	3	732	3.231	------	------	------	PRWS - 20
13	SCS Runoff	5.181	3	726	0.411	------	------	------	PRWS-21
14	Reservoir	1.887	3	741	0.375	13	182.16	0.166	UG 210
15	Combine	33.15	3	732	3.605	12, 14	------	------	20 + 210 / B
17	SCS Runoff	11.78	3	729	1.074	------	------	------	PRWS - 30 / C
18	SCS Runoff	9.525	3	732	0.977	------	------	------	PRWS - 40 / D

Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (acft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (acft)	Hydrograph Description
1	SCS Runoff	37.65	3	732	3.888	------	------	------	EXWS - 10 / A
2	SCS Runoff	39.82	3	732	4.105	------	------	------	EXWS - 20 / B
3	SCS Runoff	14.83	3	729	1.356	------	------	------	EXWS - 30 / C
4	SCS Runoff	11.48	3	732	1.179	------	------	------	EXWS - 40 / D
6	SCS Runoff	11.86	3	732	1.216	------	------	------	PRWS - 10
7	SCS Runoff	27.27	3	732	2.906	------	------	------	PRWS-11
8	Reservoir	25.95	3	735	2.800	7	188.11	0.365	UG DET 110
9	Combine	37.62	3	735	4.016	6, 8	------	------	10 + 110 / A
12	SCS Runoff	37.35	3	732	3.858	------	------	------	PRWS - 20
13	SCS Runoff	6.018	3	726	0.482	------	------	------	PRWS-21
14	Reservoir	2.801	3	738	0.445	13	182.96	0.182	UG 210
15	Combine	39.71	3	732	4.303	12, 14	------	------	20 + 210 / B
17	SCS Runoff	13.92	3	729	1.276	------	------	------	PRWS - 30 / C
18	SCS Runoff	11.48	3	732	1.179	------	------	------	PRWS - 40 / D

LLS-Model01.gpw	Return Period: 100 Year	Wednesday, 01 / 26 / 2022

Pond Report

Pond No. 2 - UG DET 110

Pond Data

UG Chambers -Invert elev. = 183.45 ft, Rise x Span = 3.75 x 6.42 ft, Barrel Len = 7.17 ft, No. Barrels = 88, Slope = 0.00%, Headers = No
Encasement -Invert elev. = 182.70 ft, Width = 6.42 ft, Height = 5.50 ft, Voids = 40.00%

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (acft)	Total storage (acft)
0.00	182.70	n/a	0.000	0.000
0.55	183.25	n/a	0.020	0.020
1.10	183.80	n/a	0.040	0.060
1.65	184.35	n/a	0.051	0.111
2.20	184.90	n/a	0.050	0.161
2.75	185.45	n/a	0.048	0.208
3.30	186.00	n/a	0.045	0.253
3.85	186.55	n/a	0.041	0.294
4.40	187.10	n/a	0.033	0.327
4.95	187.65	n/a	0.021	0.349
5.50	188.20	n/a	0.020	0.369

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 24.00	0.00	0.00	0.00
Span (in)	= 24.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 182.70	0.00	0.00	0.00
Length (ft)	= 141.00	0.00	0.00	0.00
Slope (%)	= 1.21	0.00	0.00	n/a
N-Value	= .012	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 2.75	1.25	0.00	0.00
Crest El. (ft)	= 187.70	184.30	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Rect	Rect	---	---
Multi-Stage	= Yes	Yes	No	No

Exfil.(in/hr) = 0.000 (by Wet area)
TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

Stage / Storage / Discharge Table

Stage ft	Storage acft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0.000	182.70	0.00	---	---	---	0.00	0.00	---	---	---	---	0.000
0.55	0.020	183.25	0.00	---	---	---	0.00	0.00	---	---	---	---	0.000
1.10	0.060	183.80	0.00	---	---	---	0.00	0.00	---	---	---	---	0.000
1.65	0.111	184.35	0.05 ic	---	---	---	0.00	0.05	---	---	---	---	0.047
2.20	0.161	184.90	1.99 ic	---	---	---	0.00	1.93	---	---	---	---	1.935
2.75	0.208	185.45	5.16 ic	---	---	---	0.00	5.13	---	---	---	---	5.133
3.30	0.253	186.00	9.23 ic	---	---	---	0.00	9.23	---	---	---	---	9.226
3.85	0.294	186.55	13.90 ic	---	---	---	0.00	13.87 s	---	---	---	---	13.87
4.40	0.327	187.10	18.19 ic	---	---	---	0.00	18.19 s	---	---	---	---	18.19
4.95	0.349	187.65	22.11 ic	---	---	---	0.00	22.11 s	---	---	---	---	22.11
5.50	0.369	188.20	27.00 ic	---	---	---	3.24	23.77 s	---	---	---	---	27.00

Pond Report

Pond No. 1 - UG DET 210

Pond Data

UG Chambers -Invert elev. = 178.55 ft, Rise x Span = 3.75 x 6.42 ft, Barrel Len = 7.17 ft, No. Barrels = 45, Slope = 0.00%, Headers = No
Encasement -Invert elev. = 177.80 ft, Width = 6.42 ft, Height = 5.50 ft, Voids = 40.00%

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (acft)	Total storage (acft)
0.00	177.80	n/a	0.000	0.000
0.55	178.35	n/a	0.010	0.010
1.10	178.90	n/a	0.020	0.031
1.65	179.45	n/a	0.026	0.057
2.20	180.00	n/a	0.025	0.082
2.75	180.55	n/a	0.024	0.107
3.30	181.10	n/a	0.023	0.129
3.85	181.65	n/a	0.021	0.150
4.40	182.20	n/a	0.017	0.167
4.95	182.75	n/a	0.011	0.178
5.50	183.30	n/a	0.010	0.189

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 15.00	4.00	6.00	0.00
Span (in)	= 15.00	4.00	6.00	0.00
No. Barrels	= 1	1	1	0
Invert El. (ft)	= 177.80	179.00	180.40	0.00
Length (ft)	= 53.00	0.00	0.00	0.00
Slope (%)	= 1.51	0.00	0.00	n/a
N-Value	= .012	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	Yes	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 3.50	0.50	0.00	0.00
Crest El. (ft)	= 182.90	182.50	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Rect	Rect	---	---
Multi-Stage	= Yes	Yes	No	No

Exfil.(in/hr) = 0.000 (by Wet area)
TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

Stage / Storage / Discharge Table

Stage ft	Storage acft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0.000	177.80	0.00	0.00	0.00	---	0.00	0.00	---	---	---	---	0.000
0.55	0.010	178.35	0.00	0.00	0.00	---	0.00	0.00	---	---	---	---	0.000
1.10	0.031	178.90	0.00	0.00	0.00	---	0.00	0.00	---	---	---	---	0.000
1.65	0.057	179.45	0.23 ic	0.22 ic	0.00	---	0.00	0.00	---	---	---	---	0.224
2.20	0.082	180.00	0.39 ic	0.38 ic	0.00	---	0.00	0.00	---	---	---	---	0.384
2.75	0.107	180.55	0.56 ic	0.49 ic	0.07 ic	---	0.00	0.00	---	---	---	---	0.560
3.30	0.129	181.10	1.25 ic	0.58 ic	0.63 ic	---	0.00	0.00	---	---	---	---	1.218
3.85	0.150	181.65	1.64 ic	0.66 ic	0.95 ic	---	0.00	0.00	---	---	---	---	1.607
4.40	0.167	182.20	1.92 ic	0.73 ic	1.18 ic	---	0.00	0.00	---	---	---	---	1.909
4.95	0.178	182.75	2.37 ic	0.80 ic	1.37 ic	---	0.00	0.21	---	---	---	---	2.373
5.50	0.189	183.30	6.48 ic	0.80 ic	1.54 ic	---	2.95	1.19	---	---	---	---	6.484

APPENDIX H

WATERSHED MAPS

Drainage Report

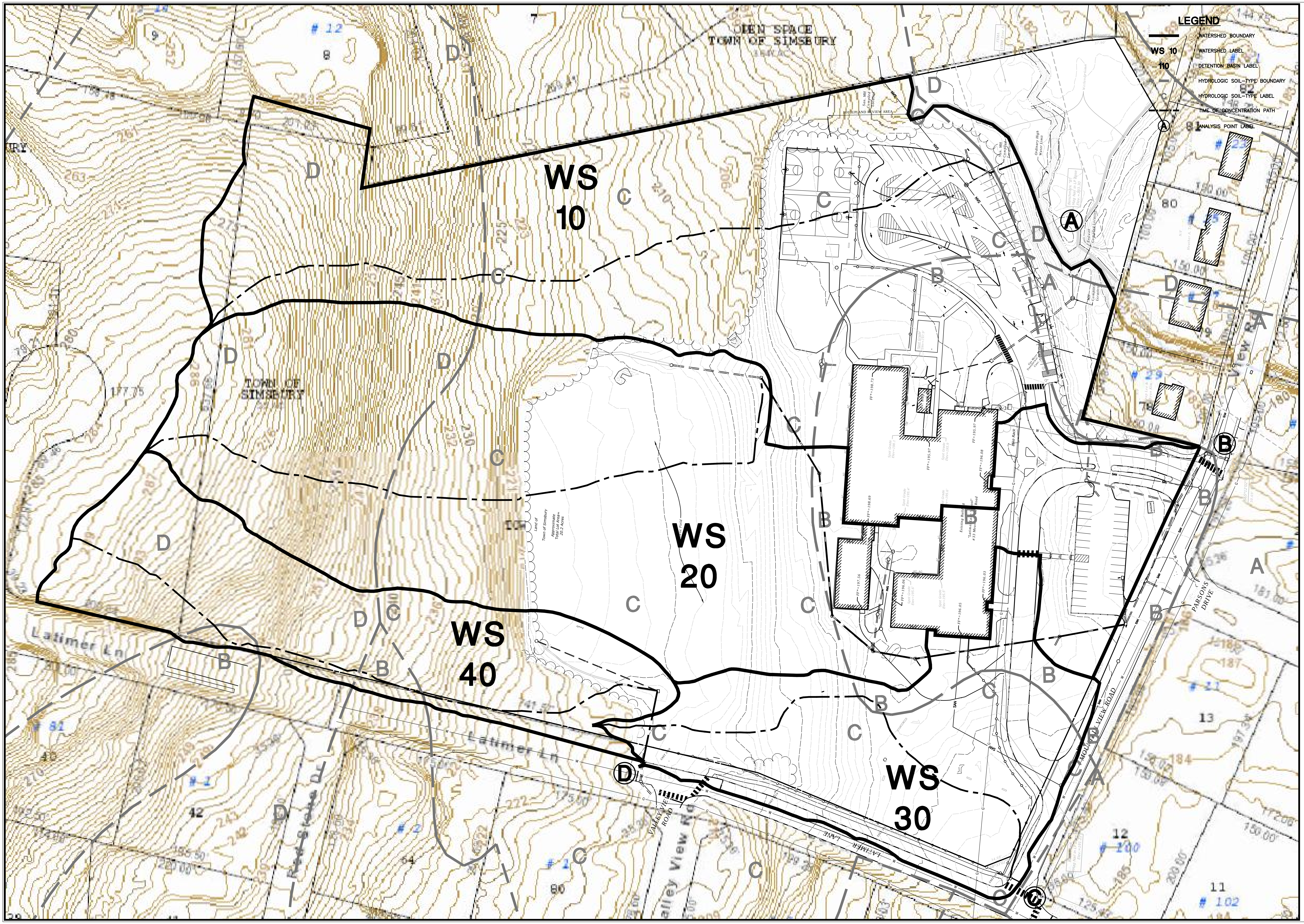
Latimer Lane School Renovations

33 Mountain View Drive

Simsbury, Connecticut

January 13, 2022

Revised: February 14, 2022



SLR

99 REALTY DRIVE
CHESHIRE, CT 06410
203.271.1773
SLRCONSULTING.COM

DESCRIPTION	DATE	BY

WATERSHED MAP - EXISTING CONDITIONS

LATIMER LANE SCHOOL

33 MOUNTAIN VIEW DRIVE
SIMSBURY, CONNECTICUT

MCB	AES	MCB
DESIGNED	DRAWN	CHECKED

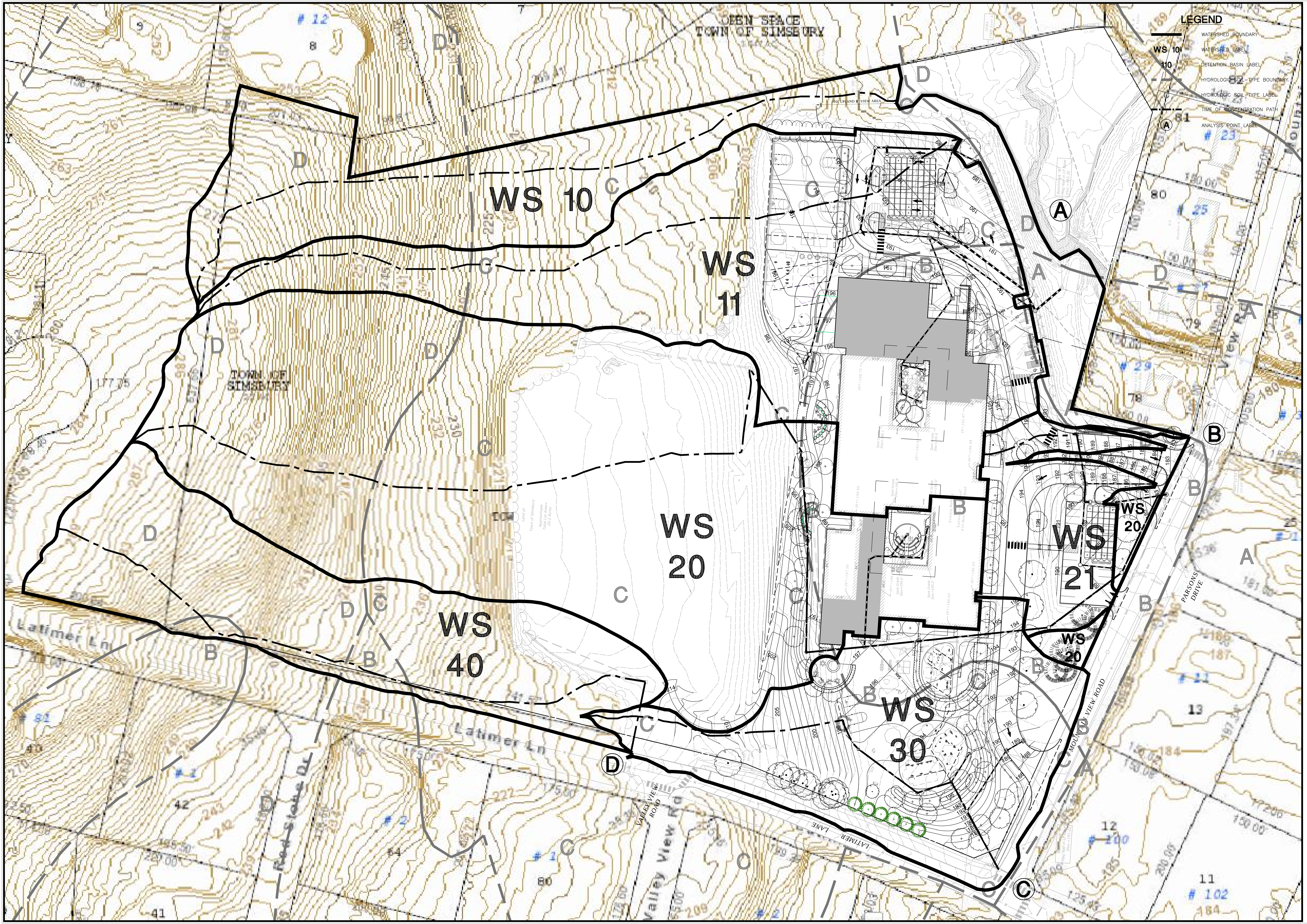
SCALE 1"=50'

DATE JANUARY 13, 2022

PROJECT NO. 14885.00037

SHEET NO. 1 OF 2

SHEET NAME **EXWS**



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
REVISIONS	02/14/2022	MCB

WATERSHED MAP -PROPOSED CONDITIONS

LATIMER LANE SCHOOL

33 MOUNTAIN VIEW DRIVE
SIMSBURY, CONNECTICUT

MCB	AES	MCB
DESIGNED	DRAWN	CHECKED

1"=50'
SCALE

JANUARY 13, 2022
DATE

14885.00037
PROJECT NO.

2 OF 2
SHEET NO.

PRWS
SHEET NAME