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October 22, 2024

Mr. Zachary McBride, Chair
Sherborn Zoning Board of Appeals
19 Washington Street
Sherborn, MA 01770

Ms. Daryl Beardsley, Chair
Sherborn Board of Health
19 Washington Street
Sherborn, MA 01770

RE: 31 Hunting Lane and 41 North Main Street, Sherborn, MA

Dear Mr. McBride, Ms. Beardsley and Fellow Board Members:

I have been retained by certain abutters and residents of Sherborn to review the above-referenced project relative to hydrologic and water quality impacts.

Qualifications: I have over 30 years of professional experience in the fields of hydrology and water resources management. I have served as a consultant to federal, state, and local government agencies, non-governmental organizations (NGOs), and private industry throughout the United States, Central America, the Caribbean, the Pacific Islands, Bulgaria, and China. I have assisted in the development and presentation of a nationwide series of U.S. Environmental Protection Agency (USEPA) workshops on drinking water protection, wetlands management, and watershed management. I have served as a consultant to the Commonwealth of Massachusetts in the development of the Smart Growth Toolkit. I have also served on numerous advisory boards to the USEPA, the National Academy of Public Administration, Massachusetts Department of Environmental Protection (DEP), Massachusetts Executive Office of Energy and Environmental Affairs (EEA), and the National Groundwater Association. I have received national (USEPA) and local awards for my work in the water resources management fields.

I currently serve as Adjunct Faculty at Harvard University Extension School and Tufts University, where I teach courses in water resources policy, wetlands management, green infrastructure (GI), and low impact development (LID). These courses focus on the critical role of local governments who have the primary responsibility and authority of regulating land uses in critical water resource protection areas. I have served as an expert witness in state and federal courts as a hydrologist in matters relative to the federal Clean Water Act, the Massachusetts Wetlands Protection Act and Regulations, Massachusetts Environmental Code (Title 5), Massachusetts Surface Water Quality Regulations, Massachusetts Stormwater Standards, Massachusetts Wetlands Protection Regulations, and the Massachusetts Groundwater Discharge Permit Regulations. I am also currently serving as a design consultant for three affordable housing projects in Massachusetts, which will provde an estimated 400 affordable units and will result in net water quality restoration benefits.

General Comments: The proposed project has been segmented into two individual projects. They include two concentrated cluster wastewater disposal systems, multiple stormwater infiltration systems, and common private drinking water wells that are proposed to serve both projects. The project sites are surrounded by abutters' private drinking water wells, on-site septic systems, and wetlands. The wetlands include a bordering vegetated wetland (BVW) that borders a tributary which flows to Indian Brook and the Charles River, The tributary stream is not shown on the site plans. The soils are comprised of glacial till which is low permeability with shallow water table.

The proposed project will cause both hydrologic impacts and water quality impacts. The proposed shared water supply well will drawdown (lower) water levels causing alterations in the adjacent wetland. It will also alter streamflow in the bordering tributary stream. The wastwater discharges will cause groundwater mounding and threaten water quality in neighboring private drinking water wells and downstream surface waters. The proposed stormwater systems will cause cumulative groundwater mounding impacts. None of these impact assessments have been provided by the Applicant.

My specific comments are as follows.

1. The proposed wastewater discharges will cause water quality impacts to downgradient private drinking water wells. The proposed project at 31 Hunting Lane proposes to discharge 7040 gallons/day of sewage to groundwater. The site topography and test pit data suggests that existing groundwater flow direction in the vicinity of the wastewater disposal area is northeasterly towards Hunting Lane. All of the properties in this area are served by private on-site drinking water wells. Groundwater mounding will modify these flow directions resulting in more radial flow in multiple directions and will cause the resulting plume of contamination to spread somewhat laterally as it moves downgradient.

I applied the nitrogen loading method as outlined in MADEP's "Guidelines for Title 5 Aggregation of Flows and Nitrogen Loading 310 CMR 15.216". These guidelines stipulate that for proposed wastewater flows exceeding 2000 gallons per day adjacent to areas served by private drinking water wells that nitrate-nitrogen concentrations must be maintained below 10 mg/liter at the downgradient property boundary to protect neighboring private wells.

My analysis shows an estimated area of impact downgradient of the proposed discharge location (see Figure 1). Based upon a wastewater flow rate of 7040 gallons/day, and effluent concentration of 35 mg/liter, and a groundwater recharge rate of 18 inches/year the calculated concentration of nitrate-nitrogen is 21.1 mg/liter at the downgradient property boundary. This is more than double the state and federal drinking water standard of 10 mg/liter. Several private wells (shown as blue dots) are located on the adjacent, downgradient parcels on Hunting Lane. Additionally, there may be other wells downgradient that should be evaluated.

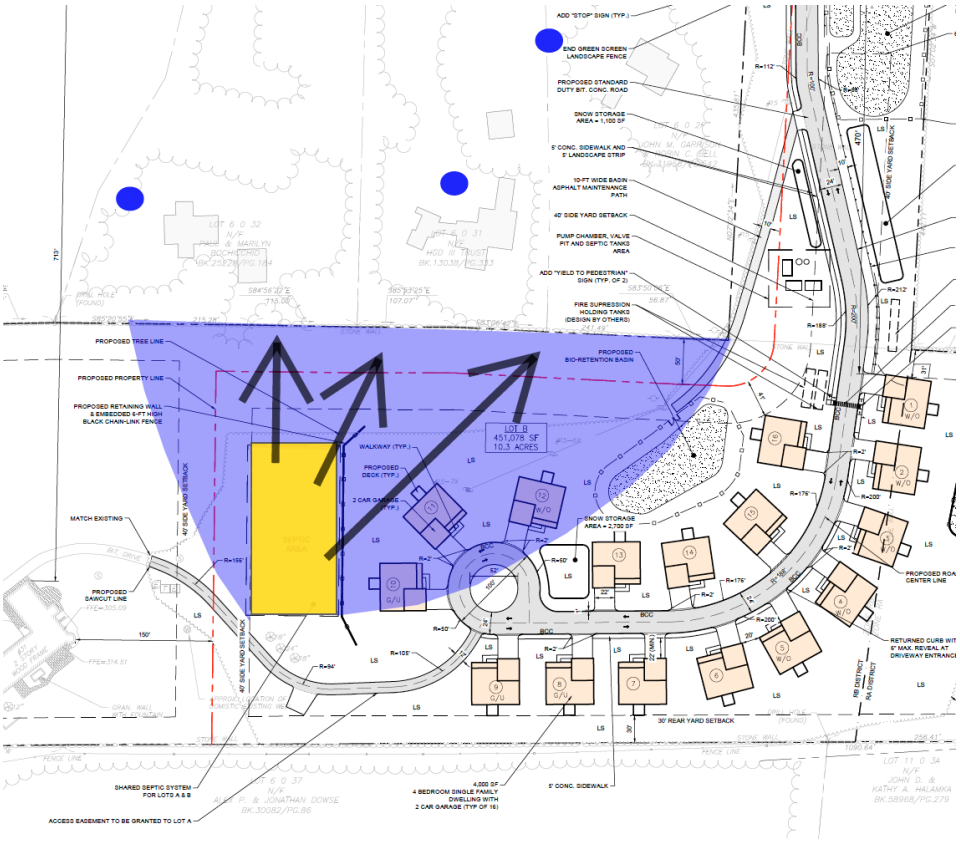


Figure 1 - Wastewater Contamination Plume at 31 Hunting Lane (Area of Impact)

2. The projects must comply with the Massachusetts Environmental Policy Act (MEPA) and have not complied with those filings. MEPA prohibits the "segmentation" of related projects. Section 11.01 (c) states, *"In determining whether a Project is subject to MEPA jurisdiction or meets or exceeds any review thresholds, and during MEPA review, the Proponent, any Participating Agency, and the Secretary shall consider the entirety of the Project, including any likely future Expansion, and not separate phases or segments thereof. The Proponent may not phase or segment a Project to evade, defer or curtail MEPA review".* These two projects have common ownership and are proposed to share a joint water supply.

MEPA Section 11.03(3) requires an Environmental Impact Report (EIR) if the project alters more than one acre of bordering vegetated wetland, or an Environmental Notification Form (ENF) if it alters more than 5000 square feet of bordering vegetated wetland. The proposed drinking water wells are proposed to service the 31 Hunting Land and 41 North Main projects. The Applicant has conducted a pump test for these wells. It shows water table drawdowns of more than 20 feet immediately adjacent to the bordering vegetated wetland (see Figure 2). This will clearly alter more than 5000 square feet and possibly more than one acre of the wetland. Additional field and/or modeling work is required to accurately evaluate these impacts. Furthermore, I belive that the existing wetlands delineation was done more than three years ago and is therefore no longer valid. Such an analysis would be required to determine compliance with MEPA.

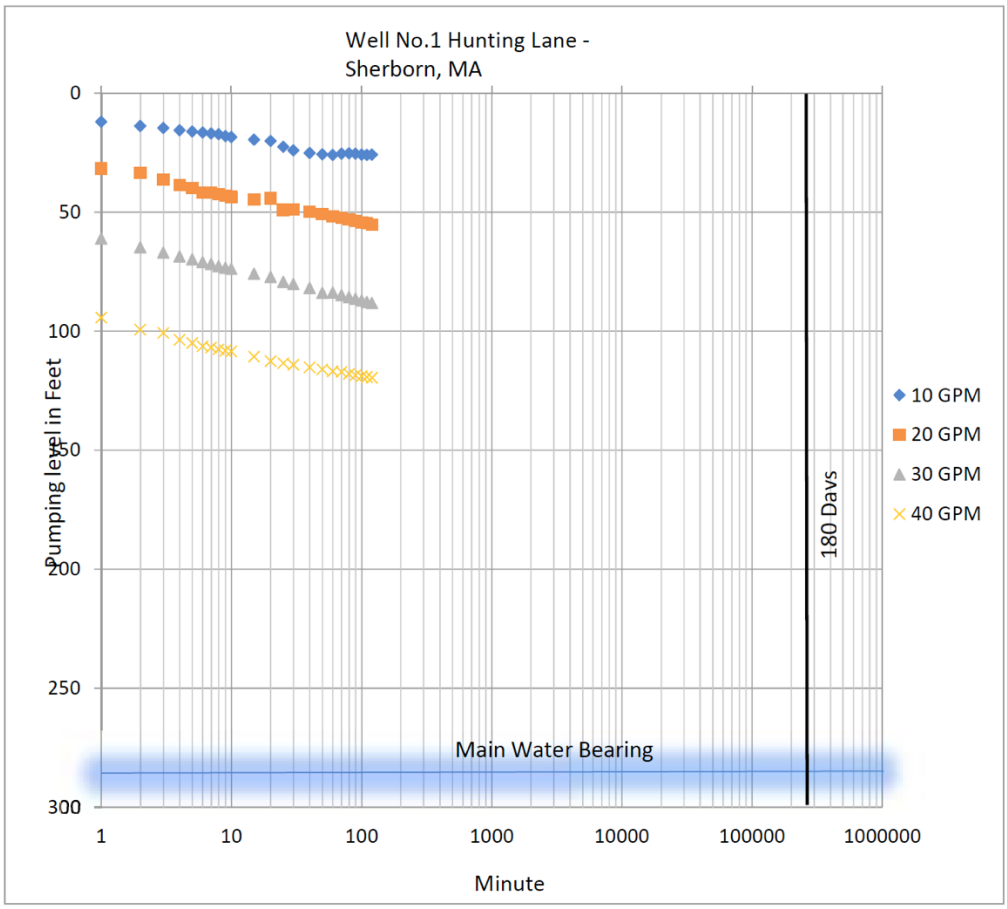


Figure 2 - Pump Test Results for Proposed Wells (Source: On-Site Engineering, October 18, 2019)

3. Groundwater mounding will compromise the functioning of the proposed septic systems and stormwater infiltration systems. Groundwater mounding refers to rises in the groundwater and water table caused by the subsurface infiltration of wastewater or stormwater (see figure 3). Title 5 requires a minimum separation distance of four feet (or five feet for highly permeable soils) between the bottom of the soil absorption system and the high groundwater elevation must be maintained while taking into account groundwater mounding (see excerpt below). The MADEP Stormwater Standards require a minimum vertical separation of two feet. These minimum separation distances provide important water quality functions including the filtration and attenuation of pathogens and other pollutants.

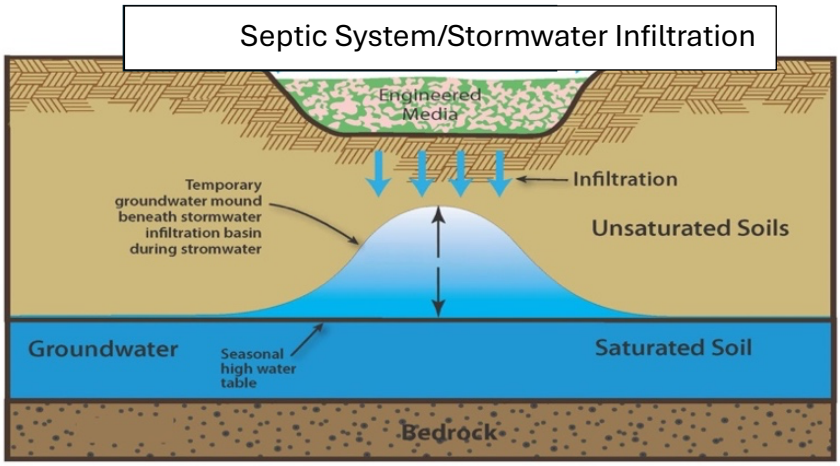


Figure 3 – Groundwater Mounding beneath an infiltration area

15.212: Depth to Groundwater

(1) The minimum vertical separation distance between the bottom of the stone underlying the soil absorption system above the high ground-water elevation shall be
(a) four feet in soils with a recorded percolation rate of more than two minutes per inch;
(b) five feet in soils with a recorded percolation rate of two minutes or less per inch.

(2) For systems with a design flow of 2,000 gpd or greater, the separation from high groundwater as required by 310 CMR 15.212(1) shall be calculated after adding the effect of groundwater mounding to the high groundwater elevation as determined pursuant to 310 CMR 15.103(3).

The hydrogeology of the site is characterized as low permeability soils and shallow water table. These conditions exacerbate the impacts caused by groundwater mounding. I have conducted a preliminary groundwater mounding analysis using the Hantush model[1]. I utilized hydraulic conductivity and specific yield values published for this area by the Massachusetts Hydrogeologic Atlas and the dimensions of the soil absorption system and saturated thickness provided by the Applicant (see Appendices to letter). The resulting analysis indicates that the groundwater mounding beneath the system will rise more than 10 feet and will inundate the wastewater soil absorption system. This groundwater mounding will also have impacts on the regulatory compliance and functioning of Title 5 septic systems on adjacent properties.

4. The project does not comply with the MADEP Stormwater Standards.

The Stormwater Report prepared by the Applicant claims that the proposed stormwater system complies with MADEP Stormwater Standards. However, the Standards require a groundwater mounding analysis for any infiltration system with less than 4.0 feet vertical separation to the estimated seasonal high groundwater elevation. The required groundwater mounding analyses have not been provided.

[1] The Hantush model is recommended by MADEP in their "Guidelines for Title 5 Aggregation Of Flows and Nitrogen Loading 310 CMR 15.216", page 10

5. The project does not comply with the Sherborn Health Regulations. The Sherborn Health Regulations requires that an Environmental Health Impact Report be prepared for *"an application for approval of a Comprehensive Permit under M.G.L. c. 40B, s. 20-23" or "a project with a sewage design flow of 2000 gallons/day or greater".* In accordance with the Health Regulations, the required Report must demonstrate (among other things):

- determination of groundwater flow directions,
- evaluation of water table (groundwater) mounding,
- prediction of downgradient water quality impacts

The applicant has not provided an Environmental Health Report or a Hydrogeologic Evaluation that would provide the necessary information for the Board of Health to determine water quality impacts on groundwater and surface waters. Additionally, the percolation tests were 1999, 2001, and 2003 when the property was owned by another entity. More current information is recommended.

6. Recommendations. Based upon my review of the project I recommend the Board require the Applicant to do the following:

a) Provide water table map and groundwater flow directions for both parcels to refine the Area of Impact (AOI) and nitrogen loading analyses to determine nitrate-nitrogen concentrations at the downgradient propety boundaries and downgradient private wells.

b) Revise outdated wetland delineation, and add streams and tributaries associated with the bordering vegetated wetlands to the site plans. Determine groundwater flow directions, and conduct water quality impact assessment (including nitrogen and phosphorus loading).

c) File Environmental Notification Form (ENF) and/or Environmental Impact Report (EIR) as required by the Massachusetts Environmental Policy Act (MEPA).

d) Conduct groundwater mounding analyses for the proposed wastewater discharge areas and stormwater infiltration systems. This analysis should include cumulative impacts of these facilities and should identify any off-site groundwater level changes that may cause compliance issues with existing Title 5 systems.

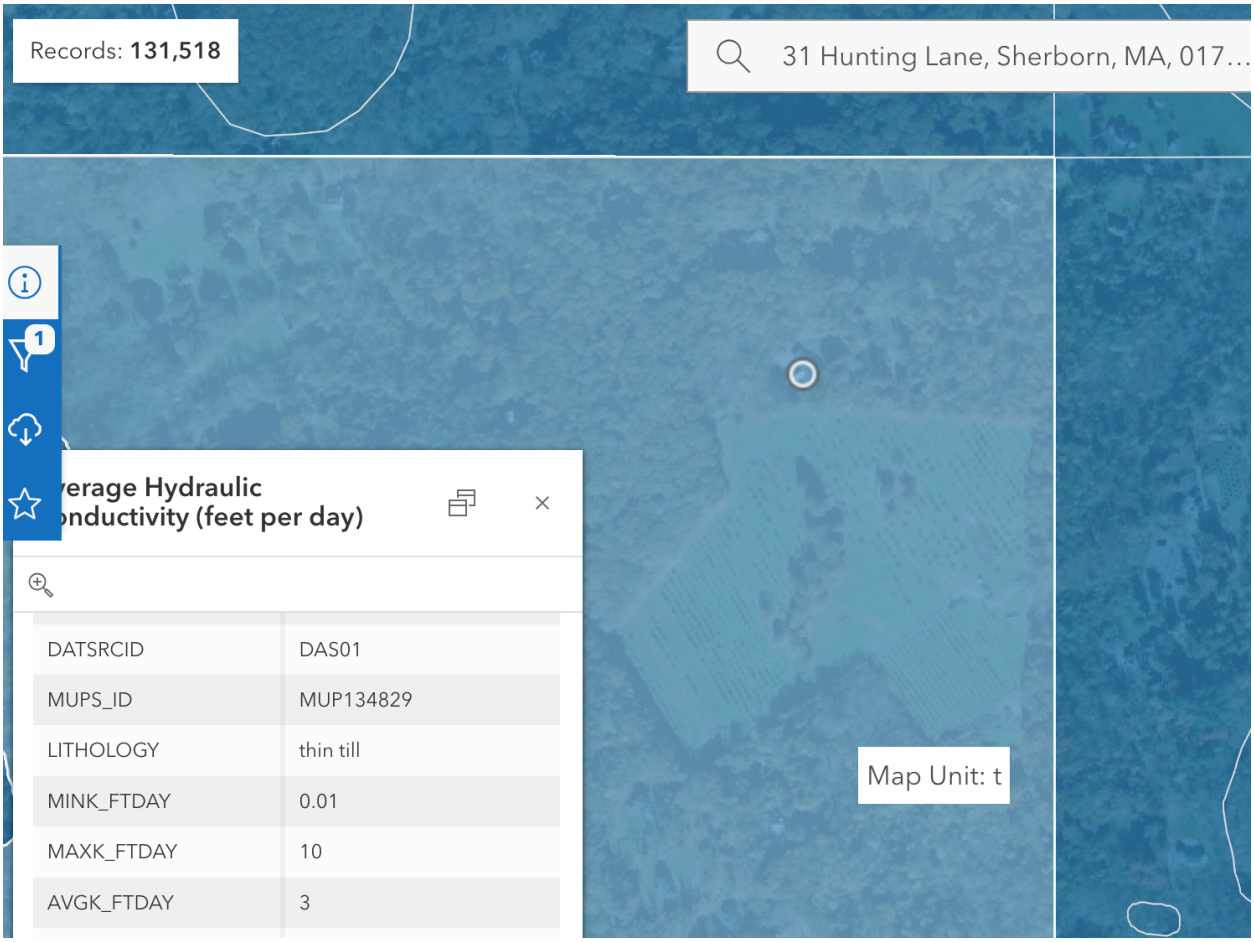
d) Prepare Environmental Health Impact Report in accordance with Sherborn Health Regulations.

Without this information I urge the ZBA to deny the project as I believe that it poses significant risks to public health, drinking water wells, wetlands impacts, and water quality impacts in surface waters.

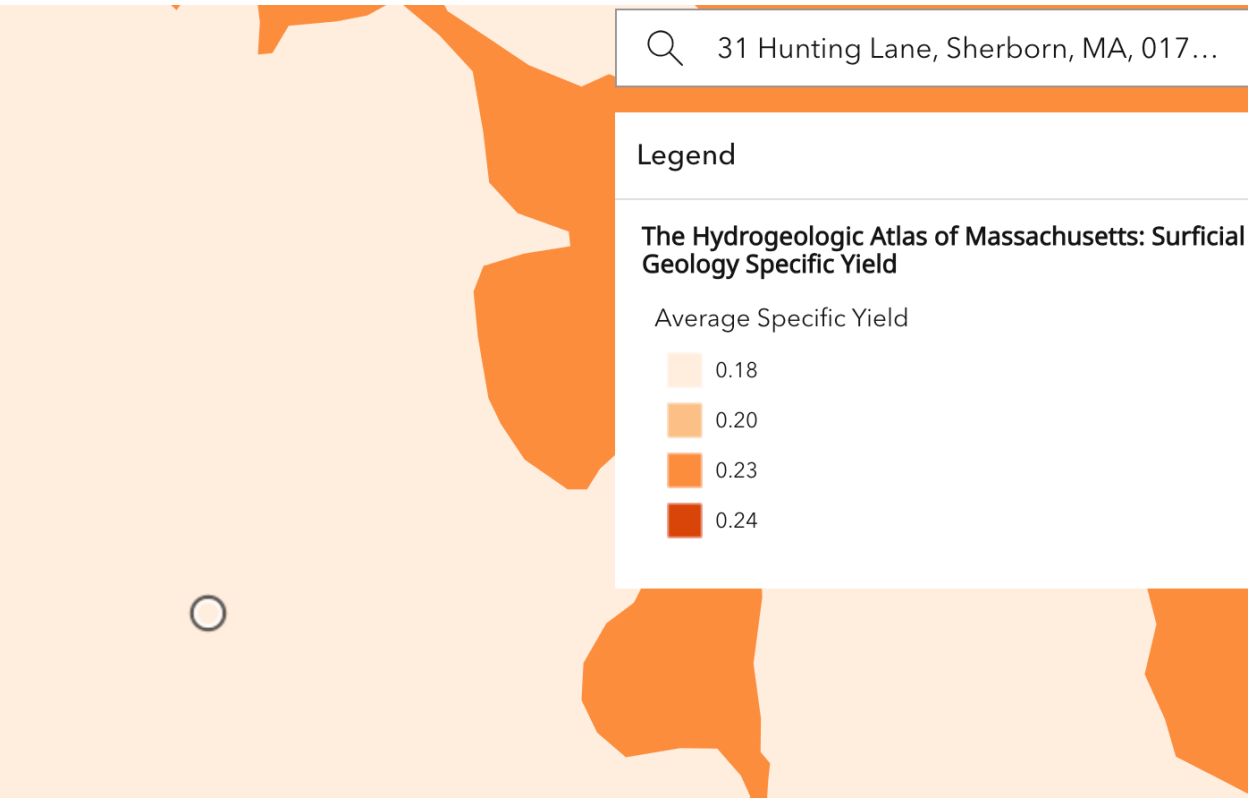
Please contact me directly with any questions that you have.

Sincerely,

Scott W. Horsley
Water Resources Consultant



Appendix A – Hydraulic conductivity (Source: Massachusetts Hydrogeologic Atlas)



Appendix B - Specific Yield (Source: Massachusetts Hydrogeologic Atlas)