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HEI Project# NM19063

April 26, 2021

Michael Behrendt, Town Planner  
Town of Durham  
8 Newmarket Road  
Durham, NH 03824

RE: Response to engineering technical review 91 Bagdad Road, Map 10, Lot 8-6

Dear Michael,

Pursuant to the engineering review letter dated March 3, 2021 by VHB the following are our responses to the review comments. Included with this response are copies of the revised plan sheets associated with the design revisions.

#### PLANS

##### Existing Conditions Plan (Sheet C100)

2. VHB recommends labeling the exiting driveway culvert on Tax Map 10 Lot 6-10 for reference.

*The existing driveway culverts have been labeled for reference.*

##### Grading and Drainage Plan - Entrance (Sheet C104)

3. The total area of disturbance is noted as 195,821 SF, accordingly an Alteration of Terrain Permit will be required from NHDES and the requirements of Env-W1 1500 will need to be met.

*We are in the process of preparing the AOT application.*

4. The proposed temporary erosion control measures (e.g. compost filter sock, rolled erosion control, stabilized construction entrance, etc.) should be shown on the plan view to confirm the locations.

*All erosion control measures have been added to the plans as necessary.*

5. It should be confirmed that the wetland impact associated with the access road will include the final design of the upstream headwall of the culvert at approximate station 1+50.

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*The headwall has been revised and this area is shown within the area of disturbance for the wetlands permit requirements.*

Grading and Drainage - Plan Cluster (Sheet C105)

6. Stormwater runoff from the proposed development flowing to the sediment forebay near station 15+25 should be treated prior to discharging to the adjacent wetland. VHB recommends evaluating whether the water quality flow to this sediment forebay could be piped separately to the first cell of the proposed gravel wetland.

*We have revised this sediment forebay to properly treat the stormwater runoff directed to it and removed the impact from the wetland. In addition, we have added a culvert to outlet directly to the gravel wetland.*

7. A detail for the sediment forebays should be provided and calculations should be included for conformance with the requirements of Env-Wq 1508.11.

*A detail has been added for the construction of the sediment forebays.*

8. The roadway, approximately from station 13+00 to 15+50, appears to be superelevated toward the outside of the loop road and should be revised to direct runoff to the inside of the loop road to be collected for detention and treatment.

*This was the original design intent and has been corrected to direct runoff to the inside of the loop and the sediment forbay.*

9. The proposed 12" culvert at approximate station 15+70 is modeled as an 18" culvert in the hydrocad model. Outlet protection should be provided for this culvert.

*The plan has been corrected and outlet protection has been added.*

10. The design of the gravel wetland should be checked for conformance with the UNH Subsurface Gravel Wetland Design Specifications. The 6" outlet pipe invert should be only 4" to 8" below the wetland soil surface. Also, the internal underdrain piping and risers should agree with the layout shown in the detail on sheet C505.

*The design has been verified and updated including the construction detail.*

11. It appears a driveway culvert may be required at Unit #15. VHB recommends providing additional information (pipe size and inverts) for all driveway culverts.

*A driveway culvert is not necessary at unit 15, however we have revised the grading to show a swale across the driveway. A table has been added showing the minimum driveway culvert will be 12' and the inverts have been shown.*

12. VHB recommends a minimum 12” pipe diameter be considered for the 8” culvert at approximate station 11+75 to reduce the potential for clogging.

*The culvert diameter has been changed to a 12” diameter.*

Roadway Plan and Profile (Sheet C201)

13. VHB recommends including details for the proposed culverts, headwalls and block retaining walls on the final plans to ensure the wetland impacts will account for the installation and any related foundations.

*We have completed the preliminary culvert, headwall and retaining wall designs to account for the footings, and wall batters to properly calculate the wetland impacts. Final structural design will be completed upon completion of a geotechnical report and prior to final approval.*

Construction Details (Sheet C502)

14. A detail for the outlet control structure related to the typical stormwater pond detail should be included on the final plans.

*The outlet control structure detail has been added to the plans.*

15. The perforated pvc underdrain pipe and the outlet should be shown on the grading and drainage plans.

*The perforated pipes are now shown within the gravel wetlands and added to the grading and drainage plans.*

16. The surface treatment for the spillway detail should be labeled. It appears that it is intended to be stone as shown on the grading and drainage plans.

*The spillway surface treatment has been labeled on the detail as riprap.*

Construction Details (Sheet C504)

17. Typical drain manhole and catch basin details should be removed for clarity if not intended to be used on the project.

*These details have been removed.*

Construction Details (Sheet C505)

18. A detail for the outlet control structure should be provided for the proposed gravel wetland.

*The outlet control structure detail has been added to the detail sheet, and the new outlet control structure for the sediment forbay has also been added.*

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## DRAINAGE REPORT

19. The final drainage report should be signed and sealed by the design engineer.

*The drainage report has been stamped by a PE and this copy submitted is also stamped.*

20. The drainage plans should be included in appendix B.

*Drainage plans have been included in appendix B.*

21. The final drainage report should incorporate the requirements of NHDES Alteration of Terrain Env-Wq 1500, including BMP worksheets.

*BMP worksheets will be included in the final drainage report submitted to the NHDES AOT bureau.*

22. A copy of the site-specific soil survey plan described in the soils section should be included and be stamped by the soil scientist.

*The soil map will be stamped by the soil scientist.*

23. The post-development peak flows for POA 1 listed in Table 1 should be revised to agree with the hydrocad results.

The 2-year post-development peak runoff rate should be 36.25 cfs and the 25-year post-development peak runoff rate should be 121.10 cfs. This shows a minor increase in the 25-year flow rate, which should be reviewed by the designer.

*We have revised the analysis and updated the tables.*

24. The inlet invert elevation should be added to Reach C1.

*This invert elevation has been added to reach C1.*

25. The outlet devices from the proposed gravel wetland (Pond 19P) show device #4 and #5 with the same invert elevation. A detail of the outlet structure should be provided and confirmed these two devices can have the same invert elevation or the model should be revised.

*The outlet structure for the gravel wetland has been corrected to eliminate this issue.*

## STORMWATER SYSTEMS MANAGEMENT PLAN

26. Any maintenance recommendations for the pervious pavement should be included.

*This has been added to the stormwater systems management plan.*

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27. A copy of the stormwater systems overview plan was not included in Appendix A.

*This plan is now included in the report in appendix A.*

#### CULVERT DESIGN MEMO AND ANALYSIS

28. VHB recommends including this analysis in the final drainage report and providing a similar analysis for the larger wetland crossing culvert to verify adequate capacity is provided.

*This analysis has been included as an appendix to the drainage report.*

#### STATE PERMITS

The project will require the following state permit(s) associated with the site design:

- \_ NHDES Alteration of Terrain Permit
- \_ NHDES Dredge and Fill Permit
- \_ NHDES Sewer Connection Permit

Copies of all state permits should be submitted to the Planning Department.

*Copies of all State permits will be provided upon receipt.*

We have addressed the comments and made the required changes to the plans to comply with this review. If you have additional questions or comments please feel free to contact me.

Sincerely,



Michael J. Sievert PE  
VP Structural Engineering

**Horizons Engineering, Inc.**