STONE ENVIRONMENTAL

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May 30, 2017

Westford Planning Commission
Attn: Melissa Manka, Planning Coordinator
Westford Town Office
1713 VT Route 128
Westford, Vermont 05494

Stone Project No. 16-130
Subject: Site Capacity Confirmation and Project Financing Options for a Community Wastewater System at the Jackson Farm Site, Westford, Vermont

Dear Melissa,

Stone and Green Mountain Engineering are pleased to provide the results of field and desktop analysis of the soil-based wastewater treatment capacity of the area identified as "Zone 3" in the Hamlin Engineers report cited below on the Jackson Farm at 123 Brookside Road, near Westford's Town Common. We also present updated system layout, project cost estimates, and financing options to construct and operate a community system at this location. This work was completed with Municipal Planning Grant funding to support the Westford Planning Commission's continued exploration of ways to build capacity to accommodate focused and appropriate development in the Town Center. The extent of suitable soils, while substantial, is smaller than was estimated during earlier evaluations, and revised capacity calculations and system layouts indicate the area is likely to support a new soil-based community wastewater system with a capacity of approximately 12,600 gallons per day. The lowest cost wastewater collection, treatment and disposal system was anticipated to be a Septic Tank Effluent Pump (STEP) system, followed by a conventional trench disposal system (Drawings No. 1 and No. 2). Construction costs were estimated $1,590,000 in 2018 dollars, total project costs were estimated to be $2,230,000, and the first-year operation and maintenance costs were estimated to be $24,000. These preliminary opinions of probable cost were used to evaluate a series of possible user fee breakdown and financing options, understanding that there are still many unknowns in how any community wastewater project in the Town Center and at the Jackson Farm property would ultimately be developed and financed.

Sources of information consulted to complete the analyses included:

- *Site Investigation, Capacity, and Preliminary Cost Estimates for a Shared Wastewater System at the Jackson Farm Property, Westford, Vermont:* Letter report, maps, test pit logs, capacity calculations, collection and disposal system layout drawings, and calculations for Opinions of Probable Cost and User Fee Estimates, from Stone Environmental, Inc. and Green Mountain Engineering, dated October 5, 2015 (and sources therein)
- Backhoe test pit logs completed by Amy Macrellis of Stone Environmental, Inc. on November 16, 2016.

- Limited topographic survey, including locations of backhoe test pits, completed by Kevin Camara, P.E. of Green Mountain Engineering on November 16, 2016.
- *Drawing No. 1: Proposed Wastewater Collection System Map*, preliminary collection system layout for existing connections completed by Green Mountain Engineering, dated October 1, 2015.
- *Drawing No. 2: Wastewater Disposal System Site Plan*, preliminary leachfield layout completed by Green Mountain Engineering, dated May 15, 2017.

### Project Background

The property, located at 123 Brookside Road, is approximately 201 acres in size with an existing single family home and associated barns and outbuildings. A soils investigation completed by Hamlin Engineering in December 2014-January 2015 identified three areas on the property that were potentially suitable for wastewater disposal. The area identified in that report as Zone 3, located in the "northern lobe" of the hay field, was further evaluated by Stone and GME in August 2015, with the excavation of nine test pits (TP-109 through TP 116) and completion of a limited topographic survey, followed by completion of preliminary capacity calculations and disposal system layouts, along with development of planning-level opinions of probable cost and project financing.

This work, presented to the Planning Commission in October 2015, indicated that a new in-ground wastewater disposal system to accommodate existing or new development with design flows of up to 16,920 gpd may be feasible in the Zone 3 area on the Jackson Farm property. This design flow would be adequate to serve the current needs of the areas identified as "high priority" for community wastewater service by the Planning Commission (combined design flow of approximately 9,435 gallons per day), with up to 7,485 gallons/day of capacity remaining available to serve other current or future needs. The preliminary disposal system layout was created to represent a maximum likely footprint, and thus extended onto previously un-tested portions of the field. Completion of limited additional soil characterization to confirm system capacity, primarily in the southern portion of Zone 3, was a recommended next step.

### Field Soil Characterization Results

Eight new text pits (TP-117 through TP-124) were located using survey-quality GPS prior to excavation, in order to precisely locate the new test pits relative to work completed previously on this property. The soils investigation was conducted by Amy Macrellis of Stone on November 17, 2016 using a backhoe supplied by John Roberts of Roberts Excavation Inc. Others present during some or all of the investigation included David Gauthier (property owner), Melissa Manka (Town of Westford Planning Coordinator), Kevin Camara (Green Mountain Engineering), Mary Clark (Vermont DEC, Indirect Discharge Permitting Program), and Jessanne Wyman (Vermont DEC, Regional Engineer). Appendix A contains test pit logs and hydraulic capacity calculations. Test pit locations are shown on the site plan (Drawing No. 2).

Test pits TP-117 and TP-118, located at the southern extent of the initial disposal field layout, generally consisted of surface horizons of gravelly very fine sandy loam to gravelly fine sand underlain by clay loam with firm consistence that corresponded with indications of seasonal high groundwater at 25 to 29 inches below ground surface. These locations could be used for mound wastewater treatment systems, but are generally not suitable for larger-scale community wastewater treatment.

Test pit TP-119 was excavated in the field north-northwest of TP-024, to confirm and attempt to extend the area of suitable soils north from that location. This test pit consisted of gravelly loamy fine to very coarse sands throughout the soil profile, with no indications of limiting features to a depth of 120 inches (10.0 feet).

Test pits TP-120 and TP-121 were excavated just north of TP-119, to further define the northern extent of the well-suited soils present at that location. Both of these locations, however, generally consisted of gravelly silt loam to clay loam, with firm horizons at 24-31 inches below ground surface. In both test pits, indications of seasonal high groundwater were identified slightly above the firm soil horizons (20-24 inches below ground surface). These locations could be used for mound wastewater treatment systems, but are generally not suitable for larger-scale community wastewater treatment.

Test pit TP-122 was excavated along the western treeline between TP-019 and TP-022, in order to more closely define the larger area of deep and sandy soils previously identified at the northern end of Zone 3. This test pit consisted of gravelly fine to very coarse sands throughout the soil profile, with no indications of limiting features to a depth of 120 inches (10.0 feet).

Test pit TP-123 was excavated towards the northern end of Zone 3 and down-slope from TP-020, in order to more closely define the eastern edge of this larger area of deep and sandy soils. At this location, gravelly sand to coarse sand extends to nearly 5 feet (58 inches) below ground surface, where it is underlain by firm, silty clay with indications of seasonal high groundwater. This location is suitable for in-ground leachfield construction, but the silty clay horizon represents a limiting condition for infiltrating large volumes of water.

Test pit TP-124 was excavated in the western tree-line to understand whether indications of shallow bedrock encountered farther north in this forested area (TP-109) were consistent along the entire field boundary. This test pit consisted of gravelly fine to coarse sands throughout the soil profile, with no indications of limiting features to a depth of 84 inches (7.0 feet). The lower four feet of this profile, however, was firm and extremely dry. If, ultimately, a decision is made to try to move the proposed disposal fields closer to or within the current tree-line in order to further expand capacity, additional testing to include infiltration testing is warranted in this vicinity.

The best possible option for wastewater disposal remains in the northern portion of the Zone 3 area identified in the Hamlin Engineering report in the vicinity of test pits TP-017, TP-018, TP-019, TP-020, TP-021, and TP-024, and expanded to include TP-110. After adjusting the previously identified area to account for the results described above and separations from areas of unsuitable soils, two areas totaling approximately 1.93 acres are available for wastewater disposal. The larger of the two areas remains additionally limited by the presence of slopes in excess of 20% in portions of the best-suited soils and associated setbacks (roughly 0.4

acres), leaving roughly 1.5 acres. The revised area identified here represents the likely maximum area available for wastewater treatment. In contrast to the prior preliminary investigation, no additional substantial constraints stemming from as-yet unidentified areas of finely textured soils with firm subsoils and shallow seasonal high groundwater are anticipated.

### Zone 3 Geology and Groundwater, Conceptual Site Model

The results of the subsurface investigation described above and in previous reports, as well as the historical information collected during the course of the project, were used to develop two east-west geologic cross sections A-A' (Figure 1) and B-B' (Figure 2), and a north-south geologic cross section C-C' (Figure 3). The following sections describe the site's geology and groundwater flow regime.

The test pits completed during this investigation showed that the soils within and near the proposed disposal fields are gravelly loamy sands near the ground surface (Appendix A and Figures 1, 2, and 3). Beneath the surficial soils, gravelly fine to coarse sands were observed to depths of five to 10 feet below the ground surface (Appendix A and Figures 1 and 2). While more finely textured materials (silt to clay) are prevalent in the eastern and southern areas of Zone 3, these were not encountered beneath lenses or areas of coarser, sandy material (see especially Figure 3, cross section C-C'). The well-drained sands, underlain by poorly drained and firm silts and clays, are consistent with surficial geologic mapping in the vicinity, which shows glaciofluvial kame terrace deposits in the vicinity of Zone 3 and glaciolacustrine deposits of clay and boulders located closer to Brookside Road.

Bedrock encountered during the subsurface investigation in and near Zone 3 was limited to TP-109, at a depth of 22 inches below ground surface. The bedrock surface topography in the vicinity of the proposed leachfield should be considered only a preliminary estimate. The presence of outcrops both west of the tree-line adjoining Zone 3 and east of Brookside Road suggest that bedrock below the site may form a buried valley that slopes from southwest to northeast.

Groundwater was encountered only in a seep at TP-111, at a depth of 41 inches below ground surface (Figure 1). Groundwater flow across the site is assumed to generally follow surface topography from west to east, from the proposed disposal fields towards an un-named stream near the eastern edge of the parcel. The un-named stream flows north from its headwaters northeast of Zone 3, ultimately reaching the Browns River.

### Revised Wastewater Capacity Analysis for Zone 3

The best possible option for wastewater disposal on this property remains in northern portion of the Zone 3 area identified in the Hamlin Engineering report in the vicinity of test pits TP-017, TP-018, TP-019, TP-020, TP-021, TP-024, and TP-110, parallel to the tree line running from north to south. In order to estimate the hydraulic capacity of this potential wastewater dispersal site, we revised the Darcy's Law calculations completed for our October 5, 2015 analysis and report.

This formula is represented as Q = KiA where

Q = design flow (gallons/day) (gpd)
K = hydraulic conductivity (ft. /day)
i = hydraulic gradient (slope of water table)
A = transmitting soil cross-sectional area (square feet) = D x L where
D = transmitting soil thickness (depth to impeding layer or water table, minus the required separation depth, minus the system depth) (feet)
L = length of the disposal system in the estimated direction of groundwater flow (feet)

We used this formula to develop two hydraulic capacity estimates—one estimate per each of the cross-sections A-A' and B-B'. The full set of assumptions and calculations for each estimate are included in Appendix A. Key assumptions are that the system's design will be in-ground absorption trenches with the bottom of the trench a maximum of 18 inches (1.5 feet) below the ground surface. In this design, the treatment capacity of the upper soil horizons will be maximized. The top of the gravel in the trenches will be at the pre-existing ground surface, and 6 inches of topsoil will be used to cover the trenches. The required separation distance to seasonal high groundwater is 3.0 feet, leaving a varying transmitting soil thickness between the induced groundwater mound and the bottom of the disposal trenches (at least 6.2 feet in cross-section A-A' and an average of 2.5 feet in cross-section B-B').

Based on our calculations, the hydraulic capacity available for wastewater disposal in the vicinity of cross-section A-A' is on the order of 38,975 gallons per day, while at cross-section B-B' the available hydraulic capacity is on the order of 10,970 gallons per day. These hydraulic capacity values suggest that, at the planning level, the area required for layout of the in-ground trenches will be a greater limitation than the capacity of the underlying soil and surficial materials to accept and transmit renovated effluent.

### Jackson Farm Property Treatment and Disposal System

The oblong area of approximately 1.5 acres determined to be available for wastewater disposal is shown on Drawing No. 2. To further refine the capacity estimate for this area, a preliminary layout was designed assuming the disposal area will be designed to treat septic tank effluent using in-ground absorption trenches. Once setbacks from steep slopes and un-suitable soils are accounted for, the equivalent of 16 trenches, each 4 feet wide by 100 feet long, can be located parallel to the ground contours in A-A' and the equivalent of 54 trenches, each 4 feet wide by 100 feet long, can be located parallel to the ground contours in B-B'. Since only half of the trenches can be loaded with renovated effluent at any given time, the leachfield's capacity is calculated based on 8 trenches in A-A' and 27 in B-B', as follows:

For A-A' System capacity (gallons/day) = trench length * trench width * total trenches * loading rate, where
Trench length = 100 feet

Trench width = 4 feet
Total trenches = 8
Loading rate = 0.9 gallons/square foot of trench area/day (for loamy sand to coarse sand, see Indirect Discharge Rules Table 19)

System capacity (gallons/day) = 4 feet * 100 feet * 8 trenches * 0.9 gal/square foot

System capacity = 2,880 gallons/day

Since the septic system capacity of 2,880 gallons per day is less than the available hydraulic capacity of 38,975 gallons per day for A-A', then the calculated flow for septic tank effluent is acceptable.

For B-B' System capacity (gallons/day) = trench length * trench width * total trenches * loading rate, where
Trench length = 100 feet
Trench width = 4 feet
Total trenches = 27
Loading rate = 0.9 gallons/square foot of trench area/day (for loamy sand to coarse sand, see Indirect Discharge Rules Table 19)

System capacity (gallons/day) = 4 feet * 100 feet * 27 trenches * 0.9 gal/square foot

System capacity = 9,720 gallons/day

Since the septic system capacity of 9,720 gallons per day is less than the available hydraulic capacity of 10,970 gallons per day for B-B', then the calculated flow for septic tank effluent is acceptable.

Therefore the total capacity of the site for septic tank effluent is 2,880 gallons per day + 9,720 gallons per day=12,600 gallons per day.

An in-ground system utilizing four-foot-wide trenches, maximizing the available length along contour (~730 ft.) with this capacity would have a linear loading rate of 12,600 gal/day / 730 ft. = 17 gallons/day/linear foot. This linear loading rate is higher than 4.5 gallons per day per linear foot, and so if pre-treatment is desired in order to further increase the system's capacity, the state's Indirect Discharge Rules (Section 14-1010(d)(2)) require that a hydrogeologic analysis be completed to demonstrate:

- An unsaturated soil zone of at least 36 inches is maintained beneath the filtrate disposal system; and
- The mounded water table is at least one foot below grade at the downhill toe of the filtrate disposal system.

### Wastewater Flow Projections

Wastewater flow projections were developed using the State of Vermont, Environmental Protection Rules (EPR), Chapter 1, dated September 29, 2007. Wastewater flow projections for residential and apartment units were developed based on the number of living units. A living unit is defined as a single family home, apartment or mobile home. For alternatives connected to a system with a system capacity of 12,600 gpd, a design flow of 245 gpd per living unit is used without regard to the number of bedrooms.

Table 1 on the following page provides a summary of the current and design year flow projections for a 12,600 gpd system at the Jackson Farm.

*Table 1. Wastewater Flow Projection Summary*

| Street | Use & Flow Rate | Initial Year Flow (gpd) | Equivalent Users |
|---|---|---|---|
| Brookside Road | White Church= 150 gpd | | |
| | 9 SFR x 245 gpd/SFR=2,205 gpd | 2,355 | 10 |
| Cambridge Road | 1 SFR x 245 gpd/SFR=245 gpd | 245 | 1 |
| Common Road | 4 SFR x 245 gpd/SFR=980 gpd | 980 | 4 |
| VT Rte. 128 | 11 SFR x 245 gpd/SFR=2,695 gpd | | |
| | 8 Apt. X 245 gpd/Apt.=1,960 gpd | | |
| | 1 Store=140 gpd | | |
| | Town Office & Library=90 gpd | | |
| | Brick Meeting House= 480 gpd | 5,365 | 22 |
| White Church Lane | 2 SFR x 245gpd/SFR=490 gpd | 490 | 2 |
| **Initial Year Total** | | 9,435 | 39 |

The number of equivalent users is used later in the report for the user cost analysis. For residential users, one equivalent user is defined as one house, one apartment, or one mobile home, etc. For non-residential users, the equivalent unit is defined as 245 gpd. The non-residential equivalent user amount is calculated by dividing that establishment's flow basis and dividing it by 245 gpd. The minimum equivalent unit for all accounts is 1 equivalent unit.

For a system designed for the maximum capacity of 12,600 gpd, there would be approximately 3,165 gpd in reserve capacity, which equates to approximately 13 additional single family homes.

### Wastewater Collection and Disposal System

For this preliminary evaluation, the lowest cost wastewater collection, treatment and disposal system was anticipated to be a Septic Tank Effluent Pump (STEP) system (Drawing No. 1), followed by a conventional trench disposal system (Drawings No. 1 and No. 2). The Indirect Discharge Rules require dual alternating disposal systems, and that the systems are pressurized. A STEP system is a system in which both the septic tank and effluent pumping processes occur in a single tank. Portions of the tank are dedicated to septic tank capacity, effluent pumping, and emergency storage. The STEP tank for a typical single family home is a 1,500 gallon tank.

Located inside the STEP tank is a pump vault that houses a filter and pumping system. Effluent from the clear zone of the septic tank enters the pump vault and is filtered by the effluent filter. Because only effluent is pumped, a small ½ horsepower submersible turbine high head effluent type pump is used to pump the effluent. The ½ horsepower effluent pump saves energy over larger horsepower solids handling pumps. The electrical service is typically connected to the property's electrical system and the electrical costs are typically borne by the property owner.

The STEP system utilizes small diameter pressure sewer and low pumping rates. The STEP tank operates on a "pump on/pump off" scenario based on float positions. The low pressure sewer service is typically minimum of 1" diameter and the main line low pressure sewer is typically 2" diameter. Pumping heads for operation of the system are developed using the combined energy of multiple STEP system pumps working together to convey flow through the collection system.

The STEP system will convey the effluent to a dosing tank at the Jackson Farm site. The dosing tanks will dose the disposal fields at the proper pressure and flow volume. There will also be a valve pit for the dosing tank.

### Opinion of Probable Construction Cost

Prior to the development of the opinion of probable construction cost, quantity take-offs were completed to establish quantities of equipment, materials, and labor necessary to construct a fully operational system. Construction costs were generated using *RS Means Building Construction Data*, cost quotations from vendors and contractors, and bid results from recent construction jobs in Vermont. An ENR cost index was used to project the construction cost to February 2018 to account for inflation. Opinions of probable construction costs were developed for both the wastewater collection system (Contract No. 1) at $1,150,000 and the wastewater disposal system (Contract No. 2) $440,000, for a total opinion of probable construction cost of $1,590,000 in 2018 dollars. A 10% contingency is included in the construction cost estimate. Detailed summaries of costs are provided in Appendix B.

### Opinion of Total Project Cost

An Opinion of Total Project Cost was developed to include all project costs including construction cost, preliminary engineering, permitting, hydrological, archeological, final design engineering, construction services engineering, land acquisition, legal, fiscal and administrative costs. The Opinion of Total Project Cost is $2,230,000. The Opinion of Total Project Cost is detailed in the table in Appendix B.

### Opinion of "First Year" Operation and Maintenance Cost

An Opinion of Operation and Maintenance (O&M) Cost was developed to include all operation and maintenance costs for the proposed system including contract operations, electrical expenses, sludge pumping, groundwater testing, capital replacement, insurance, miscellaneous repairs, and administration/billing. The Opinion of First Year O&M Cost is $24,000. The Opinion of First Year O&M Cost is detailed in the table in Appendix B.

### Opinion of User Fee Analysis

An opinion of user fess is the method used in this report to determine if an alternative is affordable or not. Annual user rates from wastewater collection and treatment systems in Vermont vary from community to community and range from a low of $250/year to as high as $1,200/year. The typical average wastewater user rate fee across the State is between $400 - $600/year. Newer systems are typically higher, in the $1,000+/year range. User costs over $1,000 are generally considered unaffordable.

Typically, the users of the system pay for 100% of the O&M costs of a system. Therefore, the user cost for the annual O&M cost of this system would be the $24,000 annual O&M cost divided by the 39 users or $615. If and as additional users or connections are added to the system, it is likely that the per-user O&M costs will decrease.

Different communities handle the debt retirement in different ways. The three most common approaches are the following:

1. The users pay all of the debt retirement.
2. The debt retirement is distributed throughout the Town on a parcel tax basis.
3. The debt retirement is distributed throughout the Town tax based on the grand list.
4. Combinations of the above.

Because the funding package is not known at this time, the debt retirement user fees are also not known. User costs were estimated for the total project cost using method #1 (only the users pay the debt retirement) and using grant scenarios of 0%, 35%, 50%, and 75%. See Appendix B for detailed calculations of the user costs per approach. Table 2 on the following page provides a summary of the user cost using the first three approaches described above.

*Table 2. Estimated User Fee Summary*

| Approach | User Fee | | | |
|---|---|---|---|---|
| | No Grants | 35% Grants | 50% Grants | 75% Grants |
| Users Pay both Debt & O&M Costs | | | | |
| Non-Connected Property | $0 | $0 | $0 | $0 |
| Connected Property | $4,112 | $2,888 | $2,364 | $1,490 |
| Users Pay O&M and Debt on a Town Wide Parcel Tax Basis | | | | |
| Non-Connected Property | $146 | $95 | $73 | $36 |
| Connected Property | $761 | $710 | $688 | $652 |
| Users Pay O&M and Debt of a Town Wide Parcel Tax Basis [1.] | | | | |
| Non-Connected Property | $151 | $98 | $76 | $38 |
| Connected Property | $766 | $714 | $691 | $653 |

1. Note: The Town wide parcel tax user fee portion is based on a property value of $275,000.

### Potential Funding Sources

A summary of the available State and Federal funding programs potentially available for this project are described in the following narratives.

- State of Vermont, Department of Environmental Conservation (VTDEC)
  - Clean Water State Revolving Fund (CWSRF)
  - Pollution Abatement Grant
- USDA Rural Development (RD)
- U.S. Environmental Protection Agency (EPA)
- Vermont Community Development Program (VCDP)

The State of Vermont offers low interest loans for planning, design, and construction of municipal infrastructure improvements. This loan is offered with an annual administrative fee equivalent to 2% of the remaining balance for a 20 year period. The funding schedule depends on the individual project's priority ranking in comparison to other projects.

The State of Vermont offers a Dry Weather Pollution Abatement Grant to municipalities for the planning and construction of facilities which have project sections that abate pollution to waters of the State. The grant is for 35% of eligible items from the point of pollution to the point of discharge. Available funding is currently limited and dependent upon legislative set-asides.

The USDA Rural Development (RD) Program includes both grants and loans, depending on the project and the community's ability to pay, which is based on the Town's user rates and median household income (MHI). The MHI for the Town of Westford is high at $61,000, which makes the Town not eligible for grants under the RD program.

The U.S. Environmental Protection Agency (EPA) offers a State and Tribal Assistance Grant (STAG) program. These grants are based on financial need and environmental protection. The municipality must work closely with Vermont's U.S. congressional delegates in an effort to get their wastewater projects into the U.S. Capital Budget for STAG grants. These grants have become very limited in the current economic and political climate.

The Vermont Community Development Program (VCDP) administers funding from the U.S. Department of Housing and Urban Development (HUD) under the Community Development Block Grant (CDBG) program. The CDBG program celebrated its 40th anniversary this year. Activities that support economic development and affordable housing continue to be VCDP's top priorities for funding. The VCDP assists communities on a competitive basis by providing financial and technical assistance to identify and address local needs in the areas of housing, economic development, public facilities, public services and handicapped accessibility modifications. The program is designed to predominantly benefit persons of low and moderate income.

### Conclusions and Next Steps

In summary, our field and desktop analyses indicate that a new in-ground wastewater disposal system to accommodate existing or new development with design flows of up to 12,600 gpd may be feasible in the Zone 3 area on the Jackson Farm property. This design flow would be adequate to serve the current needs of the areas identified as "high priority" for community wastewater service by the Planning Commission (if connected to a community system, the current uses in this area have a combined design flow of approximately 9,435 gallons per day). Thus, up to 3,165 gallons/day of capacity could be available to serve other current or future needs.

For this preliminary evaluation, the lowest cost wastewater collection, treatment and disposal system was anticipated to be a Septic Tank Effluent Pump (STEP) system, followed by a conventional trench disposal system (Drawings No. 1 and No. 2). Construction costs were estimated $1,590,000 in 2018 dollars, total project costs were estimated to be $2,230,000, and the first-year operation and maintenance costs were estimated to be $24,000. These preliminary opinions of probable cost were used to evaluate a series of possible user fee breakdown and financing options, understanding that there are still many unknowns in how any community wastewater project in the Town Center and at the Jackson Farm property would ultimately be developed and financed.

There are several steps to be taken in moving forward with developing a community wastewater project for the Town Center. The items below are by no means an exhaustive or complete list, and we look forward to collaborating with the Town, the Planning Commission, and other stakeholders on this exciting project.

1. Preliminary Design
    a. Determine receiving water for indirect discharge.
    b. Determine whether additional site-specific hydrogeologic analysis (mounding analysis) will be required to demonstrate that required thicknesses of unsaturated soil are maintained and that the mounded water table is at least one foot below grade at the system's downhill toe.
2. Project Financing and Phasing
    a. Work with project stakeholders to refine financing options, including funding for preliminary and final design, system construction, and operation/maintenance—especially to understand how public-private partnerships and/or companion proposals to develop affordable housing could impact per-user costs and potential reserve fund capacity available for other future uses. Further explore design and construction project phasing options, including constructing portions of the system to serve existing community facilities in conjunction with potential proposals for commercial re-development and new development.

Sincerely yours,

Amy Macrellis


Amy Macrellis
Project Water Quality Specialist

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Encl.

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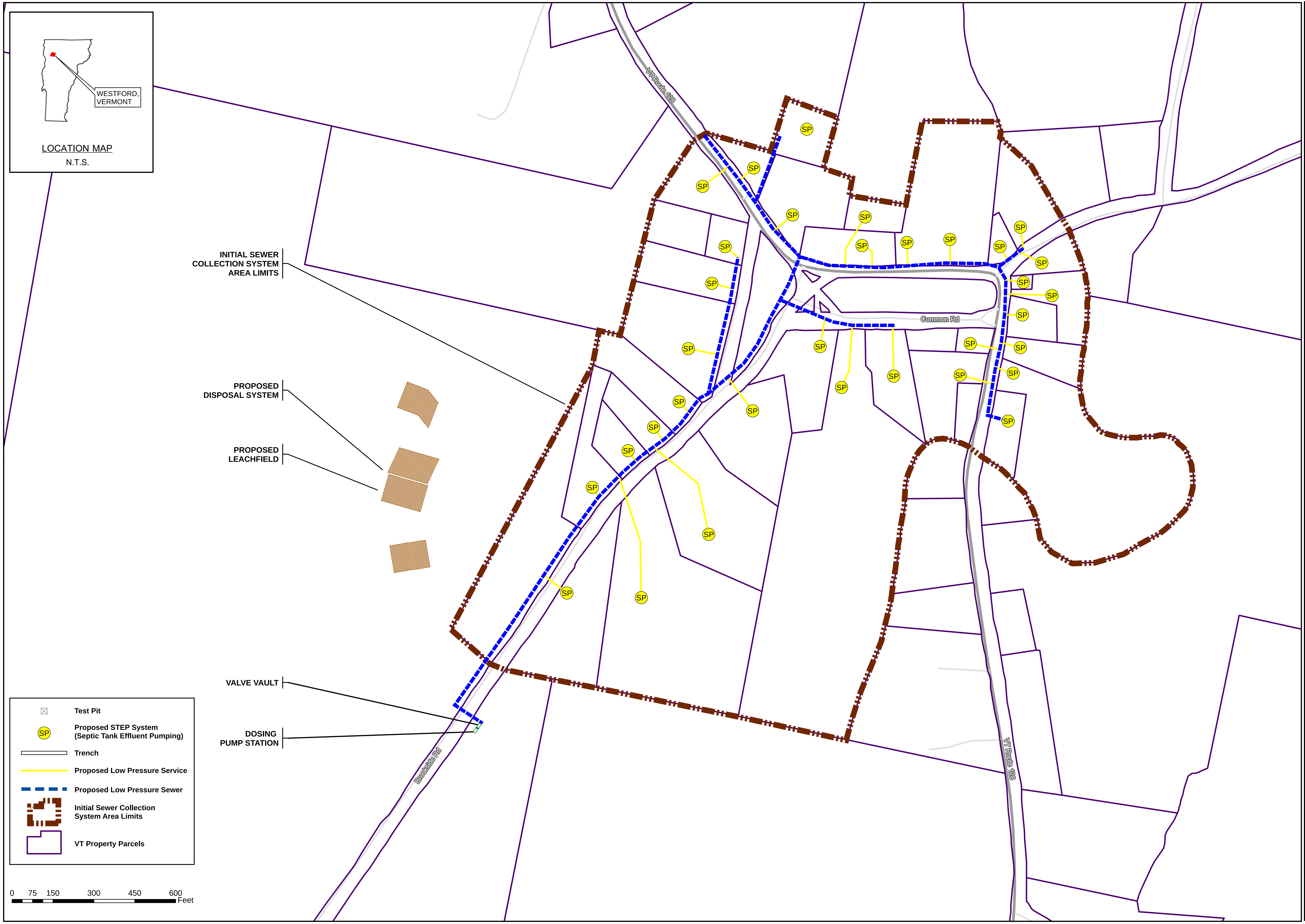


| REV. | DATE | DESCRIPTION | BY |
|---|---|---|---|


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GREEN MOUNTAIN ENGINEERING
CIVIL
WATER
WASTEWATER


DRAWING TITLE: PROPOSED WASTEWATER COLLECTION SYSTEM MAP

PROJECT: WESTFORD WASTEWATER STUDY

CLIENT: WESTFORD, VERMONT

| | |
|---|---|
| DESIGNED KJC | PLOT DATE 09/30/15 |
| DRAWN RSO | SCALE AS SHOWN |
| CHECKED KJC | DATE SEP 2015 |

PROJECT NO. 25-007

DRAWING NO. 1

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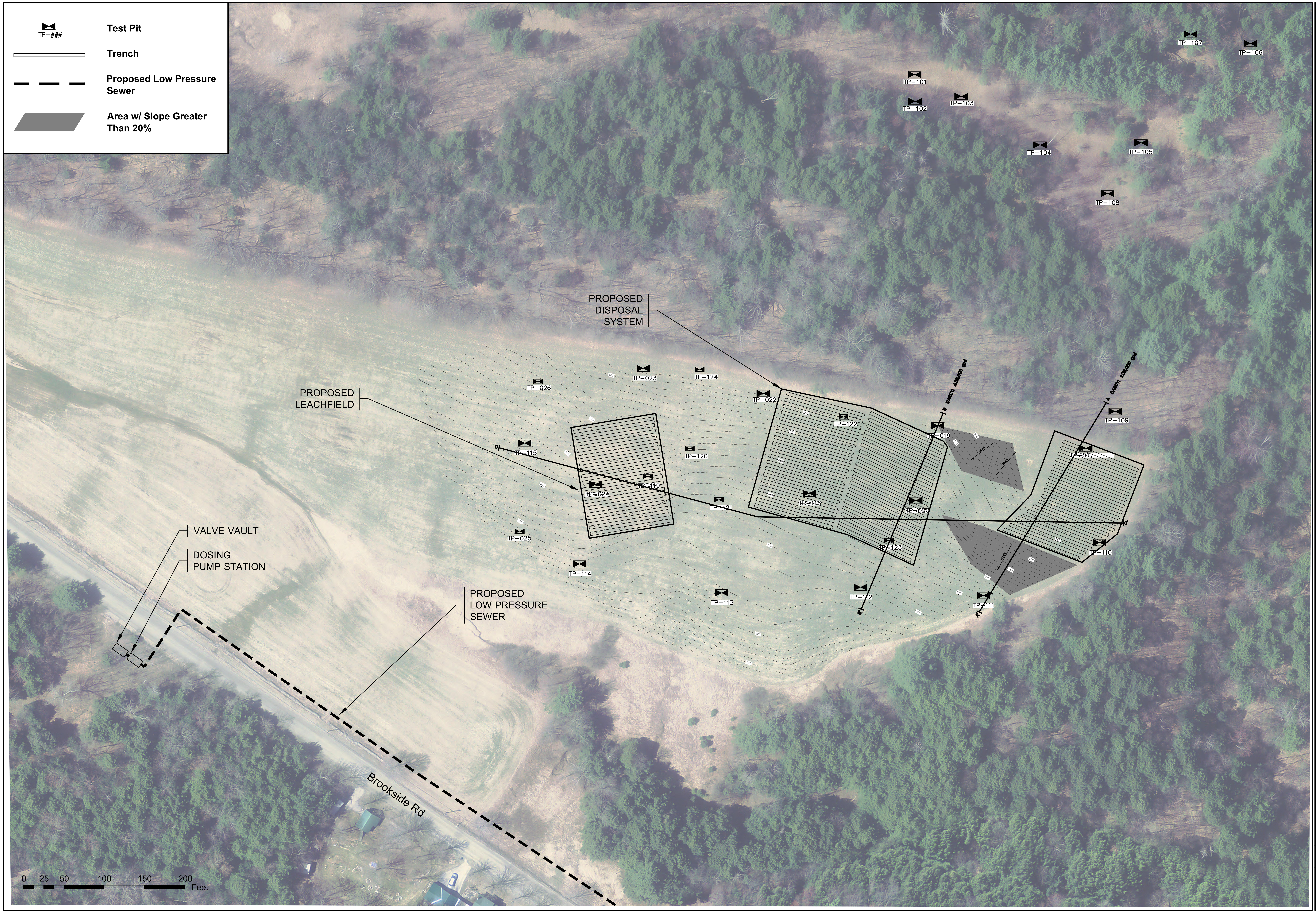


REV. | DATE | DESCRIPTION | BY


1438 SOUTH BROWNELL ROAD
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GREEN MOUNTAIN ENGINEERING
CIVIL
WATER
WASTEWATER


DRAWING TITLE: WASTEWATER DISPOSAL SYSTEM SITE PLAN

PROJECT: WESTFORD WASTEWATER STUDY

CLIENT: WESTFORD, VERMONT

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|---|---|
| DESIGNED KJC | PLOT DATE 06/01/17 |
| DRAWN RSO | SCALE AS SHOWN |
| CHECKED KJC | DATE JUNE 2017 |

PROJECT NO. 25-007

DRAWING NO. 2

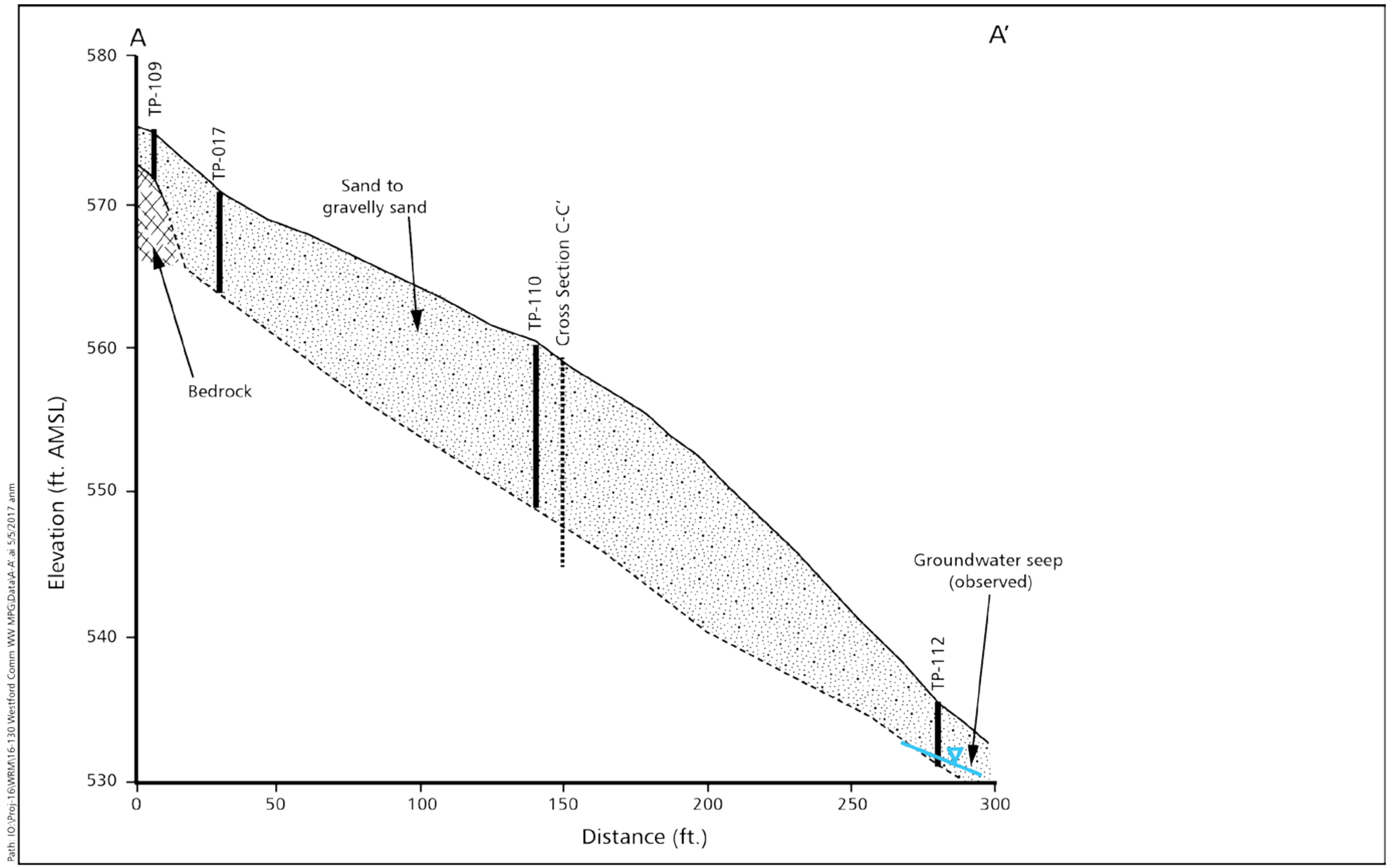


Figure 1: Stratigraphic Cross Section A-A′ (West to East)

Site Capacity Confirmation and Project Financing Options for a Community Wastewater System at the Jackson Farm Site, Westford, Vermont

Source: Hamlin Engineering field observations, 2014; Stone Environmental field observations, 2015-2016; Green Mountain Engineering topographic survey, 2015-2016.

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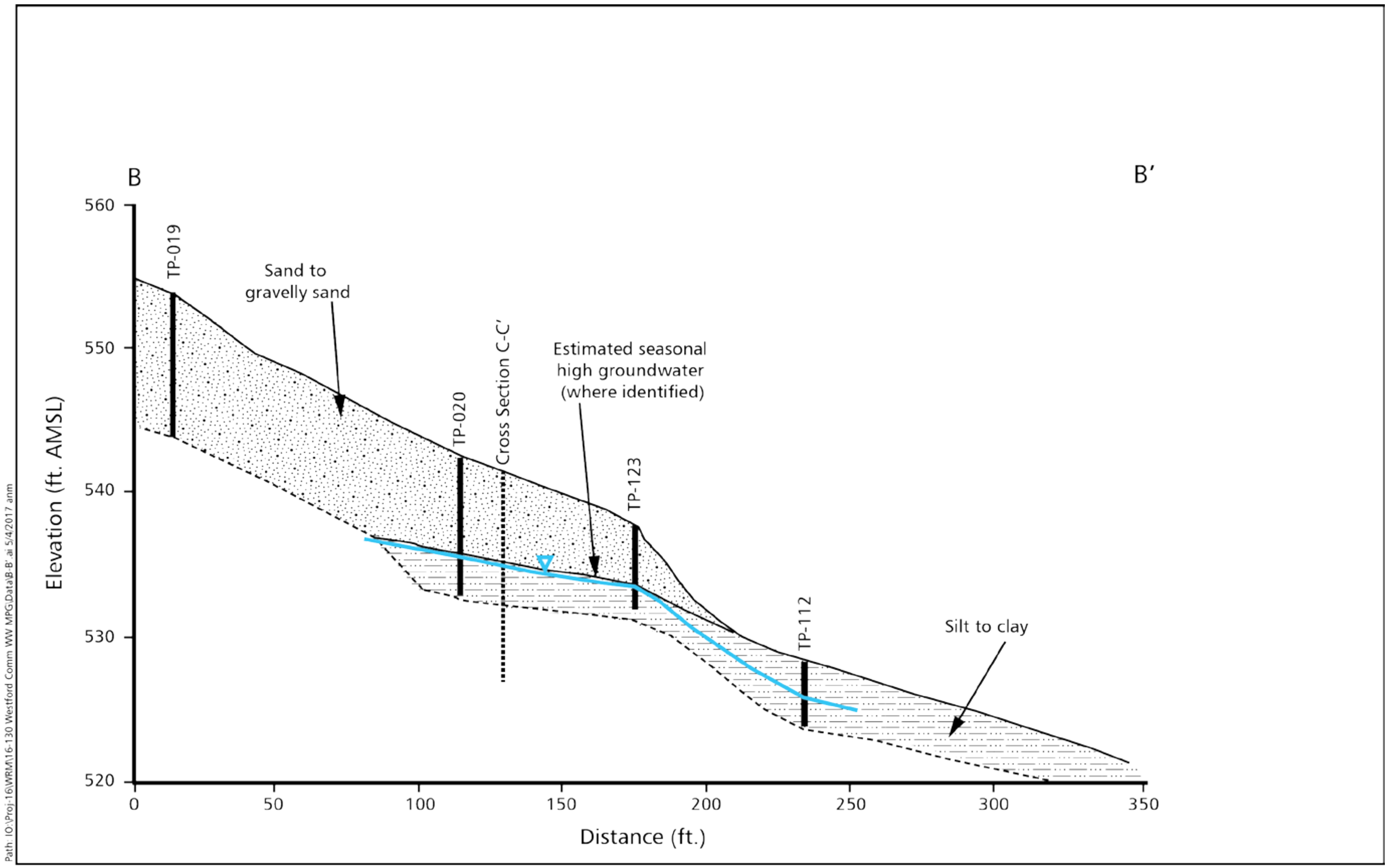


Figure 2: Stratigraphic Cross Section B-B′ (West to East)
Site Capacity Confirmation and Project Financing Options for a Community Wastewater System at the Jackson Farm Site, Westford, Vermont

Source: Hamlin Engineering field observations, 2014; Stone Environmental field observations, 2015-2016; Green Mountain Engineering topographic survey, 2015-2016.

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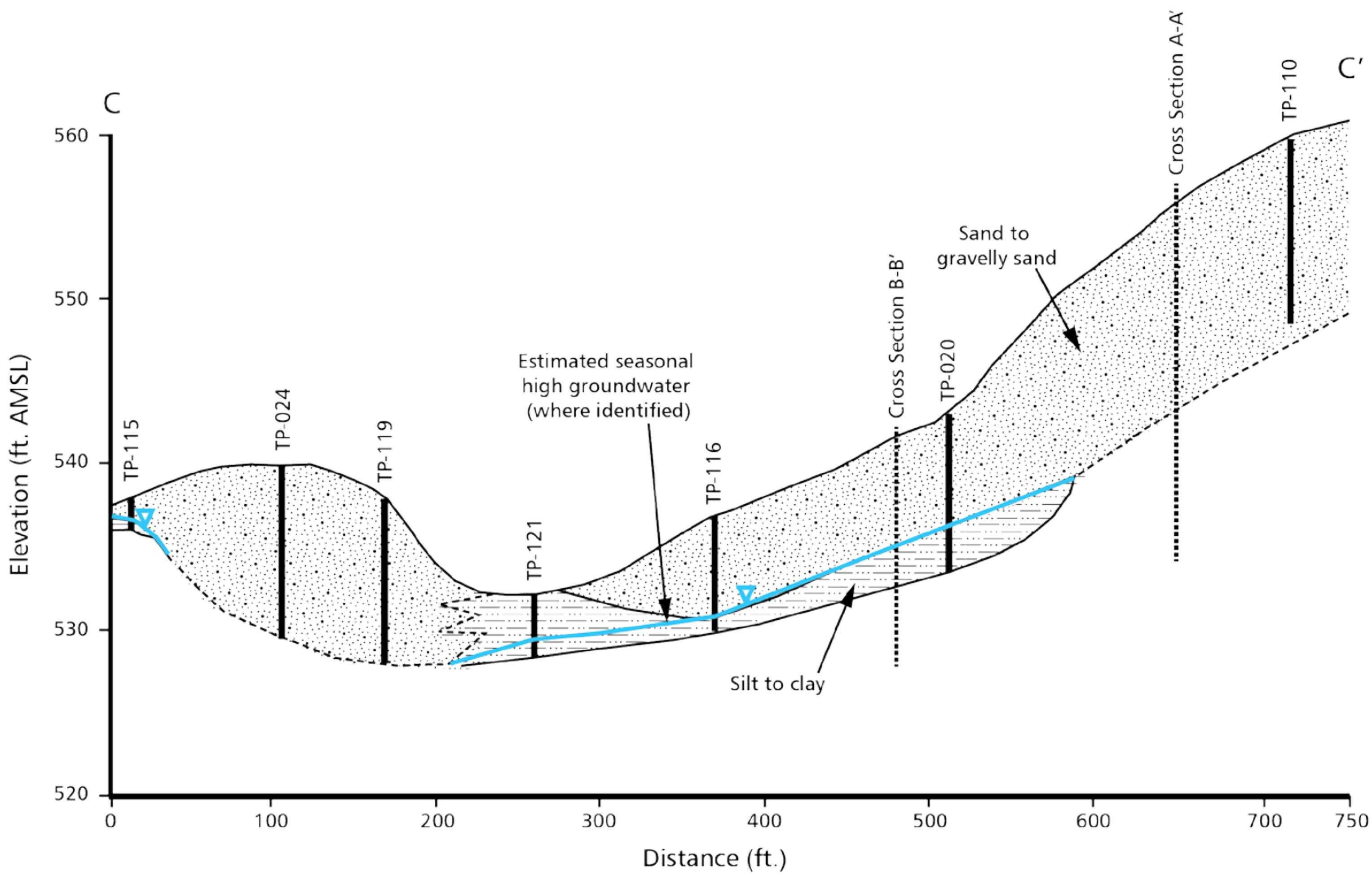


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Figure 3: Stratigraphic Cross Section C-C′ (South to North)

Site Capacity Confirmation and Project Financing Options for a Community Wastewater System at the Jackson Farm Site, Westford, Vermont

Source: Hamlin Engineering field observations, 2014; Stone Environmental field observations, 2015-2016; Green Mountain Engineering topographic survey, 2015-2016.

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## Appendix A: Test Pit Logs and Capacity Calculations

## Site Capacity Confirmation and Project Financing Options for Community Wastewater System at the Jackson Farm Property, Westford, Vermont – Backhoe Test Pit Logs

Soils investigation conducted by Amy Macrellis of Stone Environmental, Inc. on November 17, 2016. Backhoe supplied by John Roberts of Roberts Excavation Inc. Others present during some or all of the investigation included David Gauthier (property owner), Melissa Manka (Town of Westford Planning Coordinator), Kevin Camara (Green Mountain Engineering), Mary Clark (Vermont DEC, Indirect Discharge Permitting Program), and Jessanne Wyman (Vermont DEC, Regional Engineer).

Test pits were located using survey-quality GPS prior to excavation, in order to precisely locate the new test pits relative to work completed previously on this property. The preliminary numbering system used on the day of testing included some numbers that duplicated the identification scheme previously used by Donald J. Hamlin Consulting Engineers in their early 2015 investigation of this area. Thus, the descriptions below include both the test pit numbering scheme used during the field investigation, and the final test pit numbering that eliminates duplicate IDs.

## "Zone 3" Hay Field

**Test Pit TP-117 (TP-025 on day of testing)**

| | |
|---|---|
| 0" – 11" | Very dark brown (7.5YR 2.5/3) gravelly fine sandy loam, weak granular structure, loose consistence, moist. Topsoil/plow layer. ~5% gravel. |
| 11" – 18" | Strong brown (7.5YR 5/6) gravelly loamy fine sand, weak granular structure, loose consistence, moist. |
| 18" – 27" | Yellowish brown (10YR 5/8) loamy fine sand, weak blocky structure, friable consistence, moist. |
| 27" – 34" | Light olive brown (2.5Y 5/4) clay loam, weak platy structure, friable consistence, moist. Few medium faint mottles throughout the horizon. |

No bedrock to depth. Seasonal high groundwater indicators at 27" (Stone determination); DEC representatives estimated seasonal high groundwater at 25".

**Test Pit TP-118 (TP-026 on day of testing)**

| | |
|---|---|
| 0" – 9" | Very dark brown (7.5YR 2.5/2) fine sandy loam, weak granular structure, loose consistence, moist. Topsoil/plow layer. |
| 9" – 14" | Light brown (7.5YR 6/3) gravelly very fine sandy loam, weak granular structure, friable consistence, moist. |
| 14" – 18" | Strong brown (7.5YR 5/6) gravelly fine sand, weak blocky structure, friable consistence, moist. ~10% gravel. |
| 18" – 32" | Yellowish brown (10YR 5/6) fine sand, single grain structure, friable consistence, moist. Gradually becomes stony and with firmer consistence between 26" and 32". |
| 32" – 44" | Olive brown (2.5Y 4/4) clay loam, moderate platy structure, firm consistence, moist. Many medium faint mottles throughout the horizon. |

No bedrock to depth. Seasonal high groundwater indicators at 32" (Stone determination); DEC representatives estimated seasonal high groundwater at 29" in the northern end of the excavation.

**Test Pit TP-119 (TP-027 on day of testing)**

| | |
|---|---|
| 0" – 8" | Dark brown (7.5YR 3/3) fine sandy loam to silt loam, weak granular structure, loose consistence, moist. Topsoil. |
| 8" – 16" | Brown (7.5YR 4/4) gravelly loamy fine sand, single grain structure, loose consistence, moist. 15-20% gravel. |

| | |
|---|---|
| 16" – 69" | Brown (7.5YR 4/4) gravelly coarse sand to very coarse sand, single grain structure, loose consistence, moist. 15-20% gravel, 5% cobbles. |
| 69" – 120" | Overdug pit, but did not enter. Sand to coarse sand present to depth. |

No bedrock or seasonal high groundwater indicators to depth. A lens of light olive brown (2.5Y 5/4) clay loam was present at the north end of the excavation to approximately 18" below ground surface, but no indicators of seasonal high groundwater were present in this material.

**Test Pit TP-120 (TP-028 on day of testing)**

| | |
|---|---|
| 0" – 12" | Dark brown (7.5YR 3/3) silt loam, weak granular structure, loose consistence, moist. Topsoil/plow layer. |
| 12" – 17" | Strong brown (7.5YR 4/6) gravelly very fine sandy loam, weak blocky structure, friable consistence, moist. |
| 17" – 31" | Light olive brown (2.5Y 5/4) silt loam, weak blocky structure, friable consistence, moist. Few fine faint mottles present at 24". |
| 31" – 34" | Light olive brown (2.5Y 5/3) clay loam, moderate platy structure, firm consistence, moist. Few medium faint mottles throughout the horizon. |

No bedrock to depth. Seasonal high groundwater indicators at 24".

**Test Pit TP-121 (TP-029 on day of testing)**

| | |
|---|---|
| 0" – 9" | Dark brown (7.5YR 3/3) silt loam, weak granular structure, loose consistence, moist. Topsoil/plow layer. |
| 9" – 15" | Strong brown (7.5YR 4/6) gravelly sandy clay loam, weak blocky structure, friable consistence, moist. |
| 15" – 24" | Light olive brown (2.5Y 5/4) silty clay loam, weak blocky structure, friable consistence, moist. Few fine faint mottles present at 20". |
| 24" – 37" | Dark grayish brown (2.5Y 4/2) clay loam, moderate platy structure, firm consistence, moist. Few medium faint mottles throughout the horizon. |

No bedrock to depth. Seasonal high groundwater indicators at 20".

**Test Pit TP-122 (TP-030 on day of testing)**

| | |
|---|---|
| 0" – 8" | Dark brown (7.5YR 3/3) loamy fine sand, weak granular structure, loose consistence, moist. Topsoil. |
| 8" – 24" | Brown (7.5YR 4/4) gravelly fine sand to sand, single grain structure, loose consistence, moist. ~5% gravel. |
| 24" – 65" | Brown (2.5Y 5/2) gravelly sand to coarse sand, single grain structure, loose consistence, moist. 5-10% gravel and cobbles. |
| 65" – 120" | Overdug pit, but did not enter. Coarse sand present to depth. |

No bedrock or seasonal high groundwater indicators to depth.

**Test Pit TP-123 (TP-031 on day of testing)**

| | |
|---|---|
| 0" – 7" | Dark brown (7.5YR 3/3) gravelly loamy fine sand, weak granular structure, loose consistence, moist. Topsoil. ~5% gravel. |
| 7" – 36" | Strong brown (7.5YR 4/6) gravelly coarse sand to very coarse sand, single grain structure, loose consistence, moist. ~5% gravel, few cobbles. |
| 36" – 58" | Brown (7/5 YR 4/3) gravelly sand to coarse sand, single grain structure, loose consistence, moist. 5-10% gravel, increasing with depth. |

58” – 64” Olive brown (2.5Y 4/3) silty clay, weak platy structure, firm consistence, moist. Few fine faint mottles throughout the horizon.

No bedrock to depth. Seasonal high groundwater indicators at 58”.

**Test Pit TP-124 (TP-032 on day of testing)**

0” – 8” Dark brown (7.5YR 3/3) gravelly loamy sand, weak granular structure, loose consistence, moist. Topsoil with many roots.

8” – 24” Brown (7.5YR 4/4) gravelly sand to coarse sand, single grain structure, loose consistence, moist. ~10% gravel and cobbles.

24” – 36” Strong brown (7/5YR 5/6) gravelly fine sand, single grain structure, friable consistence, extremely dry. ~30% gravel.

36” – 84” Light yellowish brown (2.5Y 6/3) very gravelly fine sand, single grain structure, friable to firm consistence, extremely dry. ~50% gravel.

No bedrock or seasonal high groundwater indicators to depth (96” at uphill/western end of the excavation).

## *Appendix A, Table 1: Revised Darcy's Law Capacity Analysis, Jackson Farm Site, A-A'*

Project Title: Community Wastewater Capacity in the Westford Town Common Area, Jackson Farm site
Stone Project No.: 16-130
Date: December 22, 2016
Prepared by: Amy Macrellis

**Darcy's Law Calculations: Q = KiA**
Q = design flow (gallons / day)
K = Hydraulic conductivity (feet / day)
i = Hydraulic gradient (slope of water table, unitless)
A = transmitting soil cross-sectional area (D) times length of disposal system (L) in square feet, where
D = depth to impeding layer or water table, minus required vertical separation, minus system depth

**Assumptions:**

1. Hydraulic conductivity (K) = 69 feet/day (measured at TP-110)
2. Water table slope (i) is similar to ground surface slope, estimated from site survey, average slope along the A-A' cross section, excluding areas with slope over 20% where leachfields cannot be sited = 23'/200'= 8.7%
3. Depth to limiting feature or bottom of pit (limiting feature unknown in A-A' where leachfields would be sited; use bottom of TP-110, 10.7 feet below ground surface)
4. Design is for in-ground trenches with the bottom of the trenches located 1.5 feet below ground surface
5. Required separation distance to seasonal high groundwater = 3.0 feet for septic tank effluent
6. System length (L) across slope (perpendicular to contours) = 140 feet (along A-A', from treeline west of TP-017 to 25' setback from slope >20%)

**Calculations:**

K = 69 ft./day
i = 8.7%
L = 140 ft.
D = (10.7 ft. - 1.5 ft. - 3.0 ft.) = 6.2 ft.

Q = 69 ft./day x 0.087 x (140 ft x 6.2 ft) x 7.48 gal/ft$^3$
Q = 38,975 gallons / day

## *Appendix A, Table 2: Revised Darcy's Law Capacity Analysis, Jackson Farm Site, B-B'*

Project Title: Community Wastewater Capacity in the Westford Town Common Area, Jackson Farm site
Stone Project No.: 16-130
Date: December 22, 2016
Prepared by: Amy Macrellis

**Darcy's Law Calculations: Q = KiA**
Q = design flow (gallons / day)
K = Hydraulic conductivity (feet / day)
i = Hydraulic gradient (slope of water table, unitless)
A = transmitting soil cross-sectional area (D) times length of disposal system (L) in square feet, where
D = depth to impeding layer or water table, minus required vertical separation, minus system depth

**Assumptions:**

1 Hydraulic conductivity (K) = 69 feet/day (measured at TP-110)
2 Water table slope (i) based on elevations of ESHGW at TP-020 and TP-123 along the B-B' cross section as estimated from site survey = 3'/60'= 5%

3 Depth to limiting feature or bottom of pit (ranges from 4.8 ft to >10.0 ft where leachfields would be sited; use average of TP-019, TP-020, and TP-123 = 7.0 feet below ground surface)

4 Design is for in-ground trenches with the bottom of the trenches located 1.5 feet below ground surface
5 Required separation distance to seasonal high groundwater = 3.0 feet for septic tank effluent
6 System length (L) across slope (perpendicular to contours) = 170 feet (along B-B', from treeline west of TP-019 to TP-123)

**Calculations:**

K = 69 ft./day
i = 5.0%
L = 170 ft.
D = (7.0 ft. - 1.5 ft. - 3.0 ft.) = 2.5 ft.

Q = 69 ft./day x 0.05 x (170 ft x 2.5 ft) x 7.48 gal/$ft^3$
Q = 10,968 gallons / day

## Appendix B: Detailed Calculations for Opinions of Probable Cost and User Fee Estimates

## Town of Westford
## Jackson Farm Wastewater Capacity Study
## Contract No. 1- Septic Tank Effluent Pumping (STEP) Collection System
## Opinion of Probable Construction Cost

| DESCRIPTION | Unit | Quantity | Unit Price | Total Amount ENR 10,037 | Total Amount ENR 11,000 |
|---|---|---|---|---|---|
| **A- Sewers** | | | | | |
| A-1 2" HDPE LPS | LF | 4,600 | $40 | $184,000 | $201,654 |
| **B- Sewerline Appurtenances** | | | | | |
| B-1 5' Diameter Air Release/CO Manholes | EA | 4 | $8,000 | $32,000 | $35,070 |
| B-2 5' Dia, C.O. Manholes | EA | 4 | $7,500 | $30,000 | $32,878 |
| B-3 1 1/4" Low PressureSewer Services | LF | 3,300 | $34 | $112,200 | $122,965 |
| B-3 4" Gravity Sewer Services | LF | 500 | $38 | $19,000 | $20,823 |
| **C- Earthwork** | | | | | |
| C-1 Rock Excavation | CY | 400 | $120 | $48,000 | $52,605 |
| C-2 Boulder Excavation | CY | 50 | $100 | $5,000 | $5,480 |
| C-3 Misc. Extra and Below Grade Excavation | CY | 20 | $40 | $800 | $877 |
| C-4 Excavation & Replace Unsuitable | CY | 20 | $40 | $800 | $877 |
| **D- Roadwork** | | | | | |
| D-1 Permanent Bit. Pavement Repair | SY | 80 | $60 | $4,800 | $5,261 |
| D-2 Permanent Gravel Road & Drive Repair | SY | 800 | $50 | $40,000 | $43,838 |
| **E-Incedental Work** | | | | | |
| E-1 Class B Concrete | CY | 10 | $175 | $1,750 | $1,918 |
| E-2 Calcium Chloride | TON | 2 | $600 | $1,200 | $1,315 |
| E-3 Rigid Insulation | LF | 300 | $8 | $2,400 | $2,630 |
| E-4 Uniform Traffic Officers | HRS | 50 | $60 | $3,000 | $3,288 |
| E-5 Silt Fence | LF | 1,000 | $4 | $4,000 | $4,384 |
| E-6 Degradable Erosion Control Blankets | SY | 300 | $4 | $1,200 | $1,315 |
| E-7 Temporary Stone Check Dams | EA | 12 | $120 | $1,440 | $1,578 |
| E-8 1,500 Gallon STEP Tanks (Includes Electrical and Panels) | EA | 31 | $10,000 | $310,000 | $339,743 |
| E-9 2,000 Gallon STEP Tanks (Includes Electrical and Panels) | EA | 2 | $12,000 | $24,000 | $26,303 |
| E-10 House Replumbs | EA | 10 | $1,000 | $10,000 | $10,959 |
| E-11 Septic Tank Deactivation | EA | 33 | $1,000 | $33,000 | $36,166 |
| **F- Lump Sum Items** | | | | | |
| Preparation of Site and Miscellaneous Work (8%) | LS | 1 | $69,487 | $69,487 | $76,154 |
| Bonds (1.5%) | LS | 1 | $14,071 | $14,071 | $15,421 |
| Contingency (10%) | LS | 1 | $95,215 | $95,215 | $104,350 |
| **SUBTOTAL** | | | | **$1,047,363** | **$1,147,852** |
| **USE** | | | | **$1,050,000** | **$1,150,000** |

Notes: The estimate is based on PLANNING phase estimates for construction and engineering. The quantities noted in the estimate are based on GIS scaled unit quantities from scenario's developed by Green Mountain Engineering (GME). GME bears no responsibility for prices and quantities noted in the estimate, beyond the planning phase. The quantities and unit prices will likely vary based on the actual design, site conditions. ENR = Engineering News Record- Construction Cost Index. ENR 10,037= July 2015. ENR 11,000= Predicted February 2018 (Bid Date)

## Town of Westford
## Jackson Farm Wastewater Capacity Study
## Contract No. 2- Wastewater Disposal System
## Opinion of Probable Construction Cost

| DESCRIPTION | Unit | Quantity | Unit Price | Total Amount ENR 10,037 | Total Amount ENR 11,000 |
|---|---|---|---|---|---|
| Mobilization/Demobilization | LS | 1 | $3,000 | $3,000 | $3,288 |
| Silt Fence | LF | 600 | $3 | $1,800 | $1,973 |
| Excavate Leachfield Trenches | CY | 2,333 | $8 | $18,667 | $20,458 |
| Leachfield Stone | CY | 1,383 | $25 | $34,568 | $37,885 |
| 1 1/2" Laterals | LF | 7,000 | $6 | $42,000 | $46,030 |
| Filter Fabric | SY | 3,111 | $2 | $6,222 | $6,819 |
| Topsoil | CY | 86 | $25 | $2,160 | $2,368 |
| 3" Forcemains | LF | 2,000 | $30 | $60,000 | $65,757 |
| 3" Gate Valves | Ea | 6 | $800 | $4,800 | $5,261 |
| 6' x 12' Precast Valve Structure | | | | | |
| Excavation | CY | 80 | $8 | $640 | $701 |
| Precast Structure | LS | 1 | $8,000 | $8,000 | $8,768 |
| Hatch | LS | 1 | $3,000 | $3,000 | $3,288 |
| Steps | LS | 1 | $600 | $600 | $658 |
| Sump Pump | LS | 1 | $500 | $500 | $548 |
| 3" Gate Valves | EA | 6 | $400 | $2,400 | $2,630 |
| 3" Check Valves | Ea | 3 | $400 | $1,200 | $1,315 |
| 3" SCh 80 PVC Pipe | LF | 24 | $40 | $960 | $1,052 |
| Vent Pipe | LS | 1 | $300 | $300 | $329 |
| Misc. Items | LS | 1 | $1,500 | $1,500 | $1,644 |
| Structural Backfill | CY | 50 | $25 | $1,250 | $1,370 |
| 6' x 12' Precast Dosing Tank | | | | | |
| Excavation | CY | 80 | $8 | $640 | $701 |
| Precast Structure | LS | 1 | $8,000 | $8,000 | $8,768 |
| Hatches | LS | 1 | $9,000 | $9,000 | $9,864 |
| Pumps and Slide Rails | EA | 6 | $5,000 | $30,000 | $32,878 |
| 3" SCh 80 PVC Pipe | LF | 24 | $40 | $960 | $1,052 |
| Vent Pipe | LS | 1 | $300 | $300 | $329 |
| Misc. Items | LS | 1 | $1,500 | $1,500 | $1,644 |
| Structural Backfill | CY | 50 | $25 | $1,250 | $1,370 |
| Electrical (New Service, Panel., Wiring) | LS | 1 | $30,000 | $30,000 | $32,878 |
| Temporary Road | | | | | |
| Excavation | CY | 444 | $8 | $3,556 | $3,897 |
| Filter Fabric | SY | 1,333 | $2 | $2,667 | $2,923 |
| Gravel | CY | 444 | $25 | $11,111 | $12,177 |
| Fine Grade, Seed and Mulch | SY | 17,778 | $2 | $35,556 | $38,967 |
| Start-Up/Testing | LS | 1 | $3,000 | $3,000 | $3,288 |
| Preparation of Site and Miscellaneous Work (8%) | LS | 1 | $26,488 | $26,488 | $29,030 |
| Bonds (1.5%) | LS | 1 | $5,364 | $5,364 | $5,879 |
| Contingency (10%) | LS | 1 | $36,296 | $36,296 | $39,778 |
| **SUBTOTAL** | | | | **$399,254** | **$437,561** |
| **USE** | | | | **$415,000** | **$440,000** |

Notes: The estimate is based on PLANNING phase estimates for construction and engineering. The quantities noted in the estimate are based on GIS scaled unit quantities from scenario's developed by Green Mountain Engineering (GME). GME bears no responsibility for prices and quantities noted in the estimate, beyond the planning phase. The quantities and unit prices will likely vary based on the actual design, site conditions. ENR = Engineering News Record- Construction Cost Index. ENR 10,037= July 2015. ENR 11,000= Predicted February 2018 (Bid Date)

## Town of Westford
## Jackson Farm Wastewater Capacity Study
## Opinion of Probable Total Project Cost

| DESCRIPTION | Total Cost |
|---|---|
| **Construction** | |
| Contract No. 1- Wastewater Collection System [1.] | $1,150,000 |
| Contract No. 2- Wastewater Disposal System [1.] | $440,000 |
| **Construction Subtotal** | **$1,590,000** |
| **STEP I- Preliminary Engineering** | |
| Feasibility Study | $10,000 |
| Preliminary Engineering Study [2.] | $54,855 |
| Act 250 Permitting | $5,000 |
| Indirect Discharge Permitting | $25,000 |
| Water Supply/Wastewater Disposal Permits | $2,000 |
| Archeological Phase 1 B | $5,000 |
| Wetlands Review | $2,500 |
| Environmental Assessment Report | $5,000 |
| Bond Vote Technical Assistance | $5,000 |
| Sewer Use Ordinance | $5,000 |
| **STEP I- Preliminary Engineering Subtotal** | **$119,355** |
| **STEP II- Final Design Engineering** | |
| Final Design Allowance [2.] | $109,710 |
| **STEP II- Final Design Subtotal** | **$109,710** |
| **STEP III- Construction Engineering Services** | |
| Construction Enginering [2.] | $201,135 |
| **STEP III- Construction Engineering Subtotal** | **$201,135** |
| **Other Costs** | |
| Administrative | $5,000 |
| Land Acquisition | $150,000 |
| Easement Assistance | $5,000 |
| Legal & Fiscal | $5,000 |
| Short Term Interest | $40,000 |
| **Other Costs Subtotal** | **$205,000** |
| **BTOTAL** | **$2,225,200** |
| **USE** | **$2,230,000** |

Notes: The estimate is based on PLANNING phase estimates for construction and engineering. The quantities noted in the estimate are based on GIS scaled unit quantities from scenario's developed by Green Mountain Engineering (GME). GME bears no responsibility for prices and quantities noted in the estimate, beyond the planning phase. The quantities and unit prices will likely vary based on the actual design, site conditions. ENR = Engineering News Record- Construction Cost Index. ENR 11,000= Predicted February 2018 (Bid Date)

| | |
|---|---|
| Constuction Cost | 1590000 |

| TABLE I | Projects < $713,300 | | |
|---|---|---|---|
| Engineering Step | Fixed Fee Allowance | Variable Fee Allowance | Total Fee Allowance |
| Preliminary | N/A | N/A | N/A |
| Final Design | N/A | N/A | N/A |
| Construction | N/A | N/A | N/A |
| Total | N/A | N/A | N/A |

| TABLE II | Projects > or = $713,300 |
|---|---|
| Engineering Step | Fee Allowance |
| Preliminary | $54,855 |
| Final Design | $109,710 |
| Construction | $201,135 |
| Total | $365,700 |

## Town of Westford
## Jackson Farm Wastewater Capacity Study
## Opinion of Probable First Year O&M Cost

| Cost Category | O&M Cost |
|---|---|
| Contract Operations | $13,000 |
| Electrical | $2,500 |
| Septage Pumping | $2,500 |
| Groundwater Monitoring | $3,000 |
| Capital Replacement | $1,000 |
| Insurance | $500 |
| Misc. Repairs | $1,000 |
| Billing | $500 |
| **O&M Cost Total** | **$24,000** |

Notes: The estimate is based on PLANNING phase estimates for O&M Costs. The estimateis based on scenario's developed by Green Mountain Engineering (GME). GME bears no responsibility for prices and quantities noted in the estimate, beyond the planning phase. The costs will likely vary based on the actual design, site conditions. Contract Operations is based on $45/hour x 288 hr/yr. Electrical is based on $0.14/kw-hr. Each homeowner pays for their own STEP system electrical cost. Septage pumping is based on 1/4 systems pumped each year at a cost of $300/pump out.

**Town of Westford**
**Jackson Farm Wastewater Capacity Study**
**User Fee Estimates- Users Pay 100%**

| Category | No Grants | 35% Grants | 50% Grants | 75% Grants |
|---|---|---|---|---|
| Bond Repayment Amount | $2,230,000 | $1,449,500 | $1,115,000 | $557,500 |
| Annual Bond Payment | $136,365 | $88,637 | $68,182 | $34,091 |
| Annual O&M costs | $24,000 | $24,000 | $24,000 | $24,000 |
| Total Annual Cost | $160,365 | $112,637 | $92,182 | $58,091 |
| No. of EU's | 39 | 39 | 39 | 39 |
| **Annual User Fee** | **$4,112** | **$2,888** | **$2,364** | **$1,490** |

Notes: Annual Payment 20yr., SFRF 2% loan ($61.16/$1,000 borrowed)

## Town of Westford
## Jackson Farm Wastewater Capacity Study
## User Fee Estimates- Property Assessment Fee

| Category | No Grants | 35% Grants | 50% Grants | 75% Grants |
|---|---|---|---|---|
| Bond Repayment Amount | $2,230,000 | $1,449,500 | $1,115,000 | $557,500 |
| Annual Bond Payment | $136,365 | $88,637 | $68,182 | $34,091 |
| Increase in Tax Rate Needed | $0.055 | $0.036 | $0.027 | $0.014 |
| **Propery Value Assessed Fee** | **$151** | **$98** | **$76** | **$38** |
| Annual O&M costs | $24,000 | $24,000 | $24,000 | $24,000 |
| No. of EU's | 39 | 39 | 39 | 39 |
| User O&M Fee | $615 | $615 | $615 | $615 |
| **Total User Fee** | **$766** | **$714** | **$691** | **$653** |

Notes: Annual Payment 20yr., SFRF 2% loan ($61.16/$1,000 borrowed); Property value assessed fee is that typical for a property value of $275,000.

## Town of Westford
## Jackson Farm Wastewater Capacity Study
## User Fee Estimates- Parcel Assessment

| Category | No Grants | 35% Grants | 50% Grants | 75% Grants |
|---|---|---|---|---|
| Bond Repayment Amount | $2,230,000 | $1,449,500 | $1,115,000 | $557,500 |
| Annual Bond Payment | $136,365 | $88,637 | $68,182 | $34,091 |
| No. of Parcels | 936 | 936 | 936 | 936 |
| **Annual Parcel Fee** | **$146** | **$95** | **$73** | **$36** |
| Annual O&M costs | $24,000 | $24,000 | $24,000 | $24,000 |
| No. of EU's | 39 | 39 | 39 | 39 |
| User O&M Fee | $615 | $615 | $615 | $615 |
| **Total User Fee** | **$761** | **$710** | **$688** | **$652** |

Notes: Annual Payment 20yr., SFRF 2% loan ($61.16/$1,000 borrowed)