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## **Review of Drainage Report and Plans**

**For  
3 Boston Way**

**November 4, 2019**

I have reviewed the Drainage Report and plans for the Multifamily Residential Development located at 3 Boston Way Newburyport MA, dated October 23, 2019 as prepared by Morin Cameron Group, Inc. and offer the following review and comments.

### **Drainage Report Narrative**

The following sentence appears in the second paragraph of **Existing Site Description**:

“Stormwater from most of the parking area and the large existing building is captured in an existing catch basin between the two buildings, which leads to a drainage swale along the western edge of the property.....”

The flow path shown in Figure 5 Existing Site Development Watershed for subcatchment E1 does not conform to the description above. The flow from the large building and the parking lot is shown to flow to the east to a swale that flows to the north then turns westerly to flow to Design Point 1.

The text should be corrected to reflect Figure 5 or Figure 5 should be modified to reflect the text.

In the third paragraph it is stated “The entire site is shown to be outside of Zone X on the FEMA” map yet on Sheet C-1 the “Limit of the FEMA Flood Hazard Zone AE (EI=10)” is shown in the area of the constructed stormwater wetland on 1 Boston Way and the 10 elevation extends into 3 Boston Way. There is a Flood Note on the plan.

My review of the FEMA map 25009C0117G is that the entire site is in Zone X which is an area of minimal flooding therefore not included in the AE zone which is shown as being on the opposite side of Boston Way. However , the area of the constructed stormwater wetland is below elevation 10 (the FEMA flood elevation) and the culvert connects that area to the AE zone across the street. The engineer should explain the differences and how the FEMA flood designation effects the proposed design.

In the **Stormwater Management** section of the report within the **Existing Watershed Characteristics** a reference is made to an “existing constructed stormwater wetland”. A site inspection and aerial views of the property show the area to be overgrown and it is difficult to determine that it is a “constructed stormwater wetland”. If it is a stormwater facility it hasn’t been maintained. The engineer should confirm the area is as described. If it is a Constructed Stormwater Wetland its role as a detention pond should be accounted for in the calculations. The detention capabilities of the proposed constructed storm water wetland should also be accounted for in the calculations

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The description of water flow in **Subcatchment E1** as contained in **Description of Existing Subcatchments** matches what is diagramed in Figure 5 but is contradictory to the language in the existing site description as noted above. E1 should be expanded westerly to include to the center line of Boston Way and expanded northerly to include all of the area on 1 Boston Way that will contain improvements for the proposed project as shown on sheet C-3.

The description of **Subcatchment E2** should be expanded to include the slope to the north of the MBTA parking lot and the land to the east up to the railroad tracks. Figure 5 should be modified accordingly.

As described in **Summary of Proposed Subcatchments** stormwater from **Subcatchment P1A** flows to a proposed catch basin. The Flow path for P1A as shown on Figure 6 should be corrected to terminate at the catch basin as described in the text. The area of P1A should be expanded in the description as well as in Figure 6 to include the improvements to be made on 1 Boston Way for the proposed project.

Area P1B should be expanded in the description as well as in Figure 6 to include Boston Way to the centerline and the area to the North of P1B on 1 Boston Way that is to be modified for the proposed project.

**Subcatchment P2A** should be expanded to the east up to the railroad tracks and to the south up to the MBTA parking lot. Figure 6 should be changed accordingly.

The discharge from Subcatchment P2B does not discharge to DP1 as stated in the text but rather discharges to the constructed stormwater wetlands and thence to DP1. The text should be corrected.

### **Review of Stormwater Management Standards**

Compliance with the standards is explained in this section and also presented in the Stormwater Checklist provided in the report.

It is stated in the text that the **Standard 1** is met and each of the three boxes showing compliance with standard 1 on the Checklist are checked.

There aren't any new untreated discharges

However, calculations have only been provided for the discharge velocity from the discharge pipes as contained in the HydroCAD analysis but calculations of potential erosion from the outfall have not been provided as required by Volume 3 of the Massachusetts Stormwater Handbook.

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The locations of the discharges are not on the applicant's property. If as shown in the calculations the proposed discharge velocity is less than or equal to the existing velocity, there won't be any change in the effect on the wetlands.

In my opinion if the discharge velocity remains the same under proposed conditions as under existing conditions the project meets the standard. However, since the outlet from the culverts have not been designed for this project the second box assuring the design will not cause scour or erosion cannot be checked. Additionally, supporting calculations for rip rap or erosion control measures at the outlet were not supplied therefore the third box cannot be checked.

The calculations show that **Standard 2** is met. However, the calculations need to be rerun according to the comments above and including the pre and post from 1 Boston Way.

**Standard 3** is met as stated by the engineer in that the site consist of C/D soils and minor infiltration will occur through the stormwater wetlands as well as through landscaped areas

**Standard 4** is met by the use of Constructed Stormwater Wetlands, Pocket Wetlands, Vortsentry units, and a filter strip.

The TSS removal efficiency table for P1A and P2B should be revised to include the Constructed Stormwater wetland. The TSS removal efficiency for P2C should be revised to add the vegetative filter strip with 10% removal.

As required calculations should be provided for the equivalent flow rate associated with the Water Quality Volume for the removal systems proposed.

(See attached discussion concerning TSS standards and removal)

The plan complies with **Standards 5 and 6**

The requirements of **Standard 7** are met but not explained with use of the checklist in Volume 2 Chapter 3 of the Stormwater Handbook as suggested by the last box checked in the **Standard 7** checklist.

The plan does not comply with the requirements of **Standard 8** because it lacks the required erosion and sedimentation control plan The Construction Phase Best Management Practice Plan contained in Appendix D is thorough but not site specific. Sequence of operations for both the demolition phase as well as the new construction phase should be added to the Plan

The plan complies in part with **Standard 9** as shown by the Long-Term Best Management Practices O&M Plan contained in Appendix E but lacks the required estimated operating and maintenance budget.

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An Illicit Discharge Compliance Statement is included in the applications in Appendix F and confirms compliance with **Standard 10**

### **Hydrologic Analysis Report**

As stated above the Existing Site Development Watershed drawing, Figure 5 in the report, shows the limit of the study area at the property line. Area E2 should be expanded to include the slope on the south side of the property between the wetland and the MBTA parking lot and the area to the east between the easterly property line and the MBTA property. It should also be expanded to the north to include the area that is to be developed on the property at 1 Boston Way. That area includes the constructed stormwater wetland, trash enclosure and the garden amenity space as well as all proposed paving areas not on 3 Boston Way. In looking at the design plans it appears scuppers are proposed under the sidewalk adjacent to Boston Way to allow for water to flow from the street into the swale on the property. If that is the case the westerly limit of the drainage area should extend into the middle of Boston Way. Figure 5 should be adjusted accordingly. Figure 6 should also be adjusted to include all additional areas discussed for Figure 5. The Flow path for area PIA should end at the catch basin not in the corner of a parking space.

The outlet structures for both the Design Point 1 and 2 are modeled as concrete pipes with a friction factor of 0.010. The pipes are old and appear to not be maintained and the friction factor should be 0.015 not 0.010. In neither case are entrance losses nor ponding in front of the pipe shown in the calculations. Both need to be considered. By ignoring entrance losses and only considering pipe flow according to the Manning equation the depth of headwater is incorrectly presented, and the area of ponding misrepresented, and the outflow rate improperly represented.

Routing Diagram for 3856-pre should be revised to show ponding areas prior to discharge.

The calculated times of concentration for post development subcatchments areas P1A, P1B, P2A and P2B are 2.5 min, 2.9 min, 4.0 min and 3.3 min respectively. However, for all areas the times were increased to 6 minutes. While changing the time of concentration does not affect the volume of flow (cubic feet) it does affect the rate of flow (cubic feet per second). The shorter the time the greater the peak flow rate, the longer the time of concentration the lesser the peak rate. Thus, increasing the time of concentration to 6 minutes for all areas reduces the predicted peak rate. The calculated times of concentration should be used not the assumed 6 minutes.

The HydroCAD computer model allows for calculations with short times of concentration as explained in the following excerpt from the manual for the model

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HydroCAD does not impose any restrictions on the Tc value. The value may be as long or short as required. For example, a Tc value of zero can be used to model the instantaneous "runoff" from the surface of a pond.

The behavior of short Tc values is highly dependent on the quality of the selected rainfall distribution. For accurate results with short Tc values, the rainfall distribution must include enough 'detail' to accurately indicate the rainfall intensity for the specified duration. HydroCAD uses a polynomial representation for the most common rainfall distributions (Type I, IA, II, III) to ensure that very short durations are well represented, and avoid the loss of accuracy that can occur with linear rainfall tables.

The Routing Diagram for 3856-post should be revised to show a pond prior to DP1 and another before DP2.

On drawing C-1 the 10 ft contour north of the property, on 1 Boston Way in the area labeled as a constructed stormwater wetland is the upper limit of the 100-year flood. Will the flooding affect the use of the area as a stormwater wetland and detention area?

There is a drainpipe shown discharging into the constructed stormwater area on C-1 just east of the 30-inch outlet. It doesn't appear on any other drawings. Will that pipe be eliminated by the work on 1 Boston Way?

The flows to design point 1 are presented as flowing into 1 Boston Way without any corresponding flows from the project on 1 Boston Way. The analysis should be redone to include the pre and post flows from 1 Boston Place.

Additionally, the rainfall rates that should be used for the analysis as most recently approved by Jon-Eric White, City Engineer are

2-year	10-year	100 year
2.63 inches	4.83 inches	8.94 inches

The analysis was done with slightly higher rainfall rates which is acceptable.

The hydrologic analysis must be redone to incorporate the above comments.

The Chamber Wizard printout should be added to the HydroCAD printout.

## **Plan review**

### **Sheet C-1**

A FEMA Flood Hazard Zone AE is shown on this sheet. Explain why it is depicted as such when the FEMA Flood Maps show the entire site in Flood Zone X.

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A fire hydrant located in the northwest corner of the site is not shown

A drain line from 1 Boston Way is shown discharging into the area of the constructed stormwater wetland (CSW) but does not appear on any other drawings. Please explain.

The Invert of the 15-inch drain line that discharges into the easterly end of the CSW is not shown

### **Sheet C-3**

Inv of 15" at east beginning of CSW is missing

Vortsentry rim to invert min is 3 ft. The most southerly unit has only 2.9 ft.

The flow from P1A and P2B all flow into an existing 15" line which combine in a proposed drain manhole on 1 Boston Way An additional line of unspecified size is shown entering the manhole from the north. Does the 15-inch pipe have adequate capacity to handle all of the flows.

Need rim elevation on proposed DMH

Need to specify dimensions of proposed retain-it units as well as elevation of bottom of stone and elev. of bottom of units. Location of access manholes and elevation should be on sheet C-3

Has any testing been performed on site to determine water table elevation and if it will affect the construction or operation of proposed systems?

A limit of paving work in Boston Way should be shown

A limit of paving work into 1 Boston Way should be shown.

Proposed SMH in parking lot at 1 Boston way with a rim at 15.9 and inlet at 12.75 has only 3.15 ft from rim to invert and less than 2.15 ft from top of pipe to the rim. Cannot be built with the detail contained in the plans.

### **Sheet C-4**

Are valves proposed on the service side of the service tees or also on the main line? Need to show thrust blocks

### **Sheets C-5, C-6, C-7**

Pavers detail should be added

Overflow weir detail prior to DP2 should be added

Pocket wetland detail should be added

Constructed stormwater detail should be added

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Details to protect and enhance drainage swale should be added to the plan.

A Detail of 7 ft high wall at east end of stormwater wetland should be added

Remove steps from DMH and SMH as per DPS

Is the flow from the floor drains proposed to be directed to an MDC trap and then pumped to the sewer? If so location and elevation of MDC trap should be on the plan and a detail of MDC trap added to the plan.

Need to add thrust block detail to plan

Add City water details

Is 8" sewer adequate for the combined flows from both 1 and 3 Boston Way?

Manhole detail should show a boot for pipe connections. Note referencing drain pipe should be removed from sewer manhole detail

Add the dimensions of the on-street parking spaces.

### **Additional Information Required**

As mentioned above an Erosion and Sedimentation Control Plan is required for compliance with Standard 8 of the Stormwater Standards. That plan should be added to the plan set.

There is site demolition as well as buffer zone restoration and new construction. Sedimentation and erosion control locations may be different for each of those phases of development and perhaps more than one Sedimentation and Erosion Control Plan needs to be added to the plan set.

The plan(s) should include the location of the Stabilized Construction Entrance, location of propose sedimentation control measures, soil and material stockpiles.

The plan should also include a written description of activities involved with the site demolition and restoration of the wetlands and construction including which materials will be removed from the site and which will remain.

It appears that at least eight feet of fill is being imported to the site. This information should be added to the project description.

A substantial amount of work is proposed on 1 Boston Way which is owned by 1 Boston Way LLC a different entity than 3 Boston Way LLC. Easements should be delineated on the plans for the appropriate required easements for construction and maintenance and easement documents should be generated as required.