

### Wastewater Disposal System Design Philo Ridge Farm Mound Site 22-Oct-18

790 Design Flow (GPD)
0.82 Average Daily Flow (GPM)
4.0 Allowable application per linear foot (GPD/LF)
197 Linear feet of Trench Required (FT)
280 Equivalent Linear feet of Trench Proposed (FT)
<b>Dosing Requirements</b>
1.5 Diameter of Distribution Pipe (Inches)
1 Number of Distribution Pipes
193 Length of Distribution Pipe (FT)
18 Distribution System Volume (Gallons)
5.00 Required Dose Volume Factor
89 Required Minimum Dose Volume (Gallons)
4.00 Minimum Required Doses per Day
197 Maximum Dose Allowed (Gallons)
200 Chosen Dose Volume (Gallons)
5.00 Recommended Pumping Duration per Dose (Minutes)
40.00 Recommended Pumping Rate w/o Inflow (GPM)
40.82 Recommended Pumping Rate with Inflow (GPM)
47.75 Chosen Flow Rate (GPM)
<b>Distribution Requirements</b>
4 Trench width (FT)
1,120 Total Trench Area (SF)
25 Maximum Area per orifice Hole (SF)
45 Required Number of Orifice Holes
70 Number of Orifice Holes Proposed
0.57 Avg. Flow per Orifice (GPM)
346.75 Effluent Elevation Head
<b>TRENCH 1</b>
70 Total # of orifices
790 Total Design Flow (GPD)
280 Total Length of Trench (FT)
47.8 Chosen Design Flow (GPM)
44.66 Total Actual Design Flow (GPM)
-6.91% Percent Delta from Design

### Philo Ridge Farm Mound Distribution System Design 22-Oct-18

1 Maximum Allowable application Rate per Square Foot (GPD/SF)
47.8 Design Pumping Rate to Entire Field (GPM)
790 Total Design Flow to Site (GPD)
1 Number of Trenches/Beds
343.75 Invert Elevation
<b>Trench 1 (Bed)</b>
9 Depth of Stone (inches)
1 Application Rate per Square Foot
280 Length of Section
790 Design Flow (GPD)
47.75 Design Flow (GPM)
45 Required Number of Orifices
<b>Orifice Design</b>
0.125 Diameter of orifice (Inches)
14 Number of orifices
3 Residual pressure (FT)
0.32 Design Flow per head (GPM)
4.47 Subtotal flow (GPM)
0.1875 Diameter of orifice (Inches)
56 Number of orifices
3 Residual pressure (FT)
0.72 Design Flow per head (GPM)
40.20 Subtotal flow (GPM)
0.25 Diameter of orifice (Inches)
0 Number of orifices
3 Residual pressure (FT)
1.28 Design Flow per head (GPM)
0.00 Subtotal flow (GPM)
70 Total # of orifices
45 Required Number of Orifice Holes
44.66 Total Flow
47.75 Total Rec. Design Flow This Trench (GPM)
-6.47% Percent Delta from Design
277 Length of Distribution Pipe (FT)
3.99 Spacing of orifice holes (FT)

### Philo Ridge Farm Charlotte, Vermont Pump Station Basis of Design Rev 10/22/2018

Design Flow	790 GPD
Infiltration	0 GPD
20% Municipal Credit	0
Total Design Flow	790 GPD
Average Daily Flow	0.82 GPM
Peaking Factor	5.00
Peak Flow	4.11 GPM
Required Storage	790 gallons
Simplex Pump Station Storage Provided	500 gallons
Force Main Dia.	3.00 Inches
Min. Cleansing Velocity	2.00 FPS
Min. Pumping Rate	44.04 GPM
Chosen Pumping rate	47.75 GPM
Length of FM to Mound	880.00 feet
Friction Losses to Mound	5.31 feet
High Point of FM	357.00 feet
Low Elevation in PS	353.70 feet
Elevation Change	3.30 feet
Minor headlosses	3.00 feet
Residual	3.00 feet
TDH	14.61 feet
Pump Cycle Storage	150 Gallons
Run Cycle	4.69 Minutes
Wet Well Detention Time	182.34 Minutes
System Curve	GPM TDH
	25 10.90
	30 11.50
	40 13.10
	50 15.10
	60 17.40
	70 20.10
<b>Pump Selection</b>	Hydromatic SHEF40, 0.4 Ph, 230 v, 60 Hz, 1 HP

### Philo Ridge Farm Replacement Wastewater System Design Flow 10/12/2018

Use	Number	Unit	Flow/Unit	GPD
<b>Brick House Office</b>				
Commercial Sink	1	Sinks x	100 GPD/Sink	= 100
Employees	12	Empl. x	15 GPD/Empl	= 180
			Brick House Office Design Flow	= 280
<b>Commons Barn Processing Facility</b>				
Deli	1	Deli x	150 Deli	= 150
Commercial Sink	3	Sinks x	100 GPD/Sink	= 300
Employees	35	Empl. x	15 GPD/Empl	= 525
				975
<b>Barn Low Flow Fixture Credit</b>	10%	of	975 GPD	= -98
			Commons Barn Design Flow	= 878
<b>Flow Splitter</b>	90%	to Commons Barn Wastewater Disposal Field		
	10%	to Brick House Wastewater Disposal Field		
<b>Design Flows to Brick House Disposal Field</b>				
Brick House Office	100%	of	280 GPD	= 280
Commons Barn Processing Facility	10%	of	878 GPD	= 88
			Brick House Office Disposal Field Design Flow	= 368
			Historical Design Flow for Brick House Bldg Wastewater Disposal Field	= 490
<b>Design Flows to Commons Barn Disposal Field</b>				
Commons Barn Processing Facility	90%	of	878 GPD	= 790
			Brick House Office Disposal Field Design Flow	= 790

**Basis of Design**

Design Flow 790 GPD

Performance Based Design Approach  
Limiting Soil Condition - Loam  
Limiting Slope Condition - 2/13.26=15.1%  
Max. Allowable Linear Loading Rate - 19.6 GPD/LF/VLF

Design Trench - 4-foot Trench  
Standard Effluent Application Rate = 1 GPD/SF  
Design Linear Loading Rate - 4 GPD/LF

Resulting Groundwater Mounding  
(4 GPD/LF)/(19.6 GPD/LF) = 0.20 ft = 2.5"

Limiting Depth to SHGWT under Bed/Trench = 18" (TP#7)  
Resulting Unsaturated Depth = 18" - 2.5" = 15.5"

Required Separation to Mounded SHGWT = 36"  
Min. Required Depth of Sand under Bed 36" - 15.5" = 20.5"  
Depth of Sand under Bed Provided = 23.5"

Limiting Depth to SHGWT at Toe of Mound = 22" (TP#12)  
Resulting Unsaturated Depth = 22" - 2.5" = 19.5" which is >6" min.

Limiting Depth to SHGWT at 25' below Toe of Mound = 18" (TP#15)  
Resulting Unsaturated Depth = 18" - 2.5" = 15.5" which is >6" min.

Disposal Field  
Min Required Length of Bed 790 GPD / (4 GPD/LF) = 198 feet (280 feet provided)  
Limiting Percolation Rate = 25 Inches/Hour (Per Test #2)  
Required Effective Basal Area = 790 GPD/(0.74 GPD/SF) = 1,067 SF  
Basal Area Provided = 12,633 SF  
Separation Distance to Property Line  
10 FT to Toe, 24 FT provided  
25 FT to bed, 41 FT provided  
Required Separation to Bedrock = 4 FT, 6 FT min. provided

DISPOSAL FIELDS & FORCE MAINS

PART 1 - GENERAL

1.01 Summary

A. Section includes:

- Wastewater Disposal Field
- Force Main Materials

1.02 References

A. All work shall be done in accordance with the State of Vermont Environmental Protection Rules effective September 29, 2007.

PART 2 - PRODUCTS

2.01 General

A. Disposal Fields: Schedule 40 PVC pipe meeting the requirements of the latest revision of ASTM Specification D-1785. Fittings used in the disposal fields shall be compatible with distribution lines material.

B. Force Mains: PVC pipe shall conform in all respects to the latest revisions of ASTM Specifications D-2241. All pipe fittings shall be SDR 26 (or SCH 40) clearly marked as follows:

- Manufacturer's Name and Trademark
- Nominal Pipe Size (as shown on plans)
- Material Designation

Joints shall be push-on type using elastomeric gaskets factory installed conforming to ASTM Specification D-3212.

C. Crushed stone shall be clean, durable and no smaller than 3/4" or larger than 1 1/2 inches in diameter.

PART 3 - EXECUTION

3.01 Disposal Field Installation Procedure

A. The wastewater system shall be inspected during critical stages of construction by a qualified consultant. This shall include at a minimum the staking of the disposal field, the trenches after the initial 12 inches of stone and distribution piping is placed, and a final inspection of the entire system. The Contractor will be responsible for contacting the Engineer to set up the inspection schedule.

B. Construction of the system shall not take place when the soil moisture is high in the system area. If the soil at 6 inches below grade can be rolled into the shape of a wire, the soil moisture content is too high for construction to begin.

C. When the trench has been excavated, the sides and bottom shall be raked to scarify any smeared soil surfaces. Construction equipment not needed to construct the system should be kept off the area to be utilized for the absorption trench system to prevent undesirable compaction of the soils.

D. At least 12 inches of washed stone shall be placed in the bottom of the trench.

E. The pressure distribution pipe should be laid level on top of the stone and flushing valves installed at the ends of the pipe. Upon completion of the distribution piping, the qualified consultant shall test the system with clean water. The test shall show that a minimum pressure of three feet of head is present at the ends of the pipe and that the difference in discharge rate between the two orifices with the greatest difference in discharge rates is not greater than 15 percent. After connecting the distribution pipe to the force main, the distribution pipe shall be covered with at least two inches of clean stone aggregate. The stone aggregate shall be covered completely with filter fabric.

F. The distribution pipe shall be covered with at least 3 inches of clean stone aggregate. The stone aggregate shall be covered completely with filter fabric.

G. The filter fabric shall be covered with a minimum of 12 inches of soil but not more than 18 inches, with the upper 4 to 6 inches of soil being loam and the remainder of the fill being of a fine sandy loam to medium sand texture. A vegetated cover free of large brush and trees shall be maintained over the system.

H. The area surrounding the disposal field shall be graded to provide diversion of surface run-off waters if required.

3.02 Testing Report

A. Testing of pressure distribution shall be done in the Engineer's presence. Pressure shall be measured to insure a minimum of 1 psi.

B. The distribution line shall then be carefully placed on the bedding with no slope, orifice shields snapped into place, and covered with at least 2" of crushed stone.

C. All work shall be done in accordance with the State of Vermont Environmental Protection Rules.

D. Force Main

1. General: All force mains shall pass the hydrostatic pressure test and leakage test described herein. Prior to testing, all anchors and braces shall be installed. All concrete thrust blocks and restraints shall be in place and cured at least seven days. All buried pipe shall be backfilled. Suitable test plugs shall be installed and air release valves shall be installed at the high points.

2. Hydrostatic Test: The following procedure shall be used:

- All air release valves shall be opened and the pipe shall be filled with water at a rate not to exceed the venting capacity of the air release valves.
- The water pressure shall be raised to 150 percent of the designed operating pressure or 60 psi minimum at the highest point.
- Failure to hold the designated pressure within 5 psi of the specified test pressure for the two hour period constitutes a failure of the section tested.

3. Leakage Test: The following procedure shall be used:

- Leakage shall be defined as the quantity of water that must be supplied into the pipe being tested to maintain pressure within 5 psi of the specified test pressure.
- No pipe installation shall be accepted if the leakage is greater than that determined by the following formula:

$$L = \frac{ND(P)^{0.5}}{7,400}$$

Which ever is less

$$L = \frac{SD(P)^{0.5}}{133,100}$$

L = Allowable Leakage in Gal/Hr  
N = Nominal Diameter of Pipe (")  
P = Average Test Pressure (psi)  
D = Number of Joints in the Pipeline Tested

S = Length of Pipe Testing  
L = Allowable Leakage in Gal/Hr  
D = Nominal Diameter of Pipe (")  
P = Average Test Pressure (psi)  
N = Number of Joints in the Pipeline Tested

All testing shall be conducted in accordance with AWWA C600-87 or latest revision.

E. Prior to use of the system, the qualified consultant shall submit a written report to the Owner stating that the system has been installed according to the approved plans and permit. The report shall specifically address the inspection of the site preparations and include numerical results of the orifice discharge rate comparison.

**DISPOSAL FIELDS (SYSTEM C)**

**A. Materials**

- Schedule 40 PVC pipe meeting the requirements of the latest revision of ASTM Specification D-1785 shall be used. Fittings used in the disposal fields shall be compatible with distribution lines material.
- Crushed stone shall be clean, durable and no smaller than 3/4 or larger than 1 1/2 inches in diameter.

**B. Installation**

- The wastewater system shall be inspected during critical stages of construction by a qualified consultant. This shall include at a minimum the staking of the disposal field, the trenches after the initial 12" of stone and distribution piping is placed and a final inspection of the entire system. The Contractor will be responsible for contacting the Engineer to set up the inspection schedule.
- The distribution box shall be installed level and arranged so that effluent is evenly distributed to each distribution line. Adequate provisions shall be taken to assure stability and provide access for inspection of the distribution box.
- The pipe connection the distribution box to the distribution line shall be of tight joint construction laid on undisturbed soil or properly bedded throughout its length.
- When cover over the sewer lines to the distribution box is less than 4 feet, install 2" rigid insulation over pipe.
- When the trenches have been excavated, the sides and bottom shall be raked to scarify any smeared soil surfaces. Construction equipment not needed to construct the system should be kept off the area to be utilized for the absorption trench system to prevent undesirable compaction of the soils. Construction shall not be initiated when the soils moisture content is high.
- At least 12" of crushed stone shall be placed in the bottom of the trench.
- The distribution line shall then be carefully placed on the bedding with no slope, holes facing downward, and covered with at least 2" of crushed stone. Prior to covering, the distribution network should be tested with water for even distribution.
- All work shall be done in accordance with the State of Vermont Environmental Protection Rules.

SITE ENGINEER:



CIVIL ENGINEERING ASSOCIATES, INC.  
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DRAWN  
SAL

CHECKED  
DSM

APPROVED  
DSM



OWNER:

**PHILO RIDGE,  
L.L.C.**

2766 MT. PHILO RD.  
CHARLOTTE, VT.

PROJECT:

**SITE  
IMPROVEMENTS**

2766 MT. PHILO RD.  
CHARLOTTE, VT.

DATE	CHECKED	REVISION
10/23/18	DSM	Revised Tables

**WASTE WATER  
DETAILS AND  
NOTES**

DATE  
OCT., 2018

SCALE  
AS SHOWN

PROJ. NO.  
16107

DRAWING NUMBER  
**C2.0**