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May 12, 2025

Robert Moore, Conservation Agent
Haverhill Conservation Commission
4 Summer Street, City Hall Room 300
Haverhill, MA 01830

Re: Peer Review Services
85 Water Street
Haverhill, MA

Dear Mr. Moore:

As requested by the City of Haverhill, CEI has completed a technical review of the materials and information listed below for the proposed development project located at 85 Water Street in Haverhill, MA. Our review focuses on elements of the proposed project that pertain to the stormwater management design, based on the following information furnished to the Conservation Commission:

a. Stormwater Management Report, revised May 2, 2025, prepared by The Morin-Cameron Group, Inc.;
b. NOI Report, dated March 13, 2025, prepared by LEC Environmental Consultants;
c. Site Plans, revised May 2, 2025, prepared by The Morin-Cameron Group, Inc.
d. Response to Comments, dated May 2, 2025, prepared by The Morin-Cameron Group, Inc.

CEI's original comments are below, followed by The Morin-Cameron Group (MCG) responses in ***bold, italic text***, with CEI response comments below that in **bold, blue text.**

Standard 1: No new stormwater conveyances (e.g. outfalls) may discharge untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth.

1. CEI is concerned that the drop from the vegetated filter strip into the bioretention area will cause erosion and reduce viability of vegetation within the bioretention area reducing its effectiveness. Please show that flow over the retaining wall will not cause erosion within the bioretention basin.

MCG Response: The retaining wall is proposed with a one foot wide crushed stone strip along the top of wall that will capture runoff and direct it through wall drains at the bases of the wall/bottom of basin to prevent runoff from spilling over the wall. The locations of the wall drain pipes were added to the Bioretention Area Detail on Sheet C-8 with rip-rap to prevent erosion.

CEI: Comment addressed. Please provide documentation that shows inflow velocities will be less than 2 feet per second for the newly proposed infiltration chambers.

2. Provide calculations that the flow over the riprap spill way will not cause erosion along the grass slope downstream.

MCG Response: Rip-Rap sizing calculations were added to Appendix D of the Stormwater Management Report.

CEI: Comment addressed.

3. It appears that large portions of PS-1 will not be caught by catch basins due to the proposed grading and may cause erosion due to long and steep flow paths. Please consider adding additional drainage structures to capture this area.

MCG Response: PS-1 drains to the catch basins along Wall Street from two general areas. The first area, which consists of Wall Street and the vegetated slope from the existing parking lot will generate most of the runoff from the drainage area and is directed to catch basins adjacent to Wall Street. The second area, which contains the proposed park, will consist of crushed stone walkways, landscaped areas and some sidewalk. It is anticipated this area will generate small flows of 0.6 cfs and 1.1 cfs in the 2-year and 10-year storm events while being flooded entirely in the 100-year event. The existing drainage structures in the vicinity of the park (two catch basins) can adequately handle the proposed flow and no erosion would be anticipated from stormwater runoff in the area.

CEI: CEI concurs with explanation. Comment addressed.

4. CB3 is proposed in the middle of the driveway to Wall Street and may not catch runoff due to the grading around its location. Please review the grading and location for the catch basin to ensure it is capturing all runoff from PS-4 that may drain towards the driveway.

MCG Response: The structure was moved downslope, and the driveway grading was adjusted to pitch the pavement more toward the drain structure to ensure water will be captured as depicted in PS-4. The watershed limit of PS-1 and PS-4 was adjusted as required.

CEI: Comment addressed.

Standard 2: Stormwater management systems shall be designed so that post-development peak discharge rates do not exceed pre-development peak discharge rates.

The project proposes an infiltration system and reduction in impervious area to attenuate peak discharge rates. The post-development peak discharge rates are at or below existing discharge rates.

1. HydroCAD model should consider the WSEL of the Merrimack River to more accurately depict backwater effects that this system will be subject to.

MCG Response: Tailwater was added at the Design Point (1L) for the existing and proposed conditions analyses. Since there is no published data available for the 1-, 2-, and 5-year flood events the mean annual high water elevation was used for these events. The elevations published by FEMA for the 10-year (15.1'), 50-year (19.0') and 100-year (22.0') were used. While there is no published data for the 25-year flood event the elevation is assumed to be halfway between the 10-year and 50-year storm events (17.05'). Additionally, the pipes and structures present in the existing and proposed conditions were added to their respective HydroCAD analyses.

CEI: With the inclusion of the tailwater conditions for the river there is a significant difference in WSE and primary outflow of the proposed stormwater BMPs, specifically the chambers and the stone trench. It also appears that the rainfall distribution between the pipe analysis and the BMP analysis is different with the BMP analysis using the Type III distribution and the pipe analysis using the NRCC 24hr D distribution. CEI is concerned that with the inclusion of the

tailwater, the proposed stormwater BMPs will not meter the discharge rates to pre-development peak discharge rates.

2. It is unclear what the sewer flow node is conveying the analysis for the 36" drainpipe. It appears to have a 1 cfs baseflow flow all storm events. Please clarify what this is meant to represent.

MCG Response: The 36" drain pipe is part of a combined sewer overflow (CSO). The 1 cfs base flow is an assumed additional flow during a storm event from sewer flow based on the Title 5 flow of the buildings (use and intensity were obtained from the Haverhill GIS database) potentially connected into the CSO system.

CEI: Commented addressed.

3. It appears that subcatchment ES-2 would be collected by a catch basin and tie into the 36" pipe and should be accounted for in the calculations.

MCG Response: ES-2 was added to the Existing HydroCAD analysis for the 36" pipe. Additionally, PS-2 was added to the proposed HydroCAD analysis for the 36" pipe.

CEI: Comment addressed.

4. It appears that some areas of culvert watershed were not accounted for and should be included to give a more accurate representation of the contributing area. Please review the delineated watershed and ensure that it accounts for all the area it receives.

MCG Response: There are multiple drainage networks in the vicinity of the watershed of the 36" culvert that do not connect to the system considered. MCG feels the delineated watershed and additional areas in the HydroCAD analysis accurately represent the flow traveling through the 36" pipe based on the information received from the Haverhill Engineering Department.

CEI: Comment addressed.

5. Although the culvert outlet will be below the flood elevation for the 10-year storm event this should be accounted for to determine where flooding upstream will occur and if flooding will increase upstream of the site due to the proposed connection.

MCG Response: Flooding in the existing municipal stormwater system is anticipated to back up and rise with the water surface elevation of the Merrimack at the flood elevations determined by FEMA. Since the proposed system is equipped with a check valve, which will have an invert of approximately elevation 9.43, that will prevent backflow into the water quality unit when flood waters reach that elevation. At this point runoff flowing into the catch basins will fill in the proposed drain structures and pipes until it reaches the lowest catch basin grate at elevation 13.95. Stormwater will the flow out of the structure to Wall Street, which will already be inundated by flood waters since there are multiple catch basins between elevations 12.41 and 13.57 along the site. Flooding in this area will not be increased since the total volume of runoff for the 2-, 10- and 100-year storm events are decreasing as shown in the narrative of the Stormwater Management Report. Additionally, the project proposes to increase the available flood storage volume on site between elevations 13 and 22 as shown on sheet C-5 of the Site Redevelopment Plans.

CEI: The check valve will prevent water from backing into the system during smaller storm events but due to CB-3, the entire drainage system will receive flood water during the 10-year storm event. This would reduce the capacity of any of the chamber system to attenuate the peak discharge rates.

Standard 3: Loss of annual recharge to groundwater shall be eliminated or minimized through the use of infiltration measures.

The development proposes the reduction of impervious surface and an infiltration basin.

1. Provide calculations that show the BMP will drain within 72 hours.

MCG Response: Calculations demonstrating the required 72-hour drawdown were added to the Stormwater Management Calculations in Appendix D of the Stormwater Management Report.

CEI: Comment addressed.

2. Soil samples are required at the actual location and soil layer where stormwater infiltration is proposed. Soil samples provided were taken from the western side of the site and were not taken where the proposed BMP is situated.

MCG Response: The site is mapped in an area mapped as Urban Land (fill) on the NRCS Soil maps, which is confirmed by the soil borings performed in 2003 (Appendix H of the Stormwater Management Report). These soil borings showed bedrock 18 feet to 20 feet below existing grade and the report notes ground water between 8.5 feet and 14.9 feet below existing grade. MCG proposes to condition the requirement for a test pit to be performed in the vicinity of each stormwater BMP prior to construction. The test pit results will be provided to the design engineer for review to determine if changes would be required to the system prior to construction.

CEI: Standard 3 could be met with this condition. Permit conditions are determined by the Commission.

Standard 4: Stormwater management systems shall be designed to remove 80% of the average annual post-construction load of Total Suspended Solids (TSS).

The project is proposing deep sump catch basins, a hydrodynamic separator, and a subsurface infiltration system for water quality treatment.

1. CEI is concerned that with the check valve at the outlet of the WQU-1 and the WSEL in the outlet pipe during the larger storm events, that water will back up in the WQU-1 reducing effective treatment and possibly resuspending pollutants.

MCG Response: It is anticipated that the majority of the TSS and other pollutants will enter the proposed drainage system during the "first flush" or ½" of rain during a storm event. The CDS unit will treat the runoff following this, which would be expected to occur prior to floodwaters reaching and closing off the check valve. Per the manufacturer, solids captured in the sump will not resuspend during flood events. While floatable pollutants could escape the system, routine inspections and maintenance would reduce the amount of these pollutants in the system at a given time. Additionally, the system services a relatively small driveway with only 5 proposed parking spaces. This reduces the potential for floatable pollutants, such as oil and gas to be introduced to the system.

CEI: We agree that the WQU-1 will be able to provide water quality treatment for the contributing areas. Please provide manufacturer correspondence stating that solids will not be resuspended during flood events.

2. It appears the CB-3 will be under water during the 10-year storm event from the Merrimack River directing floodwaters to WQU-1. CEI is concerned that this will short circuit and damage WQU-1. Please confirm that the unit will not be damaged per the manufacturer.

MCG Response: Since there is a check valve included in the proposed drainage system at elevation 9.43, flow through the system will shut off when the floodwaters from the Merrimack River reach that elevation. Runoff flowing over the driveway will continue to enter and fill the system (pipes and structures) until it reaches the grate of CB-3 (elevation 13.85). At this point water in the system will flow out of CB-3, which will prevent floodwater from entering the system. Additionally, MCG reached out to the manufacturer and confirmed that WQU-1 would not damage the system if floodwater submerged the structure.

CEI: Please attach correspondence from manufacturer that states the WQU-1 will not be damaged when submerged during flooding events.

3. The vegetated filter strip is only 3' long in the proposed conditions. Massachusetts Standards requires a length of 20 feet for credit of TSS removal and pretreatment.

MCG Response: The Massachusetts Stormwater Handbook in Volume 2, Chapter 2, Page 25 states that for sheet flow a pretreatment option is "A grass and gravel combination. This should consist of at least 8 inches of gravel followed by 3 to 5 feet of sod." Therefore, the proposed 12"x12" stone diaphragm and 3' wide grass strip is an acceptable method of pretreatment for the proposed bioretention area.

CEI: Comment addressed.

4. Please provide a sitewide analysis of the proposed TSS removal. The Applicant submitted TSS removal rates for basin PS-4 and PS-5 but did not provide an average TSS removal for the entire site.

MCG Response: A sitewide average TSS calculation was added to the Stormwater Management Calculations in Appendix D of the Stormwater Management Report.

CEI: Comment addressed.

5. The calculations for phosphorus removal are incorrect. The calculations were completed assuming that the infiltration BMP was receiving 1.16 Ac of runoff but according to HydroCAD, the BMP is only receiving 4,209 SF of runoff. Please compute the total site phosphorus reduction based on the currently proposed drainage patterns.

MCG Response: The calculations for phosphorus removal were revised in Appendix D of the Stormwater Management Report.

CEI: Calculations were revised and show compliance with the required phosphorous removal. Comment addressed.

Standard 5: For Land Uses with Higher Potential Pollutant Loads (LUHPPL), source control and pollution prevention shall be implemented.

The proposed project is not classified as a LUHPPL.

Standard is met.

Standard 6: Stormwater discharges near or to any critical area require the use of specific source control and pollution prevention measures and the specific structural stormwater best management practices.

The project site is not located within any critical areas.

Standard is met.

Standard 7: Redevelopments projects are required to meet the Massachusetts Stormwater Management Standards only to the maximum extent practicable.

The project is considered redevelopment and must meet standards 2, 3, 4, 5, and 6 to the Maximum Extent Practicable (MEP).

1. CEI has provided comments for standards 2, 3, and 4 that should be addressed before we believe that the standards are being met to the MEP

MCG Response: The project is required to meet Standards 2, 3, 4, 5 and 6 to the maximum extent practicable, which MCG feels it has done given the space and site constraints and considering the project will reduce both total impervious area and pavement area typically requiring pollutant removal.

CEI: Comments have been provided for standards 2, 3, and 4 that should be addressed prior to MEP determination.

Standard 8: A plan to control construction-related impacts including erosion, sedimentation and other pollutant sources during construction and land disturbance activities.

The applicant has provided an Erosion and Soil Control Plan.

1. The notes specify that the proposed bioretention area will be protected but this is not depicted on the plan sheet. Please include proposed protection on the plan to ensure the area is protected during construction.

MCG Response: Orange construction fencing around the bioretention area was added to sheet C-3 to prevent compaction of soil beneath the drainage facility by machinery during site work.

CEI: Comment addressed.

Standard 9: A long-term operation and maintenance plan shall be developed and implemented to ensure that stormwater management systems function as designed.

The Applicant has provided a Long-Term Operation and Maintenance Plan for the Site.

1. Stormwater operation and maintenance plan must address snow disposal, including not disposing of snow in CFST.

MCG Response: Snow disposal is discussed in the snow storage section of the Long-Term Stormwater Best Management Practices O&M Plan. While snow storage is proposed within the Zone AE and areas effecting the compensatory flood storage elevations, there is still an increase in flood storage when factoring in the volume of the potential snow pile. The compensatory flood storage calculations on sheet C-5 were revised to assume the snow pile will occupy 68 cf from elevation 14-15, 286 cf from elevation 15-16 and 498 cf from elevations 16-22. These volumes are calculated assuming a vertical pile (no side slope) within the footprint of the proposed snow storage areas. The applicant understands that snow removal will be required for the site following larger snow events. A note was added to the compensatory flood storage table to state that the volume available within the snow storage area footprint was removed from the proposed flood storage volume.

CEI: Comment addressed.

Standard 10: All illicit discharges to the stormwater management system are prohibited.

The Applicant has provided an Illicit Discharge Compliance Statement.

Standard is met.

Other comments

1. Please further clarify the proposed cut and fill at each elevation for the Compensatory Flood Storage (CFST). NOI plans should show proposed fills and cuts. The CFST cannot be part of a stormwater basin.

MCG Response: A Cut and Fill Plan was added to the plans as sheet C-10 to depict the locations of cuts, fills, and grades being maintained within the limit of the FEMA Flood Zone AE. This plan shows color coding at each elevation from 13 to 22 to demonstrate the locations of cuts and fills within the site. The proposed bioretention area is assumed to be full for the CFST calculation.

CEI: Comment addressed. Adequate CFST is being provided.

2. Section 3.3 of the NOI report states that most of the site is located within a mapped Zone AE when it appears to be Zone X. Please clarify.

MCG Response: The site is located in both a Zone AE and a Zone X on FEMA FIRM PANEL 25009C00896. According to the FEMA Flood profile for the Merrimack River in the location of the site (Profile 85P, provided in Appendix H of the Stormwater Management Report) the 100-year Flood elevation is at roughly elevation 22. This elevation is delineated on the Site Plan and shown as the limit of the Zone AE. While there is a portion of the northern area of the site in the Zone X the majority of the site is beneath elevation 22 in the Zone AE.

CEI: Comment addressed.

MCG*: *In addition, revisions were made to the plans per comments from Rob Moore and input from the Conservation Commission at the March 27, 2025 hearing:

The stabilized construction entrance detail on sheet C-6 was modified to propose a rip- rap stone size of 4"-6" and 50' length per Conservations Commission comments.

In order to comply with Section 219-9D Haverhill Stormwater Management Regulations the stormwater management system was modified to retain the volume of runoff equivalent to 0.8" multiplied by the total post-construction impervious surface area on the redevelopment site. A crushed stone trench was added along the southern side of the building and a subsurface chamber system was added under the proposed driveway.

The retained volume includes both storage volume within the systems beneath the low outlet as well as the exfiltration volumes for the systems calculated in HydroCAD.

Note 5 was added to the Sewer Notes on Sheet C-5 to require a valve prior to the SGO separator to prevent flood water entering the garage from flowing into the municipal sanitary sewer system. This system will include an audible and visual alarm set to trigger prior to floodwater entering the garage. Additionally, the callout for the floor drain on the same sheet was updated to include the

valve language. This will be coordinated with the architect and MEP engineer prior to building construction.

A line was added to sheet C-4 along the south, east and west walls of the lower garage, which depicts the portion of the building which will be constructed with flood openings. These flood openings will provide an unrestricted hydrologic connection for flood waters entering and receding from the garage on the three sides of the building with walls below the limit of flood zone AE (elevation 22). The locations, size and security coverings for these openings will be coordinated with the architect prior to construction.

Language discussing compensatory flood storage and other related items was added to the Technical Narrative under the Proposed Site Description on page 2.

We appreciate the opportunity to provide the City with peer review services. If you have any questions or comments regarding this report, please contact me at 774-843-2007 or cosullivan@ceiengineers.com.

Sincerely,

COMPREHENSIVE ENVIRONMENTAL, INC.

Conor O'Sullivan

Conor O'Sullivan
Project Review Engineer

Matthew Lundsted

Matthew Lundsted, P.E.
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