

March 18, 2014

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Ms. Marnie Diffin  
Town of North Yarmouth  
10 Village Square Road  
North Yarmouth, Maine 04097

Subject: Town of North Yarmouth  
Village Center Community  
Preliminary Subsurface Wastewater Disposal Study

Dear Ms. Diffin:

As authorized by the Town of North Yarmouth (the Town), Sevee & Maher Engineers, Inc. (SME) has completed a preliminary analysis of the potential capacity for a community subsurface wastewater disposal system on the North Yarmouth Memorial School (the School) property. The purpose of this preliminary analysis is part of an assessment of the potential for development in and around the Village Center District (VCD). This assessment is based on limited information and is not intended to be an assurance for a final design flow capacity. It is, rather, intended to provide general guidance on what options may be feasible given the currently known limitations of the site. In SME's opinion, the most limiting factor for developing a community subsurface wastewater disposal system at the School property is impacts to groundwater quality of existing, offsite, and downgradient users. The ideas presented in this letter are not intended to exclude or discourage other options not mentioned.

The area of interest (i.e., the School property) is depicted on the Site Plan, which is included as Attachment 1. The Site Plan and the information displayed on it are a collection of overlays from various available information sources; therefore, it should not be considered complete in terms of applicable setback verification, or to contain all site features applicable to subsurface wastewater disposal. The School property is located partially within a portion of a mapped significant sand and gravel aquifer<sup>1</sup> that currently supports four public water supply wells operated by the Yarmouth Water District and is also located within the Groundwater Protection Overlay District (GPOD) of the Town. Therefore, the influence of subsurface wastewater disposal on groundwater must be carefully considered in any future potential design.

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<sup>1</sup> Source: Maine Geological Survey 1999, Significant Sand and Gravel Aquifers, Yarmouth Quadrangle, Maine. Open-File No. 99-28.

SME previously prepared and submitted to the Town a letter report dated December 21, 2012 regarding an *Evaluation in Future Development on the Impacts to Groundwater in the Village Center District, North Yarmouth, Maine*. Among other things, this letter provided information from available publications on the surficial geology in the VCD and the significant sand and gravel aquifer mapped within and in the vicinity of the VCD. Additionally, the evaluation included some information on the public water supply wells operated by the Yarmouth Water District. The December 21, 2012 letter is included as Attachment 2 for reference.

Since potential development of the Village Center District (VCD) will likely occur over a span of time, it may be possible that a phased approach could be taken to meet subsurface wastewater disposal needs as they progress. Below, SME provides a potential scenario for the phasing of an engineered subsurface wastewater disposal system on the School property to service community development in the Village Center District. The scenario is based on SME's understanding that the use of the North Yarmouth Memorial School will be discontinued following the 2013-2014 school year. The potential use of the existing septic fields and area for new (i.e., non-existing) disposal fields depicted is conceptual and will require additional evaluation to verify if it is feasible, including, but not limited to: suitability of soils; applicable setbacks (e.g., property lines, buildings, water bodies, water supply, etc.); and potential water quality influences to offsite groundwater users, including the Yarmouth Water District public water supply wells and private groundwater supply wells in the vicinity of the School property.

## **PHASE 1 – REUSE EXISTING SEPTIC FIELD**

Following the closure of the School, and assuming that the existing capacity for subsurface wastewater disposal at the School is available for continued use, consideration should be made for use of the existing subsurface wastewater disposal field(s) at the School as a first phase for VCD development.

Information on the condition of the existing subsurface wastewater disposal field(s) at the School is unknown. SME has reviewed permit application and design materials provided for the existing septic system by the Town. Based on the available information, the existing septic system design was completed in 1976. The design indicates that the design flow capacity for the disposal field(s) is 12,000 gallons per day and that the disposal fields are comprised of four 100 foot by 30 foot stone beds. The approximate area of the existing disposal field(s) is assumed based on aerial photography and is shown on the Site Plan in Attachment 1. The design drawings indicate that the disposal fields are approximately 30 to 40 feet from the nearest property line. The disposal field(s) were reportedly installed in Profile 6 soils (i.e., stratified glacial drift with coarse sand and gravel parent materials) with a reported seasonal-high groundwater table of more than 48 inches beneath the ground surface existing at that time. The permit application materials reviewed by SME for the existing disposal field(s) are included as Attachment 3.

Maine has made changes to disposal field sizing for Profile 6 soils since the design of the existing disposal field. Based on the current Maine Subsurface Wastewater Disposal Rules (10-144 CMR 241), a disposal field installed around 1976 with a design flow capacity of 12,000 gallons per day would currently have a reduced design flow capacity of approximately 4,600 gallons per day. This would be suitable for subsurface wastewater disposal for the equivalent of 51 bedrooms in multiple bedroom residences, or about 17 three-bedroom homes. We have assumed throughout our evaluation of the School property that the wastewater consists of typical domestic sewage equivalent to household sewage; disposal does not include toxic or hazardous substances that may be common to commercial or industrial development.<sup>2</sup>

## **PHASE 2 – PRETREATMENT AT EXISTING SEPTIC FIELD**

Further expansion beyond 4,600 gallons per day could potentially be addressed in a second phase by pre-treatment of the wastewater effluent before it enters the disposal field with an effluent treatment system approved by the Maine Department of Health and Human Services (DHHS), Division of Environmental Health (DEH) to allow for a 50 percent reduction in disposal field sizing. This would allow for twice the design flow capacity to the existing disposal field(s), which would result in an approximate capacity of up to 9,200 gallons per day (i.e., about 102 bedrooms in multiple bedroom residences, or about 34 three-bedroom homes). Pretreatment will add to the cost of wastewater disposal and involve long-term operations and maintenance.

## **PHASE 3 – CONSTRUCTION OF NEW SEPTIC FIELDS**

Additional design flow capacity on the School property is likely available in regards to suitable soils. Part of the northwest portion of the School property is mapped within the significant sand and gravel aquifer, and the majority of the soils on the property are mapped as marine, nearshore sand and gravel deposits.<sup>3</sup> The depth to water below ground surface in the soil across the property is expected to be greater than 48 inches in most areas (similar to the soils at the existing disposal fields) based on the geologic setting and topography. An area of focus on the northwest portion of the property, which is indicated by a shaded area on the Site Plan (Attachment 1), may be particularly suitable for potential subsurface wastewater disposal. This area of focus is preliminarily selected for disposal field placement on the School property for the reasons listed below; it is not intended to exclude use of land outside of this area from further consideration:

1. The area of focus appears to be outside of the mapped significant sand and gravel aquifer;

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<sup>2</sup> Non-residential wastewater contributions would require further assessment for design flow considerations.

<sup>3</sup> Source: Maine Geological Survey, 1999. Surficial Geology, Yarmouth Quadrangle, Maine. Open-File No. 99-105.

2. The area of focus appears to be outside of a model-based source water protection area for Yarmouth Water District Hayes Well; and
3. The area of focus appears to be on the hydraulically upgradient portion of the property.

Perhaps the most significant of these reasons is number three, which would allow for greater horizontal travel distance of groundwater between the area of focus and downgradient existing water uses such as the Yarmouth Water District Hayes Well. Based on information provided in a February 21, 2014 letter from Drumlin Environmental, LLC (Drumlin), groundwater flow is interpreted to flow from the School property to the east toward the Hayes Well.

One additional note regarding the area of focus is that, based on the site topography and groundwater elevation data provided by Drumlin, the depth to the groundwater table in the area of focus is on the order of about 60 feet deep. Unsaturated soils between a disposal field and the groundwater table act as filter media with natural biological aerobic treatment of effluent leached from disposal fields, which is why the Maine DHHS, DEH requires separation distances ranging between 12 to 24 inches between the base of disposal fields and the seasonal-high groundwater table. Having a separation distance of tens of feet between the base of a disposal field and the groundwater table would likely greatly enhance effluent treatment before it enters into the groundwater.

The conceptual area of focus for subsurface wastewater disposal is shown on the Site Plan. Based on the assumed soil types, the capacity for subsurface wastewater disposal in this area may be up to about 16,000 gallons per day, (i.e., about 177 bedrooms in multiple bedroom residences, or about 59 three-bedroom homes).

#### **PHASE 4 – PRETREATMENT AT NEW SEPTIC FIELDS**

Further expansion beyond the capacity of the septic fields could potentially be addressed by pre-treatment of the wastewater effluent before it enters the disposal field with an effluent treatment system. The 50 percent reduction for disposal field sizing by pre-treatment of the effluent before it enters the disposal fields with an effluent treatment system approved by the DHHS, DEH will double the capacity at the new septic fields. Thus, the total design flow capacity for both the existing and conceptual disposal fields with pre-treatment would be about 41,200 gallons per day, which is equivalent to 152 three-bedroom homes.

#### **STUDY LIMITATIONS**

It should be emphasized that this design flow capacity is substantially greater than the School's existing design flow capacity, and that the availability of soils for additional disposal fields does not guarantee protection of downgradient water quality. Design and installation of potential first-time (i.e., new) engineered disposal fields would likely require an extensive

hydrogeologic study, which, as stated above, may include determination of the groundwater flow direction(s) and aquifer characteristics by installation and monitoring of a network of surveyed groundwater monitoring wells, existing groundwater quality, determination of aquifer properties, and hydrogeologic modeling of the expected impacts to groundwater quality from the disposal fields. The results of this study would most likely determine the final design flow capacity for proposed subsurface wastewater disposal at the School property.

Utilizing the existing subsurface wastewater disposal at the School property does present some challenges due to the proximity to the downgradient property boundary (i.e., estimated to be on the order of about 30 to 40 feet) and the nearest Yarmouth Water District Hayes Well public water supply (i.e., estimated to be about 1,300 feet away). Based on the location relative to the downgradient property boundary, it is a concern that groundwater nitrate concentrations could exceed the 10 mg N/L Maine Maximum Contaminant Level (MCL) for drinking water beyond the property boundary without advanced effluent treatment. The existing disposal field(s) are also mapped within a model-based source water protection area for the Yarmouth Water District Hayes Well. It is important that continued use of the disposal fields does not adversely influence downgradient groundwater quality. Additionally, the existing disposal field(s) at the School property were installed around 1976 and the current condition of the field(s) are unknown.

If the Town is interested in using the existing disposal field(s) at the School property, SME recommends: (1) a pre-application meeting with the DHHS, DEH to discuss the potential for a change of use for the existing disposal field(s); (2) installation and sampling<sup>4</sup> of multiple monitoring wells downgradient from the existing disposal field(s) prior to the end of the 2013-2014 school year to determine baseline water quality; (3) sampling of the existing wastewater effluent water quality prior to the end of the 2013-2014 school year; and (4) inspection of the condition of the existing subsurface wastewater disposal field(s) at the School property.

One other consideration is the potential for change in the effluent water quality with a change from use from a school to community use consisting of residential and possibly commercial wastewater. Having baseline effluent and downgradient groundwater quality data would allow for extrapolation to potential future use of the existing disposal field(s) as community disposal field(s) for VCD development.

### **POTENTIAL TREATMENT ALTERNATIVES**

There are alternatives to pretreatment available that SME recommends the Town consider during the development of any community septic system. For example, there are modular

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<sup>4</sup> Recommended sampling parameters would include pH, specific conductance, dissolved oxygen, Eh, nitrate, nitrite, ammonia, total Kjeldahl nitrogen, fecal coliform bacteria, and chloride.

Membrane Biological Reactors (MBR) that could treat the wastewater before discharging it into the groundwater. If the density of development in the VCD is significantly increased and the School property is found to be inadequate for the proposed septic treatment, these alternatives could be another way to provide the required capacity.

### **SUMMARY AND RECOMMENDATIONS**

Above, SME has provided a potential scenario for subsurface wastewater disposal at the School property which would be used for VCD community subsurface wastewater disposal systems. Please note that these scenarios are based on SME's understanding that the use of the existing subsurface wastewater disposal system for the School will be discontinued following the 2013-2014 school year. Additionally, this scenario is not intended to rule out other wastewater disposal locations on the School property or to limit the design flow capacity on the School property to those indicated above. Rather, these preliminary scenarios are this study is intended to: (1) provide the Town with reasonable and cost-effective ways to approach development of a VCD community subsurface wastewater disposal system on the School property with consideration of downgradient groundwater uses, which includes (but is not limited to) Yarmouth Water District Hayes Well; and (2) identify potential obstacles and considerations that may impact permitting and cost in either use to the existing School disposal field(s) and/or installation of new disposal fields on the school property.

In summary, based on SME's preliminary subsurface wastewater disposal study, the community septic system with pretreatment would have the capacity for approximately 152 three-bedroom houses using both the existing disposal field(s) and potential new disposal fields installed in the area of focus shown on the Site Plan.

The design flow capacities discussed above do not guarantee protection of downgradient water quality, and due to the proximity of the Yarmouth Water District Hayes Well to the School property, it is SME's opinion that expanded use of the School property for subsurface wastewater disposal (beyond the existing subsurface wastewater disposal use) will require detailed hydrogeologic investigations and potential groundwater impact analyses prior to permitting. The results of these analyses are more likely to influence the actual maximum design flow capacity at the School property than soil suitability or required setback distances for first-time systems. Long-term groundwater quality monitoring downgradient from the disposal fields would also likely be required.

Below, SME has provided a summary table of recommendations as they relate, separately, to continued use of the existing School disposal field(s) and use of potential first-time (i.e., new) disposal fields. The recommendations are presented in a practical order for completion.

Summary of Recommendations for Continued Assessment of Potential VCD Community Subsurface Wastewater Disposal (Prior To Final Design)	
Use of Existing Disposal Fields	Installation of New Disposal Fields
A pre-application meeting for change of use of the existing disposal field(s) with DHHS, DEH	A pre-application meeting for new engineered subsurface wastewater disposal system with DHHS, DEH
Inspection of the existing disposal field(s)	Confirm suitable soils in area of focus with test pit observations by a Maine Licensed Site Evaluator
Survey of all existing groundwater uses in the vicinity of the existing disposal fields	Survey of all existing groundwater uses in the vicinity of the area of focus for new disposal fields
Installation of monitoring well(s) downgradient from existing disposal field prior to the end of the 2013-2014 school year	Install and survey a network of monitoring wells; map/interpret the groundwater table surface and groundwater flow directions; determine aquifer hydrogeologic characteristics (e.g., estimated saturated thickness and transmissivity); sample background groundwater quality
Baseline sampling of North Yarmouth Memorial School effluent and downgradient monitoring well(s) prior to the end of the 2013-2014 school year	Complete a refined groundwater impact study (i.e., nitrate study) based on additional information collected

In addition to the recommendations provided above, a complete inspection and walk-over of the School property would be required to complete any assessment.

To assist the Town in consideration of a community septic system, SME prepared an opinion of probable site costs for a potential sewer collection system, new septic fields and pretreatment for both the existing and proposed septic fields. The summary can be found in Attachment 4.

If you have any questions regarding SME's preliminary analysis of the potential capacity for a VCD community septic system on the North Yarmouth Memorial School property, or if you would like to discuss our recommendations for continued assessment, please do not hesitate to contact me at 207.829.5016.

Sincerely,

SEVEE & MAHER ENGINEERS, INC.



Daniel P. Diffin, P.E.  
Project Manager

Attachments