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June 26, 2019

Barrington Planning Board,  
Marcia Gasses (Planner)  
PO Box 660  
Barrington NH 03825

Ref: The Ridge at Green Hill – Map 223, Lots 24 & 26  
Engineering Review

Dear Ms. Gasses, Chairman & Members of the Board:

We are in receipt of a review letter from Jeffrey Adler, P.E. of Dubious & King, Inc. dated June 17, 2019 and we offer the following responses to the noted comments. Each comment is followed by our response in **bold**.

1. DuBois & King acknowledges that the plans were resubmitted on June 7, 2019 with minor revisions. For future revised submissions, we recommend that the applicant note the revised date on the revision block of each page within the drawing set.  
**Response: A revision note of 6-5-19 was provided on the sheets that were revised from original submittal of May and will add same as required.**
2. We recommend that the applicant provide cross sections in the plan set, in accordance with Subdivision Regulations 12.8.13(2)(f).  
**Response: Cross sections have been provided as requested in the revised plan set.**
3. Existing Conditions Plans do not indicate the current abutting landowner information in accordance with Subdivision Regulations Section 5.3.1(1).  
**Response: Abutters have been updated on 6-20-19 with no changes. Location and abutters are shown on sheet 1.**
4. Existing Conditions Plans do not indicate the proposed subdivision name in accordance with Subdivision Regulations Section 5.3.1(2).  
**Response: "The ridge at green hill" has been added to the title block**
5. Existing Conditions Plans: Sheet 8 appears to have areas where the slopes are less than 4 percent. The spot elevations provided on 9, 10, 11. are not legible due to the font size and resolution of the drawing submitted. We recommend that the applicant provides spot elevations on Sheet 8 in accordance with Subdivision Regulations Section 5.3.1(6).  
**Response: spot grades were added to sheet and scaled up.**

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6. We recommend that the applicant revise the existing conditions topographic plans to include guardrail and overhead electric in accordance with Subdivision Regulations Sections 5.3.1(10) and 5.3.1(11).  
**Response: Guardrail and overhead electric has been added to the topo sheets**
7. We acknowledge that a walking trail has been provided as depicted on sheet 26 of 31, however there are other common space portions of the site that do not appear to have access. We recommend that the applicant provide pedestrian access to all common open space areas in accordance with Zoning Ordinance Section 6.2.2(10).  
**Response: There are 2 locations of access to the open space including the access between lots 15 and 16 which have been discussed with the board and found adequate.**
8. We recommend that the applicant consult with the Barrington Fire department to determine if the proposed fire protection cisterns meet their requirements.  
**Response: We have meet with the Fire chief for review of the cistern and their locations and has approved the design.**
9. We recommend that the applicant provide the proposed street names on the plans in accordance with Subdivision Regulations 12.8.13(2)(a).  
**Response: Pending approval of the Selectmen.**
10. Sheet 19 of 31, Plan and Profile – P1: The proposed culvert at station 0+65 appears to have less than 1 foot of cover at the shoulder on the upstream side. We recommend that the applicant revise the proposed culvert configuration to provide at least 2 feet of cover.  
**Response: The inlet of the culvert has been lowered and a headwall proposed.**
11. Sheet 19 of 31, Plan and Profile – P1: We recommend that the applicant provide a headwall at the upstream end of the culvert at station 0+65 in accordance with Barrington Subdivision Regulations 12.8.8(6).  
**Response: See previous response.**
12. Sheet 21 of 31, Plan and Profile – P3: We recommend that the applicant revise the proposed 15" HOPE culvert design as shown at approximate station 25+00 to provide a minimum of 2' of cover.  
**Response: The culvert has been revised as requested.**
13. Plan and Profile Sheets: We recommend that the applicant revise the proposed roadway profile to meet the AASHTO minimum K value of 26 for sag curves, for a 25mph design speed.  
**Response: We have reviewed the proposed road design and revised where needed other than the 2 vertical curves adjacent to Route 125 which are at a stopping condition. We have also had discussions with NHDOT and their requirements for the grades leading onto the state road and the design is currently being reviewed.**
14. Sheet 27A of 31, Drainage Basin Plan. Cross Section of Infiltration Basin, Construction Sequence Note 2 states *"If possible, install infiltration basin during later phases of site construction to prevent sedimentation and or damage from construction activity."* We recommend that this note is removed and that the Contractor construct the basin prior to installation of roadway gravel courses to capture and retain runoff during construction. It is expected that the sediment forebay will need to be cleaned out during construction prior to the site being fully stabilized.

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**Response: The note has been amended as recommended.**

15. We recommend that the applicant revise the narrative in the drainage report to reference the source of the rainfall data modeled in the drainage analysis.

**Response: The rainfall data citation has been added to the Design Method Objectives section of the drainage report as recommended.**

16. We recommend that the applicant provides a figure in the drainage report that overlays the watershed boundary on a USGS quadrangle map. We were unable to confirm the watershed delineation.

**Response: The map has been added to Appendix 3 of the drainage report.**

17. We recommend that the applicant include the test pit locations and labels on the grading and drainage sheets and drainage basin sheets, so that locations of test pits and their properties can be evaluated to confirm they meet the hydrocad modeling design values and stormwater BMP design requirements.

**Response: Test pit locations have been added to the drainage pond detail plans as recommended.**

18. The Drainage Report does not include a copy of a US Department of Agriculture (USDA) – Natural Resource Conservation's (NRC) Custom Soil Resource Report as obtained by the USDA – NRCS' website to support the soil identification and associated hydraulic soil group classification. We recommend that the Drainage Report include the Soil Resource Report.

**Response: The NRCS soils report for the parcel to be developed has been added to Appendix 3 of the drainage report.**

19. Although test pit records were provided in the drainage analysis, no discussion or summary of the infiltration rates chosen based on test pits was provided. We recommend that the applicant provide a brief summary of the infiltration rates chosen for each stormwater BMP location, based on test pit results.

**Response: The infiltration rate calculation methodology has been added to the Design Method Objectives section of the drainage report as recommended.**

20. We recommend that the applicant revise the W-2 Proposed Watershed Plan to include a north arrow.

**Response: The north arrow was on the plan, the symbol has been enlarged for clarity.**

21. Wet Pond 1DP has a peak elevation of 225.75 in the 50-year storm event. The proposed elevation of the top of the berm is 226.00. We recommend that the applicant provide at least one foot of freeboard in the 50-year event to meet the NH Stormwater Design criteria for wet ponds.

**Response: Less than 1' of freeboard under the 50-YR storm has been acceptable to NHDES. We will review this with the AoT Bureau.**

22. We recommend that the applicant provide a safety bench around the perimeter of the permanent pool of wet pond 1DP, at least 10 feet in width, to create a wildlife habitat with emergent vegetation, as recommended in the NH Stormwater Design criteria for wet ponds.

**Response: A safety bench has not been historically required by NHDES. We will review this with the AoT Bureau.**

23. Sheet 26 of 31, Plan & Profile – P8. We recommend that the applicant consult with the Barrington Fire department to confirm that the proposed private road access to lots 43 and 44

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provide adequate fire truck maneuvering.

**Response: The design provided was based on direction from the fire chief in preliminary discussions and are awaiting a formal review.**

24. Sheets 27A, 278 of 31, We recommend that the applicant define the riprap protection limits on the weir between the sediment forebays and the treatment ponds for each stormwater BMP in the plan and section views.

**Response: Riprap in the areas cited has been illustrated by hatching on the details as recommended.**

25. Sheet 27B of 31, Bioretention pond (2CP):

a. We recommend that the applicant provide a planting summary to confirm that the proposed planting design for the bioretention pond meets the criteria defined in the NH Stormwater Manual. **Response: NHDES has been accepting ground cover for these ponds of loam and seed or a ground cover such as sedum. The specifications have been amended on the detail.**

b. We recommend that the applicant revise the multi-stage outlet control to provide a trash rack at the main horizontal orifice. **Response: Trash rack and or grate is proposed upstream of any outlet in the outlet structure.**

26. Sheet 27B of 31, Gravel Wetland (4JB1, 4JB2):

a. We recommend that the applicant revise the embankment design to provide at least one foot of freeboard in the 50-year, 24-hour storm event.

**Response: Less than 1' of freeboard under the 50-YR storm has been acceptable to NHDES. We will review this with the AoT Bureau.**

b. We recommend that the applicant revise the details to define the material and compaction requirements for the clay core.

**Response: Clay core specifications have been added to Sheet 27 under the filtration pond as recommended.**

27. Sheet 30 of 31, Typical Cross Section. We recommend that the applicant make the following revisions:

a. Add a general note to that indicates that a minimum of four inches of topsoil shall be placed on all disturbed areas in accordance with Article 11.11 of the Subdivision Regulations.

**Response: Notation has been added as requested.**

b. Revise Detail to indicate that all unsuitable material shall be removed from the roadbed in accordance with Article 12.8.1(1) of the Subdivision Regulations. Please note, the roadbed shall be defined as the limits of the roadway including the area one (1) foot beyond the shoulders, ditches or toe of fill slope.

**Response: Notation has been added as requested.**

c. Revise notes to state that compaction shall be performed until 95% of maximum dry density is achieved in accordance with AASHTO T99 as required in Article 12.8.1(4) of the Subdivision Regulations.

**Response: Notation has been added as requested.**

d. Identify that the shoulder leveling material shall be NHDOT Item 30

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accordance with Article 12.8.3 of the Subdivision Regulations.

**Response: Notation has been added as requested.**

- e. Provide 6' shoulders in cut sections to meet the requirements of Subdivision Regulations Section 12.2.1, Table 1 – Road Design Standards

**Response: In an effort to keep a uniform road design all shoulders are proposed 4' wide. A waiver to the referenced section has been requested.**

The following are our comments of the Traffic Impact Analysis. This review is based on best practices in traffic engineering.

**Response: For all comments related to the Traffic Impact Analysis refer to the updated Analysis prepared by the Traffic Engineer Jeffrey Dirk of Vanasse and Associates.**

28. We recommend that the applicant revise the Table of Contents to correctly reference the Tables. Table 1 in the report is shown as Table 2 in the Table of Contents.
29. We recommend that the applicant remove the duplicate phrase "issued by" in the first paragraph on page 1.
30. Executive Summary – Bullet 2 on page 1 indicates the project not having a significant impact (increase) on motorist delays or vehicle queueing. Table 8 and Table 9 in the report do not show delays for approaches with LOS F, therefore the difference in delays for these cannot be determined from the report (delays for approaches with LOS F show as ">80.0" for signalized intersection approaches and ">50.0" for unsignalized intersection approaches). We recommend showing the delays in Table 8 and Table 9 in order to make a determination as to the impact of delays due to the project.
31. Executive Summary – On page 2, bullet 4, we recommend that the applicant states that what is shown in the text is based on using the 85th percentile speed. Additionally, if the sight distance requirements are met for the speed limit, we recommend that the applicant include this information.
32. Executive Summary, Recommendations, Project Access – The text refers to a future connection between the Project site and property to the north of Old Green Hill Road. Considering that this future connection could take some traffic away from the site drives on NH Route 125, we recommend that the applicant provide more discussion on the future connector and make note that it would likely decrease the delay at the site drive intersections with NH Route 125 (which are showing as LOS E and LOS F).
33. Executive Summary, Recommendations, Off-Site (and related to later discussion of analyses) – The NH Route 125 / NH Route 9 discussion notes an increase in vehicle queue of 5 vehicles at the NH Route 125 / NH Route 9 intersection due to the project. This seems low. We recommend that the applicant confirm how long the model was run for obtaining queueing results, and confirm that the link distance in the model for south of the intersection is long enough to capture the full queues.
34. Executive Summary, Recommendations, Off-Site – NH Route 125 / NH Route 9: We recommend that the applicant indicate the anticipated extent to which delays could improve with optimization of signal timing and phasing, and provide a big-picture summary of before and after optimization improvements to delay for this intersection for the worst case of the peak hours for 2030.

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35. Project Description, Figure 1 – We recommend that the applicant corrects the label for Scruton Pond Road (shown on Figure 1 as Green Hill Road).
36. Existing Conditions, Existing Traffic Volumes, Figure 2, Existing Intersection Lane Use, Travel Lane Width and Pedestrian Facilities – We recommend that the applicant revises Figure 2 to show the southbound approach of the NH Route 125 /NH Route 9 intersection right-most lane to be a through/right turn lane.
37. Existing Conditions, Existing Traffic Volumes, Seasonal Adjustments – We recommend that the applicant revise the study to use NHDOT count station No. 02255001 for determination of an adjustment factor. The NH Rte. 125 count location appears to be more representative of the project area. The count station in Rochester is considered an urban interstate and the count station in Lee is an urban highway. A preliminary review of count station No. 0225501 indicates an adjustment factor of 1.25 instead of 1.33.
38. Existing Conditions, Existing Traffic Volumes, Seasonal Adjustments – We recommend that the applicant revise the text in the paragraph below Table 1 to change the reference of "Table 2" to "Table 1".
39. Existing Conditions, Existing Traffic Volumes, Seasonal Adjustments – Table 1: the K factor appears low, and it is unclear how the K factor was determined. It appears that the average traffic volumes in this table are based on use of the K factor. We recommend that the applicant clarify how the K factor was determined, as well as evaluating whether the factor shown is accurate.
40. Existing Conditions, Existing Traffic Volumes, Seasonal Adjustments – Table 1: D&K calculated directional distribution of the AM and Saturday peak hours to be 66.4% SB and 52.6% SB, respectively. We recommend that the applicant confirm that the numbers shown in the table are correct, and revise if needed.
41. Future Conditions, Future Traffic Growth – Figure 4: D&K calculates the NB approach through movement volume at the Rte 125 intersection with Greenhill Road / Tolend Road for the AM Peak Hour to be 584 (shown as 556). It appears that traffic volumes associated with the planned gas station nearby are not included in the number shown. We recommend that the applicant confirm that the number is correct at this location on Figure 4 and revise if needed.
42. Future Conditions, Future Traffic Growth – Figure 5: The values for the PM peak hour, Rte 125 intersection with Franklin Pierce Highway NB right turn volume and WB right turn volume appear to be typos. We recommend that the applicant confirm these numbers and revise as needed, including updating the analyses as needed to reflect the correct numbers.
43. Future Conditions, Project-Generated Traffic, Pass-By Trips - We recommend that the applicant expands the discussion of pass-by rates to indicate that these vary by the peak hour (as noted in Table 4, footnote h).
44. Future Conditions, Project-Generated Traffic, Pass-By Trips – Table 4: We recommend that the applicant uses the fitted curve equation to calculate the AM peak hour trip generation for the office building land use (fitted curve equation was used for PM peak hour).
45. Future Conditions, Project-Generated Traffic, Trip Distribution and Assignment - We recommend that the applicant clarify what the draw for traffic to the north (49%) is based on.

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(28%) in Figure 7, trip distribution map for the commercial component.

46. Future Conditions, Future Traffic Volumes – Build Condition – We recommend that the applicant changes the title of Figure 10 from "2030 Opening-Year Build" to "2030 Build".
47. Future Conditions, Future Traffic Volumes – Build Condition – In Figure 10, similar to Figure 5, the values for the PM peak hour, Rte 125 intersection with Franklin Pierce Highway NB right turn volume and WB right turn volume appear to be typos. We recommend that the applicant confirm these numbers and revise as needed, including any subsequent changes to analyses with revised numbers.
48. Future Conditions, Future Traffic Volumes – Build Condition – We recommend that the applicant deletes the bold, italicized sentence on Page 17 since no analyses were conducted outside of the immediate study area to confirm this text.
49. Future Conditions, Future Traffic Volumes – Build Condition – We recommend that the applicant update this table accordingly if changes to traffic volumes result due to prior comments.
50. Traffic Operations Analysis, Analysis Results, Signalized Intersections – We recommend that the applicant correct the heading shown as "NH Route 125 at Greenhill Road and Tolend Road" on page 22 to read "NH Route 125 at NH Route 9 intersection".
51. "Traffic Operations Analysis, Analysis Results – We recommend that the applicant shows the anticipated delays for LOS F instead of showing as ">80.0" and ">50.0" to more easily portray any locations with very significant delays. For example, the NH Rte 125 / NH Rte 9 intersection northbound approach has an anticipated delay of 422.9 seconds (7 minutes) for the 2030 Build Weekday Evening Peak Hour.
52. Traffic Operations Analysis, Analysis Results, Un-signalized Intersections – The site driveways have LOS E or LOS F for all build scenarios. We recommend that the applicant evaluates additional alternatives to the site drive approaches that could decrease delays experienced on this approach. Two alternative examples are : 1) Site drive intersection operations with two-lane approaches, one of which would be a storage lane; 2) Right turn lane on NH Route 125.
53. Sight Distance Evaluation - We recommend that the applicant elaborate on the phrase on page 28 that states "could be made to exceed the recommended minimum" by adding reference from the footnote from Table 10 that this could be done by regrading the embankment along the east side of NH Route 125. Understanding that the required minimums are based on the 85<sup>th</sup> percentile speeds, we recommend that the applicant specify whether measured sight distances meet the posted speed limit.
54. Appendices, Capacity Analysis Worksheets – We recommend that the applicant confirm that the Route 125 / Route 9 intersection phases with yellow times of 6 seconds is correct.
55. Appendices, Turn Lane Warrants Analyses – In the left turn lane warrant spreadsheets, the cell for opposing volume should include throughs plus rights from the opposing direction. Numbers in the spreadsheets did not appear to include the opposing right turning vehicles. While this will not impact the results, we recommend that the applicant update the sheets accordingly.
56. Appendices, Turn Lane Warrants Analyses – In the right turn lane warrant spreadsheets,

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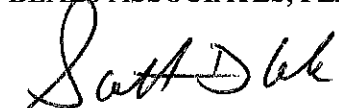
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cell for major-road volume (one direction) should include through movements as well as left and right turn movements. Numbers in the spreadsheets only included the through movement. While this will not impact the results, we recommend that the applicant update the sheets accordingly.

Thank you for your timely and professional review of the submitted plans. We trust the information provided and revisions made address your concerns. Please feel free to contact our office if you have any additional question and/or comments.

Very Truly Yours,

BEALS ASSOCIATES, PLLC



Scott D. Cole

Senior Project Manager



Christian O. Smith, PE

Director of Engineering

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