

MEMORANDUM

TO: Project File

FROM: Rachel Schnabel, EIT
Matthew Jermin, PE

DATE: February 22, 2018

RE: **Conceptual Septic System for the Scovil Hoe Mill Site**

Executive Summary

For this analysis, the redevelopment plan for the Scovil Hoe Mill site includes reuse of the two existing buildings plus one proposed building. The building uses will be a mixture of restaurant, office, and residential with an estimated **total site wastewater flow of 7,080 gallons per day**. Separate subsurface sewage disposal systems would be required to serve each building to meet State Health Department regulatory requirements without requiring special exemptions. In addition to an on-site septic system, nearby sites were also considered for a larger sized community subsurface wastewater absorption system.

The Town Green was determined to be the most suitable site for wastewater disposal for the Scovil Hoe Mill site redevelopment. Excess wastewater disposal capacity does not appear to exist at any of the sites evaluated for a larger sized community subsurface wastewater absorption system.

Wastewater Flows

There are two existing buildings onsite plus a proposed building that will all generate wastewater and require septic systems.

The proposed use of the site with multiple buildings is as follows:

- 5,000 square feet restaurant use with 70 seats
- 14,500 square feet of office space
- 6 residential units with 2 bedrooms each
- 6,800 square feet of office space

The site redevelopment will result in a projected wastewater design flow of 7,080 gallons per day which is regulated by the State Health Department. The proposed flow for the Scovil Hoe Mill site redevelopment is close to, but less than, the regulatory threshold of 7,500 gallons per day requiring a more rigorous CT DEEP design process.

Refer to Section 1 of the attached septic system design calculations showing the wastewater flow estimation computations. Unit flow rates were based on Table 4 of the Connecticut Public Health Code Technical Standards dated 01/19/2018.

Site Selection

The following nearby sites were evaluated as potential locations for the proposed subsurface sewage disposal system:

- Scovil Hoe Mill Site (11 Candlewood Hill Road on-site solution)
- Private Property (48 Killingworth Road)
- Haddam Elementary School (272 Saybrook Road)
- Higganum Town Green

Scovil Hoe Mill Site

The ideal location for a subsurface sewage disposal system is on the same property from which the sewage originates.



Several obstacles were identified at the Scovil Hoe Mill Site for constructing an on-site wastewater disposal system to serve the proposed site flows:

- The entire site appears to be located on unclassified urban fill soils according to the USDA NRCS soil survey mapping and anecdotal evidence, which are not suitable for leaching fields. Replacing the unclassified urban fill with select DPH approved septic system fill is possible but quickly becomes very costly.
- Soil contamination may significantly limit the land area available for on-site wastewater disposal unless the soil is removed and disposed of offsite at significant cost. A leaching field should not

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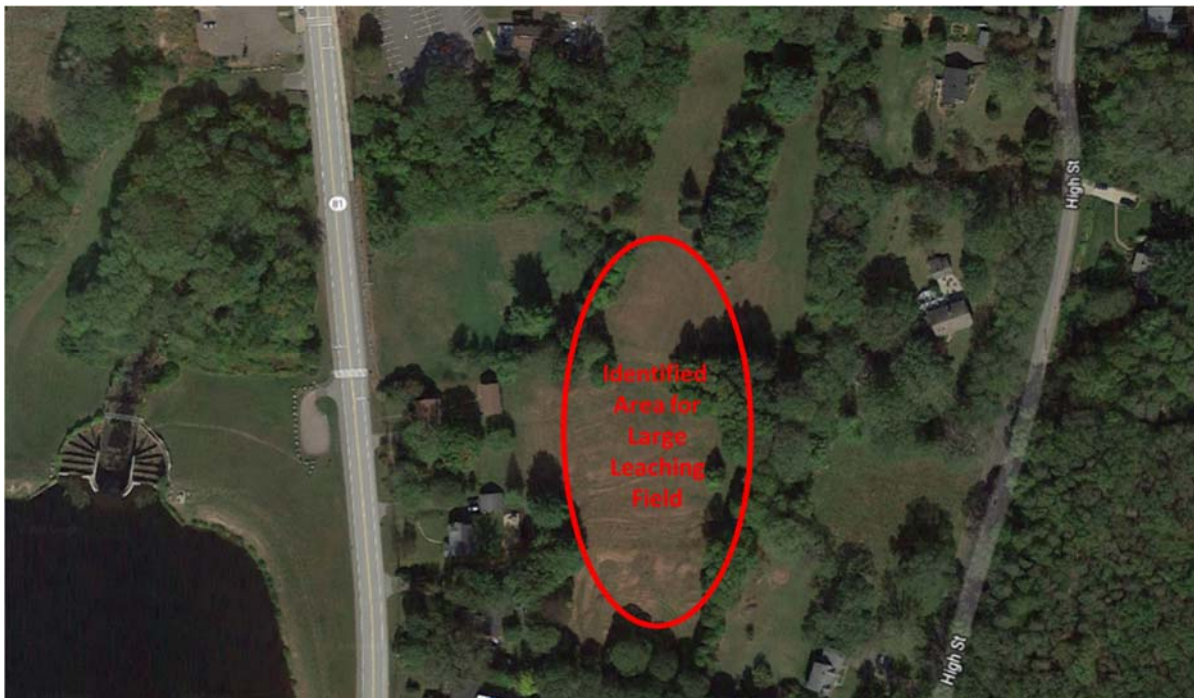
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be constructed in or adjacent to contaminated soils because the discharge of effluent may transport site contaminants to adjacent properties or nearby waterways.

- Separation distances to property lines, buildings, water courses, drinking water wells, and underground utilities limits the on-site area for a leaching system.
- The total available land area does not appear to be sufficient for a large scale on-site leaching system based upon professional judgement and past project experiences.

Private Property

The 9-acre property at 48 Killingworth Road is located approximately 0.5 miles from the Scovil Hoe Mill site and was considered due to the large area of undeveloped land available. The site, however, was identified as a candidate parcel in the Incentive Housing Zone Study Report, dated May 2015 by Milone & MacBroom for development. We understand a purchase agreement exists between the property owner and Beacon Communities of Boston, MA for a proposed development that would fall under the Housing Opportunity District Regulations of the local P&Z commission. On-site soil testing appears to have already been completed by others during the summer of 2017 based on the presence of standpipes and site figure showing soil classifications.



Haddam Elementary School

Haddam Elementary School at 272 Saybrook Road was evaluated given its close proximity to the site, large parcel size, and cleared open space surrounding the school building. With the addition of the Scovil Hoe Mill wastewater flows to the Haddam Elementary School site, the site classification would change from a State Health Department System to a Connecticut Department of Environment and Energy regulated septic system. This would introduce additional complexity and significant cost to the design, construction, and O&M of both the existing and future wastewater disposal systems.



A subsurface investigation was conducted on December 28, 2017 when school was not in session during winter break. Two test pits were excavated and observed: one near the basketball court (TP-1) and one in the opposite corner of the rear recreational field next to the existing septic system (TP-2). TP-1 was dug to 5 feet deep and contained suitable soils for subsurface sewage disposal. TP-2 was excavated to 5.5 feet deep and consisted entirely of fill. No ledge, groundwater, nor indications of groundwater were observed at either test pit. The soil observations are included as *Attachment 1*.

The Haddam Elementary School Additions & Renovation Record Drawing Plan sheet SC-4 by Jeter Cook & Jepson Architects and Fuss & O'Neill, Inc. (dated August 28, 1990) presents the existing septic

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system design for the site. The on-site percolation tests averages 2 minutes per inch at an approximate depth of 40-inches. The main leaching field is located northeast of the school. Two reserve areas for septic system leaching field repairs are designated on the record drawing; one downgradient of the existing system and one where the basketball court was constructed.

A flat, clear area behind the Haddam Elementary School was considered as a potential location for the subsurface sewage disposal system. However, both wetlands and a pond border the clearing. The topography for this clearing is significantly lower than the main school campus which suggest (when accounting for the adjacent site hydrology) shallow depth to groundwater.

Higganum Town Green

The Town Green was evaluated as a result of its close proximity adjacent to the Scovil Hoe Mill site and ownership by the Town. One of the main hurdles of constructing a leaching field on the Town Green is obtaining community support for the temporary disturbance during construction of this well-regarded parcel for wastewater disposal. It should be noted that the western property boundary between the Green and the neighboring residential property is shown being closer to the residential building on the Town's electronic GIS mapping compared to the location of the 3-foot tall granite bollards found in the field separating the properties.



Two test pits were excavated at the Town Green on February 16, 2018 to determine the site suitability for wastewater disposal. Both test pits were located just east of the parking area and were found to have highly suitable soils for a subsurface sewage disposal system. Test Pit 1 (TP-1) was located at the

northwest corner of the green and Test Pit 2 (TP-2) was located at the southwest corner of the green. No fill was observed in TP-1 and the top two feet of soil at TP-2 was made up of fill. No ledge, groundwater, nor indications of groundwater were observed at either test pit. Percolation tests were conducted in each test pit with measured soil percolation rates of less than 5 inches per minute. The soil observations are included as *Attachment 2*.

The groundwater table at the Town Green is assumed to be very deep. A monitoring well on the Scovil Hoe Mill site closest to the Green was observed with a groundwater depth of approximately 7 feet with a surface elevation of 75 feet. The Town Green topography varies from Elevation 85 to 90. Therefore the interpreted groundwater depth for the Town Green was estimated at 17 to 22 feet deep.

The Town Green was determined to be the most suitable site for a State Health Department proposed subsurface sewage disposal system with a maximum size of 7,500 gallons per day. There does not appear to be enough acreage for a much larger Connecticut DEEP community village-wide community septic system.

Conceptual Design of a Septic System at the Town Green

Total Wastewater Flow	7,080 GPD
Septic Tanks (1 per building)	3 @ varying sizes
Grease Interceptor Tank	2 @ 5,000 gallon tank in series for restaurant kitchen waste
Leaching Field Type	832 feet of 72-inches wide x 48-inches high concrete galleries
Leaching Field Footprint	Conceptual layout included as <i>Attachment 4</i>

Refer to *Attachment 3* for the State Health Department Design Calculations for this conceptual design.

Notes about the conceptual design:

- Reserve area is included in the footprint of each gallery row on *Attachment 4*.
- The State Health Department requires a minimum leaching system spread (MLSS) for a depth less than 72 inches from the bottom of the leaching system to the seasonal high groundwater table.
 - The MLSS calculation is based on the soil percolation rate, surface slope, and design flow.
 - The ground surface elevation of the proposed leaching system area is 85-90 feet and the water surface elevation of the nearby stream is 65 to 75 feet, resulting in a difference in elevation of 15 to 20 feet. The monitoring well on the Scovil Hoe Mill site has a groundwater depth of approximately 7 feet and a surface elevation of 75.

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- Based on the difference in elevation between the proposed system location and the nearby stream, it is assumed that the site exceeds the 72-inch requirement thereby eliminating the need for the MLSS calculation.
- An exception from the Commissioner of Public Health is required for using a septic system not located on the same lot as the building served; otherwise the system becomes DEEP regulated. Permitting a DEEP subsurface wastewater absorption system is a lengthy and expensive process.
- The detailed design would have separate septic tanks discharging to separate pump stations discharging to separate dedicated leaching galleries on the Town Green. Otherwise, an exception from the Commissioner of Public Health is required for a leaching field serving multiple buildings.
- Setback distances for the leaching field:
 - 10 feet from property line up-gradient (in terms of groundwater) and from sides of system.
 - Reduced from 15 feet because leaching system will be below original grade.
 - 15 feet from property line down-gradient of system.
 - Reduced from 25 feet because the MLSS calculation is assumed to not apply.
- The Town Green was occupied by a school from 1894 to 1945. If there is a buried abandoned foundation, it is likely build of field stone. It is assumed that this will not impact the construction cost of the leaching galleries.
- The drinking water well serving the residence to the west at 275 Saybrook Road is located behind the house 25 feet from the building, which is well beyond the 75-foot separation distance to a septic system on the Town Green.
- There appears to be a discrepancy between the granite posts demarcating the property boundary and the parcel locations obtained from Town GIS parcel mapping that will need to be reviewed during detailed design.



Attachment 1: Soil Testing at Haddam Elementary School

Test pits were dug on December 28, 2017 by the Town of Haddam at 272 Saybrook Road. Rachel Schnabel of Fuss & O'Neill coordinated test pit locations. Ryan Grenon of the Connecticut River Area Health District was present for test pit observations. Test pit work started at 8:00 am. A Wacker Neuson EW100 excavator was used to dig the test pits. Rachel Schnabel and Ryan Grenon read the test pits together. The site was restored to existing conditions by approximately 9:45 am.

A well identified behind the school building (to the north). There is a clearing north of the school building that is part of the Swan Hill Trail. This clearing is located on lower land, surrounded by wetlands.

TP-1

Depth	Description
0" to 29"	Fill
29" to 35"	Orange brown loamy sand with some cobbles
35" to 60"+	Orange brown medium to coarse sand and gravel with cobbles

No mottling, groundwater, nor ledge was observed.

TP-2

Depth	Description
0" to 66"+	Fill

No mottling, groundwater, nor ledge was observed.



Attachment 2: Soil Testing at Higganum Town Green

Test pits were dug on February 16, 2018 by the Town of Haddam. Rachel Schnabel of Fuss & O'Neill coordinated test pit and percolation testing locations. Ryan Grenon of the Connecticut River Area Health District was present for test pit observations and part of the percolation testing. Test pit work started at 8:15 am. A Wacker Neuson EW100 excavator was used to dig the test pits. Rachel Schnabel and Ryan Grenon read the test pits together. According to a memorial on the Town Green, the Higganum District Union School was located on the Town Green from 1894-1945. No foundation was unearthed during excavation activities. Testing was completed at approximately 11:00 am.

TP-1

Depth	Description
0" to 5"	Dark brown loamy sand (topsoil)
5" to 26"	Orange brown sandy loam with silt
26" to 52"+	Brown sandy loam with silt

No mottling, groundwater, nor ledge was observed.

Perc-1

Time	Reading	Percolation Rate
0 min.	9"	
4.5 min.	11"	2.25 min./in.
8.5 min.	13.5"	1.6 min./in.
14 min.	15"	3.67 min./in.
20 min.	16.5"	3.33 min./in.
0 min.	10.25"	
4 min.	12"	2.29 min./in.
9 min.	13.5"	<i>3.33 min./in.</i>
13.25 min.	15"	<i>2.83 min./in.</i>
18 min.	16.8"	<u>2.64 min./in.</u>
		2.93 min./in.

TP-2

Depth	Description
0" to 24"	Fill
24" to 48"+	Orange brown sandy loam with silt

No mottling, groundwater, nor ledge was observed.

Perc-2

Time	Reading	Percolation Rate
17 min.	4.8"	
23 min.	7.2"	2.5 min./in.
28 min.	8.4"	4.17 min./in.
33 min.	9.72"	<i>3.79 min./in.</i>
38 min.	10.8"	<i>4.63 min./in.</i>
43 min.	12"	<u>4.17 min./in.</u>
		4.20 min./in.

Attachment 3: State Health Department Septic System Calculations

Based on CT DPH January 2018 "Connecticut Public Health Code: On-site Sewage Disposal Regulations, and Technical Standards for Subsurface Sewage Disposal Systems"

1. Design Flow

Existing Mill Buildings (2)

Restaurant (5,000 sq.ft.)	70	seats	X	45 GPD/seat	3,150 GPD
Office/Artist/Flex Space/Specialty	14500	sq.ft.	X	0.1 GPD/sq.ft.	1,450 GPD

Proposed Buildings (2)

Office/Artist/Flex Space/Specialty	6800	sq.ft.	X	0.1 GPD/sq.ft.	680 GPD
Residential (Assume two bedrooms)	6	units	X	300 GPD/unit	1,800 GPD

Total Design Flow, Q_F = 7,080 gal / day

2. Effective Leaching Surface Area (ELA)

Percolation Rate, R_p = 5 minutes / inch

Percolation Rate, R_p = Less than 10.1 minutes / inch

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Type	Description	Application Rate	Quantity	ELA Subtotal sq. ft.
Residential Buildings	2-Bedroom Building	375 sq. ft ELA	6	2,250
	3 Bedroom Building	495 sq. ft ELA		0
	4 Bedroom Building	660 sq. ft ELA		0
	For Each Bedroom Above 4 (Single Family)	82.5 sq. ft ELA		0
	For Each Bedroom Above 4 (Multi-family)	165 sq. ft ELA		0
Nonresidential Building	Non-Problematic Sewage Application Rate	1.5 GPD/sq.ft. ELA	2,130	1,420
	Problematic Sewage Application Rate	0.8 GPD/sq.ft. ELA	3,150	3,938

Total Required ELA = 7,608

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Product = Concrete Leaching Gallery (72"w × 48"h)

Width =	62 inches	(Table Lookup)
Height =	48 inches	(Table Lookup)
ELA =	9.2 sq. ft. / lin. ft.	(Table Lookup)
Center to Center Spacing =	12 ft	(Table Lookup)
Unit Length =	8 ft	(Product DWG Lookup)

8 Unit Length, L_U (ft)

20 No. of Units for Row 1, N_{U1}

20 No. of Units for Row 2, N_{U2}

18 No. of Units for Row 3, N_{U3}

18 No. of Units for Row 4, N_{U4}

14 No. of Units for Row 5, N_{U5}

X 14 No. of Units for Row 6, N_{U6}

Total Trench Length Provided, L_T = 832 Linear feet

Leaching Area Provided = Trench Length Provided × Total Effective Leaching Area

Leaching Area Provided = 7,654 sq. ft

OK: Greater than Required Effective Leaching Area

[Leaching Area Provided must be ≥ Required Effective Leaching Area]

3. Receiving Soil Depth

Leaching Gallery Cover, D_C = 12 inches

Leaching Gallery Height, H_T = 48 inches

Depth to Bottom of Leaching System, $d_b = D_C + H_T$

d_b = 60.0 inches

Required Vertical Height of Unsaturated Soil Between the Bottom of the Leaching Galleries
and the Seasonal High Groundwater Table, R_u = 18 inches

Minimum Depth to Seasonal High Groundwater Table, D_{GW} = 132 inches = 11 feet

Depth to Bottom of Leaching System, d_b = 60 inches

Distance Between Bottom of Leaching System and Seasonal High GW = 72 inches

OK: Greater than Required Vertical Height of Unsaturated Soil

[Unsaturated Soil Depth d_u must be \geq Required Unsaturated Soil Depth R_u]

OK: MLSS Calculation is not required

[Unsaturated Soil Depth d_u > 72 inches does not require MLSS Calculation]



SEAL	SEAL
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SEAL

50 25 0 50

GRAPHIC SCALE



CONNECTICUT

ATTACHMENT 4