Chessia Consulting Services LLC

October 25, 2021

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

RE: 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 preliminary review of the above referenced project relative to a Comprehensive Permit Application to the Town of Manchester-by-the-Sea Zoning Board of Appeals (ZBA). This review has been done at the request of our client, the Manchester Essex Conservation Trust. At this time I have reviewed the project for overall issues including utility services, stormwater disposal, general civil site design and documentation of existing site conditions and constraints.

For background, I have been a registered professional engineer in the Commonwealth of Massachusetts continuously since 1992. My practice specialty is general civil engineering in relation to real estate development projects, including stormwater and wastewater engineering. I have designed comprehensive permit projects, wastewater treatment plants and numerous other site development projects. I have assisted other engineering companies with stormwater designs and quality control reviews. I have performed hundreds of peer review assignments on behalf of municipal boards and commissions across the Commonwealth with recent projects in Norwell, Weston and Nantucket.

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 consisting of 29 Sheets including 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).

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.

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I. Existing Conditions – the Project Site

The Project Site is located north of Route 128, west of School Street and east of Old School Street. The property is undeveloped woodland consisting of 1,015,729 square feet (23.32 acres). There are wetland resources including Bordering Vegetated Wetlands to the north and northwest as well as through the central part of the site that appears to flow to the northeast part of the site. The central wetlands contain two vernal pools. There is also an area listed as Isolated Land subject to Flooding (ILSF) that also contains a vernal pool. The site has frontage along School Street in the northeast part of the property and also has frontage on Old School Street to the west but Old School Street does not appear suitable for access purposes.

Topographically, the site is generally comprised of high areas with very steep slopes to the property edges, the central wetlands or the ILSF. There is also a confined depression on the west side of the site and a steep valley on the east side sloping off site.

As noted there are vernal pools on site, some of these are listed by the Natural Heritage Endangered Species Program (NHESP). The Site is not identified as being in a Zone II of water supply wells or a Zone A to a surface water supply by MassGIS mapping, but is within the Zone III for the Town's Lincoln Street well, and therefore within the Surface and Ground Water Resource Protection Overlay District under the Zoning Bylaw. The Site is tributary to a Cold Water Fishery according to MassGIS. The Site is also in the Town's Water Resource Protection District.

Based on a review of data in the Drainage Report ("Report"), included within the Application, and on the Natural Resource Conservation Service (NRSC) website, the parcel is identified as containing Chatfield-Hollis-Rock outcrop complex soils over most of the site with an area of Udorthents in the northwesterly part of the site. Chatfield soils are considered Hydrologic Soil Group (HSG) B (moderate hydraulic conductivity), Hollis soils are considered HSG D (very low hydraulic conductivity), and rock outcrops are essentially impervious excepting minor flow through fractures. Udorthents are altered soils, in this cased described as fill over either sands and gravel or coarse friable till. The plans submitted with the Application did not have any test pit locations and no test pit data was found in the Application. I note that prior plans filed with the Town for other purposes did indicate some test pit locations but did not include any test pit logs. In general the Site is reported as shallow to ledge with exposed ledge in some areas. In this type of geologic area there are frequently areas with some soil cover that may include soils with moderate to higher hydraulic conductivity, together with areas that have minimal soil and would have a high runoff potential. It is standard engineering practice to perform some testing to determine actual soil conditions on the site for both stormwater and in this case wastewater purposes - an onsite wastewater treatment facility including associated effluent disposal areas are proposed for the project.

I recommend that the ZBA require that the Site Plans include a sheet showing all of the test pit locations as noted on previous plans submitted to the Town together with all test pit logs that contain information on soil types and groundwater elevations. It is also

recommended that additional testing be performed on site to both establish the soil conditions overall and at proposed stormwater management systems and wastewater disposal areas. This information is required, at a minimum, to determine if soils are suitable for the proposed development. 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.

II. The Proposed Project

The Applicant proposes a multi-family building of three stories set above a parking garage. There are two courtyard areas that would also be constructed above the proposed garage. Access would be off of School Street and the proposed drive would wrap around the building to provide access to the parking garage on the north side of the building. The access road varies in grade from 8% on the west side with 1% slopes to a high point at the main entrance on the east side.

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. An on-site wastewater disposal facility (WWTF) is proposed to treat wastewater for disposal to the ground through two leaching systems on the property. Stormwater would be captured in a collection system of catch basins and manholes in the roadway, an undefined roof drainage collection system together with some swales and area drain catch basins. Captured runoff would be managed through various systems including subsurface infiltration systems, a subsurface detention system, an open detention basin and rain gardens. 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.

III. General Design Comments

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. 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.

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.

There is a 2,000 gallon "holding tank" proposed in one of the stormwater infiltration systems. There are no pipes to this tank. There is a detail for a "Sanitary Tight Tank". A Tight Tank is permitted through Title 5 for domestic waste and would not be appropriate for this location as they are only used for repair purposes when no other wastewater disposal option is available.

There is minimal information provided relative to grading, etc. for the southern part of the Site. There is a proposed wastewater leaching area in the southern plan section but no grading, access, etc. has been indicated on any of the plans for this system. To access this area will require crossing a wetland resource area.

IV. Water Supply

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 3 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 DPW should comment on the suitability of the proposed dead-end water main to meet DEP requirements. Long dead-end watermains 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. Wastewater Management Design Issues

The Applicant proposes to construct a wastewater treatment facility (WWTF) with an unspecified design flow. Based on the number of bedrooms proposed (232) the facility would have to have a capacity of at least of 25,520 gallons per day, based on 110 gallons per day per bedroom as required by DEP. The Site Plans divide the Site into two sections. The northerly section includes the proposed building, access drives, stormwater facilities, etc. The southerly section is not included in most of the design sheets but does indicate a separate wastewater leaching area is proposed (Sheet C-102.2) in this part of the site. Sheets C 1-102.1, C 103 and C 104 all indicate a building to house wastewater treatment equipment together with underground tanks, etc. to the south of the proposed building with a leaching area along the property line to the south of the treatment plant. All of the wastewater aspects of the plans have notes stating that the design is by others.

Given the overall poor soil conditions assumed together with the shallow depth to ledge, the ZBA should require sufficient data to determine that the project can safely and legally dispose of wastewater on-site. Although data on the wastewater treatment system is scant, even the data that has been depicted on the Site Plans does not comply with setback requirements set forth in DEP's "Guidelines for the Design, Construction, Operation, and Maintenance of Small Wastewater Treatment Facilities with Land Disposal" ("WWTF Guidelines"). Further, insufficient data has been provided to evaluate compliance with

other *WWTF Guideline* provisions. To the extent that the Applicant intends to rely on the regulatory presumption of 310 CMR 10.03(4) (governing treatment plants permitted with a groundwater discharge permit), the Project's compliance with these setbacks and related provisions is within the purview of the ZBA. Specifically, I note the following:

- Leaching facilities must be set back by at least 50 feet from slopes that are steeper than 3:1. There are retaining walls within 5 feet of the northerly leaching field above a very steep slope. This wall is as high as 18 feet at one point. It appears that the retaining wall would also be retaining wastewater. As the southerly leaching area is **at** the 100 foot setback from wetlands (also defined as Waters of the Commonwealth by DEP in CMR 310 CMR 10.00 Wetlands Regulations and in 314 CMR 4.00 Massachusetts Surface Water Quality Standards.) and has a grade change of approximately 40 feet based on existing topography, there will be the need to implement grading for the leaching area most likely requiring fill, **if** there is enough suitable soil in the area. Existing slopes below the footprint indicated are steeper than 3:1 in some areas within 50 feet of the proposed system The design does not comply with setback requirements.
- Leaching facilities must be set back at least 25 feet from property lines. The system near the WWTF tanks and building is indicated five feet from the property line at one point and the entire south side is within 25 feet of the property line.

This is a large project in a sensitive area with difficult soil conditions. The Proposal lacks even the most basic information on the wastewater disposal system. The ZBA should require a supplementation of data to demonstrate that this is a viable project relative to wastewater disposal.

VI. Stormwater System Design Issues

Although there is a detailed Drainage Report included in the Application, the submittal lacks much of the required data to support the assumptions used to develop the Report. The stormwater design for this project assumes that the site is independent of the surrounding area and only analyzes the northern portion of the site. In some areas the limit of study is the property line, and in some areas extends to a wetland internal to the Site. To the northwest it is just an arbitrary line within the Site. It is important in all cases to understand where the runoff would ultimately flow to determine if the proposed project would result in flooding off or on-site. In particular, where wetlands discharge to a culvert that restricts flow near the Site, the design point should be the restriction.

A large wastewater disposal area is proposed in the southern part of the site and would require tree clearing, grading, etc. to implement, including a wetland crossing near a vernal pool. This work would impact runoff but is not even considered in the analysis. There are three vernal pools located on the site based on the plans. The analysis should also assess the impact of hydrology changes at each of these pools. None of them are considered in the analysis.

The Application states that the Site is not suitable for recharge based on NRCS data. As noted there is no information on on-site testing provided with the Application. Despite this claim, the calculations include large subsurface recharge systems, one consisting of 96 inch pipes that would hold and infiltrate 15,716 cubic feet (117,555 gallons) in a 2 year storm and 42,647 cubic feet (319,000 gallons) in a 100 year storm. There are several other smaller systems that are also proposed to recharge runoff in order to meet overall runoff rates from the site. If the site is not suitable for recharge due to soil conditions, how is it feasible to rely on recharge to meet runoff rates?

The hydrology calculations also assume that the stormwater collection system captures all of the flow in the roadway catch basins for conveyance to the various systems. Storm sewer sizing calculations are for the 25 year storm so this has not been demonstrated. In addition, the calculations only size the pipes not the inlets.

The DEP Regulations require compliance with the 10 Standards as described in the DEP Massachusetts Stormwater Handbook. The Application does not adequately address the Standards and the Applicant should be required to demonstrate how this Project will comply. The proposed stormwater BMP's are not consistent with DEP Regulations in many cases. Rain gardens are not rate control structures and are for treatment and potentially infiltration in small storms if suitable soils are present at the proposed system locations. They are assumed to act as detention and infiltration structures in the runoff analysis. There is a detention basin proposed with a 2 foot sump which would act as an infiltration basin not a detention basin. The analysis relies on this system recharging to the ground between storms. The underground pipe detention system would require a cut of up to 50 feet to install the system. It is proposed to consist of corrugated aluminum pipe surrounded in stone for this system. The details do not specify perforated pipes but the design assumes that the surrounding stone is part of the system for storage volume. The same details are used for detention only and infiltration systems so it is unclear how these systems would actually function.

Since all of the data used to demonstrate compliance with DEP Regulations in the Drainage Report relies on infiltration, including Standard 2 Peak Rate Control, Standard 3 Recharge and Standard 4 TSS Removal, and there is no data to support this aspect of the design, none of these Standards would be met.

There are many other issues and inconsistencies in the calculations. The ZBA should have the submittal peer reviewed by a qualified professional engineer.

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.