



DiPrete Engineering

April 12, 2022

Hopkinton Planning Board
c/o Talia Jalette, Town Planner
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RE: Brushy Brook Residential Subdivision
Hopkinton, Rhode Island
DE Project No. 1193-001

Dear Planning Board Members:

DiPrete Engineering has received the comments from the town peer review consultant, Crossman Engineering, dated August 19, 2021. We have reviewed these comments and offer the following in response. The original comments are provided in italics with responses in bold, and Crossman follow-up comments from 2/22/22 in red. DiPrete response have been provided in green.

- 1. Water System: We recognize that the RIDOH issued an approval for the location of the well fields but we did not see any data to verify the number of wells, the location of wells or documentation that volume and quality of water from the planned bedrock wells will be sufficient to supply the development. The RIDOH approval provided does not yet represent approval of the new public water system but independent of the RIDOH review process, the documents provided included no water system design or indication of capacity. As a minimum, pipe sizes, valves, air release assemblies, pumping systems, treatment systems, well pump test data, water quality data, etc. will be needed in order to document that the 140 new homes can be safely served. A long-term operation and maintenance program and eventually, a licensed system operator will need to be identified. We understand that the water system has not been designed but there is insufficient data to review the adequacy of the community water system.*

The applicant is working with RIDOH as the state regulatory agency for the public water system. The applicant will follow all RIDOH regulations, including operation and maintenance. The final number of wells will be determined by the yield of individual wells. The first step in the RIDOH process (Siting Application) has been reviewed and approved confirming proper locations and setbacks for the future public wells. The next step includes drilling wells and performing the pump tests and analytical sampling of the wells, which would be performed after Preliminary Plan. It is the applicant's intention to drill the wells prior to Final Plan submission to confirm the onsite water supply. Additional details into the final design including pump sizing, storage tank sizing, and pipe layout all depend on the final location of the wells and the yield.

Crossman Response 2/22/22: Section 1.3, Policies, of the Land Development and Subdivision Regulations indicates that the Planning Board is to base its actions on consideration of the adequacy of services to a Subdivision. Water represents one of those services (1.3.6). Without performance of pump testing and water quality sampling, the adequacy of the proposed community bedrock wells remains unknown.

DiPrete Response 4/12/2022: The applicant is committed to drilling the wells prior to final approval per phase to confirm adequate water supply. Northeast Water Solutions (Bob Ferrari) has been retained to assist Pare Corporation with providing a well drilling protocol, which will be provided to the town for review. While the Comprehensive Permit process allows for state permits to be obtained after Preliminary Plan submission (but prior to Final Plan), the applicant recognizes the town's concern about water supply and has initiated the process proactively.

2. *Water System Impacts: With a planned community wellfield area adjacent to wetlands and an anticipated water demand of 64,400 gallons per day for domestic use, plus potential irrigation demands, it is reasonable to request an evaluation of the potential impact on the groundwater levels and wetlands due to groundwater withdrawals. The evaluation needs to address the domestic and irrigation demands.*

There will be no allowance of automated sprinkler irrigation systems to be operated on the public water supply. It will be the homeowner's responsibility to determine plausibility and have installed any additional wells for the purpose of operating an automated sprinkler system. These stipulations shall be included in the Homeowner's Association documents. In regards to impacts to adjacent wetlands, the bedrock drilled wells are installed with a casing that is sealed into the bedrock (typically several hundred feet below ground). The wells do not draw from the groundwater aquifer that supplies the freshwater wetlands rather from the saturated rock fractures within the bedrock. RIDEM Insignificant Alteration Permit No. 20-0307 issued on October 8, 2021, references specifically the well withdrawals adjacent to the wetlands. Conditions of Approval #19 and 20 stipulate that no water withdrawals will be permitted within 200 feet of any jurisdictional wetlands and no single well is authorized to have a yield greater than 10,000 gallons per day (GPD) nor any combination of wells within 200-feet of each other cumulatively be permitted to withdraw more than 10,000 GPD.

Finally, during the Master Plan stage, LFR completed Hydrologic Analyses (dated May 13, 2009) for the development that included research into the adjacent well yields and a water budget. The analysis was based on the original proposal for 300 units and provided the conclusion that the water budget will remain a net positive contributor of water to the aquifer. An additional copy of the LFR report is provided for reference.

Crossman Response 2/22/22: The general reply overlooks the fact that water supply to bedrock wells depends upon water movement through bedrock fissures and those same bedrock fissures allow for groundwater interaction between upper soil layers, wetlands, and the underlying bedrock (fissures). We concur that the RIDEM Conditions are reasonable but we recommend that the potential individual irrigation wells mentioned in the DiPrete Response be factored into the net Water Budget Summary. The original comment was that the Water Budget should address irrigation demands.

DiPrete Response 4/12/2022: As discussed, the Water Budget has been updated to include a value for manual lawn sprinklers. There will be no allowance of automated sprinkler irrigation systems to be operated on the public water supply. Prohibition of automated sprinkler systems shall be included in the Homeowner's Association documents.

3. *Community Septic Systems: Similar to the Water System level of detail, there is insufficient design data to confirm the adequacy of the multiple community septic systems and the net environmental results. Pipe sizes, valves, cleanouts, manholes, tank volumes, pump performance curves, leach field cross-sections, advanced treatment efficiencies and other standard design data were not provided. Also, due to the volumes of effluent per system, mounding analyses are*

required for each system and nitrate loading analyses are recommended for the plumes of each system. Systems 3 and 5 will need to be modelled together, since System 5 is adjacent to and uphill of System 3. Also, design elements that can create effluent breakout adjacent to the systems need to be addressed. We recognize that the septic systems are not yet fully designed, therefore it would be more appropriate to request the actual system designs, as opposed to listing design deficiencies. One example is that the leach field side-slope of System 3 does not provide adequate clearance to the leach field trenches (Grading Plan 6). Overall, there is insufficient data to review the actual adequacy of the multiple community septic systems and insufficient data to conclude that no impacts will result. Also, current RIDEM standards for septic system leach fields with flows of 5,000 – 10,000 gallons/day require a 300 ft separation from private drinking wells. The proposed locations of leach fields will result in this 300 ft clearance requirement encroaching onto neighboring lots. Therefore, the layout may reduce the development potential or future well placement on those lots.

The applicant is working with RIDEM OWTS Program as the state regulatory agency for the community septic systems. The applicant will follow all RIDEM OWTS Regulations, including mounding, nutrient loading, minimum required setback distances, and operation and maintenance. The applicant will be submitting an approved Subdivision Site Suitability Report at Final Plan stage. Prior to submission for building permits (per phase), the applicant will submit RIDEM approved OWTS site plans and specifications with details for pipe sizes/material, valves, cleanouts, manholes, septic tank volumes, pump specifications, leach field cross-sections, advanced treatment technologies and other standard design data. The Operations and Maintenance for the community septic systems will be through the Homeowner's Association, which ensures proper inspection and maintenance is being performed. A recorded Operations & Maintenance contract with a qualified vendor is required prior to Certificate of Conformance (COC) per RIDEM Regulations and will run in perpetuity with the land.

Crossman Response 2/22/22: Status: Section 1.3, Policies, of the Land Development and Subdivision Regulations indicates that the Planning Board is to base its actions on consideration of the adequacy of services to a Subdivision, including the provision of adequate sewage disposal (1.3.3). We recognize that RIDEM is the State permitting agency for septic systems but at this time, there is not enough data to confirm the systems' adequacy.

We also asked for confirmation if the proposed leach-field placement will impact future development potential on adjacent lots. For example, OWTS Nos. 1 & 2, which are near adjacent lot lines, appear to have a 300 ft minimum regulatory setback requirement for wells which appear to impact adjacent privately owned land.

Also, one related topic is the Planning Board's previous concern for the numerous sewer filter system and pumps on individual lots versus a complete community system.

DiPrete Response 4/12/2022: While the Comprehensive Permit process allows for state permits to be obtained after Preliminary Plan submission (but prior to Final Plan), the applicant recognizes the town's concern about onsite sewage treatment and has initiated the process proactively with RIDEM OWTS Program. The project is currently pending for a Subdivision Suitability, which is the appropriate level of detail for a Preliminary Plan submission. The applicant has also initiated the individual design for each phased community septic system. The individual designs provide the additional level of detail including the specifics for size/location/material/specification for building sewer, septic tank, effluent pipe, inspection clean-outs, and community leachfield. A copy of the Phase 1 pending design is included for

reference. Additional details and DEM state approvals will be provided prior to final approval per phase.

In regard to the adjacent properties and setbacks for future development due to proposed community leachfield locations, any future development would need to adhere to the RIDEM OWTS Regulations for setbacks including the location of future wells to the proposed community leachfield. This is consistent with any other development in Hopkinton and the applicant is not requesting any special consideration.

In response to the former Town Planner's comment about possibly considering a single, centralized community system for the 140-lot subdivision, the applicant believe they've been working off the template that was given by the town between the Master Plan approval and subsequent meetings/discussion with the Planning Staff and Planning Board. The applicant has consistently shown phased community septic systems with a separate Planning Board meeting dedicated solely to discussion of the proposed community septic system. It is the applicant's position that suggesting an alternative method of handling the onsite sewage treatment at this late stage of the engineering design process would be counter to previous discussions and town direction. The applicant believes they are following the previous guidance and discussions of the town as a roadmap to designing the project.

4. *Private Water and Sewer Lines: If the road is proposed to be a public road and the water and sewer lines will be owned and maintained by the Homeowner's Association, the recommended location of the water and sewer lines is outside of the roadway pavement structure. If the Homeowner owned utilities remain beneath public roads, Maintenance Agreements will be needed.*

The Homeowner's Association (HOA) will be responsible for all town owned roadway infrastructure maintenance and repairs required due to the HOA owned water and sewer utilities. The applicant acknowledges that Maintenance Agreements are needed similar to any private utility within the street rights-of-way including electric and telecommunication. Drafts of the Maintenance Agreements will be provided with the Final Plan submission for review by the Town Solicitor.

Crossman Response 2/22/22: Status: Input from DPW is recommended.

DiPrete Response 4/12/2022: The applicant will work with the Public Works Director to ensure the Maintenance Agreements are to the satisfaction of the town.

5. *The road profiles indicate that both the water lines and sewer lines are to be built with 4.5 feet of cover. This will result in numerous water and sewer conflicts at service connections and at intersections. We recommend that the sewer line be lowered and designed to meet the standard 18-inch vertical clearance value between sewer lines and water lines.*

The road profiles show typical details for the location of water lines and sewer lines including minimum cover per utility. In instances where the 10' horizontal separation cannot be maintained, the sewer force main can be lowered to ensure proper vertical clearance of 18 inches. If a water/sewer crossing clearance conflict arises, a concrete encasement of proper length will be established in conformance with the regulations. For clarity, a utility separation detail has been added to Sheet 40 and sewer separation notes have been added to Sheet 41.

Crossman Response 2/22/22: Status: We agree with the Sewer/Water Separation Notes added to Plan Sheet 41.

DiPrete Response 4/12/2022: No further response needed.

6. *Soil Data: The soil and groundwater conditions are the basis for the design of septic systems and stormwater infiltration systems. The designer utilizes a combination of new data and old soil test data, some of which dates back to 1995. Some of this old data, coincidentally, was prepared by our firm, Crossman Engineering, for a previous landowner and a different project. It is standard practice for a designer to review public records available at RIDEM but old work by others for other projects cannot be used as the basis for another's final design. The current designer is solely responsible for the accuracy of the data used for his/her designs and needs to perform sufficient testing in order for them to be able to certify the soil data at each septic system and each stormwater system. The septic system design data on Plan sheet 40 appears to rely upon the 1995 soil data by others.*

The applicant intends to comply with all RIDEM criteria and requirements for OWTS and stormwater systems, including verification of soil conditions. DiPrete Engineering has performed additional onsite testing to confirm the validity of the original testing.

Crossman Response 2/22/22: Status: We concur as long as old data by others is not used for final design.

DiPrete Response 4/12/2022: No further response needed.

7. *Typical Road Section: The road design does not conform to the Town required Typical Section and based upon the roadway profile slopes, berm or curbing is necessary to prevent edge of road erosion on the steeper roadway sections. Also, due to the number of new homes, sidewalks should be considered for pedestrian safety.*

Section 17.5 Drainage of Subdivision Regulations states:

Stormwater management within a proposed development shall be designed to minimize the volume of water runoff, to encourage infiltration into the ground, prevent flooding, control peak discharges and provide pollutant remediation. Wherever possible, grass swales and sheet flow of storm water over unpaved areas shall be employed instead of curbs and gutters and closed or piped drainage systems [emphasis added].

The drainage system shall be comprised of natural and manmade elements. These may include, but not be limited to grass swales, wet basins, vegetated filter strips, curbs, catch basins, culverts, and stormwater pipes. The use of retention/detention ponds will only be allowed as approved by the Planning Board when this is the only viable option for the development.

The subdivider shall incorporate natural elements into the drainage design using Best Management Practices (BMP) and standards of the State of Rhode Island Storm Water Design and Installation Standards Manual, latest edition. These elements (i.e. grass swales, wet basins, vegetated filter strips) not only collect and transport stormwater,

but also mitigate pollution, reduce sedimentation, provide visual amenities, recreational opportunities and provide potential wildlife habitat.

The applicant has designed the subdivision to utilize RIDEM Best Management Practices with the use of Low Impact Development (LID's) through the use of roadside swales and infiltration basins. The stormwater design has been reviewed and approved by RIDEM Freshwater Wetlands Program under Insignificant Alteration Permit #20-0307 dated October 8, 2021.

Crossman Response 2/22/22: Status: The design problem that was discussed with the engineer is that the lack of berm at the edge of pavement on steeper sloping roadways will create erosion along the pavement/grass line. Berm installed monolithically with the surface course of pavement can remedy the concern. As required by the Town Land Development Regulations, the potential for soil erosion needs to be addressed. The area of concern expressed to the designer is along the pavement edge and within swales on the steeper sloping profiles.

In regard to sidewalks, it should be confirmed if the previous Master Plan addressed safe circulation for pedestrians and the need for sidewalks.

DiPrete Response 4/12/2022: Per discussion and agreement with the town peer review consultant, cape cod berm has been added along sections of roadway sloped more than 3%. Paved waterways have also been included along these sections including where the berms terminate, at sag/low points, and every 300 feet.

In regard to sidewalks, the applicant is following the Master Plan conditions of approval along with the corresponding expert testimony, peer review consultant testimony, and entirety of the Master Plan submitted materials. It is the applicant's position that re-evaluating the need for sidewalks at this late stage of the engineering design process would be counter to previous discussions and town direction. The applicant believes they are following the previous guidance and discussions of the town as a roadmap to designing the project.

8. *Road Profiles: Section 17.4.6, Geometric Data, within the Subdivision Regulations require maximum centerline grades within 150 feet of intersections to be 2.5%. The Road A/Road A intersection currently has a 7.9% profile slope, and the Road A/Road C intersection has a 6.25% slope. Justification for the waiver should be provided. If a waiver is considered, a slope greater than 5% for the through road would not be recommended. The 2.5% should be maintained for approach with the stop condition.*

The applicant has designed the roadways to have all side road approaches as no greater than 2.5% slope within 150' to intersection as required by the subdivision regulations. This allows approaching vehicles to properly brake prior to stopping at the intersection. The primary roadway (running grade) has been designed to contour the existing grade slopes to the greatest extent practicable to reduce cut/fill activity and overall earth disturbance.

After discussion with the peer review consultant, we better understood the concern regarding providing adequate safe stopping sight distance at the approaching intersection. The primary roadway allows for adequate safe stopping sight distances in both directions at the intersections and the stop bar has been shifted closer to the intersection to increase sight distances. At the Road A intersection, the sight distance to the south (stopped vehicle looking left) is approximately 190' and 275' to the north (stopped vehicle looking to the right). At the Roads A/B intersection, the sight distance to the south (left) is approximately 210' and 190' to the north (right). At the Roads A/C intersection, the sight distance to the west (left) is

approximately 415' and 175' to the northeast (right). All of the safe stopping sight distances are greater than the AASHTO Design of 155' for a design speed of 25 mph. The proposed landscaping does not interfere with the sight distances.

Crossman Response 2/22/22: We have no objection to the reply.

DiPrete Response 4/12/2022: No further response needed.

9. *Roadside Swales and Driveway Culverts: Design flow velocities appear to exceed erosive velocity levels within swales on steeper slopes. Also, we recognize that no curb or berm is depicted on the Typical Road Section but on roadways with profile slopes greater than 2%, runoff commonly travels along the pavement/grass edge and not through the grass towards the swales. Gutter flow needs a means to be diverted into the swales. As a minimum, periodic paved outlets from the road into the swales are needed. Periodic baffles in the swales are also recommended to reduce velocities and promote infiltration. Also, winter conditions need to be considered (snow lining edge of road). It is always safer to have standard catch-basins at low-points to collect runoff during winter conditions, when the paved outlets may be blocked. It is also not evident if the water flow depths in the swales will overtop some of the driveway culverts. Also, flow velocities exiting the driveway culverts and the need for scour protection did not appear to be addressed.*

The roadside swales are designed with turf reinforcement mats, which stabilize the surface and prevent erosive conditions. While not necessary to prevent scour, if required by the town, the design could incorporate intermittent stone check dams within the grass swales to further reduce runoff velocities.

Crossman Response 2/22/22: The original comment remains unaddressed.

DiPrete Response 4/12/2022: Per discussion and agreement with the town peer review consultant, cape cod berm has been added along sections of roadway sloped more than 3%. Paved waterways have also been included along these sections where berms terminate, at low points, and every 300 feet. All swales are to be constructed with permanent turf reinforcement mats (North American Green C-350 or approved equal) to prevent erosion. Per discussion with the peer review consultant, check dams are not considered necessary if permanent erosion control mats are provided.

10. *Site Plans: The existing topography is missing in some areas on the following sheets and is needed for our review:*
- Existing Conditions Plan 2 (Sheet 6)*
 - SESC Plan – 3 (Sheet 10)*
 - Grading and Drainage Plans 3 and 4 (Sheets 14 and 15)*
 - Pond Complex A & B in the "Pond Complex A" detail (Sheet 36)*
 - Pond Complex C in the "WQ Infiltration Pond C" detail (Sheet 37)*
 - Pond Complex D & E in both pond details (Sheet 38)*

The revised Site Plans include the missing existing conditions topography.

Crossman Response 2/22/22: Comment resolved.

DiPrete Response 4/12/2022: No further response needed.

11. *Additional grading and drainage improvements are necessary behind the pump house on Road A STA ~71+00 to divert stormwater runoff from the 12.8-acre watershed (Subcat 333) around the pump house to the downstream 30" diameter cross culverts.*

The revised site plans include additional grading and spot grades to demonstrate how stormwater will be diverted around the proposed pump house.

Crossman Response 2/22/22: Comment resolved.

DiPrete Response 4/12/2022: No further response needed.

12. *The Stormwater Pond B Complex detail on Sheet 36 requires regrading between Road A and the Forebay B. Forebay B (Pond 304) shows a 100-year peak ponding elevation of 165.71, but the grading between the road, forebay and swale suggests that bypass flow may occur.*

The revised site plans include additional grading demonstrating how stormwater will be contained within the Pond B Complex to prevent overflow onto Road A.

Crossman Response 2/22/22: Comment resolved.

DiPrete Response 4/12/2022: No further response needed.

13. *The Stormwater Pond D Complex detail on Sheet 38 has a 100-year peak ponding elevation of 370.30 which is higher than the pond berm elevation of 370 (Pond 306). A one (1) foot freeboard is standard.*

The revised site plans have adjusted the Pond D berm elevation to ensure proper freeboard as required by RIDEM requirements.

Crossman Response 2/22/22: Comment resolved.

DiPrete Response 4/12/2022: No further response needed.

14. *The Stormwater Pond E Complex detail on Sheet 38 lists an emergency spillway elevation of 369.00. This should be revised to 280.00 to match the design calculations.*

The revised site plans have adjusted the Pond E emergency spillway elevation label to match the design calculations.

Crossman Response 2/22/22: Comment resolved.

DiPrete Response 4/12/2022: No further response needed.

15. *The Stormwater Pond F has a bottom contour of 280 and a water table level of 279. Therefore, insufficient vertical clearance is provided.*

The revised site plans have adjusted the Pond F bottom elevation to ensure proper vertical separation to the seasonal high groundwater table. OCS-F7 outlets, the overflow weir, and the

top of pond have been updated to maintain freeboard and design point discharge rates. Detailing on Sheet 39 has been updated accordingly.

Crossman Response 2/22/22: Comment resolved.

DiPrete Response 4/12/2022: No further response needed.

16. *The Pond G Complex detail on Sheet 39 requires regrading on the north side (top of forebay) for Forebay G. The highest contour shown is 166 between the forebay WQ Pond G and Infiltration Pond G but the 100-year peak ponding elevation is listed at 166.22 (Pond 357).*

The revised site plans include additional grading to demonstrate proper berm height between the forebay and infiltration pond during the 100-year storm event.

Crossman Response 2/22/22: Comment resolved.

DiPrete Response 4/12/2022: No further response needed.

17. *The Pond Cross-Sections on Sheets 36-39 depict minimum berm widths of 5 feet, but the Pond Berm Detail on Sheet 40 calls for a minimum impervious core width of 8.2 feet.*

The pond cross sections depict a minimum berm width of 5 feet for inner berms only i.e. the berms between the ponds, which do not have impervious cores. The minimum berm width for outer berms, which require impervious cores, is a minimum of 8 feet wide at the top of berm. Since the berm slopes down at 3:1 and the core starts 1' below the top of berm, the berm is 14 feet wide at the top of core.

Crossman Response 2/22/22: Comment resolved.

DiPrete Response 4/12/2022: No further response needed.

18. *The designer shows 4 Existing Subcatchment Areas draining to Existing Design Point 1 – NW Wetlands (Subcats 10, 11, 12, and 13), but two of those Subcats (11 and 12) actually drain to a separate and disconnected wetland area, identified as Wetland Series E on the plans. Similarly, in post-development conditions, Proposed Subcats 114 and 115 drain to Wetland Series E, not the same NW Wetland Design Point as the other subcatchments and Proposed Pond A. Also, the analysis assumes there are no outflows leaving Wetland Series E, which appears to drain in a southeasterly direction between the proposed houses of Lots 19 & 20. The model should include the separate modeling with stage-storage-discharge of Wetland Series E to verify whether or not flow leaves Wetland E (approximately Wetland Flag E22) and is accounted for in the downstream drainage design, especially during the larger magnitude storm events.*

Upon further inspection, we have determined that the existing subcatchments in question drain to the E-Series wetland and then to DP-3 rather than DP-1. The existing HydroCAD model and Watershed Maps have been updated accordingly. In proposed conditions, the referenced subcatchments drain to Pond Complex A. The Post Watershed Maps, and Pond Complex A have been updated to reflect this and to maintain peak mitigation to DP-1.

Crossman Response 2/22/22: Comment resolved.

DiPrete Response 4/12/2022: No further response needed.

19. *The analysis proposes a slight increase in peak flow rates to Design Point 3 - Central Wetland during the 100-year storm event (Report Page Appendix A Checklist Pg. 10 Table 5-1). Although the designer demonstrates when combining all 4 design points together the total peak flow rate decreases, just not to Design Point 3 – Central Wetlands. The Central Wetland design point flows to a separate unnamed stream which crosses beneath Dye Hill Road before converging with the Brushy Brook stream. With the design as proposed, the existing culverts beneath Dye Hill Road, which receives flow from the Central Wetlands, will expect a slight increase in runoff during the 100-year storm. The proposed infiltration BMPs discharging to this design point should be revised as necessary to demonstrate there will be no increase in stormwater runoff leaving the site.*

The analysis has been modified so that there is no proposed increase in peak flow rates to DP-3. Additionally, it should be noted that the design analysis is conservative as the proposed roadside swales do not take credit for additional infiltrated stormwater, which will occur and provide greater infiltration. This additional infiltration will likely reduce the flows beyond what is modeled in the analysis.

Crossman Response 2/22/22: The peak flow comment was addressed but in accordance with Section 17.5.E.9, the net volume increase needs to also be addressed. It appears that a 4.7 acre-feet of water volume increase will result during the 100-year storm.

DiPrete Response 4/12/2022: Please note the model has been updated per comments below. The stormwater design has a decrease in peaks for all design points for the 1, 2-, 10-, 25-, and 100-year storm events. All design points have a volume decrease for up to and including the 2-year storm event. This represents over 90% of all storm events and is in compliance with the RI Stormwater Design and Installation Standards Manual (RISDISM). For the larger storm events, the combination of design points 1, 2, and 3 have a decrease in volume. These three design points combine on the southerly side of Dye Hill Road immediately adjacent to the site. Design Point 2 has a large decrease in volume and is upstream of Design Point 3 which has an increase in volume. Since the upstream segment has a volume and flow decrease, there is no impact offsite from Design Points 1 and 2. Design Point 3 flows under Dye Hill Road where it then combines with the flow from Design Points 1 and 2.

DiPrete Engineering has conducted an analysis of the two culvert crossings under Dye Hill Road and the culvert crossing at Sawmill Road. The results of the analysis found a decrease in both peaks and volumes at the Brushy Brook/Dye Hill Road crossing (DP-1 and DP-2) and at the Brushy Brook/Sawmill Road crossing (DP-1, DP-2 and DP-3). Design Point 3 infiltrates volumes to the maximum extent practicable and has been modified to be the point where the unnamed stream crosses the property line rather than the entire central wetland. As DP-3 experiences an increase in volume, the impacts to the culvert crossing immediately downstream of the design point was evaluated. Peak flows to the culvert decrease for all storms, and the flooding elevations at the culvert crossing remains unchanged between predevelopment and post development conditions. As there is a reduction of peak flows and no change to peak flooding elevation at the DP-3 culvert crossing, and as there is a reduction to volume downstream at the convergence point of DP-1, -2, and -3, we conclude that the increase in volume at DP-3 will have no impact.

20. *The analysis also shows there will be a slight increase in stormwater runoff peak flow rates and volumes leaving the site to all design points during the 1.2-inch (Water Quality) storm event.*

Drainage problems in the area will be reviewed to assess if this increase will create an impact to off-site properties.

It is required by RIDEM to report the water quality storm discharge in proposed conditions for reference only and it is not required by to match water quality discharge. Proposed impervious has been treated for water quality to the maximum extent practicable and all ponds fully infiltrate the 1-year storm.

Crossman Response 2/22/22: Comment unresolved. We recognize that the 1.2-inch rain event is to model the water quality storm but since it shows an increase in peak flows, potential impacts to abutting land need to be addressed. We do recognize that the Town Regulations do not specifically mention a 1.2-inch rainfall but Section 17.2.3.D does state that developments shall mitigate adverse impacts of drainage on neighboring properties. Section 17.5 also states that stormwater management shall be designed to prevent flooding.

DiPrete Response 4/12/2022: The 1.2" storm in not intended to provide a pre/post analysis but rather to evaluate the effectiveness of BMPs during the water quality storm. The original model was purposely conservative and did not include any of the proposed drywells in the analysis. The revised model, included with this submission, includes all the proposed drywells for the site. Adding the drywells to the analysis, Design Points 3 and 4 have 0 cfs at 0.0 af of runoff under post development conditions. Design Point 1 has 0.01 cfs at 0.0 af of runoff, an insignificant number. Design Point 2 has 0.1 cfs at 0.008 af of runoff. This runoff is from the entrance of the site where stormwater could not be infiltrated however is treated for water quality. This insignificant amount of runoff is discharged directly to Brushy Brook. There will be no impact to offsite properties.

21. *The 2-year and 25-year storm events were not included in the HydroCAD analysis, but they were included in swale sizing calculations. Article 17.5 Drainage, Page 184 of Land Development and Subdivision Regulations require the 2- and 25- year storms to be provided.*

As requested, the additional HydroCAD summaries for the 2-year and 25-year storm events have been provided.

Crossman Response 2/22/22: Unresolved. The Stormwater Management Report, revised 02-16-22, still does not include the 2-year or 25-year storms. The previously revised draft stormwater report dated 01-14-22 included the 2-year and 25-year storms, but those sections have since been removed from the current report. The 01-14-22 report showed an increase in stormwater runoff rates to Design Point 3 during the 2-year storm.

DiPrete Response 4/12/2022: The 2-Year and 25-Year storms have been included with the revised drainage report.

22. *No groundwater mounding analyses were provided for infiltration basins with less than 4 feet of separation to the groundwater table. This analysis is needed to confirm the adequacy and operation of the systems.*

Per the Rhode Island Stormwater Design and Installation Standards Manual (RISDISM) Section 8.21.B.8: "infiltration practices that are designed for the 10-year storm event or greater and have a separation from the bottom of the system to the seasonal high groundwater of less than four feet shall provide a groundwater mounding analysis." While the basins provide infiltration at the smaller frequency storms (i.e. 2-year storm event), they provide bypass

through a traditional outlet structure for the 10-year storm and greater thus not requiring mounding calculations. RIDEM has reviewed and approved conformance to the RISDISM with the issuance of Insignificant Alteration Permit No. 20-0307 dated October 8, 2021.

Crossman Response 2/22/22: Without additional justification, the response appears incorrect, and independent of a RIDEM approval, Town Regulations require conformance to standards within the Stormwater Manual.

Based upon the revised Drainage Report, it appears that all of the proposed infiltration basins (WQ and QP Ponds) take credit for infiltration and attenuation for up to the 100-year storm. Therefore, for basins where less than 4 feet of separation to the groundwater table is provided, a mounding analysis is required to demonstrate that the underlying groundwater level will not mound and reduce the infiltration rates during the larger storms. For example, the revised analysis indicates that Pond G (Node 362) infiltrates 3.782 acre-feet (164,744 cubic-feet or 75% of inflow) and only 1.280 acre-feet (55,757 cubic-feet or 25% of inflow) discharges through the outlet structure during the 100-year storm event. The purpose of this analysis is to verify that the groundwater mound that forms under the infiltration basins will not elevate into the basin or reduce the infiltration rate (attenuation) during the larger magnitude storm events. The outcome could alter the future peak flows and total runoff volumes and is needed to document conformance to Section 17.5 of the Town Regulations.

DiPrete Response 4/12/2022: DiPrete Engineering reviewed groundwater separation for all ponds. Ponds with less than four feet of separation are Water Quality Pond C, Infiltration Pond D, Water Quality Pond F, Infiltration Pond F, and Infiltration Pond G.

Water Quality Pond C, Infiltration Pond D, Water Quality Pond F, and Infiltration Pond G have been revised to provide four feet of separation to the seasonal high groundwater table.

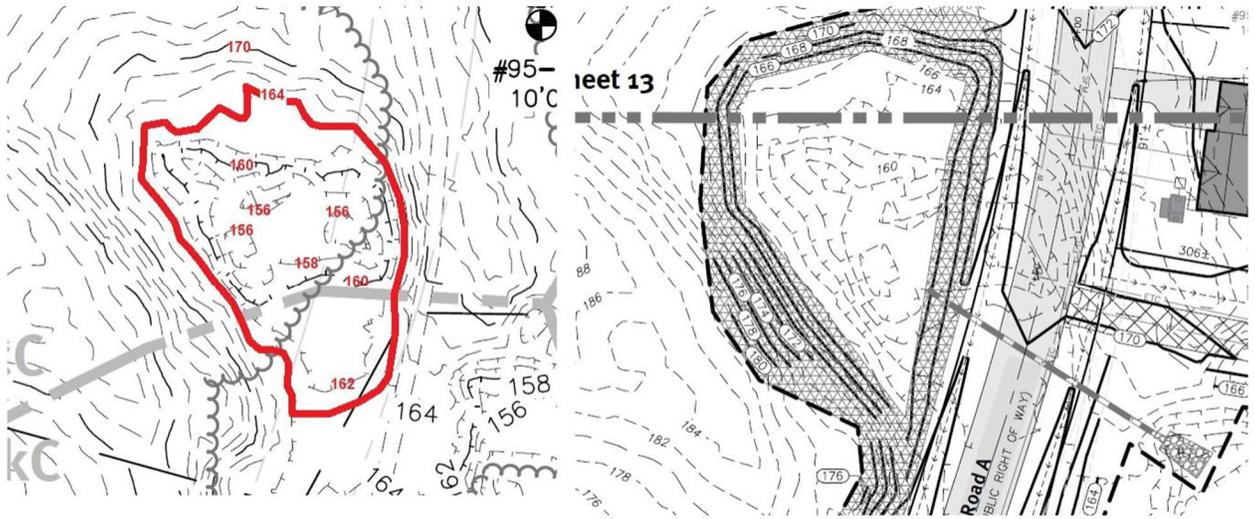
Infiltration Pond F has been revised and now only provides two feet of separation to the seasonal high groundwater table. Per the RISDISM, a Qp pond must have a minimum of 2' of separation. Due to the mounding, the infiltration rate of Pond F has been reduced in HydroCAD to ensure the mound does not impact the 1 year storm. For the 2 year, 10 year, 25, year and 100 year storm events infiltration has been removed in HydroCAD. This creates a conservative model that doesn't account for any infiltration in the upper storms when some will occur. See Appendix C of the stormwater report for mounding calculations.

23. *The Post-Development Conditions model includes an existing depression (Pond 226, "Existing Depression STA 7+00"), which takes credit for the available stage-storage-discharge of an existing depression area. Although the grading of the depression is modified from existing to proposed conditions, the stage-storage-discharge of the existing depression is not included in the existing conditions analysis. The model should include this depression in the existing conditions model. All well-defined existing depressions must also be accounted for in the existing conditions model.*

This depression does not exist in existing conditions. In proposed conditions a natural depression is created due to the elevation of the roadway and has been modeled for culvert sizing. We do not feel it is necessary to model every depression given the size of the overall watershed as it would have negligible impact from pre to post development conditions.

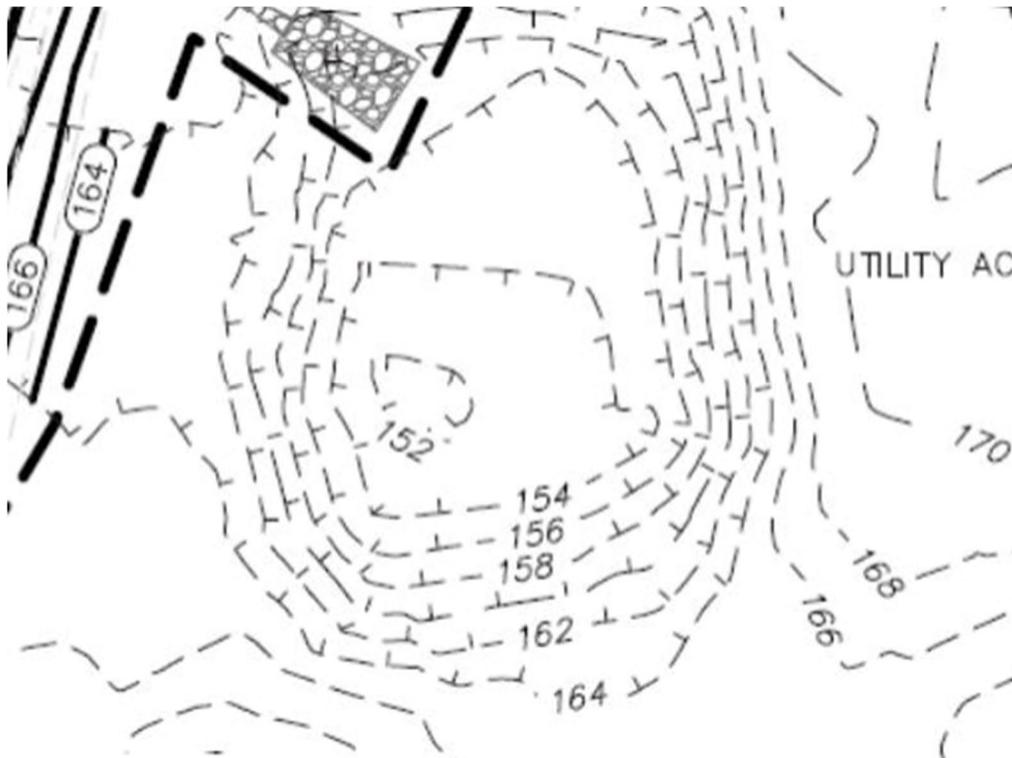
Crossman Response 2/22/22: The reply contradicts the Site Plans and Surveys, therefore is incorrect. Existing depressions of up to 12 feet deep are shown on the Existing Conditions

Topography. These depressions provide storage and infiltration of existing runoff and need to be addressed in the Existing Conditions Modeling. Otherwise, the actual change to runoff under future conditions remains unaddressed. A potential increase in runoff towards abutters and public roads is a Town concern and unrelated to the issuance of a RIDEM Permit.



Existing-Existing Depression

Proposed-Existing Depression



Another Example of an Existing On-Site Depression

DiPrete Response 4/12/2022: The depressions have been added to the pre and post development models.

- 24. We recommend the designer upgrade the proposed 2 x 15" diameter cross-culverts below Road B at STA 2+00. The low point of the roadway profile at this crossing appears to be 380.48. The

HydroCAD calculations show a peak ponding elevation of 380.53, which indicates runoff will overtop the road during the 100-year storm event.

A third 15" pipe has been added to the crossing. The flooding elevation in the 100 year is now 379.70, which alleviates concerns about overtopping the roadway during the 100-year storm.

Crossman Response 2/22/22: Comment resolved.

DiPrete Response 4/12/2022: No further response needed.

25. *The 2 x 30" diameter cross-culverts below Road A at STA 72+10 (approx.) show a 100-year peak ponding elevation of 312.07 (Pond 336). The roadway and swale grading as shown on Grading and Drainage Plan 3 indicates that stormwater runoff will overtop the road to the west of the culverts and also be directed to the 2 x 15" culverts below Road A at STA 74+40 (approx.) during larger magnitude storm events.*

A third culvert has been added to the crossing. The flooding elevation in the 100 year is now 311.13, which alleviates concerns about overtopping the roadway during the 100-year storm.

Crossman Response 2/22/22: Comment resolved.

DiPrete Response 4/12/2022: No further response needed.

26. *Minor typo on Post-Development Watershed Map 3. The subcatchment area north of WQ Pond D is labeled Subcat 365 but should be 312.*

The Post-Development Watershed Map has been updated accordingly.

Crossman Response 2/22/22: Comment resolved.

DiPrete Response 4/12/2022: No further response needed.

27. *We are in the process of reviewing off-site improvements and the downstream analysis, but it was noticed that two (2) culverts beneath Dye Hill Road immediately downstream of the site's discharge points were not included in the analysis.*

The table on page 19 of the Stormwater Report summarizes the changes in discharge and volume of the site. Discharge, volume and the time to peak during the 100-year storm all see a decrease in post development conditions as water exits the site. Therefore, no downstream impacts are anticipated.

Crossman Response 2/22/22: Comment resolved.

DiPrete Response 4/12/2022: No further response needed.

28. *Although we have not completed a review of the proposed off-site improvements, we offer the following observations:*
- We agree with the notation in the BETA Memorandum, dated March 22, 2021, which states "Pavement cores to determine pavement depth and subgrade conditions should be conducted to confirm repair recommendations where necessary."*

- *With pavement cores, the actual upgrade needs (pavement reclamation, mil & overlay, chip seal or full depth reconstruction) can be established. Otherwise, surface improvements can have a limited life.*
- *Trees and other obstacles immediately adjacent to the road should be flagged and identified for removal.*
- *In addition to widening and pavement improvements, the steepness of the road side-slopes needs to be reviewed in relation to standard road hazard guidelines, especially at road widening areas.*
- *Based upon the surface elevations, it does not appear that road runoff will enter the proposed grass filter strip and stone trench in the vicinity of Sta. 20+00 – 21+50.*
- *The guardrail layout needs to address the end sections.*
- *Cross-sections of all culvert extensions should be provided and the condition of those culverts needs to be confirmed, along with the need for scour protection.*
- *At the 24-inch culvert near Station 14+50, we recommend that the culvert be extended sufficiently on both sides to avoid the need for guardrail, which itself can be a hazard to motorists.*
- *The proposed striping should be shown.*
- *The horizontal geometry of the road centerline should eliminate the depicted angle points and use curve radii that account for the design speed.*
- *The pavement detail needs to provide the proposed thickness of each layer.*

These observations will be taken into consideration. We will work with the town peer review consultant regarding their concerns for the offsite improvements when their review is completed.

Crossman Response 2/22/22: We recommend that the above noted comments (28.A – 28.K) be addressed. Also, the January 15, 2010 Hopkinton DPW Memo states that sections of Skunk Hill Road need major improvements. Therefore, a site visit with the applicant's engineer and DPW is recommended to clarify the Skunk Hill Road items referenced in the 2010 Memo.

DiPrete Response 4/12/2022:

- Trees within the LOD have been called out to be removed
- Guardrails have been added and labeled where steeper roadside slopes are proposed or already exist. Guardrail end sections have also been called out on the plans.
- We have included an exhibit with the subcatchment boundaries to each roadside vegetated filter strip and stone trench, as well as the breakdown of impervious areas that are treated.
- Cross sections of the culvert crossing have been added to the plans. Riprap will be added to the crossings at the downstream crossing discharge within the proposed LOD area wherever disturbances occur. Since the stream beds are already stabilized and to reduce impacts to wetland areas riprap is only proposed where work is being done.
- No extensions were proposed on the upstream side of the road to minimize disturbance to the streams. Culverts have been extended on the downstream side of the road to the maximum extent practicable. Per coordination with RIDEM, this was the best approach to minimize wetland impacts and upstream flooding impacts. By impacting the downstream side of all culverts, the hydraulic capacity upstream is maintained. Extending culverts on both side of the roadway will cause more disturbance to wetland areas than is acceptable to RIDEM. It is important to note all the improvements proposed along Sawmill Road make the current situation significantly better. Currently the roadway is narrow with no vehicle protection. The proposed conditions increase roadway width and provide guardrail. Guardrail has been located away from the edge of

pavement as much as possible and end sections angled away from direction of travel wherever possible. Given that Sawmill Road is a public right-of-way owned by the Town, the Sawmill Road Offsite Improvement Plans were provided to the Town Council with the request for RIDEM Freshwater Permit application signature. The Town Council granted approval to allow the Town Manager to sign the application with the knowledge of the proposed improvements as presented.

- Proposed striping has been added to the plans
- The roadway alignment has been updated to use curve radii
- The pavement detail has been modified to include pavement thickness

Please, feel free to contact me if you have any further questions regarding this matter.

Sincerely,
DiPrete Engineering Associates, Inc.



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cc: *William Landry, Esq.*
David Allen