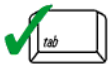
Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

A. Introduction

Important: When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.



A Stormwater Report must be submitted with the Notice of Intent permit application to document compliance with the Stormwater Management Standards. The following checklist is NOT a substitute for the Stormwater Report (which should provide more substantive and detailed information) but is offered here as a tool to help the applicant organize their Stormwater Management documentation for their Report and for the reviewer to assess this information in a consistent format. As noted in the Checklist, the Stormwater Report must contain the engineering computations and supporting information set forth in Volume 3 of the Massachusetts Stormwater Handbook. The Stormwater Report must be prepared and certified by a Registered Professional Engineer (RPE) licensed in the Commonwealth.

The Stormwater Report must include:

- The Stormwater Checklist completed and stamped by a Registered Professional Engineer (see page 2) that certifies that the Stormwater Report contains all required submittals.[1] This Checklist is to be used as the cover for the completed Stormwater Report.
- Applicant/Project Name
- Project Address
- Name of Firm and Registered Professional Engineer that prepared the Report
- Long-Term Pollution Prevention Plan required by Standards 4-6
- Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan required by Standard 8[2]
- Operation and Maintenance Plan required by Standard 9

In addition to all plans and supporting information, the Stormwater Report must include a brief narrative describing stormwater management practices, including environmentally sensitive site design and LID techniques, along with a diagram depicting runoff through the proposed BMP treatment train. Plans are required to show existing and proposed conditions, identify all wetland resource areas, NRCS soil types, critical areas, Land Uses with Higher Potential Pollutant Loads (LUHPPL), and any areas on the site where infiltration rate is greater than 2.4 inches per hour. The Plans shall identify the drainage areas for both existing and proposed conditions at a scale that enables verification of supporting calculations.

As noted in the Checklist, the Stormwater Management Report shall document compliance with each of the Stormwater Management Standards as provided in the Massachusetts Stormwater Handbook. The soils evaluation and calculations shall be done using the methodologies set forth in Volume 3 of the Massachusetts Stormwater Handbook.

To ensure that the Stormwater Report is complete, applicants are required to fill in the Stormwater Report Checklist by checking the box to indicate that the specified information has been included in the Stormwater Report. If any of the information specified in the checklist has not been submitted, the applicant must provide an explanation. The completed Stormwater Report Checklist and Certification must be submitted with the Stormwater Report.

[1] The Stormwater Report may also include the Illicit Discharge Compliance Statement required by Standard 10. If not included in the Stormwater Report, the Illicit Discharge Compliance Statement must be submitted prior to the discharge of stormwater runoff to the post-construction best management practices.

[2] For some complex projects, it may not be possible to include the Construction Period Erosion and Sedimentation Control Plan in the Stormwater Report. In that event, the issuing authority has the discretion to issue an Order of Conditions that approves the project and includes a condition requiring the proponent to submit the Construction Period Erosion and Sedimentation Control Plan before commencing any land disturbance activity on the site.

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Checklist for Stormwater Report

B. Stormwater Checklist and Certification

The following checklist is intended to serve as a guide for applicants as to the elements that ordinarily need to be addressed in a complete Stormwater Report. The checklist is also intended to provide conservation commissions and other reviewing authorities with a summary of the components necessary for a comprehensive Stormwater Report that addresses the ten Stormwater Standards.

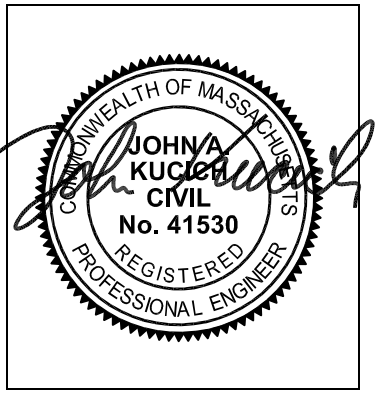
Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the item is not applicable (N.A.) and provide the reasons for that determination.

A complete checklist must include the Certification set forth below signed by the Registered Professional Engineer who prepared the Stormwater Report.

Registered Professional Engineer's Certification

I have reviewed the Stormwater Report, including the soil evaluation, computations, Long-term Pollution Prevention Plan, the Construction Period Erosion and Sedimentation Control Plan (if included), the Long-term Post-Construction Operation and Maintenance Plan, the Illicit Discharge Compliance Statement (if included) and the plans showing the stormwater management system, and have determined that they have been prepared in accordance with the requirements of the Stormwater Management Standards as further elaborated by the Massachusetts Stormwater Handbook. I have also determined that the information presented in the Stormwater Checklist is accurate and that the information presented in the Stormwater Report accurately reflects conditions at the site as of the date of this permit application.

Registered Professional Engineer Block and Signature



10/3/24
Signature and Date

Checklist

Project Type: Is the application for new development, redevelopment, or a mix of new and redevelopment?

☐ New development

☒ Redevelopment

☐ Mix of New Development and Redevelopment

Checklist for Stormwater Report

Checklist (continued)

LID Measures: Stormwater Standards require LID measures to be considered. Document what environmentally sensitive design and LID Techniques were considered during the planning and design of the project:

☒ No disturbance to any Wetland Resource Areas

☐ Site Design Practices (e.g. clustered development, reduced frontage setbacks)

☒ Reduced Impervious Area (Redevelopment Only)

☒ Minimizing disturbance to existing trees and shrubs

☐ LID Site Design Credit Requested:

- ☐ Credit 1
- ☐ Credit 2
- ☐ Credit 3

☐ Use of "country drainage" versus curb and gutter conveyance and pipe

☐ Bioretention Cells (includes Rain Gardens)

☐ Constructed Stormwater Wetlands (includes Gravel Wetlands designs)

☐ Treebox Filter

☐ Water Quality Swale

☐ Grass Channel

☐ Green Roof

☒ Other (describe): Proprietary Water Quality Unit

Standard 1: No New Untreated Discharges

☒ No new untreated discharges

☐ Outlets have been designed so there is no erosion or scour to wetlands and waters of the Commonwealth

☐ Supporting calculations specified in Volume 3 of the Massachusetts Stormwater Handbook included.

Checklist for Stormwater Report

Checklist (continued)

Standard 2: Peak Rate Attenuation

☐ Standard 2 waiver requested because the project is located in land subject to coastal storm flowage and stormwater discharge is to a wetland subject to coastal flooding.

☐ Evaluation provided to determine whether off-site flooding increases during the 100-year 24-hour storm.

☒ Calculations provided to show that post-development peak discharge rates do not exceed pre-development rates for the 2-year and 10-year 24-hour storms. If evaluation shows that off-site flooding increases during the 100-year 24-hour storm, calculations are also provided to show that post-development peak discharge rates do not exceed pre-development rates for the 100-year 24-hour storm.

Standard 3: Recharge

☒ Soil Analysis provided.

☐ Required Recharge Volume calculation provided.

☐ Required Recharge volume reduced through use of the LID site Design Credits.

☐ Sizing the infiltration, BMPs is based on the following method: Check the method used.

☐ Static ☐ Simple Dynamic ☐ Dynamic Field[1]

☐ Runoff from all impervious areas at the site discharging to the infiltration BMP.

☐ Runoff from all impervious areas at the site is *not* discharging to the infiltration BMP and calculations are provided showing that the drainage area contributing runoff to the infiltration BMPs is sufficient to generate the required recharge volume.

☐ Recharge BMPs have been sized to infiltrate the Required Recharge Volume.

☐ Recharge BMPs have been sized to infiltrate the Required Recharge Volume *only* to the maximum extent practicable for the following reason:

☐ Site is comprised solely of C and D soils and/or bedrock at the land surface

☐ M.G.L. c. 21E sites pursuant to 310 CMR 40.0000

☐ Solid Waste Landfill pursuant to 310 CMR 19.000

☐ Project is otherwise subject to Stormwater Management Standards only to the maximum extent practicable.

☐ Calculations showing that the infiltration BMPs will drain in 72 hours are provided.

☐ Property includes a M.G.L. c. 21E site or a solid waste landfill and a mounding analysis is included.

[1] 80% TSS removal is required prior to discharge to infiltration BMP if Dynamic Field method is used.

Checklist for Stormwater Report

Checklist (continued)

Standard 3: Recharge (continued)

☐ The infiltration BMP is used to attenuate peak flows during storms greater than or equal to the 10-year 24-hour storm and separation to seasonal high groundwater is less than 4 feet and a mounding analysis is provided.

☐ Documentation is provided showing that infiltration BMPs do not adversely impact nearby wetland resource areas.

Standard 4: Water Quality

The Long-Term Pollution Prevention Plan typically includes the following:

- Good housekeeping practices;
- Provisions for storing materials and waste products inside or under cover;
- Vehicle washing controls;
- Requirements for routine inspections and maintenance of stormwater BMPs;
- Spill prevention and response plans;
- Provisions for maintenance of lawns, gardens, and other landscaped areas;
- Requirements for storage and use of fertilizers, herbicides, and pesticides;
- Pet waste management provisions;
- Provisions for operation and management of septic systems;
- Provisions for solid waste management;
- Snow disposal and plowing plans relative to Wetland Resource Areas;
- Winter Road Salt and/or Sand Use and Storage restrictions;
- Street sweeping schedules;
- Provisions for prevention of illicit discharges to the stormwater management system;
- Documentation that Stormwater BMPs are designed to provide for shutdown and containment in the event of a spill or discharges to or near critical areas or from LUHPPL;
- Training for staff or personnel involved with implementing Long-Term Pollution Prevention Plan;
- List of Emergency contacts for implementing Long-Term Pollution Prevention Plan.

☐ A Long-Term Pollution Prevention Plan is attached to Stormwater Report and is included as an attachment to the Wetlands Notice of Intent.

☐ Treatment BMPs subject to the 44% TSS removal pretreatment requirement and the one inch rule for calculating the water quality volume are included, and discharge:

- ☐ is within the Zone II or Interim Wellhead Protection Area
- ☐ is near or to other critical areas
- ☐ is within soils with a rapid infiltration rate (greater than 2.4 inches per hour)
- ☐ involves runoff from land uses with higher potential pollutant loads.

☐ The Required Water Quality Volume is reduced through use of the LID site Design Credits.

☒ Calculations documenting that the treatment train meets the 80% TSS removal requirement and, if applicable, the 44% TSS removal pretreatment requirement, are provided.

Checklist for Stormwater Report

Checklist (continued)

Standard 4: Water Quality (continued)

☒ The BMP is sized (and calculations provided) based on:

- ☐ The ½" or 1" Water Quality Volume or
- ☒ The equivalent flow rate associated with the Water Quality Volume and documentation is provided showing that the BMP treats the required water quality volume.

☒ The applicant proposes to use proprietary BMPs, and documentation supporting use of proprietary BMP and proposed TSS removal rate is provided. This documentation may be in the form of the propriety BMP checklist found in Volume 2, Chapter 4 of the Massachusetts Stormwater Handbook and submitting copies of the TARP Report, STEP Report, and/or other third party studies verifying performance of the proprietary BMPs.

☐ A TMDL exists that indicates a need to reduce pollutants other than TSS and documentation showing that the BMPs selected are consistent with the TMDL is provided.

Standard 5: Land Uses With Higher Potential Pollutant Loads (LUHPPLs)

☐ The NPDES Multi-Sector General Permit covers the land use and the Stormwater Pollution Prevention Plan (SWPPP) has been included with the Stormwater Report.

☐ The NPDES Multi-Sector General Permit covers the land use and the SWPPP will be submitted ***prior to*** the discharge of stormwater to the post-construction stormwater BMPs.

☐ The NPDES Multi-Sector General Permit does ***not*** cover the land use.

☐ LUHPPLs are located at the site and industry specific source control and pollution prevention measures have been proposed to reduce or eliminate the exposure of LUHPPLs to rain, snow, snow melt and runoff, and been included in the long term Pollution Prevention Plan.

☐ All exposure has been eliminated.

☐ All exposure has ***not*** been eliminated and all BMPs selected are on MassDEP LUHPPL list.

☐ The LUHPPL has the potential to generate runoff with moderate to higher concentrations of oil and grease (e.g. all parking lots with >1000 vehicle trips per day) and the treatment train includes an oil grit separator, a filtering bioretention area, a sand filter or equivalent.

Standard 6: Critical Areas

☐ The discharge is near or to a critical area and the treatment train includes only BMPs that MassDEP has approved for stormwater discharges to or near that particular class of critical area.

☐ Critical areas and BMPs are identified in the Stormwater Report.

Checklist for Stormwater Report

Checklist (continued)

Standard 7: Redevelopments and Other Projects Subject to the Standards only to the maximum extent practicable

☒ The project is subject to the Stormwater Management Standards only to the maximum Extent Practicable as a:

- ☐ Limited Project
- ☐ Small Residential Projects: 5-9 single family houses or 5-9 units in a multi-family development provided there is no discharge that may potentially affect a critical area.
- ☐ Small Residential Projects: 2-4 single family houses or 2-4 units in a multi-family development with a discharge to a critical area
- ☐ Marina and/or boatyard provided the hull painting, service and maintenance areas are protected from exposure to rain, snow, snow melt and runoff
- ☐ Bike Path and/or Foot Path
- ☒ Redevelopment Project
- ☐ Redevelopment portion of mix of new and redevelopment.

☐ Certain standards are not fully met (Standard No. 1, 8, 9, and 10 must always be fully met) and an explanation of why these standards are not met is contained in the Stormwater Report.

☒ The project involves redevelopment and a description of all measures that have been taken to improve existing conditions is provided in the Stormwater Report. The redevelopment checklist found in Volume 2 Chapter 3 of the Massachusetts Stormwater Handbook may be used to document that the proposed stormwater management system (a) complies with Standards 2, 3 and the pretreatment and structural BMP requirements of Standards 4-6 to the maximum extent practicable and (b) improves existing conditions.

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control

A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan must include the following information:

- Narrative;
- Construction Period Operation and Maintenance Plan;
- Names of Persons or Entity Responsible for Plan Compliance;
- Construction Period Pollution Prevention Measures;
- Erosion and Sedimentation Control Plan Drawings;
- Detail drawings and specifications for erosion control BMPs, including sizing calculations;
- Vegetation Planning;
- Site Development Plan;
- Construction Sequencing Plan;
- Sequencing of Erosion and Sedimentation Controls;
- Operation and Maintenance of Erosion and Sedimentation Controls;
- Inspection Schedule;
- Maintenance Schedule;
- Inspection and Maintenance Log Form.

☒ A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan containing the information set forth above has been included in the Stormwater Report.

Checklist for Stormwater Report

Checklist (continued)

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control (continued)

☐ The project is highly complex and information is included in the Stormwater Report that explains why it is not possible to submit the Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan with the application. A Construction Period Pollution Prevention and Erosion and Sedimentation Control has ***not*** been included in the Stormwater Report but will be submitted ***before*** land disturbance begins.

☐ The project is ***not*** covered by a NPDES Construction General Permit.

☐ The project is covered by a NPDES Construction General Permit and a copy of the SWPPP is in the Stormwater Report.

☒ The project is covered by a NPDES Construction General Permit but no SWPPP been submitted. The SWPPP will be submitted BEFORE land disturbance begins.

Standard 9: Operation and Maintenance Plan

☒ The Post Construction Operation and Maintenance Plan is included in the Stormwater Report and includes the following information:

- ☒ Name of the stormwater management system owners;
- ☒ Party responsible for operation and maintenance;
- ☒ Schedule for implementation of routine and non-routine maintenance tasks;
- ☐ Plan showing the location of all stormwater BMPs maintenance access areas;
- ☐ Description and delineation of public safety features;
- ☐ Estimated operation and maintenance budget; and
- ☒ Operation and Maintenance Log Form.

☐ The responsible party is ***not*** the owner of the parcel where the BMP is located and the Stormwater Report includes the following submissions:

- ☐ A copy of the legal instrument (deed, homeowner's association, utility trust or other legal entity) that establishes the terms of and legal responsibility for the operation and maintenance of the project site stormwater BMPs;
- ☐ A plan and easement deed that allows site access for the legal entity to operate and maintain BMP functions.

Standard 10: Prohibition of Illicit Discharges

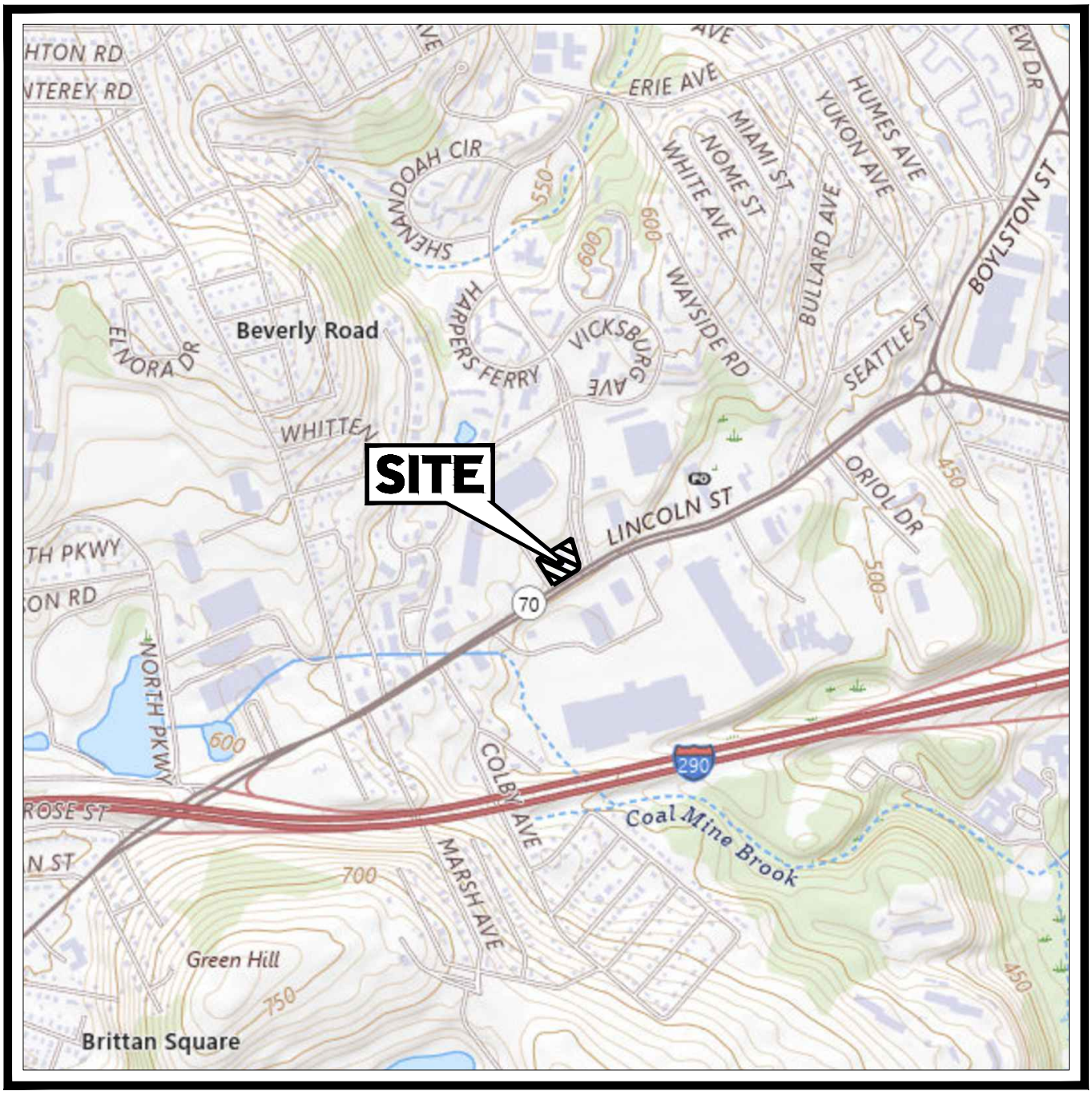
☒ The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges;

☐ An Illicit Discharge Compliance Statement is attached;

☒ NO Illicit Discharge Compliance Statement is attached but will be submitted ***prior to*** the discharge of any stormwater to post-construction BMPs.

APPENDIX B: PROJECT LOCATION MAPS

- *USGS MAP*
- *FEMA FIRMETTE*



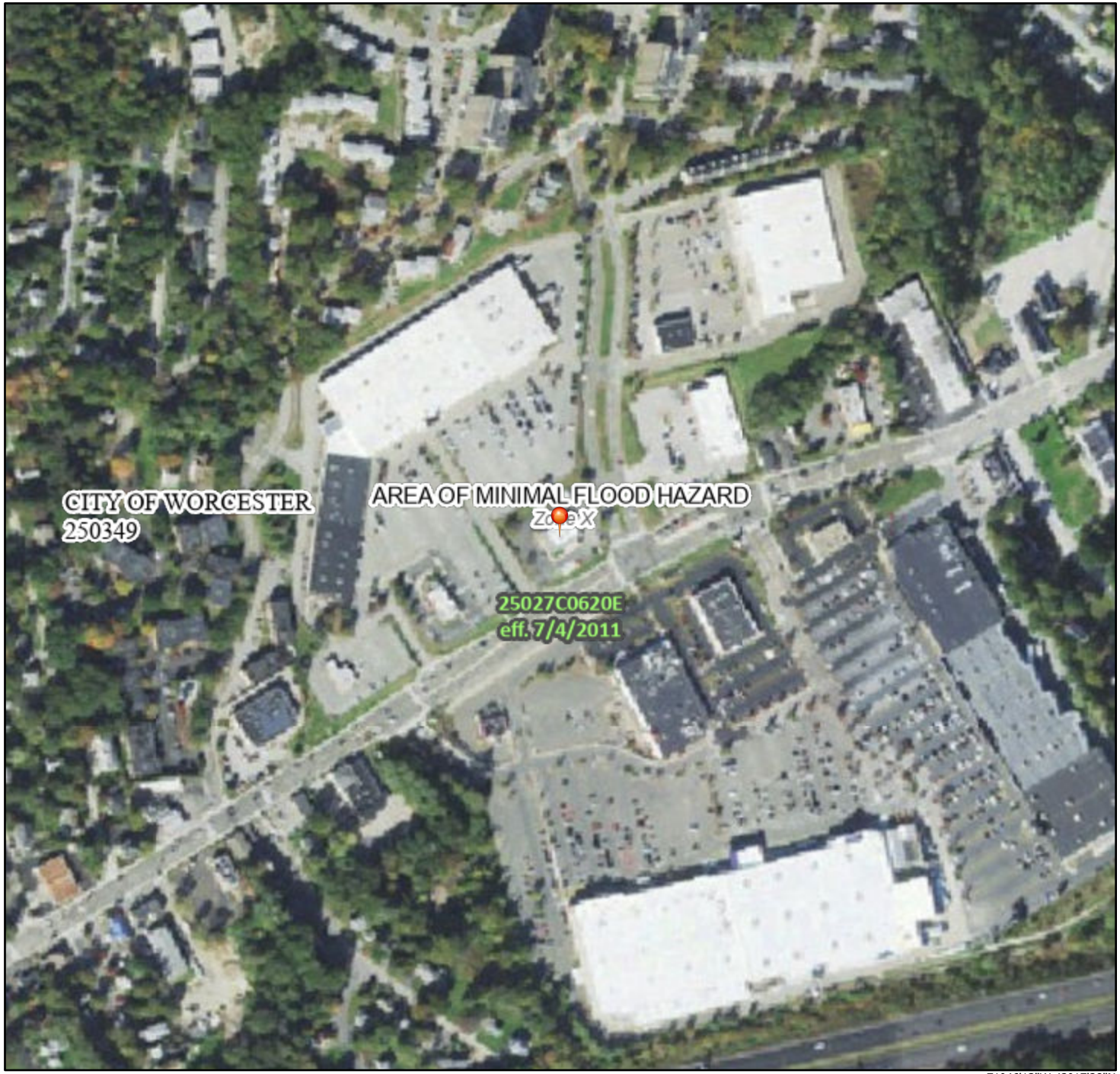
USGS MAP

SCALE: 1" = 1,000'
SOURCE: WORCESTER NORTH USGS QUADRANGLE

National Flood Hazard Layer FIRMette

FEMA

71°46'50"W 42°17'55"N



71°46'13"W 42°17'28"N

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

1:6,000

Basemap Imagery Source: USGS National Map 2023

Legend

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

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

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

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

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

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

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

N

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

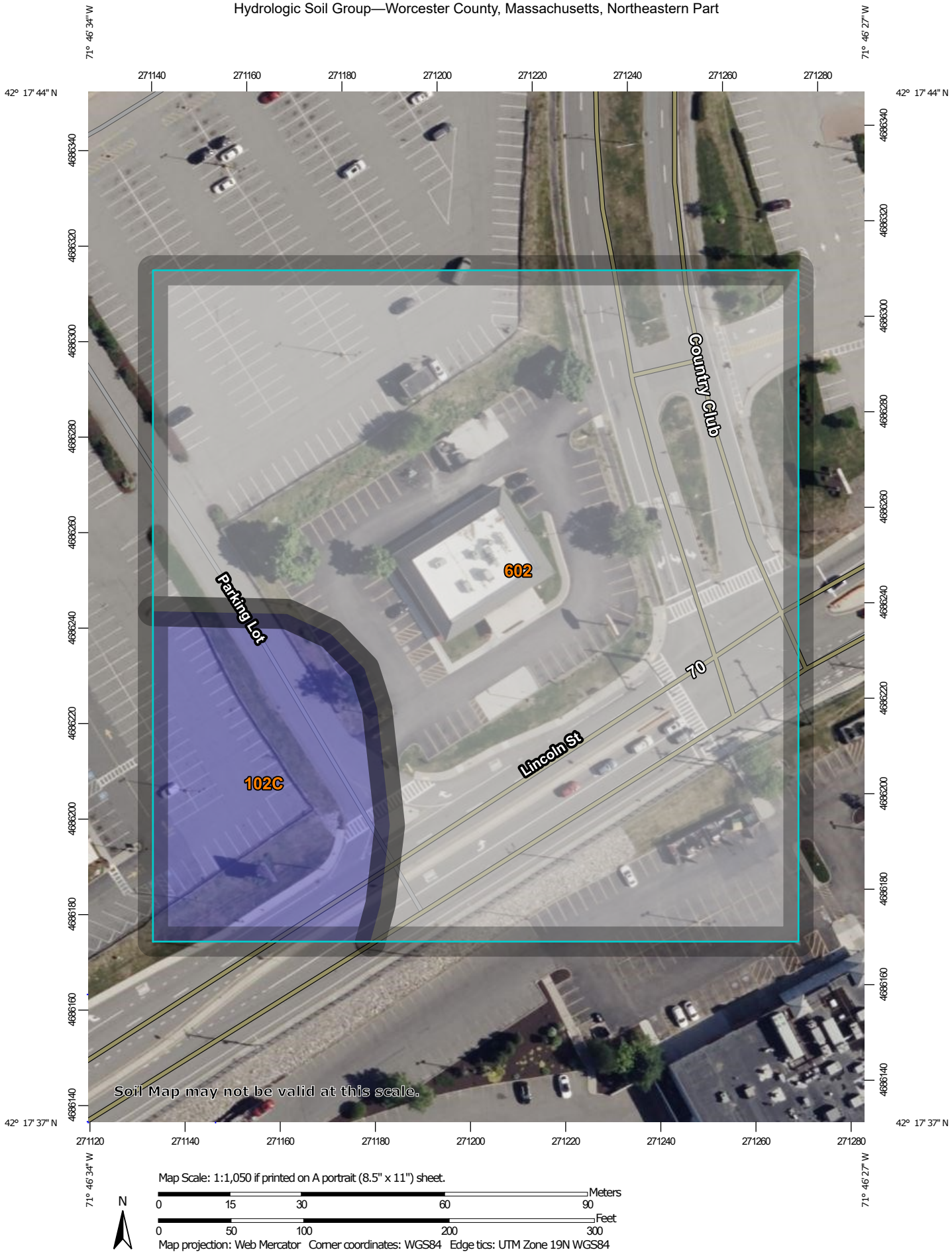
This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 9/20/2024 at 12:24 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: SOIL INFORMATION

- *NCRS CUSTOM SOIL RESOURCE REPORT*
- *SOIL LOGS*


71° 46' 34" W
71° 46' 27" W
42° 17' 44" N
42° 17' 37" N
271140
271160
271180
271200
271220
271240
271260
271280
4686340
4686320
4686300
4686280
4686260
4686240
4686220
4686200
4686180
4686160
4686140
Country Club
602
Parking Lot
70
Lincoln St
102C
Soil Map may not be valid at this scale.
Map Scale: 1:1,050 if printed on A portrait (8.5" x 11") sheet.
N
Meters
0 15 30 60 90
Feet
0 50 100 200 300
Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 19N 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 1:20,000.

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: Worcester County, Massachusetts, Northeastern Part
Survey Area Data: Version 19, Aug 27, 2024

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

Date(s) aerial images were photographed: May 22, 2022—Jun 5, 2022

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

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
102C	Chatfield-Hollis-Rock outcrop complex, 0 to 15 percent slopes	B	0.8	16.7%
602	Urban land		3.9	83.3%
Totals for Area of Interest			**4.7**	**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

Site Location or lot #					DEEP HOLE # 1
Applicant/owner:					
DATE:	6/25/2024	WEATHER:	Sunny	TEMP:	° 70+
LOCATION: (Refer to sketch attached)					
PERFORMED BY:	Owen Ryan (SE #14797)				
WITNESSED BY:	N/A (for drainage only)				

Land Use:	Vacant Lot & Building	Landform:	
Vegetation:	N/A	Slope:	0-5%
Stone Walls:	☐ Y ☒ N	Surface Stones:	☐ Y ☒ N

Distance From:

Open Water Bodies:	>100 ft.	Possible Wet Area:	>100 ft.
Drinking Water Well:	>100 ft.	Drainageway:	>100 ft.
Property Line:	±20-25 ft.	Other: Road	50-60'

DEEP OBSERVATION HOLE LOG

Depth	Soil Horizon	Soil Texture	Soil Color	Other: Structures; Stones; Boulders; Consistency; % gravel
0-48	- Fill	- SL	10yr 4/4	Massive, friable, 10-15% stones & cobbles, Moderate staining on Hands, Pavement 5-6"± thick
48-90+	- Fill	- Fine Silty loam	10yr 5/4	Massive friable, 0-5% gravel, 5-10 stones & cobbles, Heavy staining on hands, Moist sample Hit Rock
	-	-		
	-	-		

Parent Material (geologic):	-	Depth to Bedrock:	Refusal at 90"
Depth to Groundwater:	Standing Water in Hole:	None	
	Weeping From Pit Face:	None	
	Estimated Seasonal High Groundwater:	90"+	

DETERMINATION FOR SEASONAL HIGH WATER TABLE

Method used:	Depth observed standing in obs. hole:	None			
	Depth to weeping from side of obs. hole:	None			
	Depth to soil mottles, description:	None			
	Groundwater adjustment:	90"+			
Index Well #:	Reading Date:		Index Well Level:		Adj. Factor:
Adj. ground water level:					

Notes: Very Rocky with large Boulders, pockets of very fine silty loam but no real Horizon differentiation, Appears to be slightly perched horizon change but no sign of ESHGW. Hit bedrock at 90",

According to geologist, Aldi's next door had gw at 14' and found similar fine layer of soil they classified as "silty sand" However I found it to be closer to a fine silty loam

Pavement top course: 2"
Bot. Course: 2-3"

Site Location or lot #		DEEP HOLE # 2
Applicant/owner:		

DATE:		WEATHER:	Sunny	TEMP: °
LOCATION: (Refer to sketch attached)				
PERFORMED BY:	Owen Ryan (SE #14797)			
WITNESSED BY:	N/A (for drainage only)			

Land Use:	Vacant parking lot / BLDG	Landform:	
Vegetation:	Asphalt, Landscaping within 10'	Slope:	0-5%
Stone Walls:	☐ Y ☒ N	Surface Stones:	☐ Y ☒ N

Distance From:

Open Water Bodies:	>100 ft.	Possible Wet Area:	>100 ft.
Drinking Water Well:	>100 ft.	Drainageway:	>100 ft.
Property Line:	ft.	Other:	

DEEP OBSERVATION HOLE LOG

Depth	Soil Horizon	Soil Texture	Soil Color	Other: Structures; Stones; Boulders; Consistency; % gravel
0-12"	- Fill	- SL	10 yr 4/4	Massive, friable, very Rocky, Boulder/Ledge, 5/10% gravel, 10-15% stones & cobbles, Moderate staining
12-30"	- Weathered Rock	- Weathered Rock	—	Machine able to pull fragments, but hit solid refusal at 30"
	-	-		
	-	-		

Parent Material (geologic):	-	Depth to Bedrock:	→ 12" (weathered & fragmented)
Depth to Groundwater:	Standing Water in Hole:	None	→ 30" (solid refusal)
	Weeping From Pit Face:	None	
	Estimated Seasonal High Groundwater:	30" +	

DETERMINATION FOR SEASONAL HIGH WATER TABLE

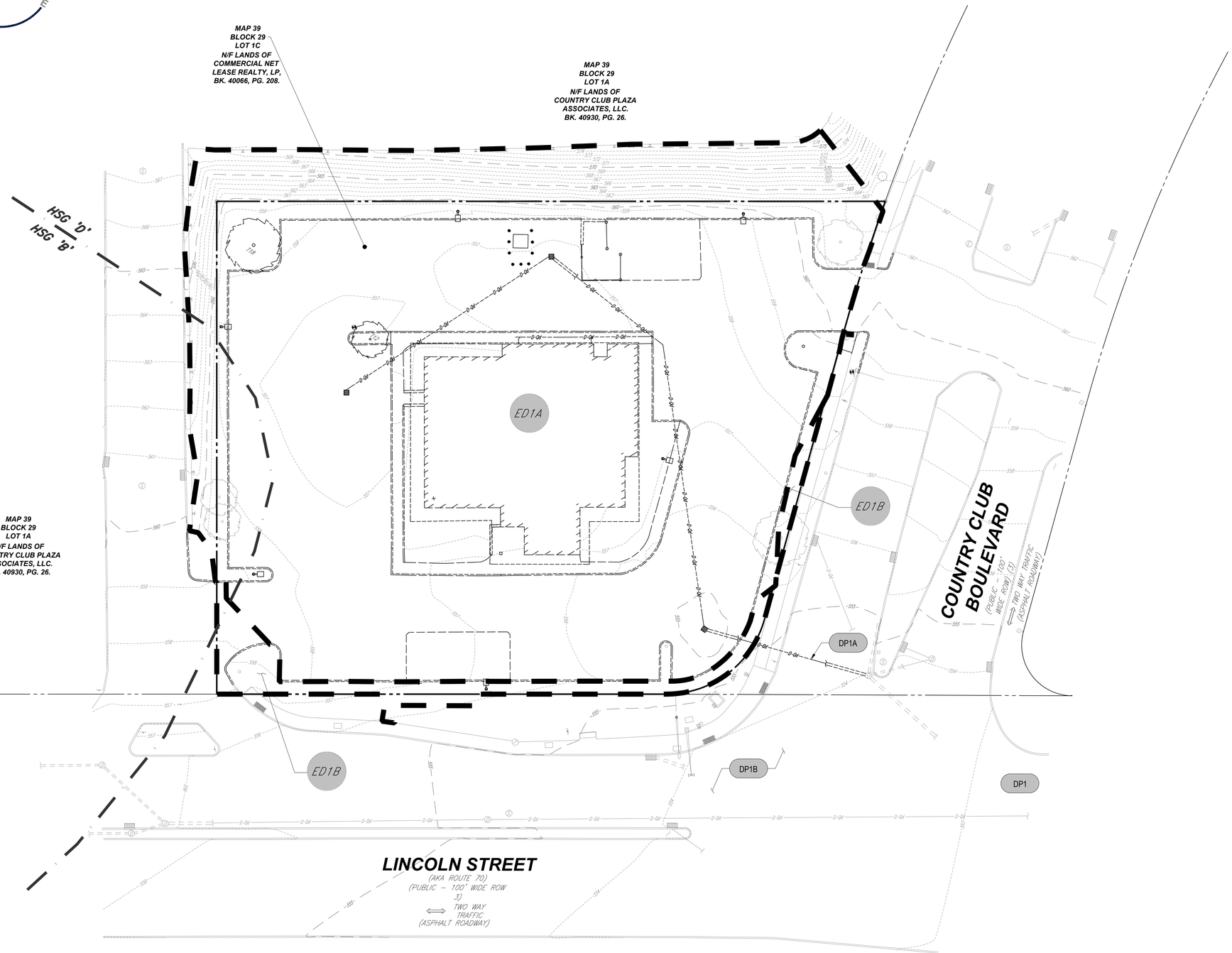
Method used:	Depth observed standing in obs. hole:	None
	Depth to weeping from side of obs. hole:	None
	Depth to soil mottles, description:	None
	Groundwater adjustment:	30" +

Index Well #:		Reading Date:		Index Well Level:		Adj. Factor:	
Adj. ground water level:							

Notes: Extremely hard digging with Boulder/Ledge present @ 18" ±.

APPENDIX D: EXISTING CONDITIONS HYDROLOGIC ANALYSIS

- *EXISTING CONDITIONS DRAINAGE MAP*
- *EXISTING CONDITIONS HYDROCAD COMPUTATIONS*



LEGEND

EXISTING WATERSHED	
DESIGN POINT	DP2, DP1
SUBCATCHMENT ID	ED1, ED1
SUBCATCHMENT BOUNDARY	

SCALE: 1" = 20'

Restaurant Support Office
6800 Bishop Road, Plano, TX 75024
Tele: 972-769-3100 Fax: 972-769-3101

PROTOTYPE ISSUE DATE: -

REVISIONS

REV	DATE	COMMENT	DRAWN BY / CHECKED BY

811 Know what's below. Call before you dig.

ALWAYS CALL 811

It's fast. It's free. It's the law.

ENTITLEMENT SET

THIS DRAWING IS INTENDED FOR MUNICIPAL AND/OR AGENCY REVIEW AND APPROVAL. IT IS NOT INTENDED AS A CONSTRUCTION DOCUMENT UNLESS INDICATED OTHERWISE.

PROJECT No.:	MAA240136.00
DRAWN BY:	CJP
CHECKED BY:	MMA
DATE:	10/03/2024
CAD I.D.:	X-CIVL-TTLB

PROJECT:

SITE DEVELOPMENT PLANS

FOR

PROPOSED DEVELOPMENT

MAP: 39 | BLK: 29 | LOT: 1C
494 LINCOLN STREET
WORCESTER COUNTY
WORCESTER, MASSACHUSETTS

STORE:

PROTOTYPE 6-V-AV
RESTAURANT #RC1233

DESIGNER INFORMATION:

BOHLER
352 TURNPIKE ROAD, 3rd FLOOR
SOUTHBOROUGH, MA 01772
Phone: (508) 480-9900
www.BohlerEngineering.com

SHEET TITLE:

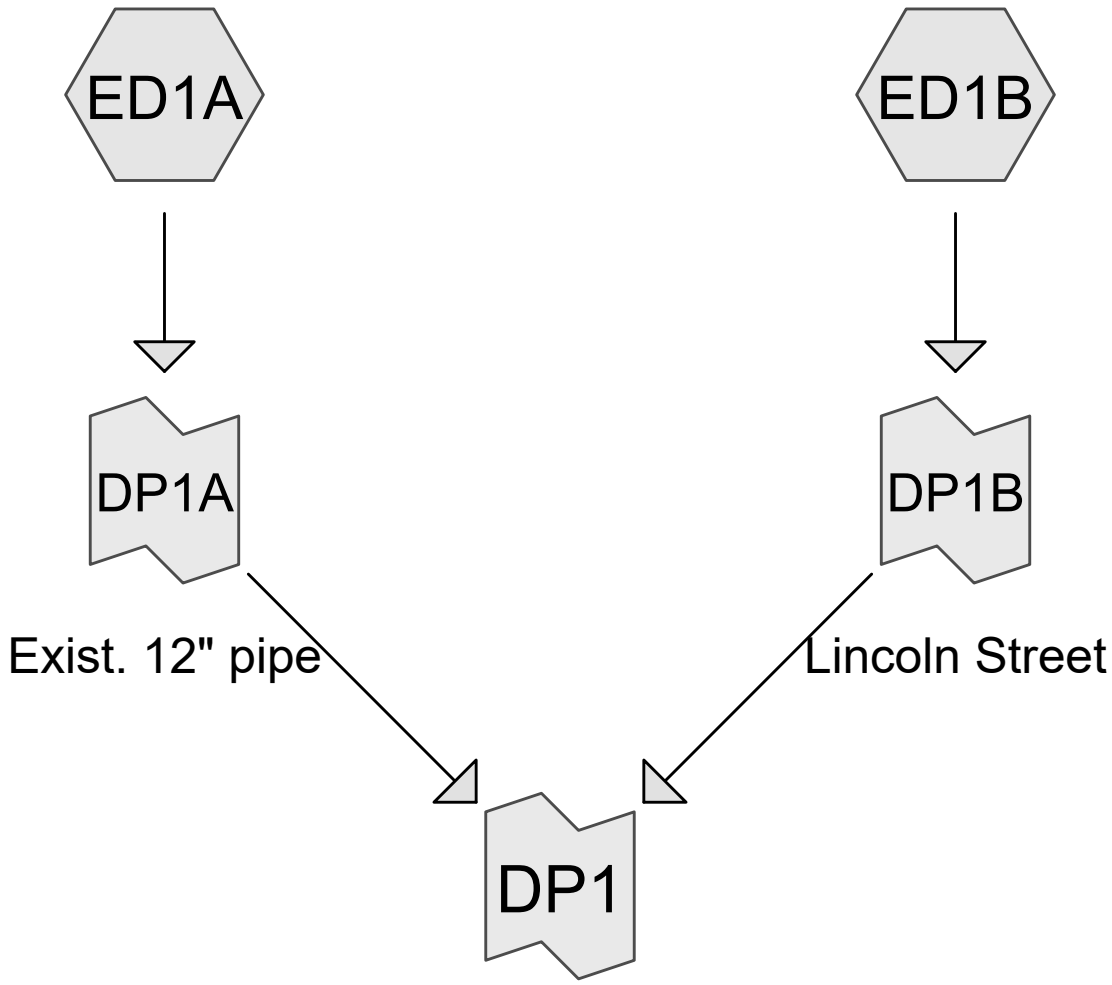
PRE DEVELOPMENT DRAINAGE AREA MAP

SHEET NUMBER:

C-402

ORG. DATE - 10/03/2024

P:\2024\MAA240136.00\CAD\DRAWINGS\PLAN SETS\DRAINAGE AREA MAPS\P-DRMAP-HYDR-MAA240136.00-00A---LAYOUT: C-402 PRED
CC



Lincoln Street Drainage System

Subcat Reach Pond Link

Routing Diagram for MAA240136_Existing
Prepared by Bohler, Printed 10/2/2024

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-Year	Type III 24-hr		Default	24.00	1	3.87	2
2	10-Year	Type III 24-hr		Default	24.00	1	6.02	2
3	25-Year	Type III 24-hr		Default	24.00	1	7.74	2
4	100-Year	Type III 24-hr		Default	24.00	1	10.60	2

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.031	61	>75% Grass cover, Good, HSG B (ED1A)
0.304	80	>75% Grass cover, Good, HSG D (ED1A, ED1B)
0.025	98	Paved parking, HSG B (ED1A, ED1B)
0.688	98	Paved parking, HSG D (ED1A, ED1B)
0.160	98	Roofs, HSG D (ED1A)
1.208	**93**	**TOTAL AREA**

Soil Listing (selected nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.056	HSG B	ED1A, ED1B
0.000	HSG C	
1.152	HSG D	ED1A, ED1B
0.000	Other	
1.208		**TOTAL AREA**

Ground Covers (selected nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.031	0.000	0.304	0.000	0.335	>75% Grass cover, Good	ED1A, ED1B
0.000	0.025	0.000	0.688	0.000	0.714	Paved parking	ED1A, ED1B
0.000	0.000	0.000	0.160	0.000	0.160	Roofs	ED1A
0.000	**0.056**	**0.000**	**1.152**	**0.000**	**1.208**	**TOTAL AREA**	

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentED1A: Runoff Area=50,339 sf 74.82% Impervious Runoff Depth=3.09"
Tc=6.0 min CN=93 Runoff=3.9 cfs 0.298 af

SubcatchmentED1B: Runoff Area=2,289 sf 16.95% Impervious Runoff Depth=2.17"
Tc=6.0 min CN=83 Runoff=0.1 cfs 0.010 af

Link DP1: Lincoln Street Drainage System Inflow=4.0 cfs 0.307 af
Primary=4.0 cfs 0.307 af

Link DP1A: Exist. 12" pipe Inflow=3.9 cfs 0.298 af
Primary=3.9 cfs 0.298 af

Link DP1B: Lincoln Street Inflow=0.1 cfs 0.010 af
Primary=0.1 cfs 0.010 af

Total Runoff Area = 1.208 ac Runoff Volume = 0.307 af Average Runoff Depth = 3.05"
27.70% Pervious = 0.335 ac 72.30% Impervious = 0.874 ac

Summary for Subcatchment ED1A:

Runoff = 3.9 cfs @ 12.09 hrs, Volume= 0.298 af, Depth= 3.09"
Routed to Link DP1A : Exist. 12" pipe

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.87"

Area (sf)	CN	Description
29,648	98	Paved parking, HSG D
1,045	98	Paved parking, HSG B
11,320	80	>75% Grass cover, Good, HSG D
1,357	61	>75% Grass cover, Good, HSG B
6,969	98	Roofs, HSG D
50,339	93	Weighted Average
12,677		25.18% Pervious Area
37,662		74.82% Impervious Area

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

Summary for Subcatchment ED1B:

Runoff = 0.1 cfs @ 12.09 hrs, Volume= 0.010 af, Depth= 2.17"
Routed to Link DP1B : Lincoln Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.87"

Area (sf)	CN	Description
331	98	Paved parking, HSG D
57	98	Paved parking, HSG B
1,901	80	>75% Grass cover, Good, HSG D
2,289	83	Weighted Average
1,901		83.05% Pervious Area
388		16.95% Impervious Area

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

Summary for Link DP1: Lincoln Street Drainage System

Inflow Area = 1.208 ac, 72.30% Impervious, Inflow Depth = 3.05" for 2-Year event
Inflow = 4.0 cfs @ 12.09 hrs, Volume= 0.307 af
Primary = 4.0 cfs @ 12.09 hrs, Volume= 0.307 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link DP1A: Exist. 12" pipe

Inflow Area = 1.156 ac, 74.82% Impervious, Inflow Depth = 3.09" for 2-Year event
Inflow = 3.9 cfs @ 12.09 hrs, Volume= 0.298 af
Primary = 3.9 cfs @ 12.09 hrs, Volume= 0.298 af, Atten= 0%, Lag= 0.0 min
Routed to Link DP1 : Lincoln Street Drainage System

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link DP1B: Lincoln Street

Inflow Area = 0.053 ac, 16.95% Impervious, Inflow Depth = 2.17" for 2-Year event
Inflow = 0.1 cfs @ 12.09 hrs, Volume= 0.010 af
Primary = 0.1 cfs @ 12.09 hrs, Volume= 0.010 af, Atten= 0%, Lag= 0.0 min
Routed to Link DP1 : Lincoln Street Drainage System

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentED1A: Runoff Area=50,339 sf 74.82% Impervious Runoff Depth=5.20"
Tc=6.0 min CN=93 Runoff=6.4 cfs 0.501 af

SubcatchmentED1B: Runoff Area=2,289 sf 16.95% Impervious Runoff Depth=4.11"
Tc=6.0 min CN=83 Runoff=0.2 cfs 0.018 af

Link DP1: Lincoln Street Drainage System Inflow=6.6 cfs 0.519 af
Primary=6.6 cfs 0.519 af

Link DP1A: Exist. 12" pipe Inflow=6.4 cfs 0.501 af
Primary=6.4 cfs 0.501 af

Link DP1B: Lincoln Street Inflow=0.2 cfs 0.018 af
Primary=0.2 cfs 0.018 af

Total Runoff Area = 1.208 ac Runoff Volume = 0.519 af Average Runoff Depth = 5.15"
27.70% Pervious = 0.335 ac 72.30% Impervious = 0.874 ac

Summary for Subcatchment ED1A:

Runoff = 6.4 cfs @ 12.09 hrs, Volume= 0.501 af, Depth= 5.20"
Routed to Link DP1A : Exist. 12" pipe

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=6.02"

Area (sf)	CN	Description
29,648	98	Paved parking, HSG D
1,045	98	Paved parking, HSG B
11,320	80	>75% Grass cover, Good, HSG D
1,357	61	>75% Grass cover, Good, HSG B
6,969	98	Roofs, HSG D
50,339	93	Weighted Average
12,677		25.18% Pervious Area
37,662		74.82% Impervious Area

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

Summary for Subcatchment ED1B:

Runoff = 0.2 cfs @ 12.09 hrs, Volume= 0.018 af, Depth= 4.11"
Routed to Link DP1B : Lincoln Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=6.02"

Area (sf)	CN	Description
331	98	Paved parking, HSG D
57	98	Paved parking, HSG B
1,901	80	>75% Grass cover, Good, HSG D
2,289	83	Weighted Average
1,901		83.05% Pervious Area
388		16.95% Impervious Area

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

Summary for Link DP1: Lincoln Street Drainage System

Inflow Area = 1.208 ac, 72.30% Impervious, Inflow Depth = 5.15" for 10-Year event
Inflow = 6.6 cfs @ 12.09 hrs, Volume= 0.519 af
Primary = 6.6 cfs @ 12.09 hrs, Volume= 0.519 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link DP1A: Exist. 12" pipe

Inflow Area = 1.156 ac, 74.82% Impervious, Inflow Depth = 5.20" for 10-Year event
Inflow = 6.4 cfs @ 12.09 hrs, Volume= 0.501 af
Primary = 6.4 cfs @ 12.09 hrs, Volume= 0.501 af, Atten= 0%, Lag= 0.0 min
Routed to Link DP1 : Lincoln Street Drainage System

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link DP1B: Lincoln Street

Inflow Area = 0.053 ac, 16.95% Impervious, Inflow Depth = 4.11" for 10-Year event
Inflow = 0.2 cfs @ 12.09 hrs, Volume= 0.018 af
Primary = 0.2 cfs @ 12.09 hrs, Volume= 0.018 af, Atten= 0%, Lag= 0.0 min
Routed to Link DP1 : Lincoln Street Drainage System

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentED1A: Runoff Area=50,339 sf 74.82% Impervious Runoff Depth=6.90"
Tc=6.0 min CN=93 Runoff=8.3 cfs 0.665 af

SubcatchmentED1B: Runoff Area=2,289 sf 16.95% Impervious Runoff Depth=5.73"
Tc=6.0 min CN=83 Runoff=0.3 cfs 0.025 af

Link DP1: Lincoln Street Drainage System Inflow=8.7 cfs 0.690 af
Primary=8.7 cfs 0.690 af

Link DP1A: Exist. 12" pipe Inflow=8.3 cfs 0.665 af
Primary=8.3 cfs 0.665 af

Link DP1B: Lincoln Street Inflow=0.3 cfs 0.025 af
Primary=0.3 cfs 0.025 af

Total Runoff Area = 1.208 ac Runoff Volume = 0.690 af Average Runoff Depth = 6.85"
27.70% Pervious = 0.335 ac 72.30% Impervious = 0.874 ac

Summary for Subcatchment ED1A:

Runoff = 8.3 cfs @ 12.09 hrs, Volume= 0.665 af, Depth= 6.90"
Routed to Link DP1A : Exist. 12" pipe

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=7.74"

Area (sf)	CN	Description
29,648	98	Paved parking, HSG D
1,045	98	Paved parking, HSG B
11,320	80	>75% Grass cover, Good, HSG D
1,357	61	>75% Grass cover, Good, HSG B
6,969	98	Roofs, HSG D
50,339	93	Weighted Average
12,677		25.18% Pervious Area
37,662		74.82% Impervious Area

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

Summary for Subcatchment ED1B:

Runoff = 0.3 cfs @ 12.09 hrs, Volume= 0.025 af, Depth= 5.73"
Routed to Link DP1B : Lincoln Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=7.74"

Area (sf)	CN	Description
331	98	Paved parking, HSG D
57	98	Paved parking, HSG B
1,901	80	>75% Grass cover, Good, HSG D
2,289	83	Weighted Average
1,901		83.05% Pervious Area
388		16.95% Impervious Area

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

Summary for Link DP1: Lincoln Street Drainage System

Inflow Area = 1.208 ac, 72.30% Impervious, Inflow Depth = 6.85" for 25-Year event
Inflow = 8.7 cfs @ 12.09 hrs, Volume= 0.690 af
Primary = 8.7 cfs @ 12.09 hrs, Volume= 0.690 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link DP1A: Exist. 12" pipe

Inflow Area = 1.156 ac, 74.82% Impervious, Inflow Depth = 6.90" for 25-Year event
Inflow = 8.3 cfs @ 12.09 hrs, Volume= 0.665 af
Primary = 8.3 cfs @ 12.09 hrs, Volume= 0.665 af, Atten= 0%, Lag= 0.0 min
Routed to Link DP1 : Lincoln Street Drainage System

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link DP1B: Lincoln Street

Inflow Area = 0.053 ac, 16.95% Impervious, Inflow Depth = 5.73" for 25-Year event
Inflow = 0.3 cfs @ 12.09 hrs, Volume= 0.025 af
Primary = 0.3 cfs @ 12.09 hrs, Volume= 0.025 af, Atten= 0%, Lag= 0.0 min
Routed to Link DP1 : Lincoln Street Drainage System

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentED1A: Runoff Area=50,339 sf 74.82% Impervious Runoff Depth=9.75"
Tc=6.0 min CN=93 Runoff=11.6 cfs 0.939 af

SubcatchmentED1B: Runoff Area=2,289 sf 16.95% Impervious Runoff Depth=8.48"
Tc=6.0 min CN=83 Runoff=0.5 cfs 0.037 af

Link DP1: Lincoln Street Drainage System Inflow=12.1 cfs 0.976 af
Primary=12.1 cfs 0.976 af

Link DP1A: Exist. 12" pipe Inflow=11.6 cfs 0.939 af
Primary=11.6 cfs 0.939 af

Link DP1B: Lincoln Street Inflow=0.5 cfs 0.037 af
Primary=0.5 cfs 0.037 af

Total Runoff Area = 1.208 ac Runoff Volume = 0.976 af Average Runoff Depth = 9.69"
27.70% Pervious = 0.335 ac 72.30% Impervious = 0.874 ac

Summary for Subcatchment ED1A:

Runoff = 11.6 cfs @ 12.09 hrs, Volume= 0.939 af, Depth= 9.75"
Routed to Link DP1A : Exist. 12" pipe

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=10.60"

Area (sf)	CN	Description
29,648	98	Paved parking, HSG D
1,045	98	Paved parking, HSG B
11,320	80	>75% Grass cover, Good, HSG D
1,357	61	>75% Grass cover, Good, HSG B
6,969	98	Roofs, HSG D
50,339	93	Weighted Average
12,677		25.18% Pervious Area
37,662		74.82% Impervious Area

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

Summary for Subcatchment ED1B:

Runoff = 0.5 cfs @ 12.09 hrs, Volume= 0.037 af, Depth= 8.48"
Routed to Link DP1B : Lincoln Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=10.60"

Area (sf)	CN	Description
331	98	Paved parking, HSG D
57	98	Paved parking, HSG B
1,901	80	>75% Grass cover, Good, HSG D
2,289	83	Weighted Average
1,901		83.05% Pervious Area
388		16.95% Impervious Area

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

Summary for Link DP1: Lincoln Street Drainage System

Inflow Area = 1.208 ac, 72.30% Impervious, Inflow Depth = 9.69" for 100-Year event
Inflow = 12.1 cfs @ 12.09 hrs, Volume= 0.976 af
Primary = 12.1 cfs @ 12.09 hrs, Volume= 0.976 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link DP1A: Exist. 12" pipe

Inflow Area = 1.156 ac, 74.82% Impervious, Inflow Depth = 9.75" for 100-Year event
Inflow = 11.6 cfs @ 12.09 hrs, Volume= 0.939 af
Primary = 11.6 cfs @ 12.09 hrs, Volume= 0.939 af, Atten= 0%, Lag= 0.0 min
Routed to Link DP1 : Lincoln Street Drainage System

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

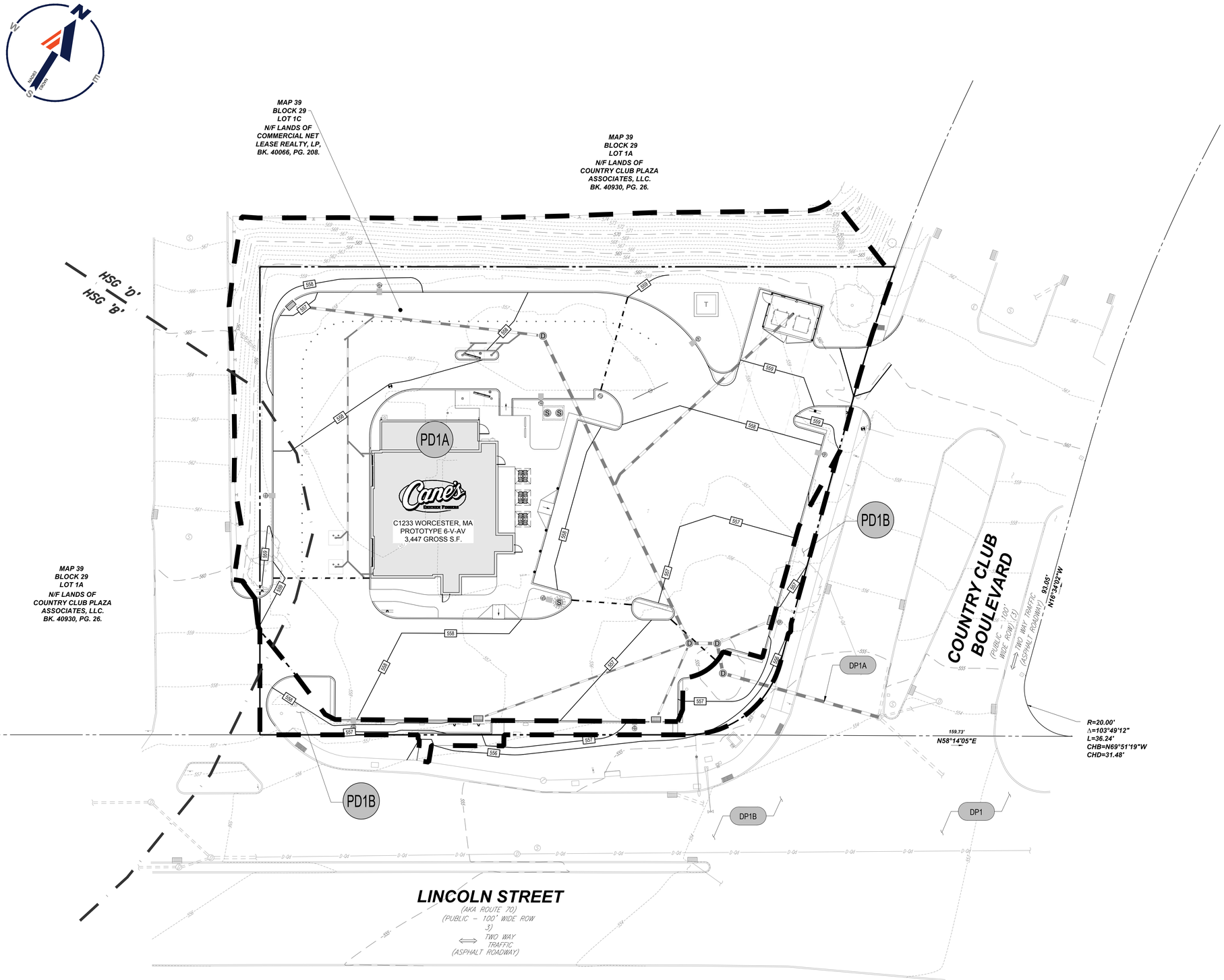
Summary for Link DP1B: Lincoln Street

Inflow Area = 0.053 ac, 16.95% Impervious, Inflow Depth = 8.48" for 100-Year event
Inflow = 0.5 cfs @ 12.09 hrs, Volume= 0.037 af
Primary = 0.5 cfs @ 12.09 hrs, Volume= 0.037 af, Atten= 0%, Lag= 0.0 min
Routed to Link DP1 : Lincoln Street Drainage System

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

APPENDIX E: PROPOSED CONDITIONS HYDROLOGIC ANALYSIS

- *PROPOSED CONDITIONS DRAINAGE MAP*
- *PROPOSED CONDITIONS HYDROCAD CALCULATIONS*



LEGEND

PROPOSED WATERSHED	
DESIGN POINT	DP1 / DP1
SUBCATCHMENT ID	PD1 PD1
SUBCATCHMENT BOUNDARY	

Restaurant Support Office
6800 Bishop Road, Plano, TX 75024
Tele: 972-769-3100 Fax: 972-769-3101

PROTOTYPE ISSUE DATE: -

REVISIONS

REV	DATE	COMMENT	DRAWN BY / CHECKED BY

811 Know what's below. Call before you dig.
ALWAYS CALL 811
It's fast. It's free. It's the law.

ENTITLEMENT SET

THIS DRAWING IS INTENDED FOR MUNICIPAL AND/OR AGENCY REVIEW AND APPROVAL. IT IS NOT INTENDED AS A CONSTRUCTION DOCUMENT UNLESS INDICATED OTHERWISE.

PROJECT No.:	MAA240136.00
DRAWN BY:	CJP
CHECKED BY:	MMA
DATE:	10/03/2024
CAD I.D.:	X-CIVL-TTLB

PROJECT:

SITE DEVELOPMENT PLANS

FOR

PROPOSED DEVELOPMENT

MAP: 39 | BLK: 29 | LOT: 1C
494 LINCOLN STREET
WORCESTER COUNTY
WORCESTER, MASSACHUSETTS

STORE:

PROTOTYPE 6-V-AV
RESTAURANT #RC1233

DESIGNER INFORMATION:

BOHLER
352 TURNPIKE ROAD, 3rd FLOOR
SOUTHBOROUGH, MA 01772
Phone: (508) 480-9900
www.BohlerEngineering.com

SHEET TITLE:

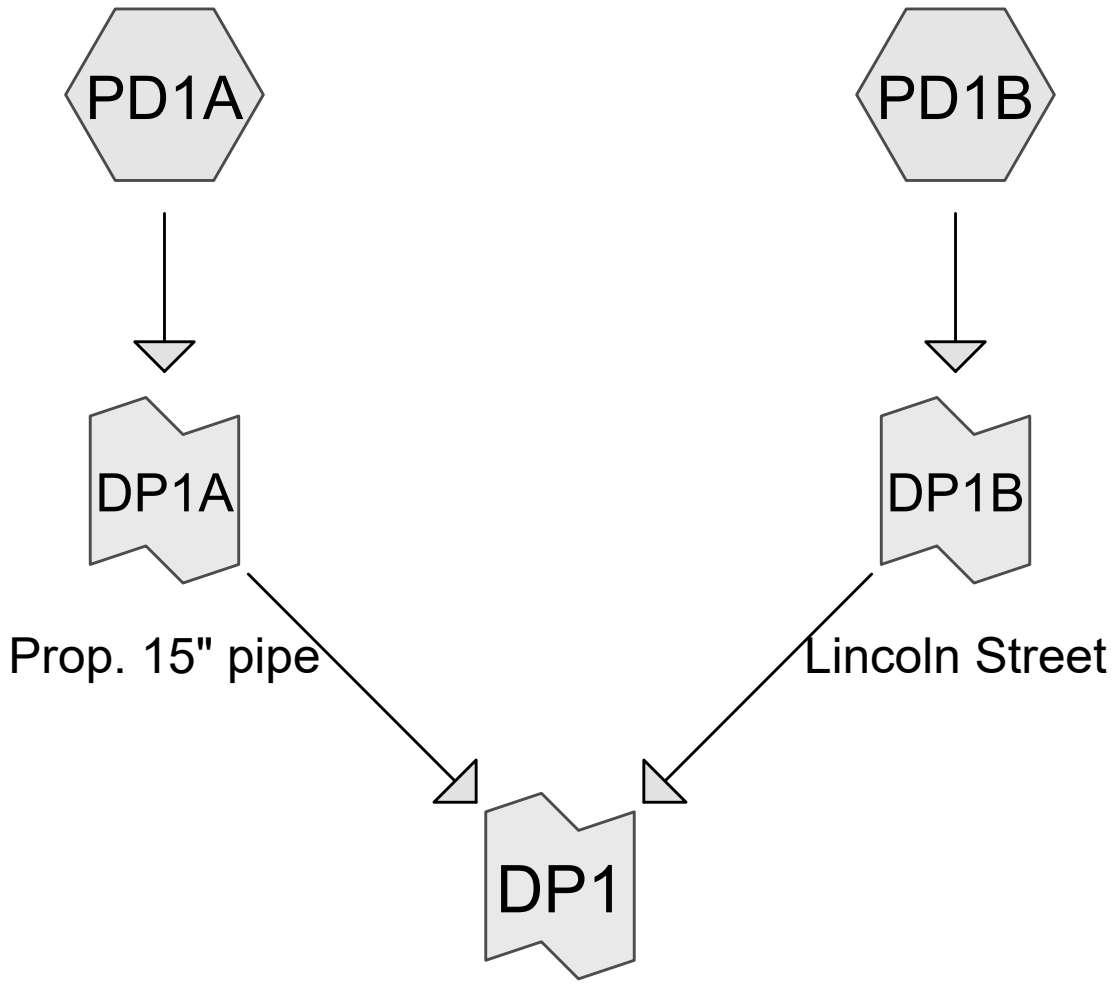
POST DEVELOPMENT DRAINAGE AREA MAP

SHEET NUMBER:

C-403

ORG. DATE - 10/03/2024

P:\2024\MAA240136.00\CAD\DRAWINGS\PLAN SETS\DRAINAGE AREA MAPS\P-DMAP-HYDR-MAA240136.00-BA----1-LAYOUT: C-403 PSTD



Lincoln Street Drainage System

Subcat Reach Pond Link

Routing Diagram for MAA240136_Proposed
Prepared by Bohler, Printed 10/2/2024

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-Year	Type III 24-hr		Default	24.00	1	3.87	2
2	10-Year	Type III 24-hr		Default	24.00	1	6.02	2
3	25-Year	Type III 24-hr		Default	24.00	1	7.74	2
4	100-Year	Type III 24-hr		Default	24.00	1	10.60	2

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.028	61	>75% Grass cover, Good, HSG B (PD1A, PD1B)
0.358	80	>75% Grass cover, Good, HSG D (PD1A, PD1B)
0.028	98	Paved parking, HSG B (PD1A, PD1B)
0.710	98	Paved parking, HSG D (PD1A, PD1B)
0.084	98	Roofs, HSG D (PD1A)
1.208	**92**	**TOTAL AREA**

Soil Listing (selected nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.056	HSG B	PD1A, PD1B
0.000	HSG C	
1.152	HSG D	PD1A, PD1B
0.000	Other	
1.208		**TOTAL AREA**

Ground Covers (selected nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.028	0.000	0.358	0.000	0.386	>75% Grass cover, Good	PD1A, PD1B
0.000	0.028	0.000	0.710	0.000	0.737	Paved parking	PD1A, PD1B
0.000	0.000	0.000	0.084	0.000	0.084	Roofs	PD1A
0.000	**0.056**	**0.000**	**1.152**	**0.000**	**1.208**	**TOTAL AREA**	

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentPD1A: Runoff Area=49,116 sf 71.20% Impervious Runoff Depth=2.99"
Tc=6.0 min CN=92 Runoff=3.7 cfs 0.281 af

SubcatchmentPD1B: Runoff Area=3,483 sf 23.31% Impervious Runoff Depth=2.26"
Tc=6.0 min CN=84 Runoff=0.2 cfs 0.015 af

Link DP1: Lincoln Street Drainage System Inflow=3.9 cfs 0.296 af
Primary=3.9 cfs 0.296 af

Link DP1A: Prop. 15" pipe Inflow=3.7 cfs 0.281 af
Primary=3.7 cfs 0.281 af

Link DP1B: Lincoln Street Inflow=0.2 cfs 0.015 af
Primary=0.2 cfs 0.015 af

Total Runoff Area = 1.208 ac Runoff Volume = 0.296 af Average Runoff Depth = 2.94"
31.97% Pervious = 0.386 ac 68.03% Impervious = 0.821 ac

Summary for Subcatchment PD1A:

Runoff = 3.7 cfs @ 12.09 hrs, Volume= 0.281 af, Depth= 2.99"
Routed to Link DP1A : Prop. 15" pipe

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.87"

Area (sf)	CN	Description
30,357	98	Paved parking, HSG D
955	98	Paved parking, HSG B
12,963	80	>75% Grass cover, Good, HSG D
1,181	61	>75% Grass cover, Good, HSG B
3,660	98	Roofs, HSG D
49,116	92	Weighted Average
14,144		28.80% Pervious Area
34,972		71.20% Impervious Area

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

Summary for Subcatchment PD1B:

Runoff = 0.2 cfs @ 12.09 hrs, Volume= 0.015 af, Depth= 2.26"
Routed to Link DP1B : Lincoln Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.87"

Area (sf)	CN	Description
562	98	Paved parking, HSG D
250	98	Paved parking, HSG B
2,634	80	>75% Grass cover, Good, HSG D
37	61	>75% Grass cover, Good, HSG B
3,483	84	Weighted Average
2,671		76.69% Pervious Area
812		23.31% Impervious Area

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

Summary for Link DP1: Lincoln Street Drainage System

Inflow Area = 1.208 ac, 68.03% Impervious, Inflow Depth = 2.94" for 2-Year event
Inflow = 3.9 cfs @ 12.09 hrs, Volume= 0.296 af
Primary = 3.9 cfs @ 12.09 hrs, Volume= 0.296 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link DP1A: Prop. 15" pipe

Inflow Area = 1.128 ac, 71.20% Impervious, Inflow Depth = 2.99" for 2-Year event
Inflow = 3.7 cfs @ 12.09 hrs, Volume= 0.281 af
Primary = 3.7 cfs @ 12.09 hrs, Volume= 0.281 af, Atten= 0%, Lag= 0.0 min
Routed to Link DP1 : Lincoln Street Drainage System

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link DP1B: Lincoln Street

Inflow Area = 0.080 ac, 23.31% Impervious, Inflow Depth = 2.26" for 2-Year event
Inflow = 0.2 cfs @ 12.09 hrs, Volume= 0.015 af
Primary = 0.2 cfs @ 12.09 hrs, Volume= 0.015 af, Atten= 0%, Lag= 0.0 min
Routed to Link DP1 : Lincoln Street Drainage System

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentPD1A: Runoff Area=49,116 sf 71.20% Impervious Runoff Depth=5.09"
Tc=6.0 min CN=92 Runoff=6.2 cfs 0.478 af

SubcatchmentPD1B: Runoff Area=3,483 sf 23.31% Impervious Runoff Depth=4.22"
Tc=6.0 min CN=84 Runoff=0.4 cfs 0.028 af

Link DP1: Lincoln Street Drainage System Inflow=6.5 cfs 0.506 af
Primary=6.5 cfs 0.506 af

Link DP1A: Prop. 15" pipe Inflow=6.2 cfs 0.478 af
Primary=6.2 cfs 0.478 af

Link DP1B: Lincoln Street Inflow=0.4 cfs 0.028 af
Primary=0.4 cfs 0.028 af

Total Runoff Area = 1.208 ac Runoff Volume = 0.506 af Average Runoff Depth = 5.03"
31.97% Pervious = 0.386 ac 68.03% Impervious = 0.821 ac

Summary for Subcatchment PD1A:

Runoff = 6.2 cfs @ 12.09 hrs, Volume= 0.478 af, Depth= 5.09"
Routed to Link DP1A : Prop. 15" pipe

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=6.02"

Area (sf)	CN	Description
30,357	98	Paved parking, HSG D
955	98	Paved parking, HSG B
12,963	80	>75% Grass cover, Good, HSG D
1,181	61	>75% Grass cover, Good, HSG B
3,660	98	Roofs, HSG D
49,116	92	Weighted Average
14,144		28.80% Pervious Area
34,972		71.20% Impervious Area

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

Summary for Subcatchment PD1B:

Runoff = 0.4 cfs @ 12.09 hrs, Volume= 0.028 af, Depth= 4.22"
Routed to Link DP1B : Lincoln Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=6.02"

Area (sf)	CN	Description
562	98	Paved parking, HSG D
250	98	Paved parking, HSG B
2,634	80	>75% Grass cover, Good, HSG D
37	61	>75% Grass cover, Good, HSG B
3,483	84	Weighted Average
2,671		76.69% Pervious Area
812		23.31% Impervious Area

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

Summary for Link DP1: Lincoln Street Drainage System

Inflow Area = 1.208 ac, 68.03% Impervious, Inflow Depth = 5.03" for 10-Year event
Inflow = 6.5 cfs @ 12.09 hrs, Volume= 0.506 af
Primary = 6.5 cfs @ 12.09 hrs, Volume= 0.506 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link DP1A: Prop. 15" pipe

Inflow Area = 1.128 ac, 71.20% Impervious, Inflow Depth = 5.09" for 10-Year event
Inflow = 6.2 cfs @ 12.09 hrs, Volume= 0.478 af
Primary = 6.2 cfs @ 12.09 hrs, Volume= 0.478 af, Atten= 0%, Lag= 0.0 min
Routed to Link DP1 : Lincoln Street Drainage System

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link DP1B: Lincoln Street

Inflow Area = 0.080 ac, 23.31% Impervious, Inflow Depth = 4.22" for 10-Year event
Inflow = 0.4 cfs @ 12.09 hrs, Volume= 0.028 af
Primary = 0.4 cfs @ 12.09 hrs, Volume= 0.028 af, Atten= 0%, Lag= 0.0 min
Routed to Link DP1 : Lincoln Street Drainage System

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentPD1A: Runoff Area=49,116 sf 71.20% Impervious Runoff Depth=6.79"
Tc=6.0 min CN=92 Runoff=8.1 cfs 0.638 af

SubcatchmentPD1B: Runoff Area=3,483 sf 23.31% Impervious Runoff Depth=5.85"
Tc=6.0 min CN=84 Runoff=0.5 cfs 0.039 af

Link DP1: Lincoln Street Drainage System Inflow=8.6 cfs 0.677 af
Primary=8.6 cfs 0.677 af

Link DP1A: Prop. 15" pipe Inflow=8.1 cfs 0.638 af
Primary=8.1 cfs 0.638 af

Link DP1B: Lincoln Street Inflow=0.5 cfs 0.039 af
Primary=0.5 cfs 0.039 af

Total Runoff Area = 1.208 ac Runoff Volume = 0.677 af Average Runoff Depth = 6.72"
31.97% Pervious = 0.386 ac 68.03% Impervious = 0.821 ac

Summary for Subcatchment PD1A:

Runoff = 8.1 cfs @ 12.09 hrs, Volume= 0.638 af, Depth= 6.79"
Routed to Link DP1A : Prop. 15" pipe

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=7.74"

Area (sf)	CN	Description
30,357	98	Paved parking, HSG D
955	98	Paved parking, HSG B
12,963	80	>75% Grass cover, Good, HSG D
1,181	61	>75% Grass cover, Good, HSG B
3,660	98	Roofs, HSG D
49,116	92	Weighted Average
14,144		28.80% Pervious Area
34,972		71.20% Impervious Area

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

Summary for Subcatchment PD1B:

Runoff = 0.5 cfs @ 12.09 hrs, Volume= 0.039 af, Depth= 5.85"
Routed to Link DP1B : Lincoln Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=7.74"

Area (sf)	CN	Description
562	98	Paved parking, HSG D
250	98	Paved parking, HSG B
2,634	80	>75% Grass cover, Good, HSG D
37	61	>75% Grass cover, Good, HSG B
3,483	84	Weighted Average
2,671		76.69% Pervious Area
812		23.31% Impervious Area

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

Summary for Link DP1: Lincoln Street Drainage System

Inflow Area = 1.208 ac, 68.03% Impervious, Inflow Depth = 6.72" for 25-Year event
Inflow = 8.6 cfs @ 12.09 hrs, Volume= 0.677 af
Primary = 8.6 cfs @ 12.09 hrs, Volume= 0.677 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link DP1A: Prop. 15" pipe

Inflow Area = 1.128 ac, 71.20% Impervious, Inflow Depth = 6.79" for 25-Year event
Inflow = 8.1 cfs @ 12.09 hrs, Volume= 0.638 af
Primary = 8.1 cfs @ 12.09 hrs, Volume= 0.638 af, Atten= 0%, Lag= 0.0 min
Routed to Link DP1 : Lincoln Street Drainage System

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link DP1B: Lincoln Street

Inflow Area = 0.080 ac, 23.31% Impervious, Inflow Depth = 5.85" for 25-Year event
Inflow = 0.5 cfs @ 12.09 hrs, Volume= 0.039 af
Primary = 0.5 cfs @ 12.09 hrs, Volume= 0.039 af, Atten= 0%, Lag= 0.0 min
Routed to Link DP1 : Lincoln Street Drainage System

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentPD1A: Runoff Area=49,116 sf 71.20% Impervious Runoff Depth=9.62"
Tc=6.0 min CN=92 Runoff=11.2 cfs 0.904 af

SubcatchmentPD1B: Runoff Area=3,483 sf 23.31% Impervious Runoff Depth=8.61"
Tc=6.0 min CN=84 Runoff=0.8 cfs 0.057 af

Link DP1: Lincoln Street Drainage System Inflow=12.0 cfs 0.962 af
Primary=12.0 cfs 0.962 af

Link DP1A: Prop. 15" pipe Inflow=11.2 cfs 0.904 af
Primary=11.2 cfs 0.904 af

Link DP1B: Lincoln Street Inflow=0.8 cfs 0.057 af
Primary=0.8 cfs 0.057 af

Total Runoff Area = 1.208 ac Runoff Volume = 0.962 af Average Runoff Depth = 9.56"
31.97% Pervious = 0.386 ac 68.03% Impervious = 0.821 ac

Summary for Subcatchment PD1A:

Runoff = 11.2 cfs @ 12.09 hrs, Volume= 0.904 af, Depth= 9.62"
Routed to Link DP1A : Prop. 15" pipe

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=10.60"

Area (sf)	CN	Description
30,357	98	Paved parking, HSG D
955	98	Paved parking, HSG B
12,963	80	>75% Grass cover, Good, HSG D
1,181	61	>75% Grass cover, Good, HSG B
3,660	98	Roofs, HSG D
49,116	92	Weighted Average
14,144		28.80% Pervious Area
34,972		71.20% Impervious Area

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

Summary for Subcatchment PD1B:

Runoff = 0.8 cfs @ 12.09 hrs, Volume= 0.057 af, Depth= 8.61"
Routed to Link DP1B : Lincoln Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=10.60"

Area (sf)	CN	Description
562	98	Paved parking, HSG D
250	98	Paved parking, HSG B
2,634	80	>75% Grass cover, Good, HSG D
37	61	>75% Grass cover, Good, HSG B
3,483	84	Weighted Average
2,671		76.69% Pervious Area
812		23.31% Impervious Area

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

Summary for Link DP1: Lincoln Street Drainage System

Inflow Area = 1.208 ac, 68.03% Impervious, Inflow Depth = 9.56" for 100-Year event
Inflow = 12.0 cfs @ 12.09 hrs, Volume= 0.962 af
Primary = 12.0 cfs @ 12.09 hrs, Volume= 0.962 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link DP1A: Prop. 15" pipe

Inflow Area = 1.128 ac, 71.20% Impervious, Inflow Depth = 9.62" for 100-Year event
Inflow = 11.2 cfs @ 12.09 hrs, Volume= 0.904 af
Primary = 11.2 cfs @ 12.09 hrs, Volume= 0.904 af, Atten= 0%, Lag= 0.0 min
Routed to Link DP1 : Lincoln Street Drainage System

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link DP1B: Lincoln Street

Inflow Area = 0.080 ac, 23.31% Impervious, Inflow Depth = 8.61" for 100-Year event
Inflow = 0.8 cfs @ 12.09 hrs, Volume= 0.057 af
Primary = 0.8 cfs @ 12.09 hrs, Volume= 0.057 af, Atten= 0%, Lag= 0.0 min
Routed to Link DP1 : Lincoln Street Drainage System

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

APPENDIX F: STORMWATER CALCULATIONS

- *MA STANDARD #4 – WATER QUALITY AND TSS REMOVAL*
- *PIPE SIZING*
- *DRAINAGE INLET MAP*
- *NOAA RAINFALL DATA*

Proposed Restaurant with Drive-Thru (Raising Cane's)
494 Lincoln Street
Worcester, MA
Bohler Job Number: MAA240136.00
October 3, 2024

MA DEP Standard 4: TSS Removal Calculation Worksheet

BMP Treatment Train: CB --> WQU (Treatment)

A BMP	B TSS Removal Rate	C Starting TSS Load*	D Amount Removed (B*C)	E Remaining Load (C-D)
Deep Sump Hooded Catch Basin	**0.25**	**1.00**	**0.25**	**0.75**
Proprietary Water Quality Unit	**0.80**	**0.75**	**0.60**	**0.15**
		Total TSS Removal =	**85%**	

*Equals remaining load from previous BMP (E) which enters BMP

Prepared By:
BOHLER
352 Turnpike Road
Southborough, MA 01772
(508) 480-9900

Proposed Restaurant with Drive-Thru (Raising Cane's)
494 Lincoln Street
Worcester, MA
Bohler Job Number: MAA240136.00
October 3, 2024
1" Water Quality Volume to Flow Rate Calculation Sheet

Compute Water Quality Flow with the following Equation

WQF = (qu)(A)(WQV)

Site Plan Callout		qu (from 1" - qu Table)	Impervious Area (SF)	Ai (sq/mi)	WQV (inches)		**WQF (cfs)**
WQU A-30	=	774	31312	0.001123	1	=	**0.87**

Water Quality Flow Rate = WQF
Water Quality Volume = WQV*
Unit peak discharge (csm/in) = qu**
Impervious Area in watershed (square miles) = Ai

*WQV is expressed in watershed inches (you must use 1.0-inches in all cases with this method and not 0.5-inches)
** calculate the qu based on the time of concentration (see 1" - qu Table)

Prepared By:
BOHLER
352 Turnpike Road
Southborough, MA 01772
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Proposed Restaurant with Drive-Thru (Raising Cane's)
494 Lincoln Street
Worcester, MA
Bohler Job Number: MAA240136.00
October 3, 2024

Rational Pipe and Grate Sizing Calculations

Design Period Storm:		**25**	**Year**	**Design Period Intensity***			**11**	**in/hr**								
LOCATION		IMPERVIOUS			OTHER			SUM CA	Tc (min)	I (in/hr)	Q (cfs)	D (in)	S (ft/ft)	Matieral	n	Q Full (cfs)	V Full (fps)
FROM	TO	A	C	CA	A	C	CA										
CB A51	DMH A50	0.31	0.95	0.29	0.18	0.30	0.05	0.35	6	11	3.83	12	0.007	PVC	0.010	3.88	4.93
AD A43	DMH A50	0.01	0.95	0.01	0.00	0.30	0.00	0.01	6	11	0.10	12	0.020	PVC	0.010	6.55	8.34
DMH A50	DMH A40	0.32	0.95	0.30	0.18	0.30	0.05	0.36	6	11	3.94	15	0.005	HDPE	0.012	4.95	4.03
CB A41	DMH A40	0.09	0.95	0.09	0.01	0.30	0.00	0.09	6	11	0.96	8	0.020	PVC	0.010	2.22	6.36
CB A42	DMH A40	0.10	0.95	0.10	0.01	0.30	0.00	0.10	6	11	1.08	8	0.010	PVC	0.010	1.57	4.50
DMH A40	WQU A30	0.51	0.95	0.48	0.20	0.30	0.06	0.54	6	11	5.97	15	0.009	HDPE	0.012	6.64	5.41
CB A31	WQU A30	0.30	0.95	0.29	0.13	0.30	0.04	0.32	6	11	3.56	12	0.020	PVC	0.010	6.55	8.34
WQU A30	DMH A20	0.81	0.95	0.77	0.33	0.30	0.10	0.87	6	11	9.54	15	0.020	HDPE	0.012	9.90	8.06
DMH A20	EX DMH A10	0.81	0.95	0.77	0.33	0.30	0.10	0.87	6	11	9.54	15	0.020	HDPE	0.012	9.90	8.06

*Rainfall intesity provided by NOAA Atlas 14, Volume 10, Version 2 on 10/2/24

Prepared By:
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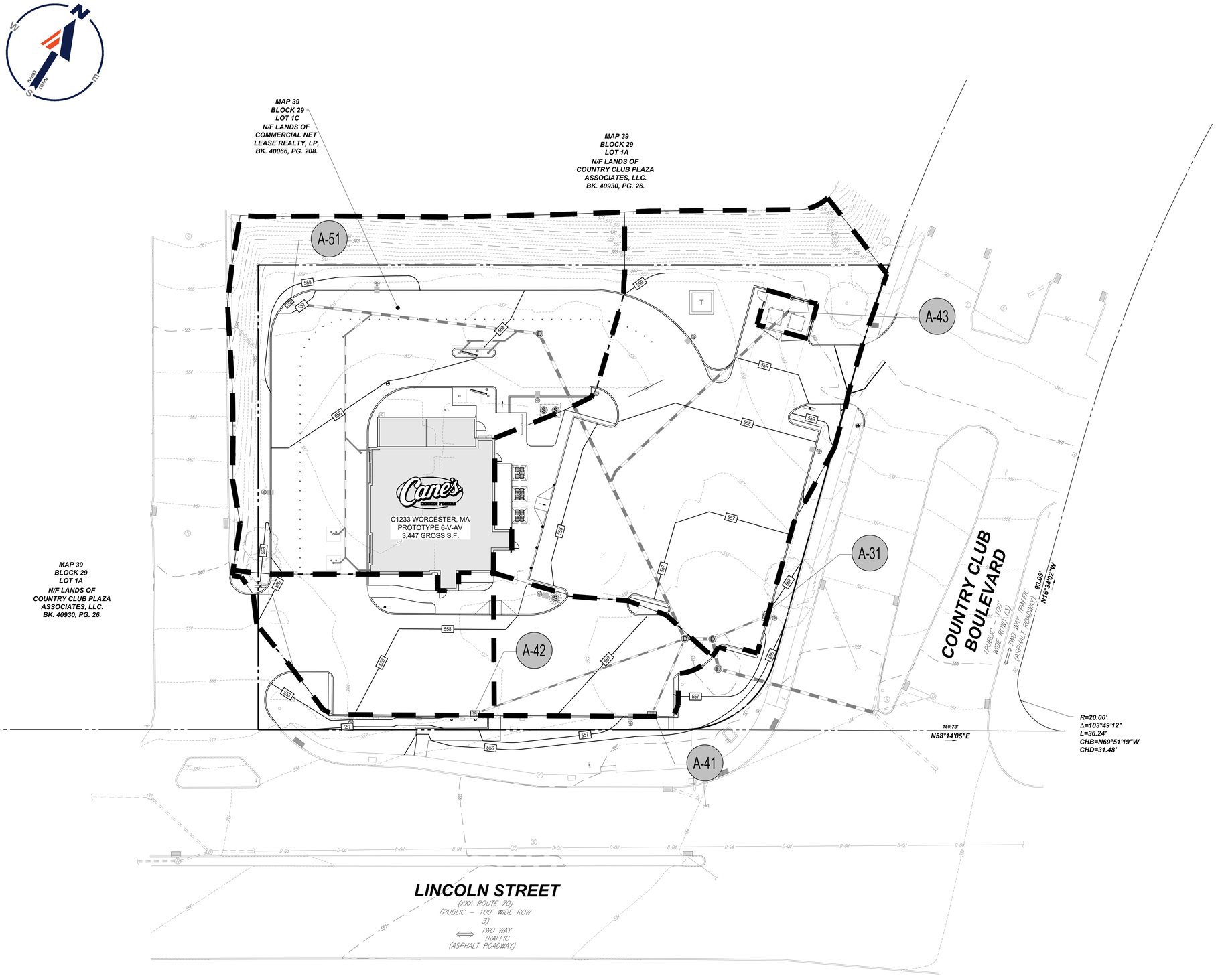
352 Turnpike Road
Southborough, MA 01772
(508) 480-9900



LEGEND

PROPOSED WATERSHED	
SUBCATCHMENT ID	PR-1 — PR-1
SUBCATCHMENT BOUNDARY	

SCALE: 1" = 20'

Restaurant Support Office
6800 Bishop Road, Plano, TX 75024
Tele: 972-769-3100 Fax: 972-769-3101

PROTOTYPE ISSUE DATE: -

REVISIONS

REV	DATE	COMMENT	DRAWN BY / CHECKED BY

Know what's below. Call before you dig.
ALWAYS CALL 811
It's fast. It's free. It's the law.

ENTITLEMENT SET

THIS DRAWING IS INTENDED FOR MUNICIPAL AND/OR AGENCY REVIEW AND APPROVAL. IT IS NOT INTENDED AS A CONSTRUCTION DOCUMENT UNLESS INDICATED OTHERWISE.

PROJECT No.:	MAA240136.00
DRAWN BY:	CJP
CHECKED BY:	MMA
DATE:	10/03/2024
CAD I.D.:	X-CIVL-TTLB

PROJECT:

SITE DEVELOPMENT PLANS

FOR

PROPOSED DEVELOPMENT

MAP: 39 | BLK: 29 | LOT: 1C
494 LINCOLN STREET
WORCESTER COUNTY
WORCESTER, MASSACHUSETTS

STORE:

PROTOTYPE 6-V-AV
RESTAURANT #RC1233

DESIGNER INFORMATION:

BOHLER
352 TURNPIKE ROAD, 3rd FLOOR
SOUTHBOROUGH, MA 01772
Phone: (508) 480-9900
www.BohlerEngineering.com

SHEET TITLE:

DRAINAGE INLET MAP

SHEET NUMBER:

C-404

ORG. DATE - 10/03/2024

P:\2024\MAA240136.00\CAD\DRAWINGS\PLAN SETS\DRAINAGE AREA MAP\SP-2MAP-NYDR-MAA240136.00-SA------3LAYOUT, C-404 PST

NOAA Atlas 14, Volume 10, Version 3
Location name: Worcester, Massachusetts, USA*
Latitude: 42.2949°, Longitude: -71.7754°
Elevation: 558 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	**0.344** (0.272-0.429)	**0.404** (0.319-0.505)	**0.502** (0.396-0.630)	**0.583** (0.457-0.736)	**0.695** (0.525-0.918)	**0.780** (0.576-1.05)	**0.868** (0.619-1.22)	**0.963** (0.652-1.39)	**1.09** (0.711-1.64)	**1.20** (0.758-1.84)
10-min	**0.488** (0.386-0.608)	**0.572** (0.453-0.715)	**0.711** (0.560-0.891)	**0.826** (0.646-1.04)	**0.985** (0.744-1.30)	**1.11** (0.816-1.49)	**1.23** (0.877-1.72)	**1.36** (0.924-1.97)	**1.55** (1.01-2.33)	**1.70** (1.07-2.61)
15-min	**0.574** (0.454-0.716)	**0.673** (0.532-0.841)	**0.836** (0.658-1.05)	**0.972** (0.761-1.23)	**1.16** (0.875-1.53)	**1.30** (0.960-1.76)	**1.45** (1.03-2.03)	**1.60** (1.09-2.32)	**1.82** (1.18-2.74)	**2.00** (1.26-3.07)
30-min	**0.775** (0.613-0.967)	**0.911** (0.720-1.14)	**1.13** (0.893-1.42)	**1.32** (1.03-1.66)	**1.57** (1.19-2.08)	**1.76** (1.30-2.38)	**1.96** (1.40-2.75)	**2.18** (1.48-3.15)	**2.48** (1.61-3.72)	**2.71** (1.72-4.17)
60-min	**0.976** (0.773-1.22)	**1.15** (0.908-1.44)	**1.43** (1.13-1.80)	**1.66** (1.30-2.10)	**1.99** (1.50-2.62)	**2.23** (1.64-3.01)	**2.48** (1.77-3.48)	**2.75** (1.86-3.98)	**3.13** (2.03-4.70)	**3.43** (2.17-5.26)
2-hr	**1.23** (0.979-1.52)	**1.46** (1.16-1.81)	**1.84** (1.46-2.29)	**2.15** (1.70-2.70)	**2.58** (1.97-3.40)	**2.91** (2.16-3.92)	**3.25** (2.35-4.57)	**3.64** (2.48-5.24)	**4.22** (2.75-6.31)	**4.70** (2.99-7.18)
3-hr	**1.40** (1.12-1.73)	**1.68** (1.34-2.08)	**2.13** (1.69-2.64)	**2.50** (1.98-3.12)	**3.01** (2.30-3.95)	**3.39** (2.54-4.57)	**3.80** (2.76-5.34)	**4.28** (2.91-6.14)	**5.00** (3.26-7.44)	**5.61** (3.57-8.53)
6-hr	**1.76** (1.42-2.17)	**2.13** (1.71-2.62)	**2.72** (2.18-3.35)	**3.21** (2.56-3.99)	**3.89** (2.99-5.08)	**4.39** (3.31-5.89)	**4.93** (3.61-6.91)	**5.58** (3.81-7.95)	**6.57** (4.30-9.71)	**7.41** (4.72-11.2)
12-hr	**2.20** (1.78-2.68)	**2.67** (2.16-3.26)	**3.43** (2.77-4.21)	**4.07** (3.26-5.02)	**4.94** (3.83-6.42)	**5.59** (4.23-7.45)	**6.29** (4.62-8.76)	**7.13** (4.89-10.1)	**8.39** (5.51-12.3)	**9.47** (6.06-14.2)
24-hr	**2.61** (2.13-3.17)	**3.19** (2.60-3.87)	**4.13** (3.35-5.03)	**4.92** (3.96-6.02)	**5.99** (4.67-7.74)	**6.79** (5.17-9.00)	**7.65** (5.66-10.6)	**8.69** (5.98-12.2)	**10.3** (6.76-15.0)	**11.6** (7.45-17.3)
2-day	**2.95** (2.43-3.56)	**3.63** (2.98-4.37)	**4.73** (3.87-5.72)	**5.64** (4.58-6.87)	**6.90** (5.41-8.87)	**7.83** (6.01-10.3)	**8.84** (6.58-12.2)	**10.1** (6.97-14.1)	**12.0** (7.93-17.4)	**13.7** (8.79-20.2)
3-day	**3.20** (2.64-3.84)	**3.93** (3.24-4.72)	**5.12** (4.20-6.17)	**6.10** (4.97-7.40)	**7.45** (5.86-9.54)	**8.45** (6.51-11.1)	**9.54** (7.13-13.1)	**10.9** (7.54-15.2)	**13.0** (8.58-18.7)	**14.8** (9.52-21.8)
4-day	**3.44** (2.84-4.11)	**4.20** (3.47-5.03)	**5.44** (4.48-6.54)	**6.47** (5.29-7.83)	**7.89** (6.22-10.1)	**8.94** (6.89-11.7)	**10.1** (7.54-13.8)	**11.5** (7.96-15.9)	**13.6** (9.05-19.7)	**15.5** (10.0-22.8)
7-day	**4.10** (3.41-4.88)	**4.93** (4.09-5.87)	**6.28** (5.19-7.51)	**7.39** (6.08-8.90)	**8.93** (7.08-11.3)	**10.1** (7.80-13.1)	**11.3** (8.47-15.4)	**12.8** (8.91-17.7)	**15.0** (10.0-21.5)	**17.0** (11.0-24.8)
10-day	**4.76** (3.98-5.65)	**5.62** (4.69-6.68)	**7.03** (5.84-8.38)	**8.20** (6.76-9.83)	**9.80** (7.78-12.4)	**11.0** (8.52-14.2)	**12.3** (9.19-16.5)	**13.8** (9.63-18.9)	**16.0** (10.7-22.8)	**17.9** (11.6-26.1)
20-day	**6.80** (5.72-8.02)	**7.72** (6.48-9.11)	**9.21** (7.70-10.9)	**10.5** (8.68-12.5)	**12.2** (9.69-15.1)	**13.5** (10.4-17.1)	**14.8** (11.0-19.5)	**16.2** (11.4-22.1)	**18.2** (12.2-25.7)	**19.7** (12.8-28.6)
30-day	**8.51** (7.19-9.99)	**9.46** (7.98-11.1)	**11.0** (9.24-13.0)	**12.3** (10.2-14.6)	**14.0** (11.2-17.3)	**15.4** (12.0-19.4)	**16.8** (12.5-21.8)	**18.1** (12.8-24.5)	**19.9** (13.4-27.9)	**21.1** (13.8-30.5)
45-day	**10.6** (9.02-12.4)	**11.6** (9.84-13.6)	**13.2** (11.1-15.5)	**14.6** (12.2-17.2)	**16.4** (13.1-20.1)	**17.8** (13.9-22.3)	**19.2** (14.3-24.7)	**20.5** (14.5-27.6)	**22.0** (14.9-30.8)	**23.0** (15.0-33.1)
60-day	**12.4** (10.6-14.5)	**13.4** (11.4-15.7)	**15.1** (12.8-17.7)	**16.5** (13.8-19.4)	**18.4** (14.7-22.4)	**19.9** (15.5-24.7)	**21.3** (15.8-27.2)	**22.5** (16.0-30.2)	**23.9** (16.2-33.4)	**24.8** (16.3-35.5)

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

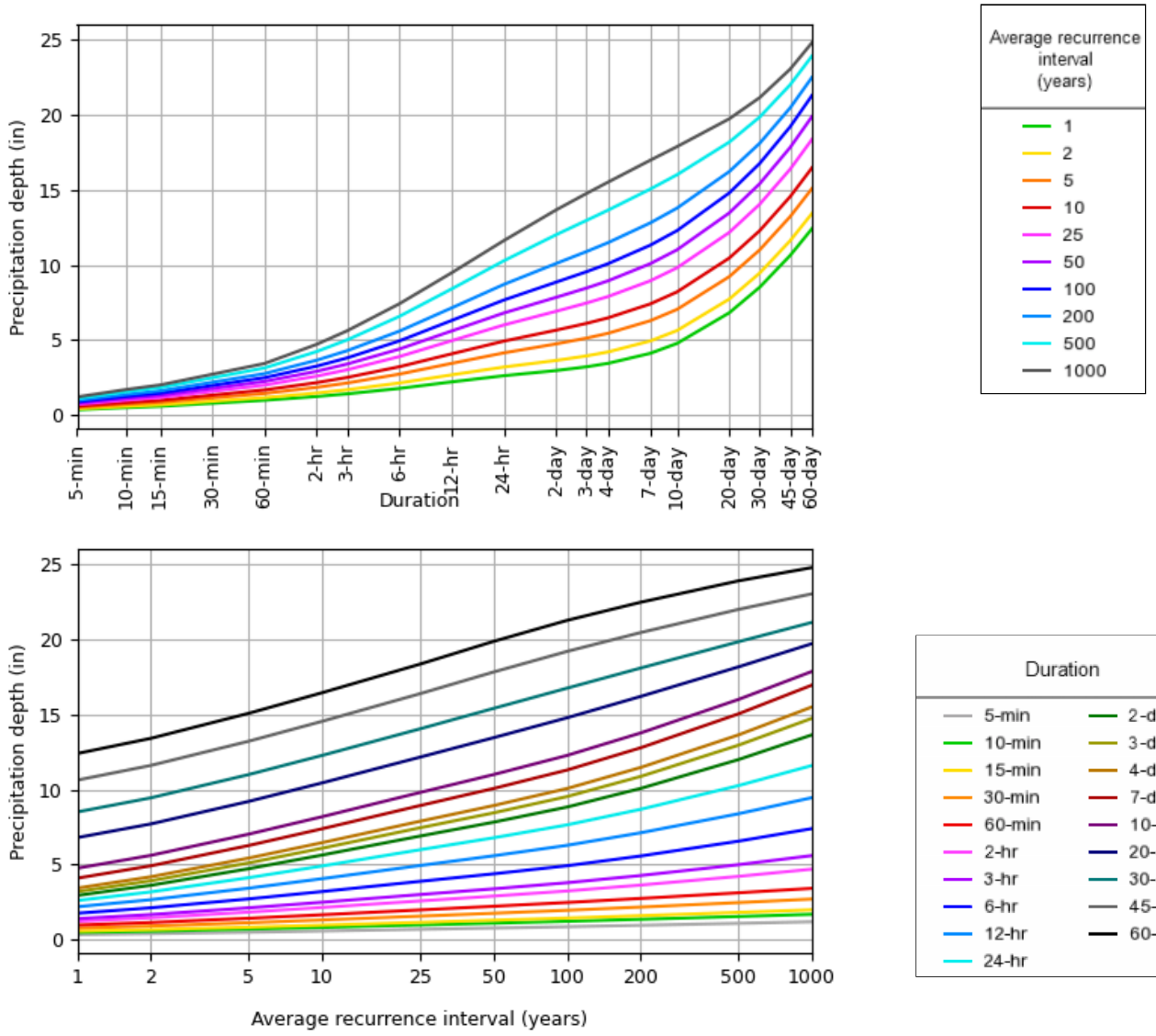
Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper 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.

Back to Top

PF graphical

PDS-based depth-duration-frequency (DDF) curves
Latitude: 42.2949°, Longitude: -71.7754°



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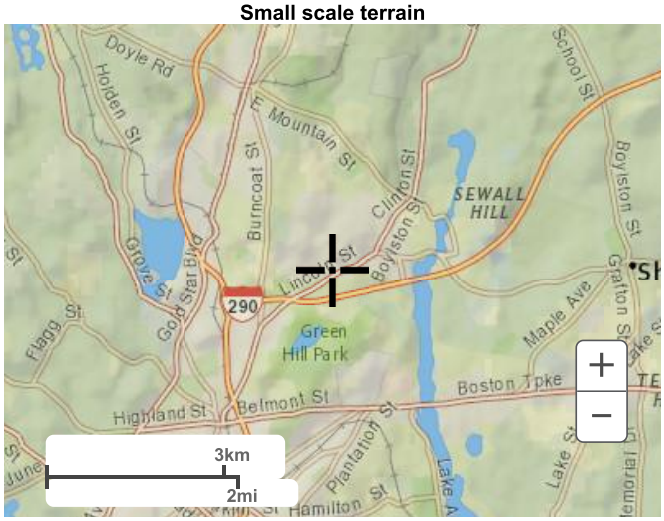
Back to Top

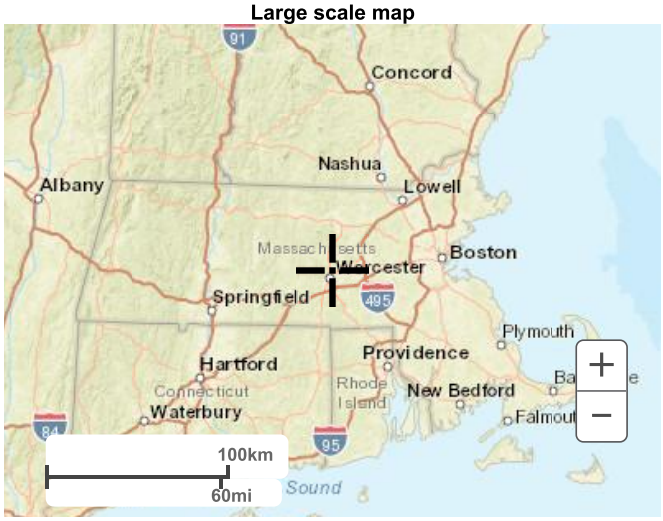
Maps & aerials

Small scale terrain

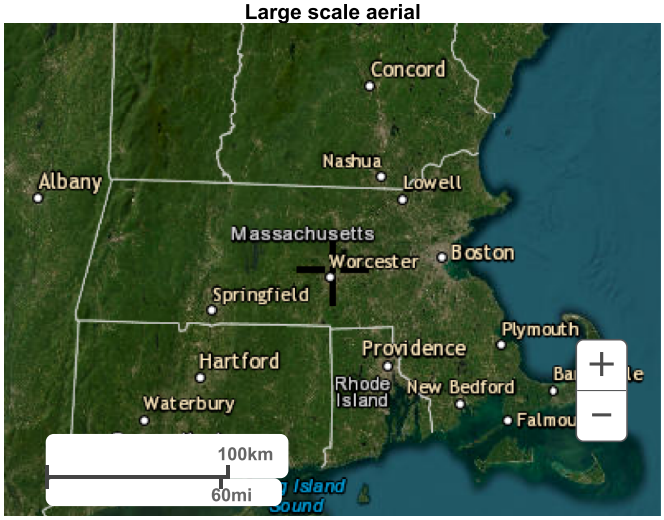


Large scale terrain

Large scale map



Large scale aerial



Back to Top

US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

NOAA Atlas 14, Volume 10, Version 3
Location name: Worcester, Massachusetts, USA*
Latitude: 42.2949°, Longitude: -71.7754°
Elevation: 558 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/hour)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	4.13 (3.26-5.15)	4.85 (3.83-6.06)	6.02 (4.75-7.56)	7.00 (5.48-8.83)	8.34 (6.30-11.0)	9.36 (6.91-12.6)	10.4 (7.43-14.6)	11.6 (7.82-16.7)	13.1 (8.53-19.7)	14.4 (9.10-22.1)
10-min	2.93 (2.32-3.65)	3.43 (2.72-4.29)	4.27 (3.36-5.35)	4.96 (3.88-6.25)	5.91 (4.46-7.80)	6.64 (4.90-8.95)	7.38 (5.26-10.3)	8.18 (5.54-11.8)	9.29 (6.04-14.0)	10.2 (6.44-15.6)
15-min	2.30 (1.82-2.86)	2.69 (2.13-3.36)	3.34 (2.63-4.19)	3.89 (3.04-4.91)	4.64 (3.50-6.12)	5.20 (3.84-7.02)	5.79 (4.13-8.11)	6.42 (4.35-9.28)	7.29 (4.74-10.9)	7.98 (5.05-12.3)
30-min	1.55 (1.23-1.93)	1.82 (1.44-2.28)	2.27 (1.79-2.84)	2.64 (2.06-3.33)	3.14 (2.37-4.15)	3.53 (2.61-4.76)	3.93 (2.80-5.50)	4.36 (2.95-6.30)	4.95 (3.22-7.44)	5.42 (3.43-8.33)
60-min	0.976 (0.773-1.22)	1.15 (0.908-1.44)	1.43 (1.13-1.80)	1.66 (1.30-2.10)	1.99 (1.50-2.62)	2.23 (1.64-3.01)	2.48 (1.77-3.48)	2.75 (1.86-3.98)	3.13 (2.03-4.70)	3.43 (2.17-5.26)
2-hr	0.614 (0.489-0.761)	0.730 (0.581-0.906)	0.919 (0.728-1.15)	1.08 (0.848-1.35)	1.29 (0.983-1.70)	1.45 (1.08-1.96)	1.62 (1.17-2.28)	1.82 (1.24-2.62)	2.11 (1.38-3.15)	2.35 (1.49-3.59)
3-hr	0.467 (0.373-0.577)	0.558 (0.446-0.690)	0.707 (0.563-0.878)	0.831 (0.657-1.04)	1.00 (0.766-1.32)	1.13 (0.844-1.52)	1.26 (0.918-1.78)	1.42 (0.970-2.04)	1.66 (1.09-2.48)	1.87 (1.19-2.84)
6-hr	0.294 (0.237-0.361)	0.355 (0.285-0.436)	0.454 (0.363-0.560)	0.536 (0.426-0.665)	0.649 (0.499-0.848)	0.733 (0.552-0.982)	0.823 (0.602-1.15)	0.932 (0.636-1.33)	1.10 (0.717-1.62)	1.24 (0.788-1.87)
12-hr	0.182 (0.147-0.222)	0.221 (0.179-0.270)	0.284 (0.229-0.349)	0.337 (0.270-0.416)	0.410 (0.317-0.533)	0.464 (0.351-0.618)	0.522 (0.383-0.726)	0.591 (0.405-0.837)	0.696 (0.457-1.02)	0.785 (0.502-1.18)
24-hr	0.108 (0.088-0.131)	0.132 (0.108-0.161)	0.172 (0.139-0.209)	0.204 (0.165-0.251)	0.249 (0.194-0.322)	0.282 (0.215-0.374)	0.318 (0.235-0.441)	0.362 (0.249-0.509)	0.427 (0.281-0.624)	0.483 (0.310-0.721)
2-day	0.061 (0.050-0.074)	0.075 (0.062-0.091)	0.098 (0.080-0.119)	0.117 (0.095-0.143)	0.143 (0.112-0.184)	0.163 (0.125-0.215)	0.184 (0.137-0.254)	0.210 (0.145-0.293)	0.249 (0.165-0.362)	0.284 (0.183-0.421)
3-day	0.044 (0.036-0.053)	0.054 (0.044-0.065)	0.071 (0.058-0.085)	0.084 (0.069-0.102)	0.103 (0.081-0.132)	0.117 (0.090-0.154)	0.132 (0.099-0.182)	0.151 (0.104-0.210)	0.179 (0.119-0.260)	0.204 (0.132-0.302)
4-day	0.035 (0.029-0.042)	0.043 (0.036-0.052)	0.056 (0.046-0.068)	0.067 (0.055-0.081)	0.082 (0.064-0.104)	0.093 (0.071-0.121)	0.104 (0.078-0.143)	0.119 (0.082-0.165)	0.142 (0.094-0.204)	0.161 (0.104-0.237)
7-day	0.024 (0.020-0.029)	0.029 (0.024-0.034)	0.037 (0.030-0.044)	0.044 (0.036-0.052)	0.053 (0.042-0.067)	0.059 (0.046-0.077)	0.067 (0.050-0.091)	0.076 (0.053-0.105)	0.089 (0.059-0.128)	0.100 (0.065-0.147)
10-day	0.019 (0.016-0.023)	0.023 (0.019-0.027)	0.029 (0.024-0.034)	0.034 (0.028-0.040)	0.040 (0.032-0.051)	0.045 (0.035-0.059)	0.051 (0.038-0.068)	0.057 (0.040-0.078)	0.066 (0.044-0.095)	0.074 (0.048-0.108)
20-day	0.014 (0.011-0.016)	0.016 (0.013-0.018)	0.019 (0.016-0.022)	0.021 (0.018-0.025)	0.025 (0.020-0.031)	0.028 (0.021-0.035)	0.030 (0.022-0.040)	0.033 (0.023-0.046)	0.037 (0.025-0.053)	0.041 (0.026-0.059)
30-day	0.011 (0.009-0.013)	0.013 (0.011-0.015)	0.015 (0.012-0.018)	0.017 (0.014-0.020)	0.019 (0.015-0.024)	0.021 (0.016-0.026)	0.023 (0.017-0.030)	0.025 (0.017-0.034)	0.027 (0.018-0.038)	0.029 (0.019-0.042)
45-day	0.009 (0.008-0.011)	0.010 (0.009-0.012)	0.012 (0.010-0.014)	0.013 (0.011-0.015)	0.015 (0.012-0.018)	0.016 (0.012-0.020)	0.017 (0.013-0.022)	0.018 (0.013-0.025)	0.020 (0.013-0.028)	0.021 (0.013-0.030)
60-day	0.008 (0.007-0.010)	0.009 (0.007-0.010)	0.010 (0.008-0.012)	0.011 (0.009-0.013)	0.012 (0.010-0.015)	0.013 (0.010-0.017)	0.014 (0.010-0.018)	0.015 (0.011-0.020)	0.016 (0.011-0.023)	0.017 (0.011-0.024)

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

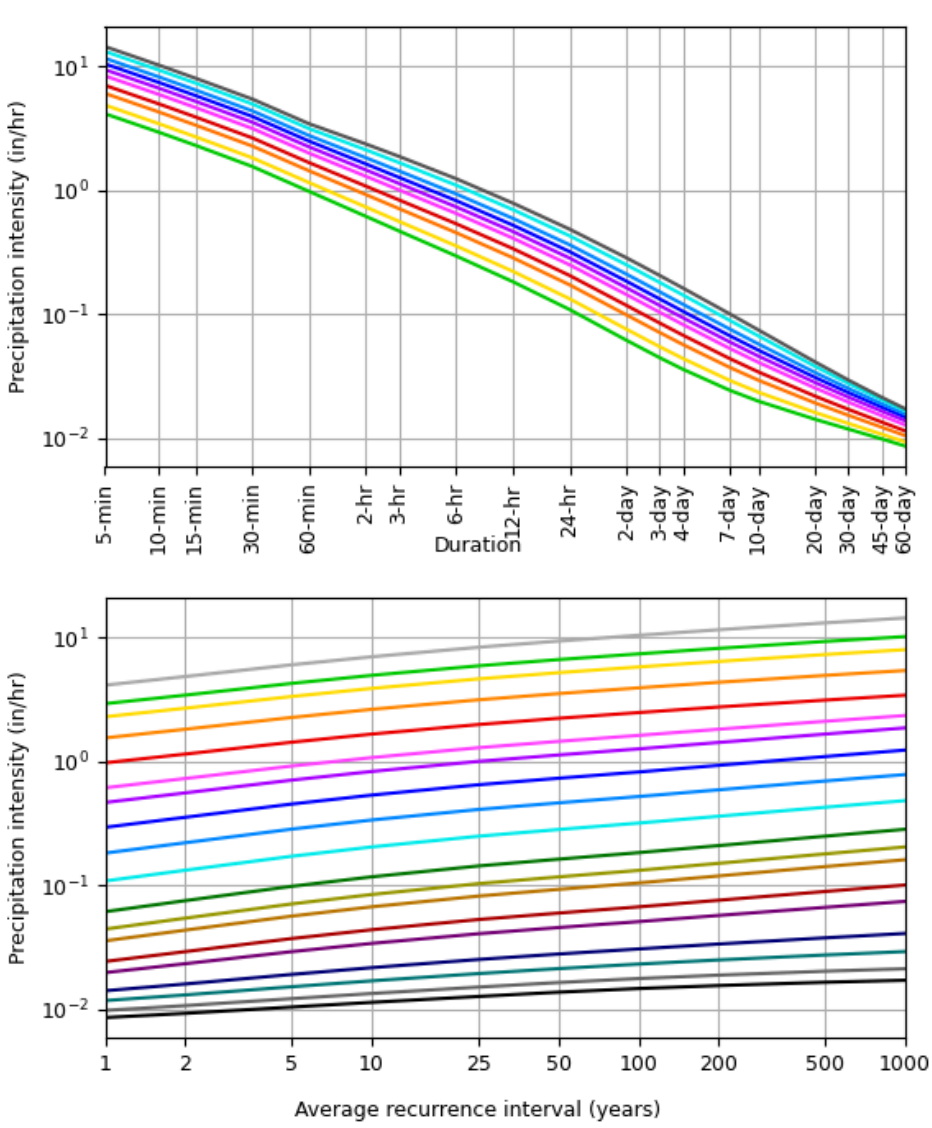
Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper 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.

Back to Top

PF graphical

PDS-based intensity-duration-frequency (IDF) curves
Latitude: 42.2949°, Longitude: -71.7754°



NOAA Atlas 14, Volume 10, Version 3

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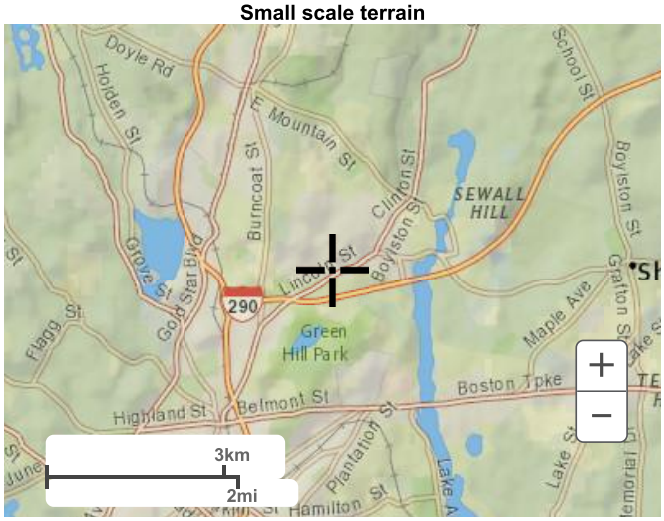
Back to Top

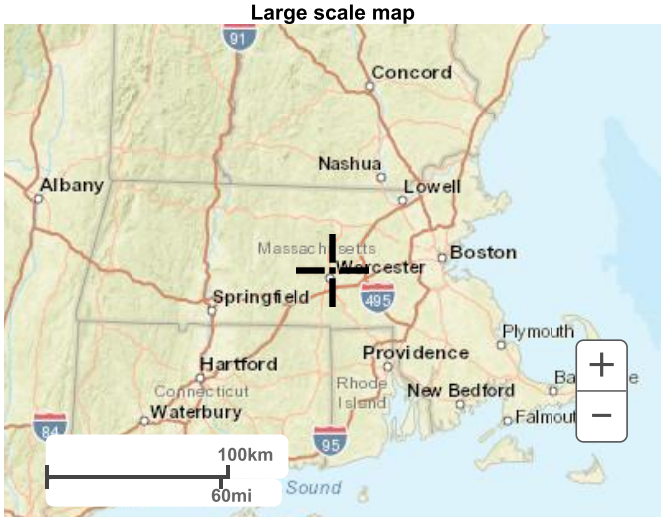
Maps & aerials

Small scale terrain

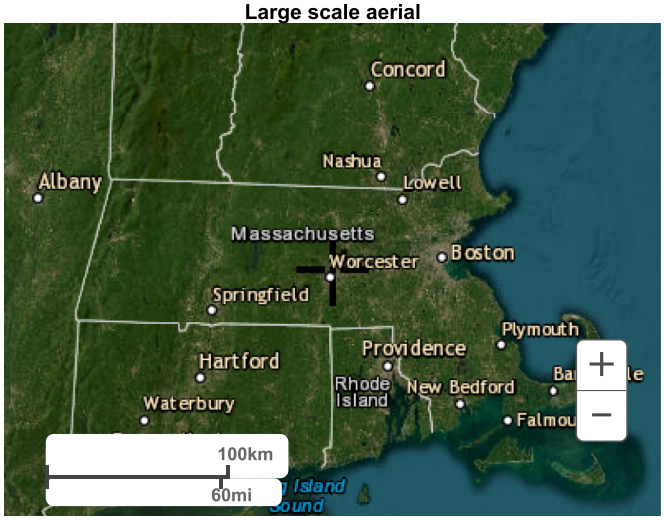


Large scale terrain

Large scale map



Large scale aerial



Back to Top

US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

APPENDIX G: OPERATION AND MAINTENANCE

- *STORMWATER OPERATION AND MAINTENANCE PLAN*
- *INSPECTION REPORT*
- *INSPECTION AND MAINTENANCE LOG FORM*
- *LONG-TERM POLLUTION PREVENTION PLAN*
- *ILLICIT DISCHARGE STATEMENT*
- *SPILL PREVENTION*
- *MANUFACTURER'S INSPECTION AND MAINTENANCE MANUALS*

STORMWATER OPERATION AND MAINTENANCE PLAN

Proposed Restaurant with Drive-Thru (Raising Cane's)
494 Lincoln Street
Worcester, MA 01605

RESPONSIBLE PARTY DURING CONSTRUCTION:

Raising Cane's Chicken Fingers
6800 Bishop Road
Plano, TX 75024

RESPONSIBLE PARTY POST CONSTRUCTION:

Raising Cane's Chicken Fingers
494 Lincoln Street
Worcester, MA 01605

Construction Phase

During the construction phase, all erosion control devices and measures shall be maintained in accordance with the final record plans, local/state approvals and conditions, the EPA Construction General Permit and the Stormwater Pollution Prevention Plan (SWPPP) if applicable. Additionally, the maintenance of all erosion / siltation control measures during construction shall be the responsibility of the general contractor. Contact information of the OWNER and CONTRACTOR shall be listed in the SWPPP for this site. The SWPPP also includes information regarding construction period allowable and illicit discharges, housekeeping and emergency response procedures. Upon proper notice to the property owner, the City or its authorized designee shall be allowed to enter the property at a reasonable time and in a reasonable manner for the purposes of inspection.

Post Development Controls

Once construction is completed, the post development stormwater controls are to be operated and maintained in compliance with the following permanent procedures (note that the continued implementation of these procedures shall be the responsibility of the Owner or its assignee):

1. Parking lots and on-site driveways: Sweep at least two (2) times per year and on a more frequent basis depending on sanding operations. Swept areas shall include all parking, drive aisles, and access aisles. All resulting sweepings shall be collected and properly disposed of offsite in accordance with MADEP and other applicable requirements.

2. Catch basins, area drains, manholes and piping: Inspect two (2) times per year and at the end of foliage and snow-removal seasons. These features shall be cleaned two (2) times per year or whenever the depth of deposits is greater than or equal to one half the depth from the bottom of the invert of the lowest pipe in the catch basin or underground system. Accumulated sediment and hydrocarbons present must be removed and properly disposed of off-site in accordance with MADEP and other applicable requirements.

3. Water Quality Unit (Proprietary Separator): Follow manufacturer's recommendations (attached).

All components of the stormwater system will be accessible by the owner or their assignee.

STORMWATER MANAGEMENT SYSTEM

POST-CONSTRUCTION INSPECTION REPORT

LOCATION:

Raising Cane's Chicken Fingers
494 Lincoln Street
Worcester, MA 01605

RESPONSIBLE PARTY:

Raising Cane's Chicken Fingers
494 Lincoln Street
Worcester, MA 01605

NAME OF INSPECTOR:	INSPECTION DATE:
Note Condition of the Following (sediment depth, debris, standing water, damage, etc.):	
Catch Basins/Area Drain:	
Storm Water Quality Unit:	
Other:	
Other:	
Other:	

Note Recommended Actions to be taken on the Following (sediment and/or debris removal, repairs, etc.):
Catch Basins/Area Drain:
Storm Water Quality Unit:
Other:
Other:
Other:
Comments:

STORMWATER INSPECTION AND MAINTENANCE LOG FORM

Raising Cane’s Chicken Fingers
494 Lincoln Street – Worcester, MA 01605

Stormwater Management Practice	Responsible Party	Date	Maintenance Activity Performed

LONG-TERM POLLUTION PREVENTION PLAN

Raising Cane's Chicken Fingers
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Worcester, MA 01605

RESPONSIBLE PARTY DURING CONSTRUCTION:

Raising Cane's Chicken Fingers
6800 Bishop Road
Plano, TX 75024

RESPONSIBLE PARTY POST CONSTRUCTION:

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Worcester, MA 01605

For this site, the Long-Term Pollution Prevention Plan will consist of the following:

- The property owner shall be responsible for "good housekeeping" including proper periodic maintenance of building and pavement areas, curbing, landscaping, etc.
- Proper storage and removal of solid waste (dumpsters).
- Sweeping of parking lots, drive aisles and access aisles a minimum of twice per year with a commercial cleaning unit. Any sediment removed shall be disposed of in accordance with applicable local and state requirements.
- Regular inspections and maintenance of Stormwater Management System as noted in the "O&M Plan".
- Snow removal shall be the responsibility of the property owner.
- Trash and other debris shall be removed from all areas of the site at least twice yearly.
- Salting and/or sanding of pavement / walkway areas during winter conditions shall only be done in accordance with all state/local requirements and approvals.
- Snow piles shall be located adjacent to or on pervious surfaces in upland areas. This will allow snow melt water to filter into the soil, leaving behind sand and debris which can be removed in the springtime.
- If necessary, stockpiled snow will be removed from the Site and disposed of at an off-site location in accordance with all local, state and federal regulations.

- The amount of sand and deicing chemicals shall be kept at the minimum amount required to provide safe pedestrian and vehicle travel.

- Deicing chemicals are recommended as a pretreatment to storm events to minimize the amount of applied sand.

- Sand and deicing chemicals should be stockpiled under covered storage facilities that prevent precipitation and adjacent runoff from coming in contact with the deicing materials. Stockpile areas shall be located outside resource areas.

OPERATON AND MAINTENANCE TRAINING PROGRAM

The Owner will coordinate an annual in-house training session to discuss the Operations and Maintenance Plan, the Long-Term Pollution Prevention Plan, and the Spill Prevention Plan and response procedures. Annual training will include the following:

Discuss the Operations and Maintenance Plan

- Explain the general operations of the stormwater management system and its BMPs
- Identify potential sources of stormwater pollution and measures / methods of reducing or eliminating that pollution
- Emphasize good housekeeping measures

Discuss the Spill Prevention and Response Procedures

- Explain the process in the event of a spill
- Identify potential sources of spills and procedures for cleanup and /or reporting and notification
- Complete a yearly inventory or Materials Safety Data sheets of all tenants and confirm that no potentially harmful chemicals are in use.

SPILL PREVENTION AND RESPONSE PROCEDURES (POST CONSTRUCTION)

In order to prevent or minimize the potential for a spill of Hazardous Substances or Oil or come into contact with stormwater, the following steps will be implemented:

1. All Hazardous Substances or Oil (such as pesticides, petroleum products, fertilizers, detergents, acids, paints, paint solvents, cleaning solvents, etc.) will be stored in a secure location, with their lids on, preferably under cover, when not in use.

2. The minimum practical quantity of all such materials will be kept on site.

3. A spill control and containment kit (containing, for example, absorbent materials, acid neutralizing powder, brooms, dust pans, mops, rags, gloves, goggles, plastic and metal trash containers, etc.) will be provided on site.

4. Manufacturer's recommended methods for spill cleanup will be clearly posted and site personnel will be trained regarding these procedures and the location of the information and cleanup supplies.

5. It is the OWNER's responsibility to ensure that all Hazardous Waste on site is disposed of properly by a licensed hazardous material disposal company. The OWNER is responsible for not exceeding Hazardous Waste storage requirements mandated by the EPA or state and local authorities.

In the event of a spill of Hazardous Substances or Oil, the following procedures should be followed:

1. All measures should be taken to contain and abate the spill and to prevent the discharge of the Hazardous Substance or Oil to stormwater or off-site. (The spill area should be kept well ventilated and personnel should wear appropriate protective clothing to prevent injury from contact with the Hazardous Substances.)

2. For spills of less than five (5) gallons of material, proceed with source control and containment, clean-up with absorbent materials or other applicable means unless an imminent hazard or other circumstances dictate that the spill should be treated by a professional emergency response contractor.

3. For spills greater than five (5) gallons of material immediately contact the MADEP at the toll-free 24-hour statewide emergency number: **1-888-304-1133**, the local fire department (**9-1-1**) and an approved emergency response contractor. Provide information on the type of material spilled, the location of the spill, the quantity spilled, and the time of the spill to the emergency response contractor or coordinator, and proceed with prevention, containment and/or clean-up if so desired. (Use the form provided, or similar).

4. If there is a Reportable Quantity (RQ) release, then the National Response Center should be notified immediately at (800) 424-8802; within 14 days a report should be submitted to the EPA regional office describing the release, the date and circumstances of the release and the steps taken to prevent another release. This Pollution Prevention Plan should be updated to reflect any such steps or actions taken and measures to prevent the same from reoccurring.

SPILL PREVENTION CONTROL AND COUNTERMEASURE FORM

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Where a release containing a hazardous substance occurs, the following steps shall be taken by the facility manager and/or supervisor:

1. Immediately notify the Worcester Fire Department (at **9-1-1**)

2. All measures must be taken to contain and abate the spill and to prevent the discharge of the pollutant(s) to off-site locations, receiving waters, wetlands and/or resource areas.

3. Notify the City of Worcester Health Department at (508) 799-8531 and the City of Worcester Conservation Commission at (508) 799-1400.

4. Provide documentation from licensed contractor showing disposal and cleanup procedures were completed as well as details on chemicals that were spilled to the City of Worcester Health Department and the City of Worcester Conservation Commission.

Date of spill:_____ Time:_____ Reported By:_____

Weather Conditions:_____

Material Spilled	**Location of Spill**	**Approximate Quantity of Spill (in gallons)**	**Agency(s) Notified**	**Date of Notification**

Cause of Spill: _____

_____

Measures Taken to Clean up Spill: _____

_____

Type of equipment: _____ Make: _____ Size: _____

License or S/N: _____

Location and Method of Disposal _____

_____

Procedures, method, and precautions instituted to prevent a similar occurrence from recurring: _____

_____

_____

Additional Contact Numbers:

- DEPARTMENT OF ENVIRONMENTAL PROTECTION (DEP) EMERGENCY PHONE: 1-888-304-1133
- NATIONAL RESPONSE CENTER PHONE: (800) 424-8802
- U.S. ENVIRONMENTAL PROTECTION AGENCY PHONE: (888) 372-7341

CONTECH®
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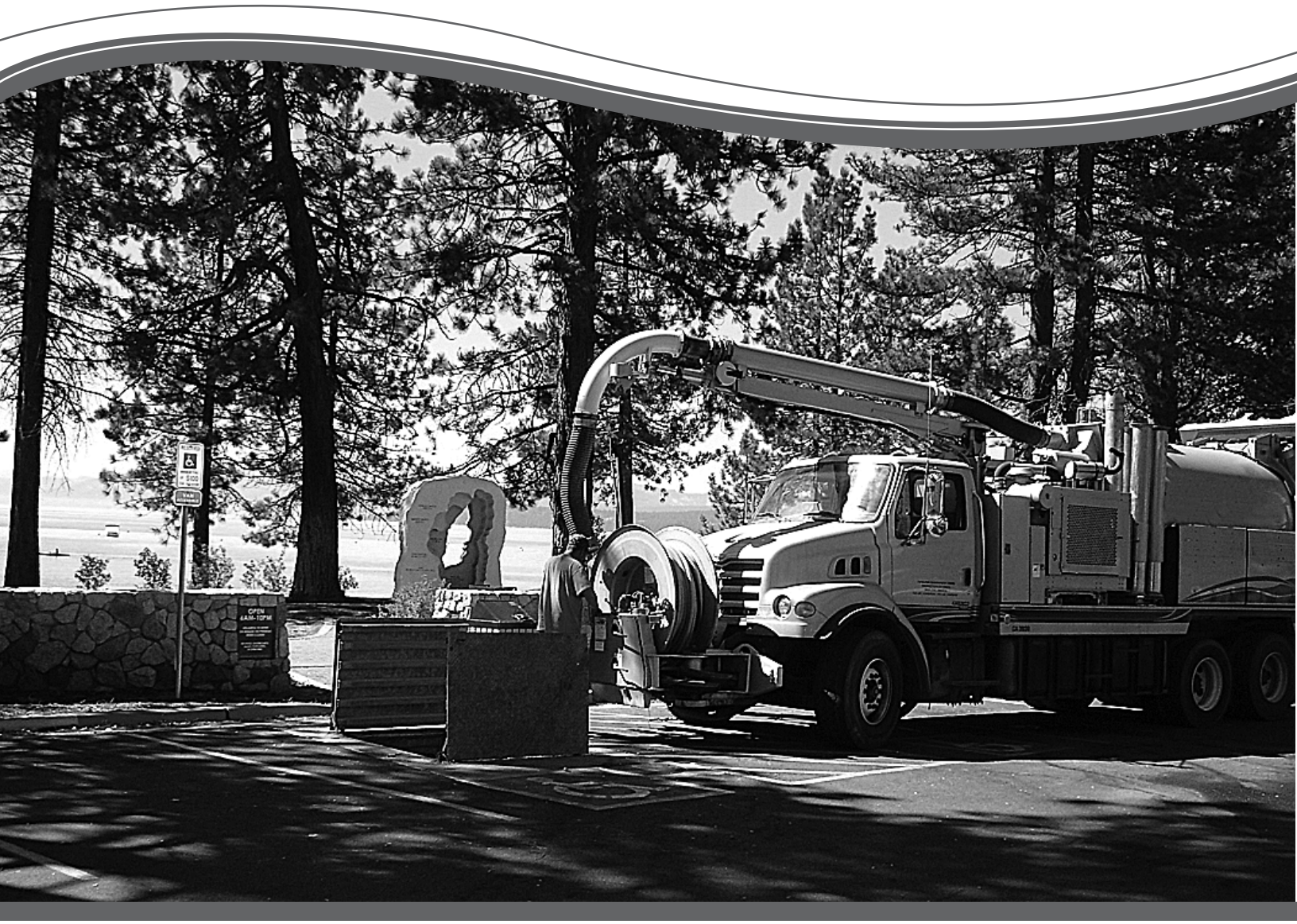
Cascade Separator® Inspection and Maintenance Guide



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.

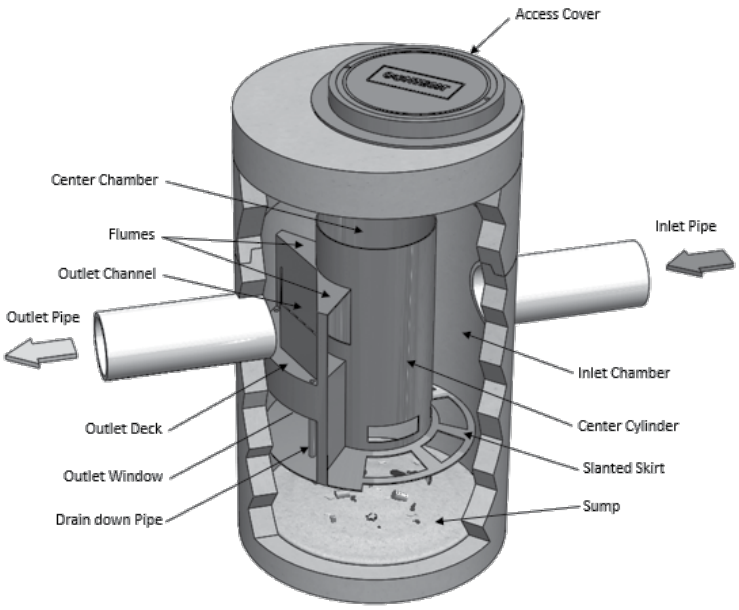
The Cascade Separator system should be cleaned before the level of sediment in the sump reaches the maximum sediment depth and/or when an appreciable level of hydrocarbons and trash has accumulated. If sorbent material is used, it must be replaced when significant discoloration has occurred. Performance 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-3	3	0.9	1.5	0.5	0.4	0.3
CS-4	4	1.2	2.5	0.8	0.7	0.5
CS-5	5	1.3	3	0.9	1.1	0.8
CS-6	6	1.8	3.5	1	1.6	1.2
CS-8	8	2.4	4.8	1.4	2.8	2.1
CS-10	10	3.0	6.2	1.9	4.4	3.3
CS-12	12	3.6	7.5	2.3	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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