

BEALS • ASSOCIATES INC.

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April 30, 2018

Martha Morrison, Chair
Topsfield Planning Board
Town of Topsfield
461 Boston Street
Topsfield, MA 01983

**Reference: 5 Orchard Lane Stormwater Management Permit
Peer Review Report**

Via: Email

Dear Chair Morrison and Members of the Board:

Our office has been working with the applicant's engineer, The Morin Cameron Group, Inc. ("MCG"), over the past several weeks to review the proposed stormwater management features for 5 Orchard Lane in Topsfield, Massachusetts. The initial issues that were raised were relatively minor in nature and have been addressed to our satisfaction. These items are discussed below and based on the following documents:

- Stormwater Management Plan, Topsfield Massachusetts, 5 Orchard Lane, Prepared by The Moring Cameron Group, Inc. revised through March 30, 2018
- Stormwater Management Report, 5 Orchard Lane, prepared by the Moring Cameron Group, Inc. revised through March 30, 2018

Our final review and recommendations to the Planning Board are based on the following documents:

- Stormwater Management Plan, Topsfield Massachusetts, 5 Orchard Lane, Prepared by The Moring Cameron Group, Inc. revised through April 18, 2018
- Stormwater Management Report Addendum, 5 Orchard Lane, prepared by the Moring Cameron Group, Inc. revised through April 18, 2018
- Pre-Development Watershed at 5 Orchard Lane, prepared by the Moring Cameron Group, Inc. revised through April 18, 2018
- Post-Development Watershed at 5 Orchard Lane, prepared by the Moring Cameron Group, Inc. revised through April 18, 2018

Our office has communicated our comments and communications with MCG with Dave Bond, and he has no further issues at this time.

For our specific comments, we have repeated the original comment, the response from MCG in *italics*, and our follow up in **bold** below.

Comment 1 - The “driveway pond” watershed is trimmed off at the property line. How much area upgradient of this is there? It looks like there may be additional area flowing through to the pond that may require either diversion from the pond or another look at the pond size.

MCG Response: Under existing conditions you are correct that portions of the offsite area would reach the proposed drainage pond. A swale is proposed along the northern & eastern property lines to keep offsite runoff from entering the proposed drainage pond.

BAI Final Comment: Our office agrees with the inclusion of the swale that was added to the 4.18.18 plans. We consider this issue resolved.

Comment 2 - The infiltration rate used for the drip edge in the calculations is 1.02 inches per hour. This is a typical value for a sandy loam, HSG B soil. The site’s soils appear to have been modeled as HSG C soils. Why was 1.02 inches per hour chosen for the rate?

MCG Response: Sandy loams were found during on-site soil testing. The infiltration trenches are proposed within these layers of soil so the rate of 1.02 was determined to be appropriate. HSG-C soils were used in the analysis as the NRCS Web Soil Survey showed the all soils on site within that soil group.

BAI Final Comment: Our office agrees with using localized soils data for infiltration rates. The NRCS data that is often used for stormwater runoff modeling provides a wide overview of soils that that is not as accurate as isolated testing in specific site locations. We consider this issue resolved.

Comment 3 - The front drip edge that catches roof runoff is intended to infiltrate into the ground. The buildings perimeter drain runs out of the building footprint under the trench and discharges into a pond. What is the possibility of the roof runoff moving from the drip edge, through the perimeter drain and into the pond, causing an unexpected flow into the pond area?

MCG Response: An impervious liner has been added to the Drip Edge/Infiltration Trench Detail on the Stormwater Management Plan. This liner will be laid approximately 2 feet above the foundation drain and will extend 5 feet out beyond the foundation wall. This barrier should prevent water from flowing into the drain while still allowing for infiltration into the surrounding soils beneath the trenches.

BAI Final Comment: Although we expect the actual volume of water to be relatively small, we believe this is an acceptable approach. We consider this issue resolved.

Comment 4: The drip edge along the front of the building is modeled in the calculations as having a bottom of 101.5 and a top of 103.5. The ground elevation along the front of the building varies from 103.5 down to 98. It is assumed that the drip edge will follow this change in elevation with a constant depth of two feet. The model doesn't really reflect the variable elevation and assumes a constant elevation. Can this be addressed?

MCG Response: The infiltration trenches have been revised in the HydroCAD analysis to include separate storage volumes for the sloped sections of the proposed trenches. This was accomplished by running a 2'x2' rectangular "pipe" at the same slope and length of the trench and including the same void ratio as stone. Modeling the sloped stone trench as pipe storage is the most effective way to acknowledge the sloped profile while correctly representing the storage volume. As overflow out of the top of the sloped section can't be modeled as accurately as a level trench in HydroCAD due to the limits of the program, it is assumed the only overtop the trench in the level sections at an elevation of 103.5.

BAI Final Comment: Our office agrees with the modified method of modeling these trenches. We consider this issue resolved.

Comment 5 - Please explain the primary outlet from the drip edge model. It is listed as a 25' x 1' broad crested weir. Is this simply a way to model the overflow as it runs across the ground?

MCG Response: You are correct the broad crested weir is a simple and effective way to model flow overtopping the stone trench and flowing over the lawn to the desired routing location. The lengths of the weirs have been revised to reflect the updated proposed conditions.

BAI Final Comment: We consider this issue resolved.

Comment 6 - Where the drainage easement is located, there is a cut of three feet at the edge of the driveway. If you consider the additional excavation for the base gravels, it is closer to four feet. It seems that it would be likely that the drainage pipe would be exposed during this excavation. What are the plans in the event the pipe is encountered during excavation on the site?

MCG Response: Prior to construction the site contractor shall verify the depth of the drain line in this location and shall provide the design engineer with the information (a note has been added to the plan regarding this). If design modifications are required to maintain the integrity of the drain they will be designed, and the Town will be notified if changes are required.

BAI Final Comment: Our office was uncomfortable with the excavation over the pipe without knowledge of the actual depth of the pipe in question. Due to the nature or the situation, without

having a contractor test pitting the area, there is no other way of gaining that knowledge. As a condition of the permit, we would suggest that the Planning Board require that a contingency plan be designed for this pipe and be presented as part of the Building Permit documentation. If this plan has not been developed, we would suggest that the Building Permit not be issued. We consider this issue resolved.

Comment 7 - The existing stockpile appears to run near the drainage line. What impact does this have on the flow patterns of the site. The existing conditions flow analysis seems to ignore this feature even though it looks like it would divert flows to some extent.

MCG Response: The existing watersheds have been revised to include the berm, which shifted runoff from DP1 to DP2 in the analysis as depicted on the revised watershed figures. The berm will not affect the post-development condition as the berm material was proposed to be blended with the existing grades.

BAI Final Comment: Our office agrees this approach. We consider this issue resolved.

Frozen Ground Conditions

During the Planning Board's meeting on April 3rd, there were questions by the Board about modeling the stormwater runoff on the site based on frozen ground conditions. In doing this, the runoff curve numbers are generally changed from the typical curve numbers that are used under Antecedent Moisture Condition II to a generally impervious curve number, similar to pavement. From a pre-development to post-development comparison, this would yield no obvious increase in runoff due to the lack of change in the modeled cover (impervious frozen ground to impervious frozen ground). If the modeling were done to compare average ground conditions at predevelopment to frozen ground conditions at post-development, the stormwater facilities would be grossly oversized.

Frozen ground stormwater modeling is typically only performed when very large tracts of forest are being removed. The main reason for this is that the ground under heavy forest cover typically does not completely freeze, and the forest litter layer is able to absorb some volume of runoff, even during winter months. When the forest cover is removed, the forest litter is also removed, and the ground can then freeze, creating a situation where runoff can increase due to frozen ground conditions.

While this condition can certainly occur on residential properties similar to 5 Orchard Lane, the practice of analyzing frozen ground conditions on residential properties is not typically employed due to the gross oversizing of the stormwater facilities that would result. If this were a much larger scale development that changed the land cover from all forest to all open land, then a frozen ground analysis may be warranted. In the case of single family residential development, we are of the opinion that it is simply not warranted.

Closure

At this time, our office recommends approval of the Stormwater Management Permit for 5 Orchard Lane with the following additional conditions:

- The contingency plan for the relocation of the drainage pipe within the easement should be prepared prior to the issuance of a Building Permit. The pipe should be relocated if the cover between the top of the pipe and the final ground surface will be less than 90% of the current cover, or 4' – 0", whichever is less.

Our office looks forward to answering any questions you may have on this review and we look forward to discussing our findings with the Board on the evening of May 8, 2018 at the Planning Board's regular meeting. If you have any questions prior to that meeting, please do not hesitate to contact me directly.

Sincerely,
Beals Associates, Inc.



Todd P. Morey, P.E.
Vice President

C: John Morin, MCG
Dave Bond, Town of Topsfield
C-979.02 File