Professional Services Corporation, PC

# Memorandum

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| **Date** | May 4, 2021 |
| **To** | Sherborn Zoning Board of Appeals |
| **From** | Thomas C. Houston, PE |
| **Project** | The Pines Residences and Apple Hill Estates Comprehensive Permit Projects |
| **Subject** | Evaluation of Additional Responses to Stormwater Peer Review Comments dated April 26, 2021. |

Professional Services Corporation, PC (PSC) reviewed the Stormwater Management Systems and Stormwater Reports for The Pines Residences and Apple Hill Estates Comprehensive Permit Projects (Proposed Projects) on behalf of the Sherborn Zoning Board of Appeals. We issued our Stormwater Peer Review memorandum on the First Submission by Allen & Major (A&M) on March 20, 2021 and a revised copy on March 22, 2021. We issued our evaluation of A&M's April 9, 2021 response to comments on April 15, 2021.

We are in receipt of memoranda dated April 26, 2021 responding to our April 15th memorandum as well as revised site plans and updated stormwater reports submitted by Allen & Major Associates, Inc. (A&M).

This memorandum includes peer review comments from our March 20th memorandum, responses from the A&M memoranda dated April 9, 2021, and our evaluation of responses dated April 15, 2021, additional responses from the A&M memoranda dated April 26, 2021, and our evaluation of the April 26th responses.

As of May 4, 2021, Comments 8, 21, 32, 37A, 37B, 37C, 37D, 37E, 37F, 37G, 38, 44, and 52 are fully resolved. We believe that Comments 7, 14, 22, 23, and 28 can be resolved if any favorable Decision incorporate recommended Conditions of Approval. Comments 3, 24, and 55 are open items.

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**BASIS – UPDATED AS OF THE APRIL 26, 2021 SUBMITTAL**

A. Allen & Major Associates, Inc. memorandum to Mr. Richard S. Novak, Chair, Zoning Board of Appeals re Response to Peer Review of Stormwater Management System & Stormwater Report The Pines – 41 N Main St (Route 27 ), Sherborn, Massachusetts dated April 26, 2021.

B. Allen & Major Associates, Inc. memorandum to Mr. Richard S. Novak, Chair, Zoning Board of Appeals re Response to Peer Review of Stormwater Management System & Stormwater Report Apple Hill Estates – Hunting Lane, Sherborn, Massachusetts dated April 26, 2021.

C. Allen & Major Associates, Inc. memorandum to Mr. Richard S. Novak, Chair, Zoning Board of Appeals re Response to Peer Review of Stormwater Management System & Stormwater Report The Pines – 41 N Main St (Route 27 ), Sherborn, Massachusetts dated April 9, 2021.

D. Allen & Major Associates, Inc. memorandum to Mr. Richard S. Novak, Chair, Zoning Board of Appeals re Response to Peer Review of Stormwater Management System & Stormwater Report Apple Hill Estates – Hunting Lane, Sherborn, Massachusetts dated April 9, 2021.

E. "The Pines Residences, 41 North Main Street, Sherborn, MA, Grading and Drainage Plan," Sheet C-103, prepared by Allen & Major Associates, Inc. dated October 23, 2020, one sheet. This plan was last revised on April 26,2021.

F. "The Apple Hill Estates, 31 Hunting Lane, Sherborn, MA , Grading and Drainage Plan," Sheet C-103, prepared by Allen & Major Associates, Inc. dated October 23, 2020, one sheet. This plan was last revised on April 26,2021.

G. "The Pines Residences, 41 North Main Street, Sherborn, MA, Drainage Report," date prepared November 18, 2020, revised April 9, 2021.

H. "Site Development Plans for The Pines Residences, 41 North Main Street, Sherborn, MA, 01770," prepared by Allen & Major Associates, Inc. issued for ZBA Application October 1, 2020, issued for Stormwater Review April 9, 2021 (Survey Sheet dated September 1, 2020), consisting of 13 sheets.

I. "Site Development Plans for Apple Hill Estates, 31 Hunting Lane, Sherborn, MA, 01770," prepared by Allen & Major Associates, Inc. issued for ZBA Application October 1, 2020, Updated ZBA Application March 1, 2021, Updated ZBA Application April 9, 2021 consisting of 13 sheets. "Details Plan," Sheet C-505 was last updated April 26, 2021.

J. "Apple Hill Estates, 31 Hunting Lane, Sherborn, Massachusetts, Drainage Report" prepared by Allen & Major Associates, Inc. date prepared November 18, 2020, revised March 1, 2021, revised April 9, 2021, and revised April 26, 2021.

K. PowerPoint presentation "Town of Sherborn Zoning Board of Appeals Water Supply and Wastewater Treatment Presentation Apple Hill Estates and Pine Residences Sherborn " prepared by Onsite Engineering, Inc.

**REFERENCE**

L. The Stormwater Management Standards (310 CMR 10.05(6)(k))

M. The Water Quality Certification Regulations (314 CMR 9.06(6)(a)).

N. Stormwater Handbook, Massachusetts Department of Environmental Protection. (SWHB).

O. MA MS4 General Permit, United States Environmental Protection Agency (EPA) National Pollutant Discharge Elimination System (NPDES) General Permits for Stormwater Discharges from Small Municipal Separate Storm Sewer Systems in Massachusetts (as modified) signed December 7, 2020, effective January 6, 2021 (MA MS4).

P. Chapter 25 Comprehensive Stormwater Management By-Law, Added 2011, Amended 2019.

Q. Stormwater Management Program, Sherborn, Massachusetts, revised November 2020 (SWMP).

R. Rules and Regulations of the Sherborn Planning Board including amendments approved through February 9, 2011 (RRPB).

S. Town of Sherborn, Board of Health Regulations, January 10, 2020 (BHR).

T. Sherborn Wetlands Administration Bylaw Regulations, revised September 25, 2017 (SWABR).

**PART I – THE PINES STORMWATER**

**THE PINES – STORMWATER COLLECTION SYSTEM**

3. Provide downgradient easements to the benefit of the Applicant over the adjacent property at FES1 and FES2 or eliminate the discharge for the 25-year frequency storm event (Town's design storm).

*A&M: Based on MADEP Stormwater Standards, "Stormwater management systems shall be designed so that post-development peak discharge rates do not exceed pre-development peak discharge rates." Since the project has been designed to reduce the peak rate of discharge at the abutting property, therefore an easement is not warranted.*
PSC: Regardless of whether the peak rate increases, the proposed stormdrain system creates new point sources directing new concentrated flow across the property line impacting the property rights of the downgradient abutter Conrail Corporation.
*A&M: As previously stated, the peak rate is decreased to abutting properties, additional measures have been added to further dissipate the flow as it exits the parcel onto the existing depression. As flow currently enters this offsite depress, from the subject parcel, the property rights of the downgradient abutter would not be impacted.*
**PSC: Open item. It is standard engineering practice that runoff cannot be discharged from a point source across a property boundary without benefit of a downgradient drainage easement. However, this is a matter of stormwater law. It should be noted that the Applicant must obtain an easement for a domestic water supply line over the same property.**

**THE PINES – BMPs**

**Subsurface Structure**

7. Provided a minimum of 4 test pits for Infiltration Structure 1 and a minimum of 6 test pits for Infiltration Structure 2 having a minimum 10 ft. length and in compliance with the requirements of Volume 3 of the Stormwater Handbook that are logged by a Massachusetts Soil Evaluator.
*A&M: Per (SWHB V. 2: C. 2: P. 88-89) One soil sample for every 5000 ft. of basin area is recommended and a minimum of three test pits are required for a site. A total of three test pits were performed on site in the area of IS-1, with a minimum of 2 were within the footprint of the infiltration system, the locations of which are shown on the Grading & Drainage Plan. Based on the footprint of the system (6176 sf), the 2 pits within the footprint meet the requirement. As the footprint extends into an area of the existing structure, test pits are impractical at that location. In the area of Infiltration #2, test pits were not conducted as the system will be constructed within the partial limits of an existing structure and in a fill condition, making test pits impractical. As the system will be constructed above the existing grade, the fill material can be closely monitored and an evaluated for permeability during the construction process. Specific notes regarding the placement of fill under the infiltration system have been added to the plans. Test pit logs are provided in the Appendix of the*

*revised Drainage Report and illustrate that the separation to the estimated seasonal high ground water is achieved.*

PSC: The response incorrectly cites the section of the Stormwater Handbook for infiltration basins. Subsurface structures are proposed not infiltration basins. For subsurface structures using chambers or perforated pipes "Take the same number of borings or observation pits as for infiltration trenches" (SWHB V. 2: C. 2: P. 104). Based upon requirements for infiltration trenches, take 4 test pits for Infiltration Structure 1 and a minimum of 6 test pits for Infiltration Structure 2. Taking no test pits at subsurface structure 2 is unacceptable. Placing a system in fill does not alleviate the requirement for test pits. The feasibility of infiltration at this location is solely dependent upon the infiltration rate at the interface between fill and in situ soils. For all test pits as provided and to be provided, show the elevation in feet of ESHGW at each test pit on the Grading and Drainage Plan.

*A&M:* As previously stated, the footprint of Infiltration System #1 extends into areas of existing active structures, making conducting test pits impractical and or impossible. The ESHGW elevation has been noted on the plan based on the information obtained, which illustrates that proper separation is achieved. In the area of Infiltration #2, test pits were not conducted as the system will be constructed within the partial limits of an existing structure and in a fill condition, making test pits impractical and or impossible. As the system will be constructed above the existing grade, the fill material can be closely monitored and an evaluated for permeability during the construction process. Specific notes regarding additional test pits have been added to the plans.

**PSC: No test pits were excavated at Infiltration Structure 1 (IS-1) resulting in a design infiltration rate without a quantitative basis. Two test pits were taken within the footprint of IS-2 that were clustered at one end leaving 230 linear feet of the system with no test pits. We recommend that any favorable Decision include a Condition of Approval requiring that soil testing to determine soil textural classifications and estimated seasonal high groundwater elevations be taken by a Massachusetts soil evaluator prior to placement of stone for the subsurface structures. A minimum of four tests shall be performed at infiltration system 1 and a minimum of 4 additional tests shall be performed at infiltration system 2. The engineer of record shall submit a letter bearing the engineer's signature and seal stating that the soil tests corroborate the design infiltration rate and the design ESHGW elevation. If the infiltration rate is less than the rate used in design or if the ESHGW elevation is higher than used in design, the Applicant shall submit a revised infiltration system design to the Zoning Board of Appeals for approval prior to installation.**

8 Provide monitoring ports for each pipe and specify HS-20 loading.
*A&M: Monitoring ports have been shown to be installed and a detail has been added to the plan.*
PSC: We could not locate the referenced detail.
*A&M: Monitoring ports have been shown on the plan.*
**PSC:** Resolved**.**

**THE PINES – WELLHEAD PROTECTION**

14. If the lined swale option is selected, provide test pits to establish the elevation of seasonal high groundwater.
*A&M: As the swale is intended for conveyance purposes only, separation requirements are not applicable.*
PSC: The lined swale was not provided. A bioretention area is provided which is lined. The limits of the bioretention area are not shown on the plans. Separation to groundwater is not at issue. The concern is that shallow groundwater could create buoyant uplift damaging the lining of the bioretention area. Therefore, a test pit is required.
*A&M: The footprint of the biorention area has been more clearly defined on the plans. As this area extends into areas of existing stockpiles associated with the active landscaping company operations on the property, making conducting test pits impractical and or impossible. Specific notes regarding conduction additional test pits have been added to the plans.*
**PSC: We recommend that any favorable Decision include a Condition of Approval requiring that soil testing to determine estimated seasonal high groundwater elevations be taken by a Massachusetts soil evaluator prior to construction. A minimum of one test shall be performed. The engineer of record shall submit a letter bearing the engineer's signature and seal stating that the ESHGW elevation is below the liner or that the system is designed to resist buoyancy.**

**THE PINES – MASSACHUSETTS STORMWATER MANAGEMENT STANDARDS**

Standard 2: Stormwater management systems shall be designed so that post-development peak discharge rates do not exceed pre-development peak discharge rates. This Standard may be waived for discharges to land subject to coastal storm flowage as defined in 310 CMR 10.04. As submitted post development peak rates of discharge do not exceed predevelopment peak rates of discharge. However, test pits must be submitted to verify design of the subsurface structure. **Per Comment 7, additional soils tests are required.**

Standard 3: Loss of annual recharge to groundwater shall be eliminated or minimized through the use of infiltration measures including environmentally sensitive site design, low impact development techniques, stormwater best management practices, and good operation and maintenance. At a minimum, the annual recharge from the post-development site shall approximate the annual recharge from pre-development conditions based on soil type. This Standard is met when the stormwater management system is designed to infiltrate the required recharge volume as determined in accordance with the Massachusetts Stormwater Handbook. As submitted, the required recharge volume is accommodated. However, test pits must be submitted to verify design of the subsurface structures. **Per Comment 7, additional soils tests are required.**

Standard 6: Stormwater discharges within the Zone II or Interim Wellhead Protection Area of a public water supply, and stormwater discharges near or to any other critical area, require the use of the specific source control and pollution prevention measures and the specific structural stormwater best management practices determined by the Department to be suitable for managing discharges to such areas, as provided in the Massachusetts Stormwater Handbook. There is an existing Zone 1 and an Interim Wellhead Protection Area (IWPA) overlying the south portion of the site. Revisions for compliance with requirements for discharge to a critical area are provided (Comments 12 through 18). A future IWPA or other regulatory mechanism may be imposed on this site in conjunction with development of a new public water supply for the project on the lot to the west (Assessor's Map 11, Lot 3B) which may extend onto the Project Site. To address these potential restrictions, a draft Condition of Approval is provided in the "Wellhead Protection" section in "Part I" of this memorandum. **As of May 4, the Onsite Engineering data indicates that the preliminary Zone 1 does not extend onto the site. However, the preliminary IWPA encompasses the entire area proposed for development.**

**THE PINES – STORMWATER MANAGEMENT PROGRAM**

21. Evaluate the option of holding all runoff on-site.
    *A&M: As exists today, stormwater runoff exits the subject parcel and it is unrealistic to presume that this runoff would be required to held solely within the parcel limits ahead of any development. The intent of RRPB 3.4.2.16 is for the protection of adjacent properties or natural resources. Through the use of currently accepted methods (TR-55 Urban Hydrology for Small Watersheds, developed by the U.S. Department of Commerce, Engineering Division and the HydroCAD 10.00)an estimation of the peak rate of runoff from various rainfall events has been provided for both existing and proposed conditions. Through the implementation of a stormwater management system, the analysis indicates that the proposed site development reduces the rate of runoff during all storm events at the identified points of analysis. In our professional opinion, the spirit and intent of RRPB*

*3.4.2.16 is met as the difference in runoff (pre vs post) from the site is illustrated to be held on-site.*
PSC: Attenuation of peak rates is not functionally equivalent to retention of all runoff. The failure to comply is of concern given the discharge to a catchbasin-to-catchbasin drainage system.
*A&M: As previously stated and in accordance with MADEP requirements, the peak rate is decreased to abutting properties, additional measures have been added to further dissipate the flow as it exits the parcel onto the existing depression. As flow currently enters this offsite depress, from the subject parcel, the property rights of the downgradient abutter would not be impacted.*
**PSC:** Resolved**.**

**PART II – APPLE HILL STORMWATER**

**APPLE HILL – STORMWATER COLLECTION SYSTEM**

22. Analyze and map the municipal stormdrain system in Hunting Lane and determine if it is a catchbasin-to-catchbasin system.
*A&M: The municipal storm drain system in Hunting Lane is catch basin-to-catch basin and is shown on the site plans.*
PSC: The municipal drain system in Hunting Lane is a catchbasin-to-catchbasin system which inherently contributes to water pollution.
*A&M: See response to comment #23 below.*
**PSC: See Comment 23.**

23. If the municipal stormdrain system in Hunting Lane is a catchbasin-to-catchbasin system, revise the design of the on-site stormwater management system to eliminate or severely restrict any additional discharge.
*A&M: As mentioned above, the municipal storm drain system in Hunting Lane is catch basin-to-catch basin. As is acknowledged in the letter provided by PSC, the Project drainage system has been designed such that additional discharge is already restricted, since peak discharges are slightly reduced for each of the design storm events. In order to alleviate concerns of re-suspending material within the sump of the connected catch basin, we are proposing to install a new drain manhole, upstream of said catch basin. By doing this, in combination with reducing peak flow rates for each design storm event, we believe that any concern of re-suspending materials within the catch basins can be eliminated.*
PSC: Adding a drain manhole at the point of connection will lessen churning the sump at the point of connection. However, as soon as flow reaches the next downgradient

catchbasin churning of the sump and dissipation of contaminants will occur. The catchbasin-to-catchbasin system downgradient of the point of connection should be upgraded with a catchbasin-to-manhole system.
*A&M: As previously stated, the project proposes to install a drain manhole to alleviate concerns of re-suspending material within the sump of the connected catch basin. The project also reduces peak flow rates for all design storm events. Additionally, the development team will review the option to clean the catch basins within Hunting Lane, downstream of the project connection, prior to completion of construction.*
**PSC: Water pollutants added to stormwater in the public drainage system by churning and mixing contaminants in the catchbasin sumps correlates with both the peak rate and volume of discharge. For the 2-year frequency storm event, the volume of discharge from the site to the Hunting Lane system increases by 42%. For the 100-year frequency storm event, the volume of discharge from the site to the Hunting Lane system totals ¾ million gallons. We recommend that any favorable Decision include a Condition of Approval requiring that the Applicant provide a catchbasin to manhole system in Hunting Lane between the point of connection at the Project Site to North Main Street. Design of the system shall be subject to approval of the Director of Public Works.**

24. Determine the use to capacity ratio based on total system flow in the municipal drain system at the point of connection and limit the site discharge to the available capacity based on the hydrograph for the municipal system.
*A&M: As mentioned above, the project reduces the peak rate of runoff for each design storm event. For the 25-year event, which is the typical storm event used for sizing pipes, the Project reduces the peak flow rate directed to the connection point by over 26%. We are not aware of any existing problems with the municipal drainage system and therefore see no reason to reduce the flow rates any further.*
PSC: While peak rate attenuation is provided from on-site, this is achieved by detaining stormwater runoff and therefore delaying the time of peak flow. As the municipal system is likely to have a longer time of concentration, delaying the peak flow from the site is likely to decrease the offset between the time of peak flow of the on-site and off-site hydrographs and thus increase the peak rate of the combined off-site and on-site hydrographs within the municipal system. The use to capacity ratio in the Hunting Lane drain system must be determined as a prerequisite to an informed decision as to whether a direct connection can be allowed.
*A&M: The HydroCAD model indicates that the peak rate of runoff occurs earlier in the storm event for both the 10 and 100 year storm events. Therefore the above suggestion that "peak flow from the site is likely to decrease the offset between the time of peak flow of the on-site*

*and off-site hydrographs" is incorrect for these two storm events. The peak rate of runoff does occur later during the 2 year storm event, but by less than two minutes. Since this is the smallest storm design storm event, this offset is irrelevant. The offset for the 25 year storm event is barley over one minute, which is insignificant, given that the peak rate of runoff during the 25 year storm event is decreased by 25%, compared to the existing conditions. We therefore posit that any further analysis of the municipal system is unnecessary, seeing that it will not be adversely affected by the proposed site work.*

**PSC: Open item. A piped connection to the municipal storm drain system requires authorization by the Department of Public Works. Quantifying the use to capacity ratio as a basis is a reasonable basis for determining if a connection can be allowed.**

**APPLE HILL – BMPs**

**Partial Exfiltration Basin**

28. Provide the logs of all 4 test pits taken to date. Ensure that a minimum of three test pits are located within the footprint of Basin DB2, are logged by a Massachusetts soil evaluator, and are witnessed by the Town.

*A&M: Test pits were performed in the locations of DB-1 and DB-2, the locations of which are shown on the Grading & Drainage Plan. Test pit logs are provided in the Appendix of the revised Drainage Report. The estimated seasonal high ground water within the test pits was found to be too shallow to provide the separation necessary to allow for infiltration. Therefore both DB-1 and DB-2 will be lined and infiltration has been provided elsewhere onsite. The two basins have been revised to include a bioretention/filtration layer and underdrains. This provides additional storage and treatment for TSS and phosphorus.*

PSC: The elevation of estimated seasonal high groundwater is given in the test pits in inches referenced to the top of the test pit but is not shown in terms of an elevation referenced to the datum. By scale, ESHGW is actually 3± feet above the bottom of DB-1 and DB-2 causing buoyancy and likely damage to the liners. Please label the elevation of ESHGW at each basin and address buoyancy as required. Further, basin DB2 is labeled "retention basin" which should be corrected to avoid confusion.

*A&M: The ESHGW for each test pit was labeled on the plan and the label for DB-2 was corrected. Modifications have been made to the design of DB-1 and DB-2 in order to address buoyancy concerns. The liner in both basins was changed to a clay liner for additional weight and ease of installation (12" of clay for DB-1 and 4" of clay for DB-2). Another 12" of filter media was added to DB-1 to provide additional buoyancy resistance. The outlet controls for DB-1 were modified slightly to maintain peak rates of runoff. A figure has been added to the*

*end of the appendix of the Drainage Report to illustrate that the liner will be maintained in position.*
**PSC: ESHGW in DB-1 creates an upward buoyant force of 125 lbs./sq.-ft. and ESHGW in DB-2 creates an upward buoyant force of 170 lbs./sq.-ft. Although the weight per sq.-ft. is not provided for the filter media, the combined weight of the filter media plus the clay liner should resist overall buoyancy. However, the resistance to water intrusion particularly of the 4 in. clay layer in DB-2 is not provided. We recommend that any favorable Decision include a Condition of Approval requiring that prior to construction, the integrity of the 4 in. clay layer in DB-2 to preclude water intrusion be calculated.**

32. Provide a sediment forebay.
*A&M: A sediment forebay is not necessary as pretreatment is provided by the hydrodynamic separator style water quality devices.*
PSC: The hydrodynamic separator is not shown.
*A&M: DMH-4 and DMH-11 are indicated on the Grading & Drainage plan as "Water Quality" devices.*
**PSC: Resolved.**

**Infiltration Trench IS-1**

37A. Provide 3 test pits establishing soil texture at the interface between the fill and the in-situ soils. Although the bottom of trench is 2± ft. above existing grade, establish ESHGW (SWHB V. 2: C. 2: P. 97).
*A&M: We respectfully request that it be made a condition of approval to perform the requested test pits prior to construction. We believe this is a reasonable request seeing that the bottom of the trench is above existing grade. A note regarding these test pits have been added to the plan.*
**PSC: We generally do not recommend deferring soils testing. However, the scale of the system is relatively small and there should be alternative on-site locations where infiltration could be provided.**

37B. Remove A and B horizon soils beneath and extending at 1/1 from the outside edge of the trench outward.
*A&M: This has been noted on the Perforated Corrugated Metal Pipe detail, see sheet C-505.*
**PSC: Resolved.**

37C. The setback between the residential buildings and the trench is 10± ft. The required setback is 20 ft (SWHB V. 2: C. 2: P. 97).

*A&M: In lieu of a 20 foot buffer, an impermeable liner will be placed on the side of the trench to direct infiltration downward, to eliminate impacts to the residential buildings. See the Corrugated Metal Pipe detail on sheet C-505.*
**PSC: Resolved.**

37D. The setback between the slope of greater than 20% is 0 to 10 ft. the required setback is 100 ft (SWHB V. 2: C. 2: P. 97).
*A&M: In lieu of a 100 foot buffer, an impermeable liner will be placed on the side of the trench to direct infiltration downward, to eliminate potential bleed-out from the side of the slope. This liner will extend all the way down below the level of the A and B horizon soils, to be removed. See the Corrugated Metal Pipe detail on sheet C-505. Extending the liner below the existing grade results in the system effectively being separated from the 20% slope so that the above requirement no longer applies.*
**PSC: Resolved.**

37E. The setback between the Zone 1 and the trench is 140± ft. The required setback is 150 ft (SWHB V. 2: C. 2: P. 97).
*A&M: The infiltration trench is located outside the Zone 1 radius, as required, per SWHB V.2:C.2:P.97. This requirement is met.*
**PSC: Resolved.**

37F. Modify the IS-1 detail to show the inverts and outlet controls for runoff to enter the infiltration trench (SWHB V. 2: C. 2: P. 97).
*A&M: The inlet and outlet connections to the Corrugated Metal Pipe infiltration system will be made by standard corrugated metal pipe stubs and risers. The outlet is controlled by one 12" stub, located approximately halfway up the side of the pipe. Detail information for the infiltration system is provided on sheet C-505. Additional detail will be provided on the shop drawings which will be required prior to construction to verify compliance with the design drawings.*
**PSC: Resolved.**

37G. Prevent runoff from entering the trench until the site if fully stabilized (SWHB V. 2: C. 2: P. 98).
*A&M: A note has been added to sheet C-103 to address this comment.*
**PSC: Resolved.**

**<u>Dry Detention Basin</u>**

38. Provide at least one test pit to determine soils, depth to bedrock, and depth to water table.

*A&M: Test pits have been performed. Locations are depicted on the Grading & Drainage Plan and test pit logs are included in the Appendix of the revised Drainage Report.*
PSC: The elevation of estimated seasonal high groundwater (ESHGW) is shown in the test pit logs in inches referenced to the top of the test pit but is not shown in terms of an elevation referenced to the datum. By scale, ESHGW is actually 3± feet above the bottom of DB-1 causing buoyancy and likely damage to the liner. Please label the elevation of ESHGW at the basin and address buoyancy as required.
*A&M: See response to comment #28.*
**PSC: Resolved.**

**Proprietary Interceptors**

44. Provide TSS removal spreadsheets for each compete treatment train.
*A&M: The TSS removal spreadsheets for each treatment train have been provided as requested in the revised Drainage Report.*
PSC: The treatment trains for DB2 to IS-1 and DB1 to Jellyfish include TSS removal for a hydrodynamic separator but the hydrodynamic separator is not shown on the plans.
*A&M: DMH-4 and DMH-11 are indicated on the Grading & Drainage plan as "Water Quality" devices.*
**PSC: Resolved.**

**APPLE HILL – MASSACHUSETTS STORMWATER MANAGEMENT STANDARDS**

Standard 3: Loss of annual recharge to groundwater shall be eliminated or minimized through the use of infiltration measures including environmentally sensitive site design, low impact development techniques, stormwater best management practices, and good operation and maintenance. At a minimum, the annual recharge from the post-development site shall approximate the annual recharge from pre-development conditions based on soil type. This Standard is met when the stormwater management system is designed to infiltrate the required recharge volume as determined in accordance with the Massachusetts Stormwater Handbook. The required recharge volume must be recomputed including building roof areas (Comment 27). Infiltration of the required recharge volume must be recomputed based upon submission of test pits and related infiltration rates end the elevation of seasonal high groundwater (Comments 28 through31). Provide a time to drain calculation per Comment 33.

52. Recompute infiltration of the required recharge volume per Comments 28 through 31.
*A&M:*

PSC: No response provided. However, infiltration calculations are provided. Test pits are required to substantiate the infiltration calculations for IS-1. See comments 37A through 37G.

*A&M: The infiltration system will be placed in free draining material and the existing A and B horizons are to be removed and replaced with additional free draining material. This results in the bottom of the system being between 2 and 6 feet above native material. An infiltration rate of 1.02 inches per hour was assumed, based on soils found elsewhere onsite. This is a conservative assumption, considering the amount of separation to native material, and the backfill material will be free draining. We therefore, as mentioned above, respectfully request that these test pits be required as a condition of approval, to be performed prior to construction.*

**PSC: Resolved. See Comment 37A.**

**APPLE HILL – STORMWATER MANAGEMENT PROGRAM**

Impacts to adjacent properties caused by discharge of runoff must be authorized by ownership, i.e., drainage easements (RRPB §4.4.3.b.3) (Comment 0).

*A&M: .Adjacent property owner is also the applicant who is satisfied with the anticipated discharges.*

**PSC: The Applicant's team states that the well site is in separate ownership. The owner should provide easements to address future changes in ownership. It is anticipated that ownership will change with the well site transferred to a corporation or comparable legal entity who will license and operate the public water company serving The Pines Residences and Apple Hill Estates.**

55. Evaluate the option of holding all runoff on-site.

*A&M: As exists today, stormwater runoff exits the subject parcel and it is unrealistic to presume that this runoff would be required to held solely within the parcel limits ahead of any development. The intent of RRPB 3.4.2.16 is for the protection of adjacent properties or natural resources. Through the use of currently accepted methods (TR-55 Urban Hydrology for Small Watersheds, developed by the U.S. Department of Commerce, Engineering Division and the HydroCAD 10.00)an estimation of the peak rate of runoff from various rainfall events has been provided for both existing and proposed conditions. Through the implementation of a stormwater management system, the analysis indicates that the proposed site development reduces the rate of runoff during all storm events at the identified points of analysis. In our professional opinion, the spirit and intent of RRPB 3.4.2.16 is met as the difference in runoff (pre vs post) from the site is illustrated to be held on-site.*

PSC: While peak rate attenuation is provided from on-site, this is achieved by detaining stormwater runoff and therefore delaying the time of peak flow. As the municipal system is likely to have a longer time of concentration, delaying the peak flow from the site is likely to make the time of peak flow of the on-site and off-site hydrographs more coincident and thus increase the peak rate of the combined off-site and on-site hydrographs within the municipal system. The use to capacity ratio in the Hunting Lane drain system must be determined in order to identify the potential impacts of allowing connection of the on-site system to the Hunting Lane system.

*A&M: See response to comment 24 above.*

**PSC: Open item. The option of holding runoff on-site can be achieved by increasing infiltration, decreasing impervious materials, or a combination of the two. The feasibility of connecting to the catchbasin-to-catchbasin system in Hunting Lane has not been established.**