Chessia Consulting Services LLC

May 25, 2022

Daniel C. Hill, Esq.
Hill Law
Six Beacon Street, Suite 600
Boston, MA 02108

RE: Supplemental Professional Engineering Review
Proposed Comprehensive Permit
The Sanctuary
School Street, Manchester-by-the-Sea, MA

Dear Mr. Hill:

Chessia Consulting Services, LLC has performed a review of the revised plans and drainage calculations for the above referenced project relative to a Comprehensive Permit Application to the Town of Manchester-by-the-Sea Zoning Board of Appeals (ZBA). The plans were revised on May 5, 2022, with newly-submitted test pit data.

As you know, I submitted a comment letter to the Board dated April 13, 2022. The Applicant responded to my comments on May 11, 2022. This letter responds only to the "Applicant's Responses" that require additional comment. I have added the Applicant's Responses to my comments in *italic type*, and my current comments below that, in **bold type**.

The data reviewed included the following information:

Plans Entitled:

- "Site Development Plans for The Sanctuary School Street Manchester-by-the-Sea, MA" dated July 16, 2021 last revised May 5, 2022 consisting of 21 Sheets of Civil Site plans prepared by Allen & Major Associates, Inc. (Site Plans). Landscape Plans prepared by Bohler Engineering (Landscape Plans) and Architectural Plans prepared by Embarc (Architectural Plans) have not been revised according to the cover sheet.
- "Conceptual ADA Ramp Plan" dated 7/16/2021, prepared by Allen & Major Associates, Inc.
- "Conceptual Land Plan (Overall)" undated, prepared by Allen & Major Associates, Inc.

P.O. Box 724
Norwell, MA 02061
jchessia@chessia.com
781 378-1400 tel
781 424-9407 cell

Supporting Data:

- The Sanctuary at Manchester by the Sea, Manchester by the Sea, MA Application for a Comprehensive Permit Submitted To: Manchester by the Sea Zoning Board of Appeals, undated on the Cover Sheet. *Previously submitted.*
- "Drainage Report Site Development The Sanctuary at Manchester by the Sea Manchester-by-the-Sea, MA" dated 7/16/2021 revised 05/08/2022 prepared by Allen & Major Associates, Inc.
- Response Chessia Consulting Services, LLC letter dated April 13, 2021(sic) including comments from SLV inserted into the letter.
- Preliminary Narrative to Snow Storage dated March 24, 2022.
- Letter from SLV discussing proposed sewer system extension to the project site.
- Table of Waivers from Zoning Bylaw dated March 23, 2022.

1. Existing Conditions – the Project Site

5. Based on the testing performed over a limited portion of the site, soils are deeper and have a higher hydraulic conductivity, than assumed for drainage runoff calculations. The Report claims that since they did not test other areas, they used the most restrictive and highest runoff potential soil assumptions. This is not consistent with on-site testing performed. It is recommended that additional testing be performed on site to both establish the soil conditions overall and any potential for infiltration at other locations. I recommend that the ZBA request that an agent of the Town witness any future testing proposed and that any testing be performed by a Soil Evaluator licensed in the Commonwealth of Massachusetts.

Applicant's Response 5/11/22:
The applicant has updated the drainage report model to include the areas with higher hydraulic conductivity. The applicant has provided sufficient test pit information to confirm the soils for the drainage runoff calculations. The currently non-accessible areas of steep outcrops and the low poor drainage areas are correctly modeled as HSG D. The applicant is not proposing any additional test pits at this time. All test pits were performed by Soil Evaluator licensed in the Commonwealth of Massachusetts as noted on the soil logs. In addition, the soil logs performed on 11/18 & 11/19/2020 were witnessed by Paul Blain a senior hydrologist with the MassDEP. The applicant will be conducting additional soil testing post permitting when the entire site is characterized as part of the preparation of construction documents.

Chessia Comment 5/24/22:
Partially addressed. Although the runoff curve number was appropriately adjusted in locations where test pits revealed permeable soils, more test pits should be excavated across the site given the variable soils and topography to better characterize recharge rates for the HydroCAD modeling. The Response

states that they will test other areas later but since this is a critical aspect of the entire design the basis for the soils should be determined prior to issuance of a Comprehensive Permit.

II. The Proposed Project

7. Water Utilities - The plans indicate that water would be brought to the site from School Street and an extension of over a mile in length, including the on-site portion, would be required to connect to the existing water main. The capacity of existing water main feeding the proposed system should be determined as part of this Application.

Per discussions with the Town DPW and information provided by the municipality, the Town has adequate capacity to service this project. The applicant is continuing to work with the DPW to assess infrastructure needs specific to the proposed project.

Comment remains. Although the Response states that the municipality has the capacity to serve the project, this project does not propose a simple connection to the existing system. It is proposed to implement an expansion of the served area by installing nearly 3,700 feet of new pipe together with a booster station and on-site service and fire protection pipes. Further, given that the water line extension would occur on the outer reaches of the existing distribution system, there is cause for concern that water pressure may be not be adequate. When a simple water service connection is proposed, a flow test can usually be accomplished by opening a nearby hydrant. That is not possible here. The Board should require a professionally-prepared water capacity analysis that models the predicted water pressure at the project site. See Comment 12 below.

8. Sewer Utilities – The revised submittal proposes an extension to the existing sanitary sewer system. The plans indicate a proposed pumping station on-site with a force main proposed in School Street. The application does not include any information on the proposed extension other than the force main label, and although it is stated that the treatment plant has capacity, the capacity of existing sewer mains at the tie in point should also be determined as part of this Application.

Per discussions with the Town DPW and information provided by the municipality, the Town has adequate capacity to service this project. The applicant is continuing to work with the DPW to assess infrastructure needs specific to the proposed project.

Comment remains. Although the Response states that the municipality has the capacity to serve the project, this project does not propose a simple connection to the existing system. It is proposed to implement an expansion of the served area by installing approximately 3,400 feet of new pipe together with a pump station and on-site collection system. It was disclosed at the last Board hearing that a sewer capacity analysis will not be available to the Board for review until after it needs to close the public hearing under Chapter 40B regulations. Given that the Applicant only recently changed its wastewater arrangements from an on-site system to a municipal sewer extension, it is unreasonable for the Applicant to refuse to extend the public hearing deadline to accommodate a peer review of the sewer extension plans, including an evaluation of the capacity of the existing municipal system.

9. Stormwater Utilities – The Stormwater design has been revised to have one subsurface infiltration system and two open bio-retention/rain gardens. The collection system includes standard catch basins with storm sewers and manholes as well as proprietary treatment units with a swale proposed along one side of the road to collect slope and walkway runoff. There is also a roof drainage collection system, listed as TBD (to be determined). The sizing of the collection system should be done at this stage with a performance requirement given to the mechanical engineer that is designing the roof collection system, as the entire roof in all storms is assumed to connect to the subsurface system. The Utility Plan indicates that gas, electric and cable services are available in School Street and would be extended into the site along the access drive.

The Response does not take exception to the above.

I note that the roof drainage pipe system has been sized, the building design will need to address the collection system sizing.

III. General Design Comments

10. Steep Slopes and Walls – The site has extremely steep slopes and shallow depth to ledge based on a review of available data. There are proposed retaining walls up to 28 feet high. Some walls are within 5 feet of the property line. Some of these walls are proposed to be installed on existing slopes of steeper than 3:1. There are sections with up to three terraced walls with a total height of up to 42 feet. The details on the plans indicate modular block walls with geotextile reinforcing tying back into the slope. It is not specified how far back the reinforcing will extend. There are utilities including water, wastewater leaching and stormwater infiltration close to these walls. It should be demonstrated to the Board that the design is feasible for these walls on this Site as they are an integral part of the plan.

As is standard practice, the applicant will prepare stamped retaining wall design plans for the review by the building department as part of the building permit application.

The Response states that retaining wall plans will be submitted with the building permit application. This may be reasonable for some sites, but it is not unreasonable for the Board to have an understanding of the feasibility of the proposed walls given the unusual heights and conceptual design here. Fully engineered stamped drawings may not be required but sufficient detail to determine the feasibility of the proposal should be submitted to the Board.

11. Foundation Drain - The plans include a detail of a foundation drain but do not indicate where this drain is proposed to discharge. Foundation drains for a building area this large can have significant flows depending upon groundwater conditions, etc. The foundation drain outlet(s) should be indicated on the plans and designed for outlet protection and impacts from this system assessed.

The building is located on the top of the hill and has been designed to provide positive pitch away from the building. It is unlikely to encounter any significant flows and require a foundation drain. If required, all building foundation drains will be tied into the onsite infiltration system.

The Response states that if required the building foundation drain would be connected to the stormwater infiltration system. This is not an acceptable design; if there is groundwater flow to the infiltration system, it will impact capacity and functionality. Infiltration systems for stormwater are designed to fill and drain, and dry out between storms. A steady flow of groundwater will interfere with that function.

IV. Water Supply

12. It is proposed to construct over a mile of dead-end water main to service the Site. The pipe is proposed to be 8-inch ductile iron. There is no data on the available flow, pressure, etc. to determine if this proposal meets Massachusetts DEP water supply requirements. In addition, the project proposes five (5) on-site fire hydrants. Flow testing and hydraulic analysis of the proposed system should be performed to determine that the project will be able to meet requirements for safe pressure and flow both for domestic use and fire protection.

The applicant is proposing an onsite booster pump to meet the requirements for safe pressure and flow for both domestic use and fire protection. The boosted pump design and approval is under the jurisdiction of the MassDEP with review by the Town DPW. That review and approval process cannot begin until a local approval for a project has been obtained.

Comment remains. This is not a particularly onerous task to perform. Final designs may not be required but a general understanding of what is being

proposed and a demonstration of viability should be provided to the Board, as it would if the Applicant were not operating under Chapter 40B and were seeking Water Division approval of a water service extension and connection. This is a local permit that is subsumed within the comprehensive permit, and therefore the Board has jurisdiction to review these details.

13. The DPW should comment on the suitability of the proposed dead-end water main to meet DEP requirements. Long dead-end water mains can be problematic due to stagnation, pressure drops due to emergency uses, etc. The Fire Chief also should comment on the suitability of the proposed system for public safety purposes.

V. Sanitary Sewer

14. The Applicant no longer proposes to construct a wastewater treatment facility (WWTF) but intends to connect to the municipal sewer system. The flow is reportedly 28,000 gpd. The Application should include sufficient data for the Board to review this aspect of the project including preliminary pumping station design data, existing sewer collection system capacity, etc. This would be a significant contribution to flow at the connection point and the pumping rate proposed, pipe size, etc. should all be addressed sufficiently for the Board to make a determination on the suitability of this proposal.

The applicant is continuing to work with the DPW to assess infrastructure needs specific to the proposed project.

Comment remains. Final designs may not be required but a general understanding of what is proposed and a demonstration of feasibility should be provided to the Board, as it would if the Applicant were not operating under Chapter 40B and were seeking Sewer Division approval of a sewer service extension and connection. This is a local permit that is subsumed within the comprehensive permit, and therefore the Board has jurisdiction to review these details. The DPW's role is advisory, and ultimately the Board steps into the shoes of the DPW to allow the sewer extension and connection.

VI. State Stormwater Management Regulations

The DEP Stormwater Management Regulations consist of ten (10) broad stormwater standards. This section of the correspondence discusses each standard, and identifies whether the submittal complies, does not comply, or if additional information is required to demonstrate compliance.

The DEP Handbook has extensive requirements that describe appropriate types of BMP's to use based on applicability for each Standard, suitability for specific locations, etc. The Application appears to have ignored many of these aspects of the Handbook. Projects

should be developed by first reviewing what types of BMP's are suitable and where they can be located. After this effort a plan should be developed to properly implement the proposed BMP's.

Standard 1 – Untreated Stormwater

16. The Project's stormwater system includes one new point source discharge and connection to an existing culvert with associated discharge point. There are other issues as noted below, which would impact flows at some of the outlets. The submittal includes the required computations for sizing outlet protection at discharge points. In the case of outlet FES-5, which discharges at the property line and 5-10 feet from wetlands, the design is inconsistent with the detail as over 10 feet of grade change is indicated on the plans but the base is proposed to be level.

    FES-5 was revised such that the discharge area and scouring protection is level.

    The flared end outlet has been removed and now a spillway further up the slope is proposed. This does not address the issue as flow over a steep unprotected slope is prone to erosion.

17. This design will likely result is erosion and scour offsite as the stone stops at the property line. The existing outlet should, at a minimum, be inspected for condition and if there are erosion or scour issues mitigation should be required. It is unclear that the Town has or will grant permission to install a new pipe for this project in the public way, typically an easement from the Town would be required.

    An easement is not customarily required for a utility connection in a public right-of-way. In addition to approvals issued under c. 40B, the Applicant will work with the Town to ensure work within a right of way is consistent with standard practices.

    On Plan Sheet C-103.2 (Drainage Plan), the Applicant is proposing to pipe excess runoff into an existing culvert that runs under School Street, and which discharges on the east side of School Street. The Applicant should explain what legal right it has to install a new drain pipe and manhole in a public way without an easement, and introduce a new concentrated flow into the public way. The Town should not be responsible for on-going maintenance of this pipe and manhole. I recommend that the Board require a proper outlet be designed for the Bio-retention area.

Standard 2 – Post Development Peak Discharge Rates

18. The HydroCAD model assumes that the Site consists of all Hydrologic Soil Group (HSG) D soils based on NRCS data. The information provided for on-site testing,

although performed well before the initial submission and apparently withheld from the Application, indicates differing, more favorable soil conditions.

The applicant has updated the drainage report model to include the areas with higher hydraulic conductivity.

Partially addressed, the model assumes that an area approximately 50 feet beyond the soil test locations would be similar soils as observed in the test pits. The Response states that they will test other areas later but since this is a critical aspect of the entire design the basis for the soils should be determined prior to issuance of a Comprehensive Permit.

19. The design includes a large subsurface recharge system consisting of 96-inch pipes that would hold and infiltrate 32,555 cubic feet (243,511 gallons) in a 2 year storm and 63,670 cubic feet (476,252 gallons) in a 100 year storm. The bioretention/raingarden (2P in the model) also recharges volume runoff. The model uses an infiltration rate of 2.41 inches/hour based on a loamy sand. Obviously if the soils are suitable for this recharge the correct HSG should also be used in these areas for runoff computations as well.

The applicant has updated the drainage report model to include the areas with higher hydraulic conductivity.

Refer to comments under Comment 18.

20. Only one test indicated ledge at 24 inches below grade. There are certainly ledge outcrop and shallow to ledge areas but the soils encountered are more permeable and the limits of more pervious soils should be determined and the HSG corrected to reflect actual conditions on the site.

The applicant has updated the drainage report model to include the areas with higher hydraulic conductivity.

Refer to comments under Comment 18.

21. Use of HSG D soils overestimates existing runoff where more permeable soils are present on the site. Based on available results, there has been insufficient testing to determine soil conditions across the site.

The applicant has updated the drainage report model to include the areas with higher hydraulic conductivity.

Refer to comments under Comment 18.

24. Under the proposed case, sub-area E5 is eliminated as the low area is proposed to be filled in. The other four general discharge areas are the same but the flow paths are not consistent with the existing in some cases. As noted under Existing Conditions, the model should assess impact to the vernal pool to the east of the proposed building. It is assumed that all runoff flows to the culvert under School Street.

The design has been updated to provide a subwatershed to the vernal pool to the east of the proposed building.

The watershed plan has been revised to map flow to the central vernal pools as one additional subarea. The area has also been extended to the east side although it appears incomplete relative to offsite flow into the vernal pool areas.

In addition, the HydroCAD analysis assumes that the flow to the vernal pools just directly connects to the 18-inch culvert. However, a vernal pool would be an area of ponding and should be reflected as such in model. The submittal does not include any further survey data to define the overflow outlets, contours for the ponding areas, initial water level conditions for the vernal pools etc. The limit of each of the vernal pools may be the initial water level for the model, although vernal pools are a seasonal phenomenon in the spring during high water periods and may not be representative of typical conditions for this type of model.

The revised design is an inadequate model of proposed conditions and should assess each vernal pool based on actual site characteristics. It is likely that the two vernal pools are separated by some topography or they would not have been identified as distinct areas.

25. The proposed conditions assumes that the slope between the access road and the building (west of the building) would be developed with a "good brush" condition. This is a questionable assumption as it takes some effort to develop soil conditions associated with "good brush". This condition has a lower runoff curve number than the existing "good woods" condition and would underestimate runoff.

The soil condition for the slope between the access road and the proposed building was revised from "good brush" to "dense grass."

Unaddressed. The "good brush" condition remains in the calculations and in fact has been added to area P-1.

26. Open stormwater basins (bioretention and/or rain gardens in the model would be inundated with water during storms and should have a runoff curve number of 98 for water. Area P6 assumes that the impervious area is disconnected and would be

adjusted by uptake through flow over vegetated areas. The vegetated area appears to be swales between the walls. Runoff in this area would flow over the 5-foot wall, and then the 13.5-foot-high wall at the transformer. I note that there is an error in the time of concentration in P6, and Bermuda grass is a southern species that does not grow in New England.

The design has been updated to provide runoff curve numbers of 98 for the open bioretention areas and removed the reference to Bermuda grass.

Partially addressed. The calculations include the runoff curve number for water in open basins and eliminated the Bermuda grass from the time of concentration calculations. The unconnected impervious condition remains and should be removed since flow would be into the swale.

27. The storm sewer system is designed for the 25-year storm; it is not a reasonable assumption that all of the runoff in a 100-year storm would be conveyed to the various systems since the pipe and inlet sizing has not been designed for that case. The design should assess the capacity of inlets and pipes, in particular where catch basins are located on a slope, where bypass would discharge to a different system than assumed in the HydroCAD calculations. This Site is on a very steep hill with a constant steep slope from the building entrance on the east, all the way around to School Street at the northerly end. Catch basin inlets along this slope discharge to three different systems and bypass of one would impact flows to the next system. Capacity of the inlets in particular is a critical factor to be considered.

Catch basin inlets calculations for the 100-year storm have been provided for the entry driveway; pipe sizing calculations were revised to reflect the 100-year storm intensity (10.3 inches/hour).

The design now proposes double grate catch basins (4' of grate perpendicular to gutter line) along the access roadway on both sides. Based on a review of the grate capacity analysis it does not appear that the flows from the pipe capacity analysis for the 100-year storm were used for the few catch basins analyzed. This issue remains to be properly addressed.

28. The use of bioretention areas and rain gardens for rate control is not consistent with the DEP Handbook and Specifications. Volume 2, Chapter 1 provides a description of the selection process for appropriate BMP's. Appropriate BMP's for rate control are listed on page 29 of Volume 2, Chapter 1. In addition, the Specifications for bioretention areas and rain gardens cited in Volume 2, Chapter 2, page 23 of the Handbook includes a Table that lists the applicability for Standard 2 as N/A (not applicable).

The bioretention areas are provided to control Water Quality and Quantity as recommended in the DEP Handbook.

Not addressed. We agree that bio-retention area/rain gardens are for Water Quality and Quantity, but the issue is that the Applicant is using these systems inappropriately for runoff rate control. Page 28 of Volume 2, Chapter 1 describes the types of Quantity controls various BMPs provide as listed in Table 2-2 on page 29 of Volume 2, Chapter 1.

29. In addition to the basic use of these systems, the design and calculations are not consistent between details and the HydroCAD calculations. Sheet C 505 has two details, one for a "Typical Filtering Bioretention Area" and one for a "Rain Garden". The Plans identify both the area to the north of the access road (2P in HydroCAD) and at the south side of the entrance (RG-2 in HydroCAD) as "bio-retention area/rain garden". The details are quite different as the Typical Filtering Bioretention Area has an impervious liner where the Rain Garden is designed to exfiltrate.

The design and calculations have been revised to clarify

Partially addressed. The details now distinguish between the two different systems although the details are not consistent with the HydroCAD calculations relative to the infiltrating bio-retention area. The only outlet is an emergency spillway, located above a steep slope and utilized in all storms greater that the 2 year storm. The Board should require a normal outlet appropriately located. The detain indicates a beehive grate outlet. The rain garden at the entrance is modeled with a standard flat grate with 2 inch square openings, although the detail again has a beehive grate.

30. In the case of the northerly system (2P) the bottom of the media and stone, i.e. the exfiltration surface below the treatment zone, is at EL 54.7 +/- and ledge is listed as EL 55 in Test Pit 14. The design includes exfiltration although it is not going to occur in ledge. The rate in the HydroCAD calculations is for loamy sand, although the test pits encountered fill and sandy loam; even if exfiltration were feasible, the rate is over estimated. The plans and details do not provide sufficient data on elevations to construct the system properly to match the values in the calculations.

The design has been adjusted to provide adequate separation to Test Pit 14.

The system has been raised to EL 57, which provides the minimum separation of two feet and uses a sandy loam infiltration rate consistent with soil conditions. Please see Comment 37 below.

32. The detail indicates a 12-inch beehive grate yet the model uses a flat grate with 16 2-inch square openings. The overflow outlet is located within the Town right-of-way. The project should provide sufficient space to install BMP's within the property.

The detail was revised to indicate a 2 24" x 24" grate. The proposed project will alter the right-of-way significantly by installing the entrance driveway. The plan has been revised to illustrated the BMPs completely out of the right-of-way.

Partially addressed. See Comment 17 above concerning the proposed concentrated flow into School Street. Also, the outlet structure details on the plans are internally inconsistent.

33. The DEP Handbook also lists subsurface structures as not suitable for rate control in the same table as listed above, 29 of Volume 2, Chapter 1. The Specifications for subsurface structures cited in Volume 2, Chapter 2 page 103 of the Handbook also includes a Table that lists the applicability for Standard 2 as N/A (not applicable). Although it is understood that frequently these structures are used for rate control purposes and infiltration trenches are listed as suitable for rate control, the design of these systems should comply with setback requirements for infiltration trench systems at a minimum when used for this application. In this case there is both a retaining wall and steep slope (greater than 20% slope) within 15 feet of the system. The exterior face of the retaining wall is EL 94+/- and the base of the stone for the system is at EL 101. The maximum water level in the system varies from 102.82 in the 2-year storm to EL 106.78 in the 100-year storm. It is likely that there would be breakout through the wall or discharge to the proposed wall drainage system as indicated in the details for the wall. Soil testing indicates both sandy loam and loamy sand in the small part of the system area that was tested (testing was limited to the southeastern corner of the system). The slowest Rawls rate should be used for the design to comply with DEP Handbook requirements. In this case additional testing at the north and west sides should be performed. The limit of the geotextile reinforcing is not indicated but should also be a factor in the design. The submittal should include site specific details, cross sections, etc. This is a critical component of the stormwater management system and it does not appear to have been well thought out relative to requirements and impacts.

The subsurface infiltration system is provided to control Water Quality and Quantity as recommended in the DEP Handbook. The subsurface infiltration system and retaining wall was designed using the MassDEP "Guidelines for Design and Installation of Impervious Barriers and Slope Stabilization for title 5 Systems" to address the breakout concern. The Rawls rate used for UIS-1 was revised from a loamy sand (2.41 in/hr) to a sandy loam (1.02 in/hr).

The Response claims that the design is based on Title 5 guidelines for a breakout barrier. The use of a breakout barrier consistent with a Title 5 septic design is not consistent with Stormwater Handbook requirements. These are completely different systems with different functions. This is a significant issue as two very large infiltration systems are designed to retain and infiltrate all runoff from all storms excepting a small discharge in the 100 year storm. No supporting data of any kind has been included in the plans or calculations.

As noted previously site-specific cross sections should be provided for the Board to evaluate this design.

Th plan and details for the outlet control structure (OCS 3) for the 96 inch pip system is inconsistent with the calculations. The systems as drawn on the plans are linked by pipes and an overflow weir set at EL 107. Anytime the water level in either system is above EL 107.0, flow would be directed to the other system. The easterly chamber system would exceed EL 107 in the 10 year storm and greater and the pipe system would exceed EL 107 in the 100 year storm. The model or plans and details should be revised to correct this issue.

Additional issues with the model in the May submission:

- **Insufficient testing for the new proposed system has been provided. The one test pit within the system encountered ledge at 58 inches and this test pit was at the lower end of a very steep slope. It is unclear that this is a feasible system to construct as proposed. The state Stormwater Standards require a minimum of two test pits for each system. Although it is acceptable to install fill over pervious soils, the data should document that sufficient suitable soils exist in this area.**
  The HydroCAD (computer simulation) model has fundamental input errors. For example, the model is showing more flow out of a system than enters it, indicating an input error at some stage of the model.

Overall, the Applicant has not provided sufficient documentation to demonstrate compliance with Stormwater Standard 2.

Standard 3 – Recharge to Groundwater

34. This standard requires recharge of runoff to compensate for the increase in impervious area. The submittal claims that the Site is not suitable for recharge due to poorly drained soils and high groundwater and has only complied to the extent practicable. As noted insufficient testing has been performed to justify this claim. Although there is exposed ledge and shallow to ledge areas, the Applicant should perform sufficient testing to demonstrate that there are no other areas available. In particular, infiltration should be provided to the vernal pool to the east of the building if feasible.

The checklist has been updated to note that the recharge BMPs have been sized to infiltrate the Required Recharge Volume. The applicant has updated the design to provide a recharge system that is directed to the same subwatershed as the vernal pool.

The submittal no longer claims the site is not suitable for recharge, but still claims that all but the few areas where soil testing has occurred are D soils. D soils have the lowest required recharge volume. As noted, if more permeable

soils are present on the site the required recharge would increase and the design would need to be revised to reflect actual conditions.

35. The recharge calculations are based on the entire site consisting of HSG D soils, although as noted in the Report, soils are not HSG D in the areas tested. The submittal needs to quantify the limits of soil types to accurately estimate required recharge. This calculation should be based on each receiving area.

The applicant has updated the drainage report model to include the areas with higher hydraulic conductivity.

Recharge calculations assume all HSG D soils where impervious areas are proposed. As noted, there has been insufficient on-site soil testing to justify this claim.

36. Where vernal pools are present it is critical to maintain the water balance. In addition, the existing site has a large recharge area in sub-area E5. This volume should be included as part of the overall requirement as this low area is completely eliminated. The Applicant should review the requirements of Volume 3, Chapter 1 of the DEP Handbook, in particular page 17 that discusses impacts for vernal pools due to redirected recharge. The design does not meet this requirement.

The existing HydroCAD model accurately indicates the recharge area in sub-area E- 5. The applicant has updated the design to provide a recharge system that is directed to the same subwatershed as the vernal pool.

There are three vernal pools in or proximate to the work proposed. One is in Wetland D where it is proposed to reduce direct runoff volume significantly. Infiltration is proposed in the bio-retention system, which would likely contribute baseflow to the vernal pool 100 feet to the west. In the center of the site are two other vernal pools, although the submittal treats them as one. Each vernal pool should be modeled and additional topographic data is required to define the limits of each. The revised system proposes recharge near the southern vernal pool. In the prior submission the wetlands and vernal pools were not included in the analysis. The revised data, while an improvement, does not provide adequate information to determine that the project complies with state stormwater requirements.

As noted under Standard 2, although there appear to be suitable soils under the subsurface infiltration system, slope conditions, retaining wall design, etc. impact the practicality of the design.

37. Based on the data provided, the northerly bioretention area/rain garden would not be suitable as designed due to ledge. Soil conditions also vary from the infiltration rate used. There appears to be sufficient soil depth but it is proposed to excavate to

ledge removing most of the available soil. It is likely that less than four feet of soil separation could be provided, which would also require a mounding analysis.

The design has been revised to remove the system from the ledge. A mounding analysis is required when a system has less than four of separation and the recharge system is proposed to attenuate the peak discharge rates. The northerly bioretention area is not proposing to attenuate peak discharges so no mounding analysis would be required.

The system has been raised with the base of the stone at EL 57, two feet above the ledge. As this system has just two feet of separation from ledge and the system is proposed to be used for runoff rate control in the 10-year and greater storm (nearly a 50% rate reduction through the system in a 10-year storm), a mounding analysis is required and has not been performed. I disagree with the contention in the Response that the system is not proposed to attenuate peak discharge rates; it is in the model and the results indicate rate reduction due to this system. The testing in this system is listed as "Preliminary" and complete logs were not provided. The logs omit information on soil color, structure, consistency, and redoximorphic features. The Board should require additional testing for this system.

38. The drawdown calculations should be for the 100-year storm where infiltration is part of the rate control component, or at a minimum drawdown time for the volume below the outlet should be used. The basis for the volumes provided has not been explained in the submittal but is a significantly lower volume than the storage below the outlets.

Drawdown calculations were revised utilizing the 100-year storm volume and using 1.02 in/hr. infiltration rate. Storm events were extended from 30 hours to 72 hours to show that the system is empty within the required time.

Calculations have been provided for two of the systems. However, the plans and calculations do not match relative to the design. There are no calculations for system "UIS 2" as required. The recharge volume used for the bioretention area is much lower than the HydroCAD infiltrated volume; if the correct volume is used the system would require 121 hours to drain and does not comply.

Under existing conditions there is a large depression on the site that currently collects and infiltrations runoff. This area is identified as Subarea E5 in the Report. It is proposed to fill this area in completely, which would also result in a loss of recharge over existing conditions. The recharge volume lost by filling in this area should be included in the recharge calculations as the DEP Stormwater Regulations require compensation for reduced recharge.

Standard 4 – 80% TSS Removal

This standard requires that runoff be treated to 80% removal of total suspended solids (TSS) prior to discharge.

39. The submittal erroneously combines treatment trains for the northerly bioretention area/rain garden. This area would receive direct runoff from several catch basins that do not flow through the subsurface infiltration system. Treatment trains should be broken out based on the areas.

    TSS removal calculations were revised to include a table for all treatment trains.

    Partially satisfied. The treatment trains have been corrected, although one should also be provided for UIS 2 or if the same as UIS 1 it should be listed on the form.

40. Catch basins can provide 25% TSS removal provided that the tributary area is .25 acre or less. Most of the catch basins may meet this requirement but the Applicant should document the area tributary complies.

    All catch basins meet the required area minimum. CB-15 is the only catch basin with greater than 0.25 acres flowing to it and all of the area is pervious

    The Response states that all catch basins meet requirements but the supporting documentation has not been provided.

43. Bioretention areas and Rain Gardens are credited with 90 % TSS removal subject to proper design. As noted above under Standard 2 in particular there are several issues to address in the design.

    The applicant's design meets the requirements of Standard 2.

    See comments above under Standard 2.

    Insufficient data has been provided to confirm compliance with Standard #4.

Standard 6 – Protection of Critical Areas

Based on a review of MassGIS data and information in the submittal and other supplied information, the Site would be in a critical area as tributary to both a Cold Water Fishery and Certified Vernal Pools.

45. The submittal proposes an outlet within 100 feet of a vernal pool and does not comply with this Standard. In addition, a habitat evaluation must be performed and potentially a Thornthwaite water balance analysis for all vernal pools to confirm that there would not be an impact.

The MassDEP Stormwater guidelines note that the stormwater best management practices (BMPs) should be set back 100'. The stormwater outlet is not considered a BMP. The design does comply with this standard. Water budgeting analysis is not required if the recharge is directed to the same watershed where the impervious surfaces are proposed. The project is proposing recharge be directed to the same watershed where the impervious surfaces are proposed. Therefore, it is not required.

It is questionable having a large spillway directly at the 100 foot buffer to the vernal pool is adequate protection.

The submittal does not comply with Standard #6.

Standard 8 – Erosion/Sediment Control

This Standard requires that an Erosion and Sedimentation Control plan be developed for the Site.

46. In this case a NPDES SWPPP will be required. As a detailed construction management plan has not been provided at this time, I have not reviewed this aspect in detail.

It is not customary to prepare a SWPPP without a general contractor's input. The applicant will prepare a SWPPP prior to the submittal of a building permit and would anticipate a condition of the Comprehensive Permit requiring as much.

The Response indicates that the Applicant would like to defer this aspect until submission of a building permit. For a site of this magnitude in a sensitive area The Board should require a construction management plan with sufficient detail to assess how the project will impact the area. The Board should require that a draft SWPPP be submitted for review and approval prior to the close of the hearings. The SWPPP should include detailed data on staging including parking, trailer locations storage areas, etc. in addition to stockpile locations, temporary basins etc.

Standard 9 – Operation and Maintenance Plan

This standard requires a plan for long term Operation and Maintenance (O&M) of stormwater BMP's.

47. A Long-Term Pollution Prevention Plan was included in the Report. In this case, aspects of the construction phase are included with the long term plan. There should be separate plans, as the long term plan will be transferred to the homeowners association and the construction phase involves different BMP's etc.

The following structural BMP's are proposed:

Catch basins – Catch basin O&M complies with DEP requirements.

Bioretention areas – The O&M should specify monthly inspections and include when to replace all of the media.

Proprietary treatment units – The manufacturers maintenance manual should be included in the O&M.

Subsurface Systems – No data on maintenance of this critical system, which will be difficult to maintain, has been provided.

The O&M plan can be provided as a standalone document at such time it needs to be transferred to a property management company. The applicant is agreeable to providing this as a condition of approval prior to the final occupancy permit, as is customary.

None of the above issues have been addressed.

48. There is a Plan included with the O&M that identifies, snow storage areas (which appear to be limited on this site), but the plan should also include all BMP locations.

The Snow Storage Plan was revised to show all BMP locations.

Not addressed, the Snow Storage Plan only shows snow storage not all BMPs.

The Operation and Maintenance Plan needs additional information as discussed above.

<u>Standard 10 - Illicit Discharge</u>

49. The DEP Checklist states that an illicit discharge statement has been provided, but it was not found in the Report.

A signed and executed Illicit Discharge Statement was included with the revised Drainage Report.

Partially addressed, an unsigned illicit discharge statement has been included.

This report is for your use and for submission to the Town of Manchester-by-the-Sea land use agencies only, and provides no engineering, planning or other advice that may be relied upon by any other party. If you have any questions please do not hesitate to contact us.

Very truly yours,
Chessia Consulting Services, LLC

John C. Chessia, P.E.