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July 20, 2017

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**Subject: Fieldstone Farms (aka Meadow Lane)
Retaining Wall Replacement Plan Review**

Dear Joe:

We received the following documents on July 18, 2017 via e-mail:

- Correspondence from Land Planning, Inc. to Grafton Planning Board dated July 18, 2017.
- Plans entitled Retaining Wall Replacement Located at Meadow Lane, Grafton, MA dated April 10, 2017 and revised July 17, 2017, prepared by Land Planning, Inc. for Magill Associates, Inc. (2 sheets)

Graves Engineering, Inc. (GEI) has been requested to review and comment on the plans' consistency with the definitive plans dated February 1, 1994 and last revised November 21, 1994, consistency with the retaining wall replacement goals set in 2012, and standard engineering practices. As part of our initial review, GEI visited the site on June 2, 2017.

This letter is a follow-up to our previous review letter dated June 5, 2017. For clarity, comments from our previous letter are *italicized* and our comments to the design engineer's responses are depicted in **bold**. Previous comment numbering has been maintained.

Our comments follow:

1. *The plans do not show the existing stone/boulder wingwalls located at the ends of the existing gabion retaining walls. The plans need to clarify how the proposed retaining walls will tie into the existing wing walls.*
Acknowledged. Sheet 1 was revised to show the existing boulder wingwalls and a set of construction notes was added to guide the contractor relative to construction at the wingwall/retaining wall interface.
2. *The "Culvert Through Wall Section" on Sheet 2 of the plans proposes only six inches of concrete around the culvert pipe and mislabeled the culvert pipe as "RCP" instead of "HDPE." We are concerned about the load being placed onto the HDPE culvert. A reinforced concrete lintel of sufficient strength needs to be designed to span each of the three culvert penetrations, and the mislabeling of the pipe material needs to be corrected. The design engineer responded that reinforced concrete pipe is to replace the high-density polyethylene pipe at the walls. This approach is reasonable. However, the "Culvert Through Wall Section" construction detail proposes that the two pipe materials are to be butted together with only a "doublewide Mar Mac polyseal repair coupler" to seal (cover) the joint between the two pipe materials. Due to the*

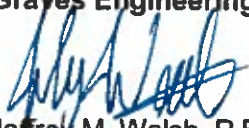
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different pipe materials (rigid concrete and flexible HDPE), one pipe could be displaced from the other due to shear forces. Our research found that in addition to the Mar Mac seal, the pipes need to be protected from movement by using an HDPE "internal coupler spigot adapter" (not recommended for use when the HDPE pipe is downstream from the RCP), a similar bell/spigot-type connection, a coupling connection, or a concrete collar.

3. *Information available from the wall block manufacturer indicates that guard rail posts are to be set in a grout-filled Sonotube with a minimum embedment of five feet. The plans propose direct-burial posts embedded only 41" into the ground. The plans need to be revised to meet or exceed the manufacturer's recommendations.*
The plans were revised to include a Sonotube whose bottom is five feet below grade with a post length of only 41". The Sonotube offers little, if any, structural strength. Whereas the post is located near the retaining wall and protecting the wall's integrity is important, we understand that the post needs to be embedded five feet (per the wall manufacturer) even if this length exceeds the guard rail manufacturer's recommendation. The detail needs to be revised to provide a post embedment depth of at least five feet and to specify grout between the post and the Sonotube.
4. *The wall section construction details on Sheet 2 show the base blocks having grooves in their bottom (these are middle blocks) instead of having a flat bottom (base blocks). The construction details must be revised to show base blocks.*
Acknowledged. The construction details were revised to show base blocks at the bottom of the walls.
5. *On Sheet 1, the individual blocks weren't labeled on the two retaining wall elevations. Standard practice for wall systems such as the one proposed is to label the block type (e.g. 60B, 60M, 45M, 24T) of each block to avoid confusion during construction. For example, there are sections of the walls that require nine courses adjacent to sections that require ten courses, each of which requires different base blocks.*
The blocks were labeled as requested. On the right side of the "North Retaining Wall Elevation" there are two base blocks labeled as 60M that need to be revised to 60B.
6. *On Sheet 2, Note II.B, II.G and E.1 refer to geogrid. However, geogrid is not proposed elsewhere on the plans; the design is for a gravity wall instead. The references to geogrid are confusing and should be deleted.*
Acknowledged. The notes referencing geogrid were deleted.
7. *The retaining wall is available in various textures. The plans do not propose a texture; we recommend that the design engineer coordinate a texture with the Planning Board.*
GEI has no issue with the proposed North Shore Granite texture; we defer final consideration of the texture to the Planning Board.
8. *GEI did not perform a structural engineering peer review of the proposed replacement wall. Such a review is beyond the scope of this general civil engineering peer review.*
No further comment necessary.

We trust this letter addresses your review requirements. Feel free to contact this office if you have any questions or comments.

Very truly yours,
Graves Engineering, Inc.



Jeffrey M. Walsh, P.E.
Vice President

cc: Norman Hill, P.E., P.L.S.; Land Planning, Inc.
Maria Mast, Grafton Conservation Department
Bob Berger, Grafton Building Department
Brian Szczurko, Grafton Engineering Department
Dave Crouse, Grafton DPW
Paul Cournoyer, Grafton Sewer Department

