DRAINAGE REPORT

For

PROPOSED

RESTAURANT

90 Pleasant Valley Street
Methuen, Massachusetts
Essex County

Prepared by:

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COMMONWEALTH OF MASSACHUSETTS
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#W211254

BOHLER

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I. EXECUTIVE SUMMARY

This report examines the changes in drainage that can be expected as the result of the development of a proposed Raising Cane's Restaurant at 90 Pleasant Valley Street in the City of Methuen, Massachusetts. The site, which contains approximately 46± acres of land, contains an existing shopping mall ("The Loop"), paved parking areas, on-site utilities, landscaping, and shrub/wooded areas. The proposed project, and this report, focus only on the 0.72± acres of land included in the Raising Cane's development area ("The Site"), containing an existing paved parking area with landscaped islands.

The proposed project involves the construction of a new 3,181 SF Raising Cane's Restaurant with Drive-Thru along with new paved parking areas, landscaping, a stormwater management system, utilities, and other associated site improvements.

This report addresses a comparative analysis of the pre- and post-development site runoff conditions. Additionally, this report provides calculations documenting the design of the proposed stormwater conveyance/management system as illustrated within the accompanying Site Development Plans prepared by Bohler. The project will also provide erosion and sedimentation controls during the demolition and construction periods, as well as long term stabilization of the site.

For the purposes of this analysis, the pre-and post-development drainage conditions were analyzed at one (1) "design point" where stormwater runoff currently drains to under existing conditions. The Design Point is described further in detail in **Section II**, below. A summary of the existing and proposed peak runoff rates for the 2-, 10-, 25-, and 100-year storms can be found in **Table 3.1**, below. In addition, the project has been designed to meet or exceed the stormwater management standards as detailed herein.

II. EXISTING SITE CONDITIONS

Existing Site Description

The lease area consists of approximately 0.72± acres of land located at 90 Pleasant Valley Street in the City of Methuen, Massachusetts. The overall parcel currently features an existing shopping mall ("The Loop"), paved parking areas, on-site utilities, landscaping, shrub/wooded areas, and

other associated site improvements. Within the Raising Cane's Site there is a paved parking area, existing utility services, and landscape islands.

Existing Watersheds and Design Point Information

For the purposes of this analysis, the pre-and post-development drainage conditions were analyzed at one (1) "design point" where stormwater runoff currently drains to under existing conditions. The minimum time of concentration for all existing areas is calculated as 6 minutes (0.1 hr). Runoff generated on-site flows to the design points described below.

Design Point #1 (DP1) is the outlet pipe and existing detention basin to the south of the Site. Under existing conditions this design point receives stormwater flows from the entire 0.72± acres of the Site designated as Watershed "EX-1". Watershed EX-1 flows overland and through an existing stormwater collection and conveyance system and consists of the existing on-site paved parking area and landscaped areas with a CN of 95 and time of concentration of 6 minutes.

On-Site Soil Information

The soils at the site are mapped as Urban by the Natural Resource Conservation Service (NRCS). Areas to the south of the site are mapped as Canton Five Sandy Loam which is classified as Hydrologic Soil Group (HSG) "B". The entire site has been analyzed as HSG "B" for the purposes of this analysis. Refer to **Appendix C** for additional information.

Slopes on the site range from 1.1%-4.5% with on-site elevations ranging from 123 at the Internal Access Drive in the northwest corner of the lease area to 118 at the southeast corner.

III. PROPOSED SITE CONDITIONS

Proposed Development Description

The proposed project involves the construction of a new 3,181 SF Raising Cane's Restaurant with Drive-Thru along with new paved parking areas, landscaping, a stormwater management system, utilities, and other associated site improvements. No changes are proposed outside the lease area for the site. The project will increase impervious coverage on the site by approximately 530 SF. A new underground stormwater management system is proposed for the roof runoff to offset the

slight increase in impervious area. Additionally, water quality units are proposed to treat stormwater prior to discharge into the existing stormwater system for the parcel.

Proposed Development Collection and Conveyance

The proposed paved parking areas have been designed to drain to deep-sump, hooded catch basins which will capture and convey stormwater runoff, via an unground pipe system, to the existing stormwater conveyance system and existing detention basin. Pretreatment of stormwater runoff will be provided by a combination of the deep-sump, hooded catch basins and proprietary treatment units prior to discharge into the existing stormwater conveyance system. Additionally, runoff from the roof of the proposed building will be routed to an underground stormwater system to provide groundwater recharge prior to discharging to the existing system. Remaining perimeter landscape areas will flow overland to the detention basin adjacent to the lease area.

Proposed Watersheds and Design Point Information

The project has been designed to maintain the existing drainage watershed to the greatest extent practicable, with the same design point described in **Section II** above. The site was analyzed at one (1) design point described below.

Design Point #1 (DP1) is the detention basin adjacent to the lease area. Under proposed conditions this design point receives stormwater flows from the entire 0.72± acres of the Site designated as Watershed "PR-1". Watershed PR-1 flows overland then through the proposed stormwater collection and conveyance system. The watershed contains the proposed Raising Cane's Restaurant building, on-site pavement parking area, and landscaped areas with a CN of 94 and time of concentration of 6 minutes.

Refer to **Table 3.1** for the calculated existing conditions peak rates of runoff. For additional hydrologic information refer to the Post-Development Drainage Analysis Exhibit in **Appendix D and E** of this report for a graphical representation of the existing drainage areas.

Table 3.1: Peak Runoff Rates & Comparison (cubic feet per second)

Point of Analysis	2-Year Storm			10-Year Storm			25-Year Storm			100-Year Storm		
	Pre	Post	Δ	Pre	Post	Δ	Pre	Post	Δ	Pre	Post	Δ
DP1	2.08	1.91	**-0.17**	3.47	3.40	**-0.07**	4.33	4.33	**0.00**	5.64	5.63	**0.00**

**Flows are represented in cubic feet per second (cfs)*

The best management practices (BMPs) incorporated into the proposed stormwater management system have been designed to meet the total suspended solid (TSS) removal requirements as set forth in the Massachusetts Department of Environmental Protection Stormwater Handbook standards. Refer to **Appendix F** for calculations. In addition, a Stormwater Operation and Maintenance (O&M) Plan, attached in **Appendix G**, has been developed which includes scheduled maintenance and periodic inspections of stormwater management structures.

IV. METHODOLOGY

Peak Flow Calculations

Methodology utilized to design the proposed stormwater management system includes compliance with the guidelines set forth in the latest edition of the Massachusetts DEP Stormwater Handbook. The pre- and post-development runoff rates being discharged from the site were computed using the HydroCAD Computer Program. The drainage area and outlet information were entered into the program, which routes storm flows based on NRCS TR-20 and TR-55 methods. The other components of the model were determined following standard NRCS procedures for Curve Numbers (CNs) and times of concentrations documented in the appendices of this report. The rainfall data utilized and listed below in **Table 4.1** below for stormwater calculations is based on Technical Paper-40. Refer to **Appendix D** for more information.

Table 4.1: Methuen Rainfall Intensities

Frequency	2 year	10 year	25 year	100 year
Rainfall* (inches)	3.14	4.97	6.11	7.87

*Values derived from NOAA Atlas 14

The proposed stormwater management as designed will provide a decrease, or no increase, in peak rates of runoff from the proposed facility for the 2-, 10-, 25- and 100-year design storm events. The proposed project as designed meets, to the greatest extent practicable, the MADEP Stormwater Management standards. Compliance with these standards is described further below.

V. STORMWATER MANAGEMENT STANDARDS

Standard #1: No New Untreated Discharges

The project has been designed so that proposed impervious areas shall be collected and passed through the proposed drainage system for treatment prior to discharge.

Standard #2: Peak Rate Attenuation

As outlined in **Table 3.1**, the development of the site and the proposed stormwater management system have been designed so that post-development peak rates of runoff are at or below pre-development conditions for the 2-, 10-, 25- and 100-year storm events.

Standard #3: Recharge

As proposed the project will create an additional 530 SF of impervious area over existing conditions and per this standard is required to provide 132 CF of groundwater recharge. The proposed underground stormwater system has 375 CF of storage below the lowest pipe outlet, which exceeds the required amount of recharge volume. Additional groundwater recharge is assumed to be provided in the existing detention basin that the site drains to under existing conditions, but the volume provided by this basin has not been determined at this time.

Standard #4: Water Quality

Water quality treatment is provided via a combination of deep sump catch basins and proprietary water quality structures. TSS removal calculations are included in **Appendix F** of this report. The project as proposed will involve the construction of 530 SF of new paved parking area and that requires water quality treatment for 375 cubic feet of water quality volume as defined in Stormwater Standard 4. The proposed underground stormwater system has 375 CF of storage below the lowest pipe outlet, which exceeds the required amount of Water Quality Volume. Additional Water Quality treatment will be provided through a combination of the deep-sump and hooded catch basins and proprietary water quality units. Water quality units will be sized to meet the one (1) inch water quality flow rate for water quality treatment. Additional water quality treatment is assumed to be provided in the existing detention basin that the site drains to under existing conditions, but the volume provided by this basin has not been determined at this time.

Standard #5: Land Use with Higher Potential Pollutant Loads

The existing use of the parcel generates more than 1,000 daily vehicle trips, and while the project is not anticipated to increase the number of existing trips to the site by more than 1,000 it will still be considered a LUHPPL. The on-site infiltration system is proposed to only receive runoff from the roof and no pretreatment is required. The paved parking areas will be drain to deep sump and hooded catch basins and proprietary water quality units to provide 44% TSS removal prior to discharging to the existing surface basin. TSS Removal calculations are provided in **Appendix F** of this report.

Standard #6: Critical Areas

The project is not located within any critical areas as shown in **Appendix B**.

Standard #7: Redevelopment

The project is a redevelopment and is required to meet certain Standards to the maximum extent practicable.

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

The proposed project will provide construction period erosion and sedimentation controls as indicated within the site plan set provided for this project. This includes a proposed construction exit, protection for stormwater inlets, protection around temporary material stock piles and various other techniques as outlined on the erosion and sediment control sheets.

Standard #9: Operation and Maintenance Plan (O&M Plan)

An Operation and Maintenance (O&M) Plan for this site has been prepared and is included in **Appendix F** of this report. The O&M Plan includes a list of responsible parties and outlines procedures and time tables for the long-term operation and maintenance of the proposed site stormwater management system, including initial inspections upon completion of construction, and periodic monitoring of the system components, in accordance with established practices and the manufacturer's recommendations.

Standard #10: Prohibition of Illicit Discharges

The proposed stormwater system will only convey allowable non-stormwater discharges (firefighting waters, irrigation, air conditioning condensates, etc.) and will not contain any illicit discharges from prohibited sources. An Illicit Discharge Statement is included in **Appendix E** of this report.

VI. SUMMARY

In summary, the proposed stormwater management system illustrated on the drawings prepared by Bohler results in a reduction in peak rates of runoff from the subject site when compared to pre-development conditions for the 2-, 10-, 25- and 100-year storm.

In addition, the proposed best management practices will result in an effective removal of total suspended solids from the post-development runoff. The pre-development versus post-development stormwater discharge comparisons are contained in **Table 3.1**.

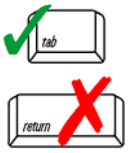
APPENDIX A: MASSACHUSETTS STORMWATER MANAGEMENT CHECKLIST

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.

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[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.

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

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.

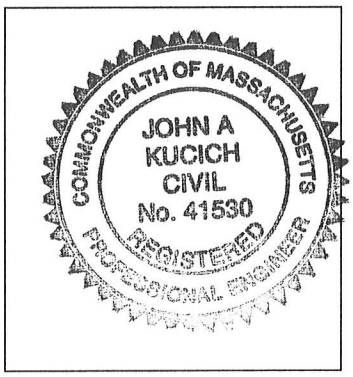
Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the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



04-05-2022
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): Subsurface infiltration systems

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.

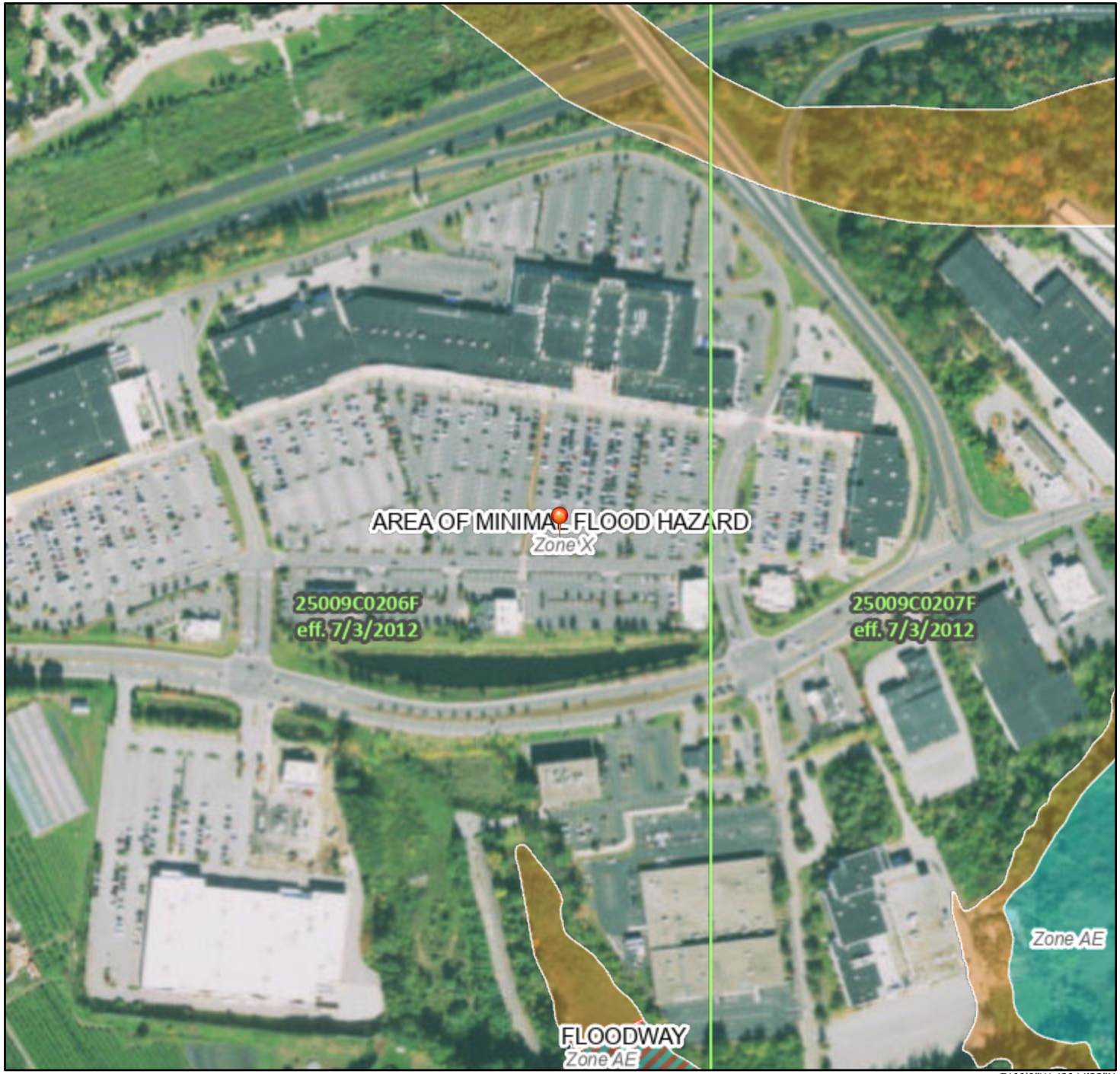
APPENDIX B: PROJECT LOCATION MAPS

- *USGS MAP*
- *FEMA FIRMETTE*
- *GIS ONLINE MAPPING*
- *NRCS CUSTOM SOIL RESOURCE REPORT*

National Flood Hazard Layer FIRMette

FEMA

71°9'46"W 42°44'48"N



71°9'9"W 42°44'22"N

Feet 1:6,000

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

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

Legend

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

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

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

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

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

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

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

N

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

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

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 3/14/2022 at 12:25 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.

State GIS Map

Zone IIs

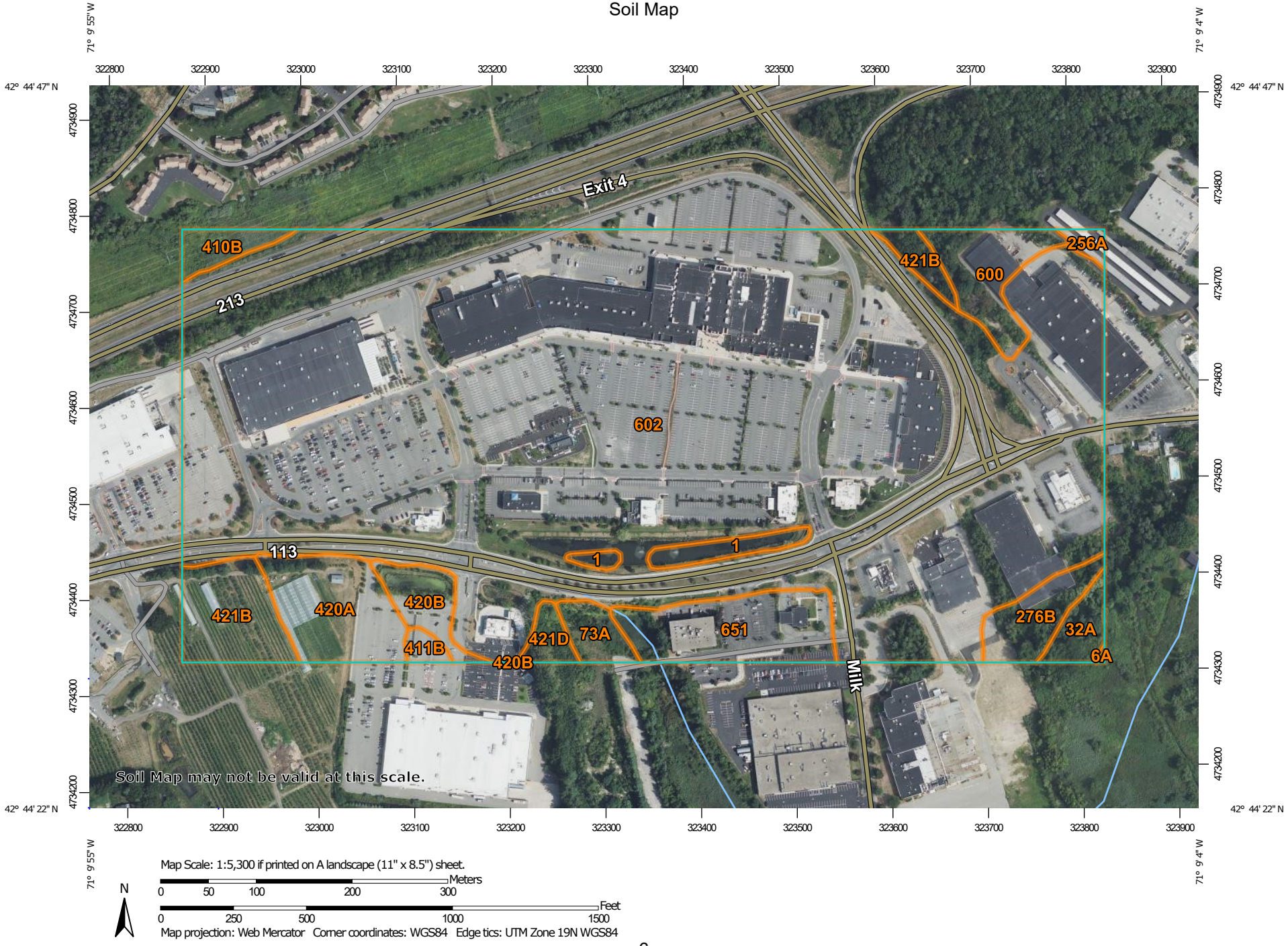
NHESP Priority Habitats of Rare Species

Map Features for Imagery

Structures

Property Tax Parcels

Custom Soil Resource Report
Soil Map



MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: Essex County, Massachusetts, Northern Part
Survey Area Data: Version 17, Sep 2, 2021

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

Date(s) aerial images were photographed: Aug 13, 2020—Sep 15, 2020

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
1	Water	1.0	0.9%
6A	Scarboro mucky fine sandy loam, 0 to 3 percent slopes	0.0	0.0%
32A	Wareham loamy sand, 0 to 3 percent slopes	0.9	0.8%
73A	Whitman fine sandy loam, 0 to 3 percent slopes, extremely stony	0.9	0.8%
256A	Deerfield loamy fine sand, 0 to 3 percent slopes	0.3	0.3%
276B	Ninigret fine sandy loam, 3 to 8 percent slopes	1.7	1.5%
410B	Sutton fine sandy loam, 3 to 8 percent slopes	0.8	0.8%
411B	Sutton fine sandy loam, 0 to 8 percent slopes, very stony	0.3	0.3%
420A	Canton fine sandy loam, 0 to 3 percent slopes	3.3	3.1%
420B	Canton fine sandy loam, 3 to 8 percent slopes	1.3	1.2%
421B	Canton fine sandy loam, 0 to 8 percent slopes, very stony	3.3	3.0%
421D	Canton fine sandy loam, 15 to 25 percent slopes, very stony	0.6	0.5%
600	Pits, gravel	2.3	2.1%
602	Urban land	87.6	81.2%
651	Udorthents, smoothed	3.6	3.4%
Totals for Area of Interest		**107.9**	**100.0%**

USGS
science for a changing world

U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

The National Map
US Topo

LAWRENCE QUADRANGLE
MASSACHUSETTS-NEW HAMPSHIRE
7.5-MINUTE SERIES

SITE

Produced by the United States Geological Survey

North American Datum of 1983 (NAD83)
World Geodetic System of 1984 (WGS84). Projection and
1 000-meter grid: Universal Transverse Mercator, Zone 19T
10 000-foot ticks: Massachusetts Coordinate System of 1983
(mainland zone), New Hampshire Coordinate System of 1983

This map is not a legal document. Boundaries may be generalized for this map scale. Private lands within government reservations may not be shown. Obtain permission before entering private lands.

Imagery	NAIP, July 2014
Roads	HERE, ©2013 - 2014
Names	GNIS, 2015
Hydrography	National Hydrography Dataset, 2014
Contours	National Elevation Dataset, 2012
Boundaries	Multiple sources; see metadata file 1972 - 2015

MN 14° 52' 264 MILS
GN 1° 29' 26 MILS
UTM GRID AND 2015 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

U.S. National Grid
100,000-m Square ID
CH
Grid Zone Designation
19T

SCALE 1:24 000

1 0.5 0 KILOMETERS 1 2
1000 500 0 METERS 1000 2000
1 0.5 0 1
MILES
1000 0 1000 2000 3000 4000 5000 6000 7000 8000 9000 10000
FEET

CONTOUR INTERVAL 10 FEET
NORTH AMERICAN VERTICAL DATUM OF 1988

This map was produced to conform with the
National Geospatial Program US Topo Product Standard, 2011.
A metadata file associated with this product is draft version 0.6.18

MASSACHUSETTS
QUADRANGLE LOCATION

1	2	3
4		5
6	7	8

ADJOINING QUADRANGLES
1 Windham
2 Salem Depot
3 Haverhill
4 Lowell
5 South Groveland
6 Billerica
7 Wilmington
8 Reading

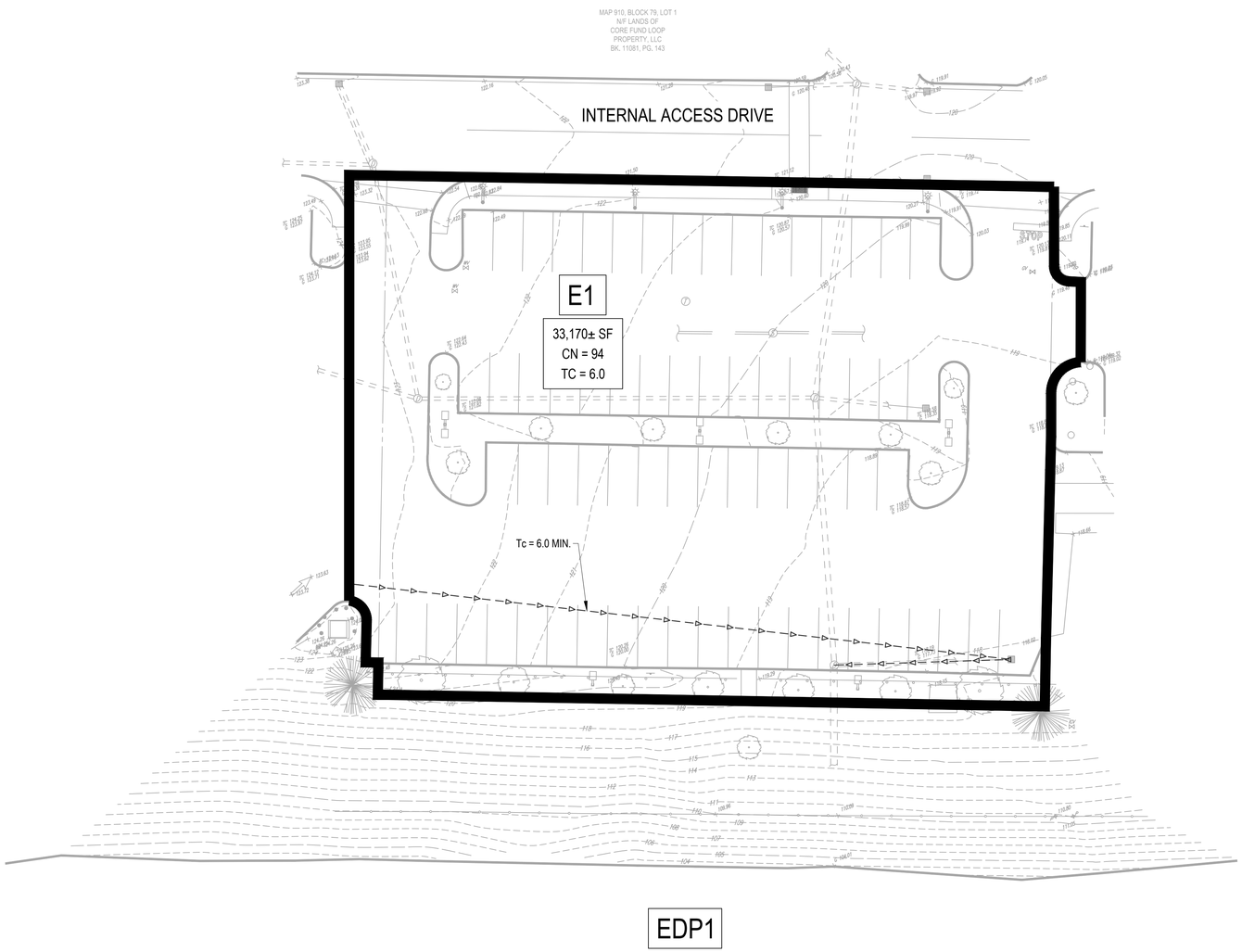
ROAD CLASSIFICATION
Expressway
Secondary Hwy
Ramp
Local Connector
Local Road
4WD
Interstate Route
US Route
State Route

LAWRENCE, MA-NH
2015

NSN 7643016369555
NGA REF NO. USGSX24K25140

APPENDIX C: EXISTING CONDITIONS HYDROLOGIC ANALYSIS

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



KEY

- - ▷ - -	TIME OF CONCENTRATION (Tc)
E1	WATERSHED
EDP1	DESIGN POINT

20 10 5 0 20

1"= 20'

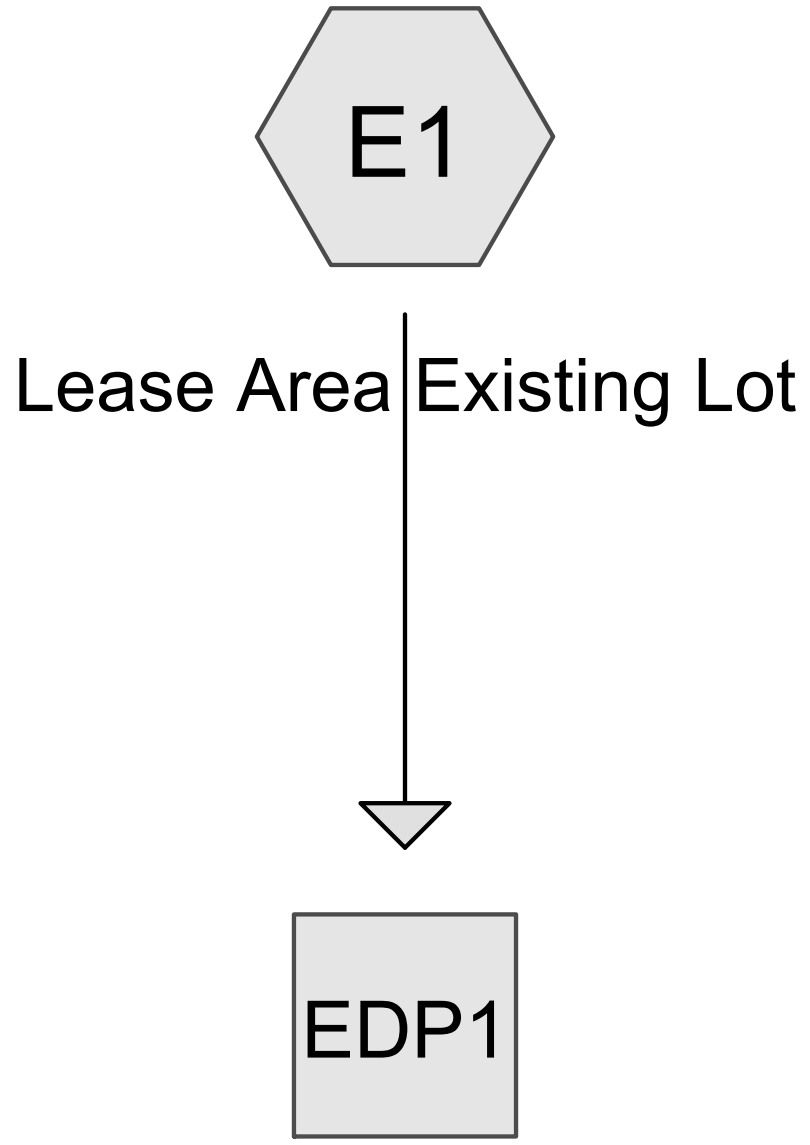
PRE-DEVELOPMENT DRAINAGE ANALYSIS EXHIBIT

90 PLEASANT VALLEY STREET
METHUEN, MA

PREPARED BY

BOHLER

SCALE:1"=20 DATE: 04/05/2022



Existing Detention Basin

Subcat Reach Pond Link

Routing Diagram for W211254 Existing
Prepared by Bohler Engineering, Printed 4/5/2022

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.114	74	>75% Grass cover, Good, HSG C (E1)
0.647	98	Paved parking, HSG C (E1)

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
0.761	HSG C	E1
0.000	HSG D	
0.000	Other	

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	0.114	0.000	0.000	0.114	>75% Grass cover, Good	E1
0.000	0.000	0.647	0.000	0.000	0.647	Paved parking	E1

Summary for Subcatchment E1: Lease Area Existing Lot

Runoff = 2.08 cfs @ 12.09 hrs, Volume= 0.158 af, Depth> 2.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Rainfall=3.14"

Area (sf)	CN	Description
28,197	98	Paved parking, HSG C
4,973	74	>75% Grass cover, Good, HSG C
33,170	94	Weighted Average
4,973		14.99% Pervious Area
28,197		85.01% Impervious Area

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

Summary for Reach EDP1: Existing Detention Basin

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.761 ac, 85.01% Impervious, Inflow Depth > 2.48" for 2-yr event
Inflow = 2.08 cfs @ 12.09 hrs, Volume= 0.158 af
Outflow = 2.08 cfs @ 12.09 hrs, Volume= 0.158 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Subcatchment E1: Lease Area Existing Lot

Runoff = 3.47 cfs @ 12.09 hrs, Volume= 0.271 af, Depth> 4.28"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Rainfall=4.97"

Area (sf)	CN	Description
28,197	98	Paved parking, HSG C
4,973	74	>75% Grass cover, Good, HSG C
33,170	94	Weighted Average
4,973		14.99% Pervious Area
28,197		85.01% Impervious Area

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

Summary for Reach EDP1: Existing Detention Basin

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.761 ac, 85.01% Impervious, Inflow Depth > 4.28" for 10-yr event
Inflow = 3.47 cfs @ 12.09 hrs, Volume= 0.271 af
Outflow = 3.47 cfs @ 12.09 hrs, Volume= 0.271 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Subcatchment E1: Lease Area Existing Lot

Runoff = 4.33 cfs @ 12.09 hrs, Volume= 0.343 af, Depth> 5.40"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr Rainfall=6.11"

Area (sf)	CN	Description
28,197	98	Paved parking, HSG C
4,973	74	>75% Grass cover, Good, HSG C
33,170	94	Weighted Average
4,973		14.99% Pervious Area
28,197		85.01% Impervious Area

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

Summary for Reach EDP1: Existing Detention Basin

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.761 ac, 85.01% Impervious, Inflow Depth > 5.40" for 25-yr event
Inflow = 4.33 cfs @ 12.09 hrs, Volume= 0.343 af
Outflow = 4.33 cfs @ 12.09 hrs, Volume= 0.343 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Subcatchment E1: Lease Area Existing Lot

Runoff = 5.64 cfs @ 12.09 hrs, Volume= 0.454 af, Depth> 7.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-yr Rainfall=7.87"

Area (sf)	CN	Description
28,197	98	Paved parking, HSG C
4,973	74	>75% Grass cover, Good, HSG C
33,170	94	Weighted Average
4,973		14.99% Pervious Area
28,197		85.01% Impervious Area

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

Summary for Reach EDP1: Existing Detention Basin

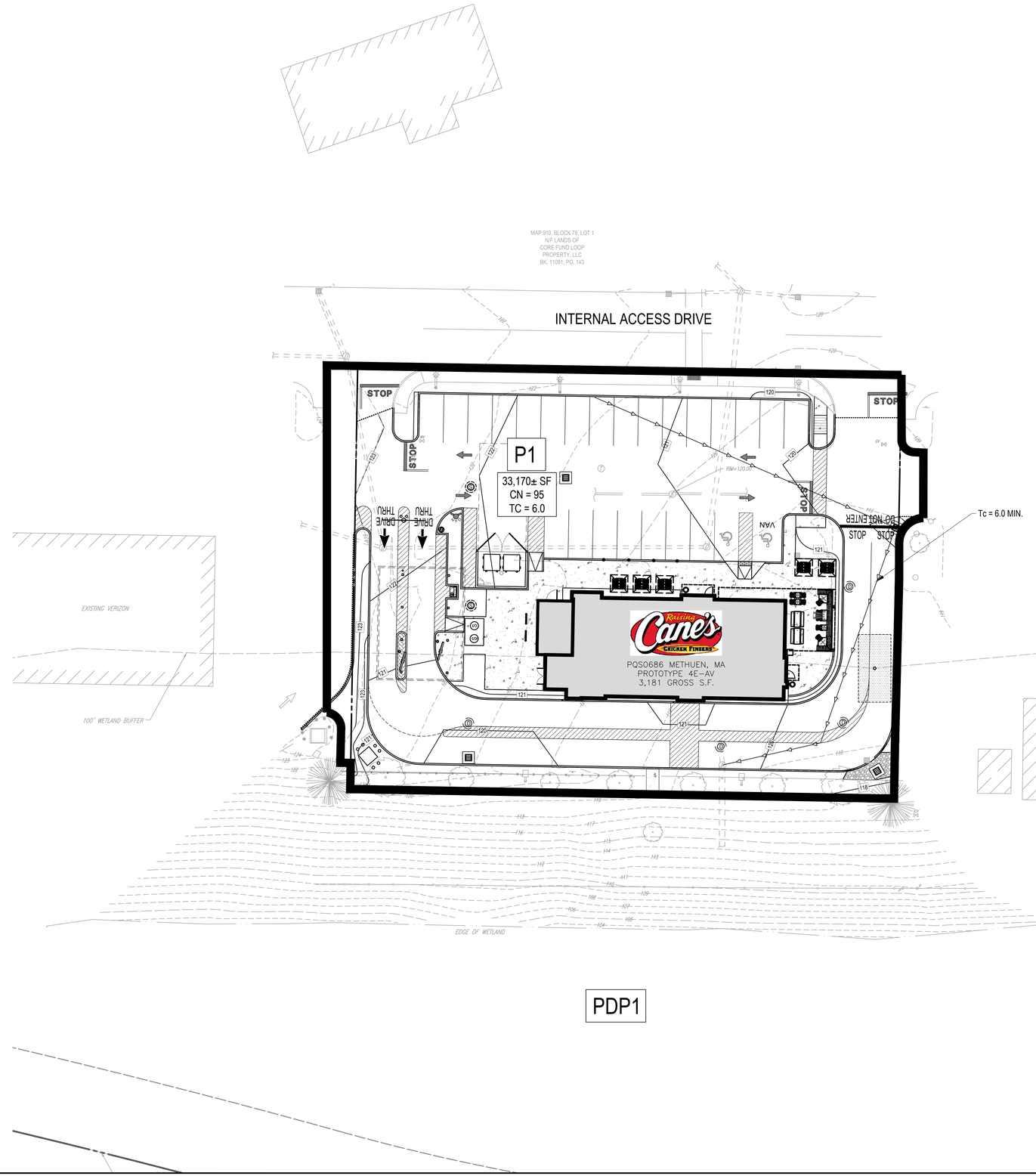
[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.761 ac, 85.01% Impervious, Inflow Depth > 7.15" for 100-yr event
Inflow = 5.64 cfs @ 12.09 hrs, Volume= 0.454 af
Outflow = 5.64 cfs @ 12.09 hrs, Volume= 0.454 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

APPENDIX D: PROPOSED CONDITIONS HYDROLOGIC ANALYSIS

- *PROPOSED CONDITIONS DRAINAGE MAP*
- *PROPOSED CONDITIONS HYDROCAD COMPUTATIONS*



KEY

- TIME OF CONCENTRATION (Tc)
- P1 — WATERSHED
- PDP1 — DESIGN POINT

POST-DEVELOPMENT DRAINAGE ANALYSIS EXHIBIT

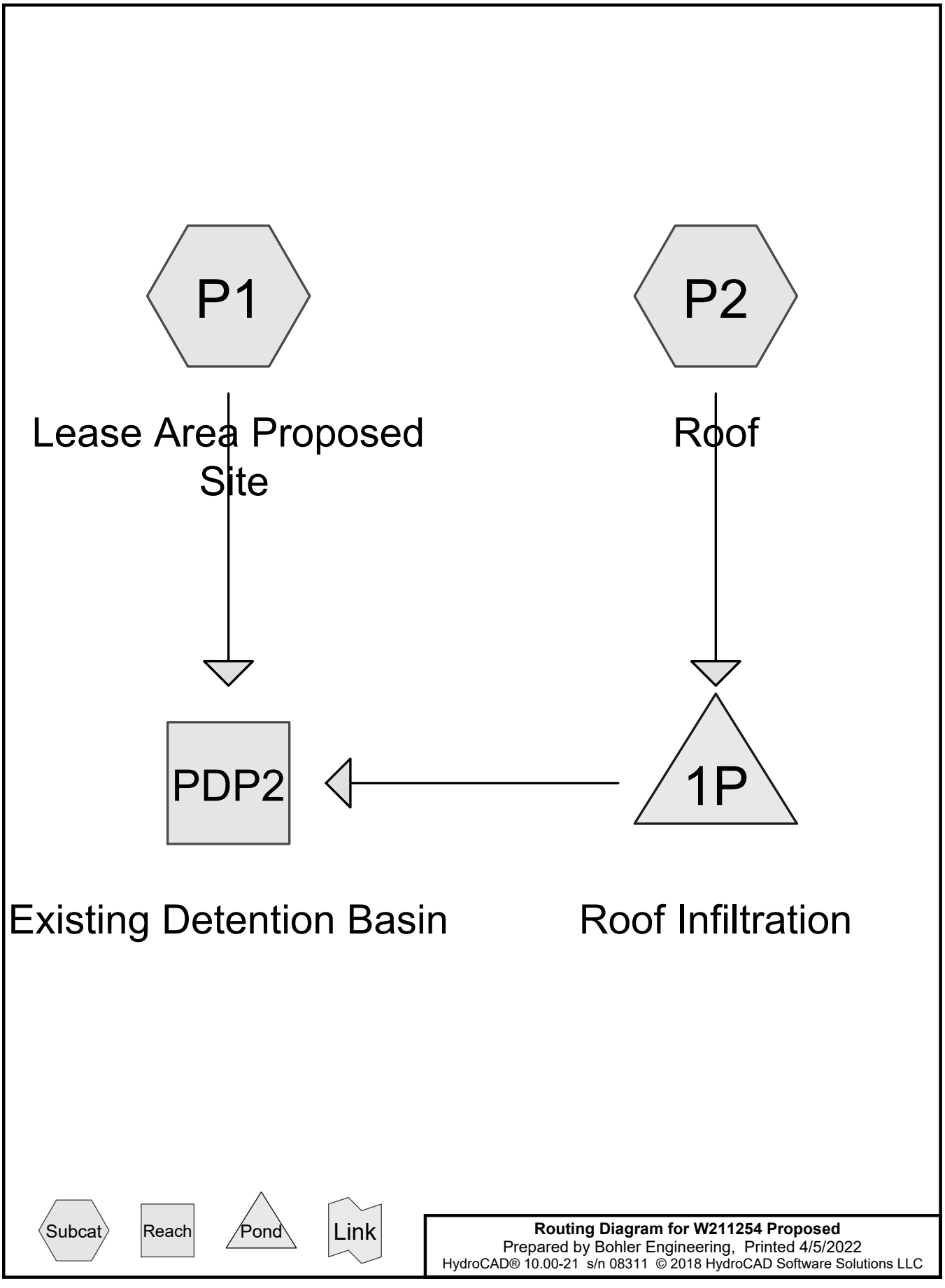
90 PLEASANT VALLEY STREET
METHUEN, MA

PREPARED BY

BOHLER

SCALE:1"=20' DATE: 04/05/2022

20 10 5 0 20
1"= 20'



Routing Diagram for W211254 Proposed
Prepared by Bohler Engineering, Printed 4/5/2022

Summary for Subcatchment P1: Lease Area Proposed Site

Runoff = 1.91 cfs @ 12.09 hrs, Volume= 0.147 af, Depth> 2.58"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Rainfall=3.14"

Area (sf)	CN	Description
25,504	98	Paved parking, HSG C
4,230	74	>75% Grass cover, Good, HSG C
29,734	95	Weighted Average
4,230		14.23% Pervious Area
25,504		85.77% Impervious Area

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

Summary for Subcatchment P2: Roof

Runoff = 0.23 cfs @ 12.09 hrs, Volume= 0.019 af, Depth> 2.91"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Rainfall=3.14"

Area (sf)	CN	Description
3,436	98	Unconnected roofs, HSG A
3,436		100.00% Impervious Area
3,436		100.00% Unconnected

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

Summary for Reach PDP2: Existing Detention Basin

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.761 ac, 87.25% Impervious, Inflow Depth > 2.36" for 2-yr event
Inflow = 1.91 cfs @ 12.09 hrs, Volume= 0.150 af
Outflow = 1.91 cfs @ 12.09 hrs, Volume= 0.150 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Pond 1P: Roof Infiltration

Inflow Area = 0.079 ac,100.00% Impervious, Inflow Depth > 2.91" for 2-yr event
Inflow = 0.23 cfs @ 12.09 hrs, Volume= 0.019 af
Outflow = 0.04 cfs @ 12.56 hrs, Volume= 0.012 af, Atten= 83%, Lag= 28.5 min
Discarded = 0.01 cfs @ 8.65 hrs, Volume= 0.010 af
Primary = 0.03 cfs @ 12.56 hrs, Volume= 0.003 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 116.96' @ 12.56 hrs Surf.Area= 275 sf Storage= 394 cf

Plug-Flow detention time= 217.6 min calculated for 0.012 af (65% of inflow)
Center-of-Mass det. time= 116.8 min (873.2 - 756.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	114.50'	329 cf	**11.00'W x 24.98'L x 4.00'H Field A** 1,099 cf Overall - 276 cf Embedded = 823 cf x 40.0% Voids
#2A	115.50'	276 cf	**ADS_StormTech SC-740 +Cap** x 6 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 2 Rows of 3 Chambers
		605 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	116.85'	**8.0" Round Outlet Pipe** L= 12.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 116.85' / 116.50' S= 0.0292 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.35 sf
#2	Discarded	114.50'	**1.020 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.01 cfs @ 8.65 hrs HW=114.54' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.03 cfs @ 12.56 hrs HW=116.96' (Free Discharge)
↑—**1=Outlet Pipe** (Inlet Controls 0.03 cfs @ 0.88 fps)

Summary for Subcatchment P1: Lease Area Proposed Site

Runoff = 3.15 cfs @ 12.09 hrs, Volume= 0.250 af, Depth> 4.39"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Rainfall=4.97"

Area (sf)	CN	Description
25,504	98	Paved parking, HSG C
4,230	74	>75% Grass cover, Good, HSG C
29,734	95	Weighted Average
4,230		14.23% Pervious Area
25,504		85.77% Impervious Area

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

Summary for Subcatchment P2: Roof

Runoff = 0.37 cfs @ 12.09 hrs, Volume= 0.031 af, Depth> 4.73"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Rainfall=4.97"

Area (sf)	CN	Description
3,436	98	Unconnected roofs, HSG A
3,436		100.00% Impervious Area
3,436		100.00% Unconnected

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

Summary for Reach PDP2: Existing Detention Basin

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.761 ac, 87.25% Impervious, Inflow Depth > 4.13" for 10-yr event
Inflow = 3.40 cfs @ 12.10 hrs, Volume= 0.262 af
Outflow = 3.40 cfs @ 12.10 hrs, Volume= 0.262 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Pond 1P: Roof Infiltration

Inflow Area = 0.079 ac,100.00% Impervious, Inflow Depth > 4.73" for 10-yr event
Inflow = 0.37 cfs @ 12.09 hrs, Volume= 0.031 af
Outflow = 0.33 cfs @ 12.15 hrs, Volume= 0.023 af, Atten= 13%, Lag= 3.6 min
Discarded = 0.01 cfs @ 6.85 hrs, Volume= 0.011 af
Primary = 0.32 cfs @ 12.15 hrs, Volume= 0.013 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 117.22' @ 12.15 hrs Surf.Area= 275 sf Storage= 439 cf

Plug-Flow detention time= 141.9 min calculated for 0.023 af (75% of inflow)
Center-of-Mass det. time= 56.2 min (803.9 - 747.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	114.50'	329 cf	**11.00'W x 24.98'L x 4.00'H Field A** 1,099 cf Overall - 276 cf Embedded = 823 cf x 40.0% Voids
#2A	115.50'	276 cf	**ADS_StormTech SC-740 +Cap** x 6 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 2 Rows of 3 Chambers
		605 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	116.85'	**8.0" Round Outlet Pipe** L= 12.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 116.85' / 116.50' S= 0.0292 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.35 sf
#2	Discarded	114.50'	**1.020 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.01 cfs @ 6.85 hrs HW=114.54' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.31 cfs @ 12.15 hrs HW=117.21' (Free Discharge)
↑—**1=Outlet Pipe** (Inlet Controls 0.31 cfs @ 1.62 fps)

Summary for Subcatchment P1: Lease Area Proposed Site

Runoff = 3.92 cfs @ 12.09 hrs, Volume= 0.314 af, Depth> 5.52"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr Rainfall=6.11"

Area (sf)	CN	Description
25,504	98	Paved parking, HSG C
4,230	74	>75% Grass cover, Good, HSG C
29,734	95	Weighted Average
4,230		14.23% Pervious Area
25,504		85.77% Impervious Area

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

Summary for Subcatchment P2: Roof

Runoff = 0.46 cfs @ 12.09 hrs, Volume= 0.039 af, Depth> 5.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr Rainfall=6.11"

Area (sf)	CN	Description
3,436	98	Unconnected roofs, HSG A
3,436		100.00% Impervious Area
3,436		100.00% Unconnected

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

Summary for Reach PDP2: Existing Detention Basin

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.761 ac, 87.25% Impervious, Inflow Depth > 5.25" for 25-yr event
Inflow = 4.33 cfs @ 12.09 hrs, Volume= 0.333 af
Outflow = 4.33 cfs @ 12.09 hrs, Volume= 0.333 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Pond 1P: Roof Infiltration

Inflow Area = 0.079 ac,100.00% Impervious, Inflow Depth > 5.87" for 25-yr event
Inflow = 0.46 cfs @ 12.09 hrs, Volume= 0.039 af
Outflow = 0.44 cfs @ 12.11 hrs, Volume= 0.030 af, Atten= 5%, Lag= 1.7 min
Discarded = 0.01 cfs @ 5.90 hrs, Volume= 0.011 af
Primary = 0.43 cfs @ 12.11 hrs, Volume= 0.019 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 117.29' @ 12.11 hrs Surf.Area= 275 sf Storage= 451 cf

Plug-Flow detention time= 124.0 min calculated for 0.030 af (79% of inflow)
Center-of-Mass det. time= 44.0 min (788.4 - 744.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	114.50'	329 cf	**11.00'W x 24.98'L x 4.00'H Field A** 1,099 cf Overall - 276 cf Embedded = 823 cf x 40.0% Voids
#2A	115.50'	276 cf	**ADS_StormTech SC-740 +Cap** x 6 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 2 Rows of 3 Chambers
		605 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	116.85'	**8.0" Round Outlet Pipe** L= 12.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 116.85' / 116.50' S= 0.0292 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.35 sf
#2	Discarded	114.50'	**1.020 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.01 cfs @ 5.90 hrs HW=114.54' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.42 cfs @ 12.11 hrs HW=117.28' (Free Discharge)
↑—**1=Outlet Pipe** (Inlet Controls 0.42 cfs @ 1.76 fps)

Summary for Subcatchment P1: Lease Area Proposed Site

Runoff = 5.09 cfs @ 12.09 hrs, Volume= 0.413 af, Depth> 7.27"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-yr Rainfall=7.87"

Area (sf)	CN	Description
25,504	98	Paved parking, HSG C
4,230	74	>75% Grass cover, Good, HSG C
29,734	95	Weighted Average
4,230		14.23% Pervious Area
25,504		85.77% Impervious Area

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

Summary for Subcatchment P2: Roof

Runoff = 0.60 cfs @ 12.09 hrs, Volume= 0.050 af, Depth> 7.63"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-yr Rainfall=7.87"

Area (sf)	CN	Description
3,436	98	Unconnected roofs, HSG A
3,436		100.00% Impervious Area
3,436		100.00% Unconnected

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

Summary for Reach PDP2: Existing Detention Basin

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.761 ac, 87.25% Impervious, Inflow Depth > 6.98" for 100-yr event
Inflow = 5.63 cfs @ 12.09 hrs, Volume= 0.443 af
Outflow = 5.63 cfs @ 12.09 hrs, Volume= 0.443 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Pond 1P: Roof Infiltration

Inflow Area = 0.079 ac,100.00% Impervious, Inflow Depth > 7.63" for 100-yr event
Inflow = 0.60 cfs @ 12.09 hrs, Volume= 0.050 af
Outflow = 0.57 cfs @ 12.11 hrs, Volume= 0.042 af, Atten= 4%, Lag= 1.6 min
Discarded = 0.01 cfs @ 4.10 hrs, Volume= 0.012 af
Primary = 0.56 cfs @ 12.11 hrs, Volume= 0.030 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 117.37' @ 12.11 hrs Surf.Area= 275 sf Storage= 464 cf

Plug-Flow detention time= 108.3 min calculated for 0.041 af (83% of inflow)
Center-of-Mass det. time= 38.4 min (779.4 - 741.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	114.50'	329 cf	**11.00'W x 24.98'L x 4.00'H Field A** 1,099 cf Overall - 276 cf Embedded = 823 cf x 40.0% Voids
#2A	115.50'	276 cf	**ADS_StormTech SC-740 +Cap** x 6 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 2 Rows of 3 Chambers
		605 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	116.85'	**8.0" Round Outlet Pipe** L= 12.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 116.85' / 116.50' S= 0.0292 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.35 sf
#2	Discarded	114.50'	**1.020 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.01 cfs @ 4.10 hrs HW=114.54' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.55 cfs @ 12.11 hrs HW=117.36' (Free Discharge)
↑—**1=Outlet Pipe** (Inlet Controls 0.55 cfs @ 1.92 fps)

APPENDIX F: STORMWATER CALCULATIONS

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

NOAA Atlas 14, Volume 10, Version 2
Location name: Methuen, Massachusetts, USA*
Latitude: 42.7408°, Longitude: -71.1607°
Elevation: 127.31 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	**0.310** (0.242-0.389)	**0.369** (0.288-0.464)	**0.467** (0.363-0.588)	**0.547** (0.423-0.693)	**0.658** (0.492-0.870)	**0.744** (0.545-1.00)	**0.829** (0.589-1.16)	**0.933** (0.629-1.34)	**1.07** (0.694-1.59)	**1.17** (0.743-1.78)
10-min	**0.439** (0.343-0.551)	**0.523** (0.408-0.657)	**0.661** (0.514-0.833)	**0.775** (0.599-0.982)	**0.932** (0.697-1.23)	**1.05** (0.771-1.42)	**1.17** (0.835-1.64)	**1.32** (0.891-1.89)	**1.52** (0.983-2.25)	**1.66** (1.05-2.52)
15-min	**0.517** (0.404-0.648)	**0.616** (0.480-0.773)	**0.778** (0.605-0.980)	**0.912** (0.705-1.16)	**1.10** (0.820-1.45)	**1.24** (0.908-1.67)	**1.38** (0.982-1.93)	**1.56** (1.05-2.23)	**1.78** (1.16-2.65)	**1.96** (1.24-2.96)
30-min	**0.712** (0.556-0.893)	**0.848** (0.662-1.07)	**1.07** (0.833-1.35)	**1.26** (0.971-1.59)	**1.51** (1.13-2.00)	**1.71** (1.25-2.30)	**1.90** (1.35-2.66)	**2.14** (1.44-3.07)	**2.46** (1.59-3.64)	**2.69** (1.71-4.08)
60-min	**0.907** (0.709-1.14)	**1.08** (0.843-1.36)	**1.37** (1.06-1.72)	**1.60** (1.24-2.03)	**1.92** (1.44-2.54)	**2.17** (1.59-2.94)	**2.42** (1.72-3.39)	**2.73** (1.84-3.91)	**3.13** (2.03-4.64)	**3.43** (2.17-5.19)
2-hr	**1.17** (0.917-1.45)	**1.40** (1.10-1.74)	**1.78** (1.39-2.23)	**2.09** (1.63-2.63)	**2.53** (1.91-3.33)	**2.86** (2.12-3.86)	**3.19** (2.30-4.49)	**3.66** (2.48-5.22)	**4.28** (2.78-6.32)	**4.75** (3.02-7.15)
3-hr	**1.34** (1.06-1.67)	**1.62** (1.28-2.01)	**2.07** (1.63-2.58)	**2.44** (1.91-3.06)	**2.95** (2.24-3.89)	**3.35** (2.49-4.52)	**3.74** (2.72-5.27)	**4.33** (2.93-6.15)	**5.10** (3.32-7.50)	**5.69** (3.62-8.52)
6-hr	**1.71** (1.36-2.11)	**2.08** (1.65-2.57)	**2.67** (2.12-3.31)	**3.16** (2.49-3.95)	**3.84** (2.94-5.04)	**4.37** (3.28-5.87)	**4.89** (3.58-6.86)	**5.69** (3.87-8.04)	**6.75** (4.41-9.86)	**7.54** (4.81-11.2)
12-hr	**2.14** (1.72-2.63)	**2.62** (2.10-3.22)	**3.40** (2.72-4.19)	**4.04** (3.21-5.01)	**4.93** (3.80-6.43)	**5.62** (4.24-7.50)	**6.30** (4.63-8.79)	**7.34** (5.02-10.3)	**8.71** (5.71-12.7)	**9.74** (6.24-14.4)
24-hr	**2.52** (2.04-3.08)	**3.14** (2.54-3.83)	**4.14** (3.33-5.07)	**4.97** (3.98-6.12)	**6.11** (4.74-7.93)	**6.99** (5.31-9.30)	**7.87** (5.83-10.9)	**9.24** (6.34-12.9)	**11.1** (7.28-16.0)	**12.4** (7.98-18.3)
2-day	**2.82** (2.30-3.42)	**3.57** (2.91-4.34)	**4.80** (3.90-5.85)	**5.82** (4.70-7.13)	**7.23** (5.66-9.36)	**8.31** (6.38-11.0)	**9.39** (7.04-13.1)	**11.2** (7.71-15.6)	**13.6** (8.97-19.5)	**15.4** (9.91-22.5)
3-day	**3.10** (2.54-3.74)	**3.90** (3.20-4.72)	**5.22** (4.26-6.33)	**6.31** (5.12-7.70)	**7.82** (6.14-10.1)	**8.98** (6.92-11.9)	**10.1** (7.63-14.1)	**12.1** (8.35-16.7)	**14.7** (9.71-21.0)	**16.7** (10.7-24.3)
4-day	**3.36** (2.77-4.05)	**4.19** (3.45-5.06)	**5.55** (4.54-6.72)	**6.68** (5.43-8.13)	**8.23** (6.49-10.6)	**9.42** (7.28-12.4)	**10.6** (8.01-14.7)	**12.6** (8.74-17.4)	**15.3** (10.1-21.9)	**17.3** (11.2-25.2)
7-day	**4.10** (3.40-4.91)	**4.96** (4.10-5.95)	**6.37** (5.25-7.66)	**7.53** (6.16-9.12)	**9.14** (7.24-11.7)	**10.4** (8.05-13.6)	**11.6** (8.77-15.9)	**13.7** (9.50-18.8)	**16.4** (10.9-23.3)	**18.5** (12.0-26.7)
10-day	**4.77** (3.97-5.70)	**5.65** (4.69-6.76)	**7.09** (5.87-8.51)	**8.29** (6.81-10.0)	**9.94** (7.89-12.6)	**11.2** (8.71-14.6)	**12.5** (9.42-17.0)	**14.5** (10.1-19.8)	**17.2** (11.5-24.3)	**19.2** (12.5-27.7)
20-day	**6.66** (5.59-7.91)	**7.64** (6.40-9.08)	**9.23** (7.70-11.0)	**10.5** (8.74-12.7)	**12.4** (9.86-15.5)	**13.8** (10.7-17.6)	**15.2** (11.4-20.1)	**17.0** (11.9-23.0)	**19.4** (13.0-27.2)	**21.2** (13.8-30.4)
30-day	**8.24** (6.95-9.75)	**9.29** (7.82-11.0)	**11.0** (9.23-13.1)	**12.4** (10.4-14.9)	**14.4** (11.5-17.9)	**15.9** (12.4-20.1)	**17.4** (13.0-22.8)	**19.1** (13.5-25.7)	**21.3** (14.3-29.7)	**23.0** (15.0-32.8)
45-day	**10.3** (8.68-12.1)	**11.4** (9.64-13.4)	**13.2** (11.2-15.7)	**14.8** (12.4-17.6)	**16.9** (13.5-20.8)	**18.6** (14.4-23.3)	**20.2** (15.0-26.1)	**21.7** (15.4-29.2)	**23.8** (16.0-33.0)	**25.3** (16.5-36.0)
60-day	**12.0** (10.2-14.1)	**13.2** (11.2-15.5)	**15.1** (12.8-17.9)	**16.8** (14.1-19.9)	**19.0** (15.3-23.3)	**20.8** (16.2-25.9)	**22.5** (16.7-28.9)	**24.0** (17.0-32.1)	**25.9** (17.5-36.0)	**27.4** (17.9-38.9)

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

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

Please refer to NOAA Atlas 14 document for more information.

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TSS Removal Calculation Worksheet

Location: Raising Cane's Treatment

A BMP[1]	B TSS Removal Rate[1]	C Starting TSS Load*	D Amount Removed (B*C)	E Remaining Load (C-D)
Deep Sump and Hooded Catch Basins	**0.25**	**1.00**	**0.25**	**0.75**
Proprietary Separators	**0.80**	**0.75**	**0.60**	**0.15**

Total TSS Removal = **85%**

Project: **W211254**

Prepared By: **Bohler Engineering**

Date: **4/5/2022**

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

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

Raising Cane's Restaurant
90 Pleasant Valley Street
Methuen, MA
Bohler Job Number: W211254
April 5, 2022

Rational Pipe Sizing Calculations

Design Period Storm:		**25**	**Year**	**Design Period Intensity***			**6.1**	**in/hr**								
LOCATION		IMPERVIOUS			OTHER			SUM CA	Tc (min)	I (in/hr)	Q (cfs)	D (in)	S (ft/ft)	Material	n	Q Full (cfs)	V Full (fps)
FROM	TO	A	C	CA	A	C	CA										
CB-1	WQU-3	0.15	0.95	0.14	0.01	0.30	0.00	0.15	6	6.1	0.89	12	0.010	HDPE	0.012	3.86	4.91
CB-2	WQU-3	0.15	0.95	0.14	0.05	0.30	0.02	0.16	6	6.1	0.96	12	0.010	HDPE	0.012	3.86	4.91
WQU-3	DDMH	0.30	0.95	0.29	0.06	0.30	0.02	0.30	6	6.1	1.85	12	0.010	HDPE	0.012	3.86	4.91
WQU-2	DMH-2	0.30	0.95	0.29	0.02	0.30	0.01	0.29	6	6.1	1.78	12	0.010	HDPE	0.012	3.86	4.91
WQU-1	DMH-1	0.08	0.95	0.08	0.02	0.30	0.01	0.08	6	6.1	0.50	12	0.010	HDPE	0.012	3.86	4.91

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

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*
- *PROPOSED OPERATION AND MAINTENANCE MAP*
- *MANUFACTURER'S INSPECTION AND MAINTENANCE MANUALS*

STORMWATER OPERATION AND MAINTENANCE PLAN

Raising Cane's Chicken Fingers
90 Pleasant Valley Street
Methuen, MA

RESPONSIBLE PARTY DURING CONSTRUCTION:

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

RESPONSIBLE PARTY POST CONSTRUCTION:

Raising Cane's Chicken Fingers
90 Pleasant Valley Street
Methuen, MA 01844

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. All resulting sweepings shall be collected and properly disposed of offsite in accordance with MADEP and other applicable requirements.

2. Catch basins, yard drains, trench 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 offsite in accordance with MADEP and other applicable requirements.

3. Underground Infiltration Basins: Preventative maintenance after every major storm event during the first three (3) months of operation and at least twice per year thereafter. Inspect structure and pretreatment BMP to ensure proper operation after every major storm event (generally equal or greater to 3.0 inches in 24 hours) for the first three months. The outlet of the basin, if any, shall be inspected for erosion and sedimentation, and rip-rap shall be promptly repaired in the case of erosion. Sediment collecting in the bottom of the basin shall be inspected twice annually, and removal shall commence any time the sediment reaches a depth of six inches anywhere in the basin. Any sediment removed shall be disposed of in accordance with MADEP and other applicable requirements.

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
90 Pleasant Valley Street
Methuen, MA 01844

RESPONSIBLE PARTY:

Raising Cane's Chicken Fingers
90 Pleasant Valley Street
Methuen, MA 01844

NAME OF INSPECTOR:	INSPECTION DATE:
Note Condition of the Following (sediment depth, debris, standing water, damage, etc.):	
Catch Basins / Area Drains:	
Discharge Points/ Flared End Sections / Rip Rap:	
Subsurface Infiltration Systems:	
Isolator Rows:	

Other:
Note Recommended Actions to be taken on the Following (sediment and/or debris removal, repairs, etc.):
Catch Basins / Area Drains:
Discharge Points / Flared End Sections / Rip Rap:
Subsurface Infiltration Systems:
Isolator Row:
Other:
Comments:

STORMWATER INSPECTION AND MAINTENANCE LOG FORM			
Raising Cane's Chicken Fingers ***90 Pleasant Valley St – Methuen, MA***			
Stormwater Management Practice	Responsible Party	Date	Maintenance Activity Performed

LONG-TERM POLLUTION PREVENTION PLAN

Raising Cane's Chicken Fingers
90 Pleasant Valley Street
Methuen, MA 01844

RESPONSIBLE PARTY DURING CONSTRUCTION:

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

RESPONSIBLE PARTY POST CONSTRUCTION:

Raising Cane's Chicken Fingers
90 Pleasant Valley Street
Methuen, MA 01844

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 and driveways 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. Snow shall not be plowed, dumped and/or placed in infiltration basins or similar stormwater controls. Salting and/or sanding of pavement / walkway areas during winter conditions shall only be done in accordance with all state/local requirements and approvals.
- Trash and other debris shall be removed from all areas of the site at least twice yearly.
- Pet waste shall be disposed of in accordance with local regulations. Pet waste shall not be disposed of in a storm drain or catch basin.
- Snow piles shall be located adjacent to or on pervious surfaces in upland areas. This will allow snow melt water to filter in to 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.

ILLICIT DISCHARGE STATEMENT

Certain types of non-stormwater discharges are allowed under the U.S. Environmental Protection Agency Construction General Permit. These types of discharges will be allowed under the conditions that no pollutants will be allowed to come in contact with the water prior to or after its discharge. The control measures which have been outlined previously in this LTPPP will be strictly followed to ensure that no contamination of these non-storm water discharges takes place. Any existing illicit discharges, if discovered during the course of the work, will be reported to MassDEP and the local DPW, as applicable, to be addressed in accordance with their respective policies. No illicit discharges will be allowed in conjunction with the proposed improvements.

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

Raising Cane's Chicken Fingers
90 Pleasant Valley Street
Methuen, MA 01844

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 Methuen 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 Methuen Health Division at (978) 983-8625 and the Methuen Conservation Commission at (978) 983-8650.

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 Methuen Health Division and 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 AGENCYPHONE: (888) 372-7341

CONTECH®
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CDS® Inspection and Maintenance Guide

CDS TECHNOLOGIES

Maintenance

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

Inspection

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

The visual inspection should ascertain that the system components are in working order and that there are no blockages or obstructions in the inlet and separation screen. The inspection should also quantify the accumulation of hydrocarbons, trash, and sediment in the system. Measuring pollutant accumulation can be done with a calibrated dipstick, tape measure or other measuring instrument. If absorbent material is used for enhanced removal of hydrocarbons, the level of discoloration of the sorbent material should also be identified during inspection. It is useful and often required as part of an operating permit to keep a record of each inspection. A simple form for doing so is provided.

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

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

Cleaning

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

In installations where the risk of petroleum spills is small, liquid contaminants may not accumulate as quickly as sediment. However, the system should be cleaned out immediately in the event of an oil or gasoline spill should be cleaned out immediately. Motor oil and other hydrocarbons that accumulate on a more routine basis should be removed when an appreciable layer has been captured. To remove these pollutants, it may be preferable to use absorbent pads since they are usually less expensive to dispose than the oil/water emulsion that may be created by vacuuming the oily layer. Trash and debris can be netted out to separate it from the other pollutants. The screen should be 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 also to ensure that proper safety precautions have been followed. Confined space entry procedures need to be followed if physical access is required. Disposal of all material removed from the CDS system should be done in accordance with local regulations. In many jurisdictions, disposal of the sediments may be handled in the same manner as the disposal of sediments removed from catch basins or deep sump manholes.

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

Table 1: CDS Maintenance Indicators and Sediment Storage Capacities

Support

- Drawings and specifications are available at www.contechstormwater.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, earth stabilization and wastewater treament products. For information, visit www.ContechES.com or call 800.338.1122

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CDS Inspection & Maintenance Log

CDS Model: _____ Location: _____

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

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

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