PINKHAM&GREER
CONSULTING ENGINEERS

28 Vannah Avenue
Portland, Maine 04103
Tel: (207) 781-5242
Fax: (207) 781-4245

Date: September 23, 2013	
Job No: 11161	
Attention: Ms. Jeanie Bourke	
Re: Cliff Island Septic, Wharf Rd	

TO: City of Portland
Code Enforcement Officer
389 Congress St
Portland, ME 04101

Letter of Transmittal

WE AREL SENDING YOU ☒ **Attached** ☐ **Under separate cover via** **the following items**:

Copies	Date	Description	Action
3	9/23/13	Cover Letter, HHE-200 Subsurface Wastewater Disposal System Application, Mounding Analysis, Groundwater Impact Study, Test Pits, DHHS Permit, Operations & Maintenance Manual, & City Approval of Utility Location	For Approval
3	9/23/13	Prints 24x36: C1.1Rev2, C1.2Rev4, & C2.1Rev2	"
1	9/23/13	Check # 17943 for $160.00	Fees Paid

IF TRANSMITTALS ARE NOT AS INDICATED, PLEASE NOTIFY US AT ONCE.

REMARKS: Hand Delivered

COPIES TO: Roger Berle, Steven Little, Walter Swift, Robert Anderson, File

Signed: ______________________
Rita J. Sawyer

PINKHAM & GREER
CONSULTING ENGINEERS

28 Vannah Avenue
Portland, Maine 04103
Tel: 207.781.5242
Fax: 207.781.4245

September 23, 2013
File: 11161

Ms. Jeanie Bourke, Code Office
City of Portland
389 Congress St
Portland, ME 04101

RE: COMMUNITY SEPTIC SYSTEM
CLIFF ISLAND COMMUNITY SEPTIC SYSTEM ASSOCIATION

Dear Jeanie,

Attached are 3 copies of the HHE-200 application by Mark Hampton for a community septic system located on Cliff Island. It includes engineered drawings by Pinkham & Greer, as well as a Mounding Analysis and a Groundwater Impact Study by Sweet Associates, test pits by Mark Hampton, the DHHS Permit and modified Operations and Maintenance Manual. Also included is the City's Approval of the utility location.

The island residents have formed the Cliff Island Community Septic System Association (CICSSA) for the sole purpose of constructing and maintaining the septic system and collection system. The Association will own all of the piping system from and including the septic tanks, piping, and pump station to the beds, as well as the beds.

The construction of the system will be by Anderson Construction. The final contract will be signed once all of the approvals are in place.

Based on current events, we plan to start construction in October of this year and be complete by January of 2014. This meets the DEP deadlines for the overboard discharge.

The system is designed for 5,120 gallons per day. This will be monitored at the pump station with a flow meter. We expect peak flows in the summer to approach this flow with much smaller flows in the winter.

The pump station and forcemain are located within the City's right-of-way. South Road is a gravel road and will be returned to equal or better condition once the work is complete.

With this project, the discharge of wastewater directly to the ocean will be eliminated. This project will be a successful community program.

Sincerely,

PINKHAM AND GREER,

Thomas S. Greer, P.E.

cc: Roger Berle, Steve Little, Walter Swift, Robert Anderson, File

Enclosures

TSG/rjs

3512

SUBSURFACE WASTEWATER DISPOSAL SYSTEM APPLICATION

Maine Dept.Health & Human Services
Div of Environmental Health , 11 SHS
(207) 287-5672 Fax: (207) 287-4172

PROPERTY LOCATION

City, Town, or Plantation	Portland
Street or Road	Cliff Island
Subdivision, Lot #	

OWNER/APPLICANT INFORMATION

Name (last, first, MI)	Cliff Island Septic System Assn ☒ Owner ☐ Applicant
Mailing Address of Owner/Applicant	P.O. Box 78, Cliff Island 04019
Daytime Tel. #	

OWNER OR APPLICANT STATEMENT

I state and acknowledge that the information submitted is correct to the best of my knowledge and understand that any falsification is reason for the Department and/or Local Plumbing Inspector to deny a Permit.

[signature] 7/23/2013
Signature of Owner or Applicant Date

>> CAUTION: LPI APPROVAL REQUIRED <<

Town/City ______ Permit # ______
Date Permit Issued __/__/__ Fee: $______ Double Fee Charged [ ]

______ L.P.I. # ______
Local Plumbing Inspector Signature

The Subsurface Wastewater Disposal System shall not be installed until a Permit is issued by the Local Plumbing Inspector. The Permit shall authorize the owner or installer to install the disposal system in accordance with this application and the Maine Subsurface Wastewater Disposal Rules.

Municipal Tax Map # ______ Lot # ______

CAUTION: INSPECTION REQUIRED

I have inspected the installation authoirzed above and found it to be in compliance with the Subsurface Wastewater Disposal Rules Application. ______ (1st) date approved

______ Local Plumbing Inspector Signature ______ (2nd) date approved

PERMIT INFORMATION

TYPE OF APPLICATION
- ☒ 1. First Time System
- ☐ 2. Replacement System
- Type replaced: ______
- Year installed: ______
- ☐ 3. Expanded System
  - ☐ a. <25% Expansion
  - ☐ b. >25% Expansion
- ☐ 4. Experimental System
- ☐ 5. Seasonal Conversion

THIS APPLICATION REQUIRES
- ☒ 1. No Rule Variance
- ☐ 2. First Time System Variance
  - ☐ a. Local Plumbing Inspector Approval
  - ☐ b. State & Local Plumbing Inspector Approval
- ☐ 3. Replacement System Variance
  - ☐ a. Local Plumbing Inspector Approval
  - ☐ b. State & Local Plumbing Inspector Approval
- ☐ 4. Minimum Lot Size Variance
- ☐ 5. Seasonal Conversion Permit

DISPOSAL SYSTEM COMPONENTS
- ☐ 1. Complete Non-engineered System
- ☐ 2. Primitive System (graywater & alt. toilet)
- ☐ 3. Alternative Toilet, specify: ______
- ☐ 4. Non-engineered Treatment Tank (only)
- ☐ 5. Holding Tank, ______ gallons
- ☐ 6. Non-engineered Disposal Field (only)
- ☐ 7. Separated Laundry System
- ☒ 8. Complete Engineered System (2000 gpd or more)
- ☐ 9. Engineered Treatment Tank (only)
- ☐ 10. Engineered Disposal Field (only)
- ☐ 11. Pre-treatment, specify: ______
- ☐ 12. Miscellaneous Components

SIZE OF PROPERTY
±1 acre ☐ SQ. FT. ☒ ACRES

SHORELAND ZONING
☐ Yes ☒ No

DISPOSAL SYSTEM TO SERVE
- ☐ 1. Single Family Dwelling Unit, No. of Bedrooms: ______
- ☐ 2. Multiple Family Dwelling, No. of Units: ______
- ☒ 3. Other: Common Disposal System (specify)

Current Use ☒ Seasonal ☐ Year Round ☐ Undeveloped

TYPE OF WATER SUPPLY
☒ 1. Drilled Well ☐ 2. Dug Well ☐ 3. Private ☐ 4. Public ☐ 5. Other

DESIGN DETAILS (SYSTEM LAYOUT SHOWN ON PAGE 3)

TREATMENT TANK
- ☒ 1. Concrete
  - ☒ a. Regular (at homes)
  - ☐ b. Low Profile
- ☐ 2. Plastic
- ☐ 3. Other: ______
- CAPACITY: ______ GAL.

DISPOSAL FIELD TYPE & SIZE
- ☐ 1. Stone Bed ☐ 2. Stone Trench
- ☒ 3. Proprietary Device
  - ☐ a. cluster array ☒ c. Linear
  - ☒ b. regular load ☐ d. H-20 load
- ☐ 4. Other: ______
- SIZE: 16,896 ☒ sq. ft. ☐ lin. ft.

GARBAGE DISPOSAL UNIT
- ☒ 1. No ☐ 2. Yes ☐ 3. Maybe
- If Yes or Maybe, specify one below:
  - ☐ a. multi-compartment tank
  - ☐ b. ___ tanks in series
  - ☐ c. increase in tank capacity
  - ☐ d. Filter on Tank Outlet

DESIGN FLOW
5120 gallons per day
BASED ON:
- ☒ 1. Table 4A (dwelling unit(s))
- ☐ 2. Table 4C(other facilities)
  SHOW CALCULATIONS for other facilites
- ☐ 3. Section 4G (meter readings)
  ATTACH WATER METER DATA

SOIL DATA & DESIGN CLASS
PROFILE CONDITION
2 / AIII
at Observation Hole # TP1
Depth 15"
of Most Limiting Soil Factor

DISPOSAL FIELD SIZING
- ☐ 1. Medium---2.6 sq. ft. / gpd
- ☒ 2. Medium---Large 3.3 sq. f.t / gpd
- ☐ 3. Large---4.1 sq. ft. / gpd
- ☐ 4. Extra Large---5.0 sq. ft. / gpd

EFFLUENT/EJECTOR PUMP
- ☒ 1. Not Required
- ☐ 2. May Be Required
- ☐ 3. Required
- Specify only for engineered systems:
- DOSE: ______ gallons

LATITUDE AND LONGITUDE
at center of disposal area
Lat. 43 d 41 m 26 s
Lon. 70 d 06 m 41 s
if g.p.s, state margin of error: ______

SITE EVALUATOR STATEMENT

I certify that on 9/27/12 (date) I completed a site evaluation on this property and state that the data reported are accurate and that the proposed system is in compliance with the State of Maine Subsurface Wastewater Disposal Rules (10-144A CMR 241).

[signature]	263	9/27/12
Site Evaluator Signature	SE #	Date
Mark J. Hampton	756-2900	
Site Evaluator Name Printed	Telephone Number	E-mail Address

Note : Changes to or deviations from the design should be confirmed with the Site Evaluator.

3312

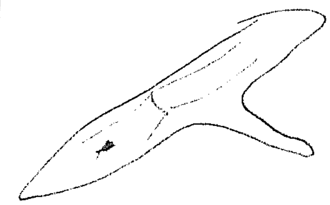
Maine Dept. of Health & Human Services
Division of Environmental Health, STS 11
(207) 287-5689 FAX (207) 287-3165

Town, City, Plantation	Street, Road, Subdivision	Owner or Applicant Name
Portland	Cliff Island	Cliff Island Septic System Assn

SITE PLAN

Scale: 1" = ________ ft.

SITE LOCATION MAP
(Attach map from Maine Atlas for First Time System Variance)



See Plans

SOIL PROFILE DESCRIPTION AND CLASSIFICATION (Location of Observation Holes Shown Above)

Observation Hole # TP1 ☒ Test Pit ☐ Boring

________ " Depth of organic horizon above mineral soil

Depth below mineral soil surface (inches)	Texture	Consistency	Color	Mottling
0–6	Sandy loam	Friable	Dark brown	
6–14	Sandy loam	Friable	Brown	None noted
15	Ledge			

Soil	Classification	Slope	Limiting Factor	
2 Profile	AIII Condition	6 Percent	15 " Depth	☐ Groundwater ☐ Restrictive Layer ☒ Bedrock

Observation Hole # TP2 ☒ Test Pit ☐ Boring

________ " Depth of organic horizon above mineral soil

Depth below mineral soil surface (inches)	Texture	Consistency	Color	Mottling
0–6	Sandy loam	Friable	Dark brown	
6–20	Sandy loam	Friable	Brown	
20	Ledge			

Soil	Classification	Slope	Limiting Factor	
2 Profile	AIII Condition	6 Percent	20 " Depth	☐ Groundwater ☐ Restrictive Layer ☒ Bedrock

[signature] Site Evaluator Signature — 263 SE # — 9/27/12 Date

3312

Maine Dept. of Health & Human Services
Division of Environmental Health, STS 11
(207) 287-5689 FAX (207) 287-3165

Town, City, Plantation	Street, Road, Subdivision	Owner or Applicant Name
Portland	Cliff Island	Cliff Island Septic System Assn

SUBSURFACE WASTEWATER DISPOSAL PLAN Scale: 1" = – ft.

See plans

BACKFILL REQUIREMENTS

Depth of Backfill (upslope) ______"

Depth of Backfill (downslope) ______"

DEPTHS AT CROSS-SECTION (shown below)

CONSTRUCTION ELEVATIONS

Finished Grade Elevation ______"

Top of Distribution Pipe or Proprietary Device ______"

Bottom of Disposal Field ______"

ELEVATION REFERENCE POINT

Location & Description: ________________.

________________.

Reference Elevation is: **0.0"** or: ________.

DISPOSAL FIELD CROSS-SECTION

Scales:
Vertical: 1" = ______ ft.
Horizontal: 1" = ______ ft.

See plans

Mark Hampton — Site Evaluator Signature

263 — SE #

9/27/12 — Date

Sweet Associates
HYDROGEOLOGY | SITE EVALUATIONS

155 Gray Road
Falmouth, Maine 04105
207.797.2110
fax: 207.878.2364
email: sweet@maine.rr.com
www.sweetassociates.com

April 2, 2013

WASTEWATER MOUNDING AND TRANSMISSION ANALYSIS
CLIFF ISLAND SEPTIC SYSTEM ASSOCIATION
CLIFF ISLAND (PORTLAND), MAINE

INTRODUCTION:

The purpose of this study is to determine the extent of mounding and wastewater effluent movement beneath proposed engineered subsurface wastewater disposal fields serving the Cliff Island Septic System Association. The total design flow of the proposed subsurface wastewater disposal fields is 5,120 gallons per day. The disposal field design by Pinkham and Greer Consulting Engineers, test pit logs by Mark Hampton, S.E. 263, and available literature were used to estimate the parameters used for these calculations.

SUBSURFACE WASTEWATER DISPOSAL SYSTEM:

The proposed subsurface wastewater disposal fields each consist of 176 Eljen In-drains covering an area of 91 feet by 31 feet. The two disposal fields are separated by 75 feet. The design flow of each disposal field is 2,560 gallons per day (gpd). The uniform infiltration rate of 2,560 gpd over a 31 foot by 91 foot area is 0.126 feet per day (ft/day). The ground surface slope beneath the disposal fields average 3% then increases to 11% ten feet downslope of the northernmost disposal field, based on existing grade contours shown on the disposal field design.

WASTEWATER MOUNDING AND TRANSMISSION ANALYSIS:

Groundwater mounding is anticipated to occur beneath the proposed disposal fields due to the presence of a low hydraulic conductivity layer (bedrock) beneath the disposal field. The following analysis is a three-step approach used to estimate the height of a groundwater mound beneath a wastewater disposal field on a sloping site and estimate the size of a fill extension to prevent wastewater breakout. The first step is to use an analytical model (Khan *et al.* 1976) to estimate the geometry of a groundwater mound assuming that the ground surface below the disposal field is level. The second step is to evaluate the analytical modeling results using Darcy's Law. The third step is to use the analytical modeling results to determine the appropriate down-slope fill extension length.

Step 1 - Analytical Model:

Khan *et al.* (1976) presents an analytical model that can be used to estimate the extent of groundwater mounding on a low hydraulic conductivity layer in the vadose zone below a wastewater disposal field. The conceptual model and a spreadsheet with all calculations are presented in Appendix A. Khan *et al.* (1976) used the following assumptions to simplify the model:

- The conceptual model is for a two-dimensional vertical cross-section with a disposal area (W). The half-width (w) is assumed to be much smaller than the length of the disposal area (if the half-width is not much smaller than the length of the disposal area, then the model will provide a more conservative estimate of mounding).

- The low hydraulic conductivity layer (K_2) and high hydraulic conductivity layer (K_1) interface is the sole cause of mounding (the seasonal high water table is below the interface).

- The soil in each hydraulic conductivity layer is homogeneous and isotropic. $K_1 > K_2$. The K_1/K_2 interface is horizontal.

- The infiltration rate of wastewater (q') is greater than the hydraulic conductivity of the lower layer (K_2). Infiltration is assumed to be constant.

The following equations, based on the conceptual model illustrated in Appendix A, were used to calculate the estimated maximum groundwater mounding and the distance from the center of the disposal field where groundwater mounding becomes negligible (the required extent of fill material downgradient from the disposal field to contain the mounded groundwater).

The height of the mound, H (ft), is calculated by:

$$H = w\left[\frac{K_2}{K_1}\left(\frac{q'}{K_2}-1\right)\left(\frac{q'}{K_2}-\frac{x^2}{w^2}\right)\right]^{1/2}$$

where,

w	=	½ width of the disposal area (ft) - *full width used for this analysis*,
q'	=	uniform recharge rate into the disposal area (ft/day),
K_1	=	hydraulic conductivity of the upper soil layer (ft/day),
K_2	=	hydraulic conductivity of the lower soil layer (ft/day),
x	=	distance from center of disposal field (ft).

The maximum height of the mound, H_{max} (ft), is calculated by setting the distance from the center of the disposal field (x) to zero.

The ground surface below the proposed disposal fields slopes easterly toward the ocean at an initial slope of 3% then at 11% starting 10 feet from the disposal field and ending at the wetland 245 feet away. Since all wastewater will flow predominately in one direction (down-slope), rather than uniformly around the disposal field in all directions, the one-half width of the disposal field (w) is assumed to be the actual width of the disposal field parallel to the direction of groundwater flow (31 feet). Hydraulic conductivity K_1 is estimated to be 275 ft/day, based on values found in literature and previous constant head permeameter tests of septic system sand from gravel pits in Southern and Central Maine completed by Sweet Associates. The existing soil was assumed to be too thin to be of consequence in the calculation.

Based on the values of the abovementioned parameters, the maximum height of the mound above the K_2 layer at the center of the disposal field (H_{max}) is 1.96 feet.

Step 2 - Validate Analytical Model Results:

The low conductivity layer beneath the disposal field is sloping, which violates an assumption of the analytical model. Darcy's Law will be used to examine whether the calculated mound height from the analytical model is appropriate. Darcy's Law is expressed as:

$$Q = K\,i\,A$$

where,

Q	=	flow of water (cubic feet per day)
i	=	hydraulic gradient (unitless) - in this case the ground surface slope
A	=	cross section area (square feet)

Given a design flow of 2,560 gpd (684.4 ft^3), a hydraulic conductivity of 100 ft/day and a hydraulic gradient of 3%, the required cross-sectional area of sand fill below the disposal field is 200 ft^2. The results suggest that a 2.28 foot groundwater mound would occur beneath the downslope margin of the disposal field. This result is considered to be in the same order of magnitude as the Khan model.

Step 3 - Estimate Length of Down-Slope Fill Extension:

The length of the fill extension required to prevent the possibility of wastewater breakout on nearby side slopes can be determined by rearranging and solving the Khan *et al.* (1976) equations for a distance where the height of the mound is zero (Poeter *et al.*, 2005):

$$L = w * (q'/K_2)\ ,$$

where,

L	=	length of fill extension required from center of disposal field (ft),
w	=	½ width of the disposal area (ft) - *full width used for this analysis*,
q'	=	uniform recharge rate into the disposal area (ft/day),
K_2	=	hydraulic conductivity of the lower soil layer (ft/day).

L is calculated to be 310 feet long. Since the average 11% slope of the hillside is 245 feet from the edge of the closest disposal field to the relatively flat wetland. Any fill should stop at the edge of the wetland. Because this is an island site, we are recommending installation of a wood chip fill surface at least 12-inches thick from the downslope edge of the toe of the fill of the lowest disposal field shown on the site plan to the upslope edge of the wetland. The hydraulic conductivity of the wood chips should more than exceed the designed hydraulic conductivity of the sand fill used in the calculations.

CONCLUSIONS:

According to the assumptions and parameters used in this mounding and transmission analysis, the maximum groundwater mound height above the bedrock surface at the bottom edge of each disposal field is 1.96 feet. The proposed base of the disposal field should be at least 1.0 foot above the top of the groundwater mound or 2.96 feet above the bedrock surface, which is in compliance with the minimum one foot separation distance. The sand fill used under the disposal field and for the fill extensions should have a hydraulic conductivity of at least 275 feet per day.

Two 4-inch diameter monitoring wells should be installed down to the bedrock surface and located at the toe of the lowest disposal field fill and 10 feet into the wetland directly downslope from the disposal fields. These wells should be measured for water depth and lab tested for nitrates and fecal coliform in September each year the system is used.

Richard A. Sweet
Certified Geologist #GE100

RAS/smh

STATE OF MAINE
RICHARD A. SWEET
100
CERTIFIED
GEOLOGIST

REFERENCES

Khan, M.Y., *et al.*, 1976, "Shapes of Steady State Perched Groundwater Mounds," *Water Resources Research*, 12(3), 429-436.

Poeter, E., *et al.*, 2005, *Guidance for Evaluation of Potential Groundwater Mounding Associated with Cluster and High-Density Wastewater Soil Absorption Systems*, International Groundwater Modeling Center of Colorado School of Mines, Golden Colorado, p. 3-5 to 3-8.

U.S.D.A. Soil Conservation Service in cooperation with Maine Agricultural Experimentation Station and Maine Soil and Water Conservation Commission, Soil Survey of York County, Issued June 1982, U.S. Government Printing Office.

Ayotte, J.D., Nielsen, M.G., Robinson, G.R., Moore, R.B. (1999) Relation of Arsenic, Iron, and Manganese in Ground Water to Aquifer Type, Bedrock, Lithogeochemistry, and Land Use in the New England Coastal Basins. U.S.G.S. Water-Resources Investigations Report 99-4162.

APPENDIX A

Khan *et al.* (1976) Model Description and Calculations

GREEN Cells for Data Entry	RED Cells for Solutions

Khan Mounding Model (Khan et al, 1976)

K1 (ft/day)	K2 (ft/day)	*1/2 Width of Field* w (ft)	*Flow into Field Footprint* q' (ft/day)	*Distance from Center of Field* x (ft) - Use 0 for Max Mound
275	0.01	31	0.11	0

	3.63636E-05			
EQUATION	*10*		**Mound Height**	
TERMS	*11*		1.960612149	feet
	0.063245553			

Length of Fill extension required to prevent the possibility of wastewater breakout on side slopes

L=	341	feet from middle of disposal field
	310	feet from edge of disposal field

Calculate Equivalent Hydraulic Conductivity of Two Layers

Layer 1	Thickness	1.5	ft
	Hydraulic Conductivity	275	ft/day
	Transmissivity	412.5	ft2/day
Layer 2	Thickness	100	ft
	K	0.01	ft/day
	Transmissivity	1	ft2/day
	Equivalent Hydraulic Conductivity	4.073891626	ft/day

Calculate Flow into Field Footprint (q')

Design Flow	2560	gpd
Field Length	100	
Field Width	31	ft
Flow into Field Footprint (q')	0.110387174	ft/day

Sweet Associates
HYDROGEOLOGY | SITE EVALUATIONS

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Falmouth, Maine 04105
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email: sweet@maine.rr.com
www.sweetassociates.com

April 2, 2013

GROUNDWATER IMPACT STUDY
CLIFF ISLAND SEPTIC SYSTEM ASSOCIATION
CLIFF ISLAND (PORTLAND)

INTRODUCTION:

The purpose of this study is to make an assessment of the hydrogeologic conditions of the abovementioned site and estimate the groundwater quality impact caused by the proposed on-site subsurface wastewater disposal system serving the houses currently on the Association overboard discharge system. The proposed disposal field location is shown on the site plan. Data used for this project includes a site plan provided by Pinkham and Greer Engineers, soil evaluations done by Mark Hampton, S.E., and existing regional maps and literature.

DISPOSAL FIELDS AND WATER WELLS:

The proposed disposal field is designed for a total wastewater flow of 5,120 gallons per day. All houses to be connected to this system are served by private, individual septic tanks and by individual or community drilled wells.

SURFICIAL GEOLOGY AND TOPOGRAPHY:

The site is located on the *U.S.G.S. South Harpswell, Maine Quadrangle 7.5 Minute Series*. The *Surficial Materials* and *Surficial Geology Maps of the South Harpswell Quadrangle* show that the entire island is underlain by a thin layer of glacial till overlying shallow bedrock. This soil is identified as Hollis very rocky fine sandy loam by the Soil Conservation Service. There is no *Significant Sand and Gravel Aquifer Map of the South Harpswell Quadrangle* and no sand and gravel aquifer is present on the Island.

HYDROGEOLOGY:

Precipitation falling on this site enters the open pore spaces in the upper soil horizons, and percolates vertically downward through the sandy loam till until the water table and or bedrock is encountered. Thereupon, flow is largely downslope or downgradient following the slope of the underlying bedrock surface. An unknown percentage of the precipitation captured by the soils will enter the fractured bedrock and the remaining water will move through the soil above the bedrock surface. Wetlands and the ocean will be discharge points for the groundwater moving through the soil. It is assumed that the groundwater in the bedrock will also discharge to wetlands, however, some percentage of the bedrock groundwater may not discharge until reaching the ocean. We are assuming that all surface water, groundwater in the soil, and bedrock groundwater will move downslope to the ocean starting at the highest point of land which represents the start of the watershed. At this site, the proposed disposal fields are situated on an east facing slope with the beginning of the watershed slightly to the west, which means surface water and groundwater flow will flow toward the east shore of the island as shown on the site plan.

The soil is mapped as Hollis very rocky fine sandy loam by the Soil Conservation Service and the permeability is rated at greater than 12.6 feet per day. We have assumed a conservative permeability of 10 feet per day.

The groundwater seepage velocity is used to calculate the extent of groundwater impact downgradient and has been calculated utilizing the following equation:

$$\mathbf{v = K\textit{i}/n}$$

where,

v	= groundwater seepage velocity (ft/day)
K	= hydraulic conductivity (ft/day)
i	= hydraulic gradient (ft/ft)
n	= effective porosity (dimensionless)

<u>CONTAMINATION POTENTIAL</u>:

It is assumed that the worst potential for contamination is the nitrate-nitrogen (NO_3-N) released from wastewater disposal fields. NO_3-N is known to cause methemoglobinemia in infants and is a suspected cause of stomach cancer. The average NO_3-N concentration value of untreated septic tank effluent entering a disposal field is assumed to be 40 milligrams per liter (mg/L). The Federal and State Drinking Water Limit for NO_3-N in public water supplies is 10 mg/L.

The primary mechanism of NO_3-N concentration reduction is through dilution in groundwater and surface water. Since groundwater is always slowly flowing beneath a disposal field, the NO_3-N intercepting the water table below a disposal field mixes and dilutes in the groundwater and moves in the direction of groundwater flow in the form of a plume. NO_3-N is more concentrated in the center than near the edges of a plume. A source that emanates a constant quantity of potential contaminants into groundwater will eventually reach a “steady state.” The plume can then be characterized with regard to size, shape, and distribution of concentration.

The method of analysis used to assess the impact of the septic systems on groundwater is an analytical model used to simulate individual plumes. Analysis of the results of this model is instructive in assessing the possible shape and size of wastewater plumes. The model was developed by Baetsle (1969) to depict the migration of radionuclides in porous media, which is adapted here to represent the subsurface migration of NO_3-N. It is a three-dimensional transport model of plumes generated by continuous, point sources in a uniform groundwater flow field. Variables employed include seepage velocity (hydraulic conductivity multiplied by hydraulic gradient, divided by effective porosity), nitrate mass, time, and dispersivity. The concentration of NO_3-N is calculated at a downgradient point at a specified time by use of the following equation:

$$C(x,y,z,t)=\left[\frac{CoVo}{8(\pi t)^{1.5}\sqrt{DxDyDz}}\right]\exp\left[-\frac{(x-vt)^2}{4Dxt}-\frac{y^2}{4Dyt}-\frac{z^2}{4Dzt}\right] \;;$$

where,

C(x,y,z,t)	=	NO_3-N concentration at specified location and time (mg/L)
x	=	specified distance from source parallel to the direction of groundwater flow (ft)
y	=	specified distance from source perpendicular to the direction of groundwater flow (ft)
z	=	specified vertical distance from source (ft)
Co	=	initial concentration at the source (mg/L)
Vo	=	volume of source (ft^3)
t	=	time elapsed (day)
Dx,Dy,Dz	=	dispersion coefficient along the x,y,z axes (ft^2/day)
v	=	average linear velocity (ft/day).

Assuming that groundwater flow is horizontal, the dispersion coefficient can be calculated as follows:

$D_{x,y,z}$ = v $_{x,y,z}$;

where $_{x,y,z}$ is dispersivity (ft).

The contaminant velocity of a solute subject to sorption/adsorption is calculated as follows:

V_p = v/R_d;

where V_p is the contaminant velocity (ft/day) and R_d is the retardation factor (unitless). The retardation factor for NO_3-N is equal to one, however, so the contaminant velocity is equal to the average linear velocity ($V_p = v$).

Dispersivity is estimated by an equation based on a weighted least-squares statistical analysis of collected longitudinal dispersivity data versus scale (Xu, Eckstein, 1995). Longitudinal dispersivity can be estimated based on the following calculation:

$_x$ = $(0.83)[\log_{10}(L_p)]^{2.414}$;

where $_x$ is longitudinal dispersivity (ft), and L_p is the plume length (ft). The plume length is a function of the elapsed time and is calculated by the following equation:

L_p = $V_p t$.

It has already been established that for NO_3-N, the contaminant velocity (V_p) is equal to the average linear velocity (v). Thus, L_p = vt.

The transverse and vertical dispersivities are related to the longitudinal dispersivity, as shown below:

$_y$ = $_x/3$

$_z$ = $_x/20$.

This method is used to calculate a downgradient NO_3-N concentration at a specified elapsed time for a single release of NO_3-N. However, by applying the superposition technique, the estimated concentration of NO_3-N downgradient at a specified time can be calculated for reoccurring daily NO_3-N releases to simulate the NO_3-N plume of a septic system (Chang, *et al*. 1998).

In the main equation, CoVo is represented as a daily mass of nitrate-nitrogen loaded into the subsurface wastewater disposal systems. This is estimated by multiplying the design flow volume of effluent by the assumed NO_3-N concentration in the effluent. The simulations were run based on average annual precipitation during drought conditions (60% of average annual precipitation). The NO_3-N concentration of the wastewater is diluted by the rainfall infiltrating the disposal fields during drought conditions. The rainfall is assumed to have a NO_3-N concentration of 0.5 mg/L. The percent of rainfall infiltrating the soils above the disposal fields is estimated based on the soil type and ground surface slope (Maine Department of Environmental Protection, 1991).

Parameters and results for the disposal field are displayed on the Groundwater Impact Site Plan. The resulting 10 mg/L NO_3-N concentration plume length for the combined disposal fields is 340 feet. Other factors affecting the plume are the variable slope the plume will move through, the thin soil cover from the disposal fields to the wetland, and the treatment value of the wetland on the nitrates. It is likely that the plume will be higher in concentration upon reaching the wetland than the calculations show due to the thin soil cover, and the inorganic high carbon content of the wetland will denitrify the plume faster than shown. For these reasons, we feel that the calculated nitrate plume is reasonable.

CONCLUSION:

The nitrate plume of 10 mg/L shown on the site plan is calculated to drop to safe levels within the wetland as shown.

Richard A. Sweet
Certified Geologist #100

RAS/smh

REFERENCES

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Department of Human Services, *et al.*, Maine Subsurface Waste Water Disposal Rules, 144A CMR 241.

Fetter, C.W., 1994, Applied Hydrogeology, 3rd Edition, Prentice Hall.

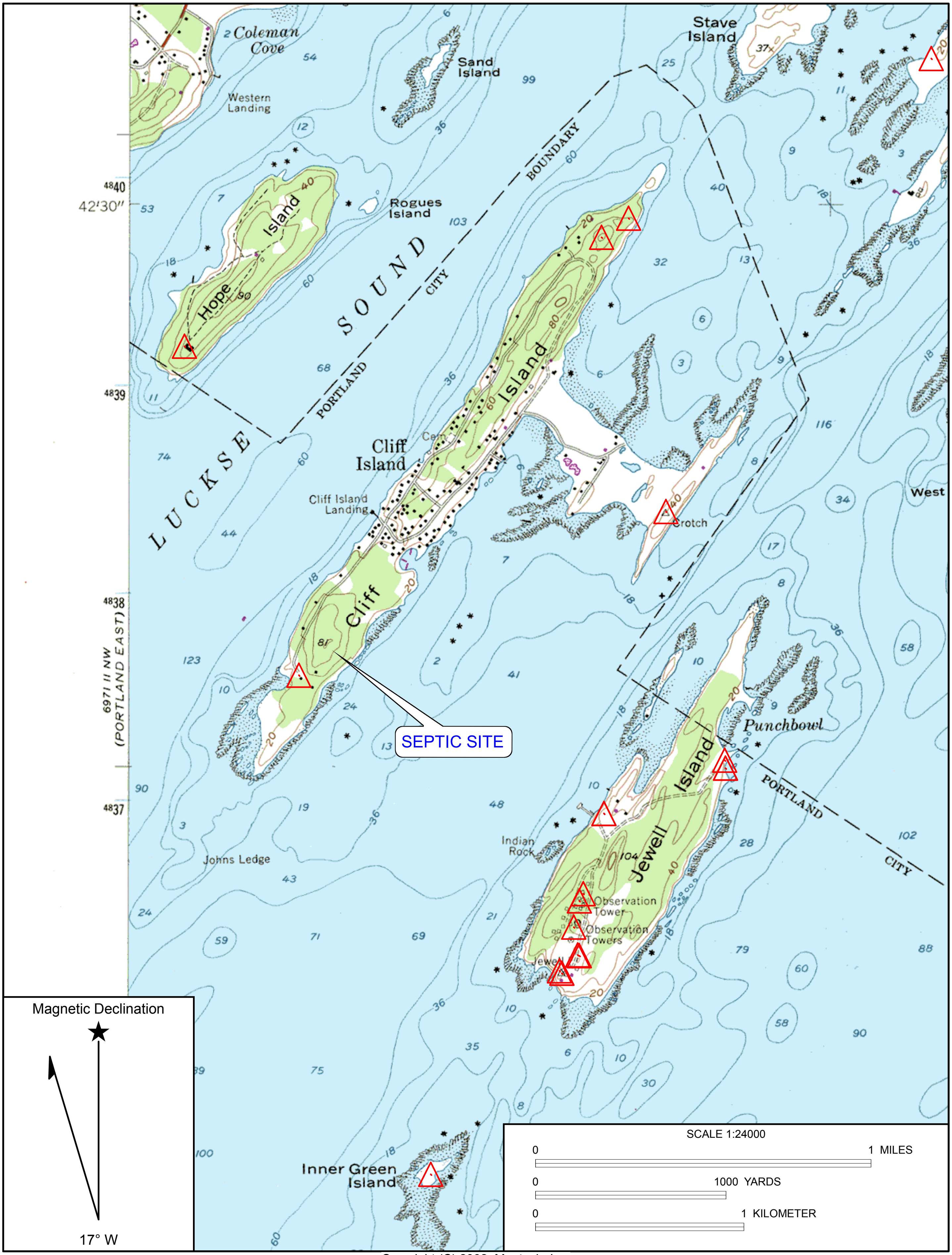
Maine Association of Professional Soil Scientists and USDA Soil Conservation Service of Maine, *Soil Series of Maine Soil Interpretations*.

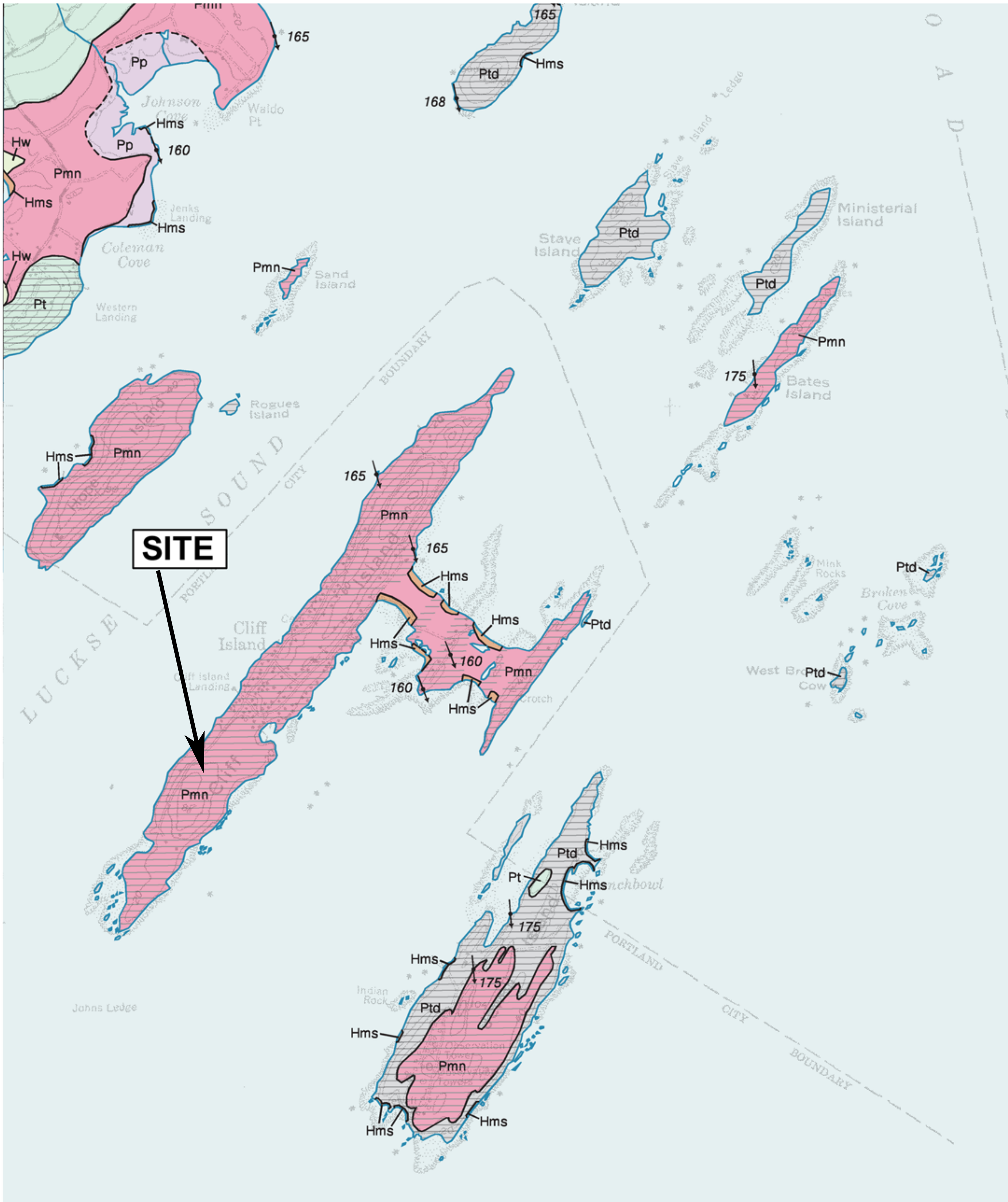
Maine Geological Survey, South Harpswell Quadrangle, Maine, Surficial Geology.

U.S.G.S., South Harpswell Quadrangle (Maine) 7.5' Quadrangle 1:24,000, Topographic Map.

Xu, M. and Y. Eckstein, 1995, *Use of Weighted Least-Squares Method in Evaluation of the Relationship Between Dispersivity and Field Scale*: Ground Water, vol.33, No.6, pp.905-908.

APPENDIX A


Coleman Cove
Sand Island
Stave Island
Western Landing
Rogues Island
Hope Island
LUCKSE SOUND
PORTLAND CITY BOUNDARY
Cliff Island
Cliff Island Landing
Cem
Crotch
West
Punchbowl
PORTLAND CITY
Jewell Island
Indian Rock
Johns Ledge
Observation Tower
Observation Towers
Jewell
Inner Green Island
SEPTIC SITE
42'30"
6971 II NW (PORTLAND EAST)
Magnetic Declination
17° W
SCALE 1:24000
0
1 MILES
0
1000 YARDS
0
1 KILOMETER



0 2000 4000
Feet - 1:24,000

Surficial Geology
South Harpswell Quadrangle

Surficial Geology - South Harpswell Quadrangle
Map Unit and Symbol Descriptions

Pmn

Marine nearshore deposits - Deposits of sand, interbedded with gravel and silt. Formed as a result of erosion and reworking of surficial sediments during the late-glacial regression of the sea. Occurs as a thin cover over bedrock or older glacial deposits.

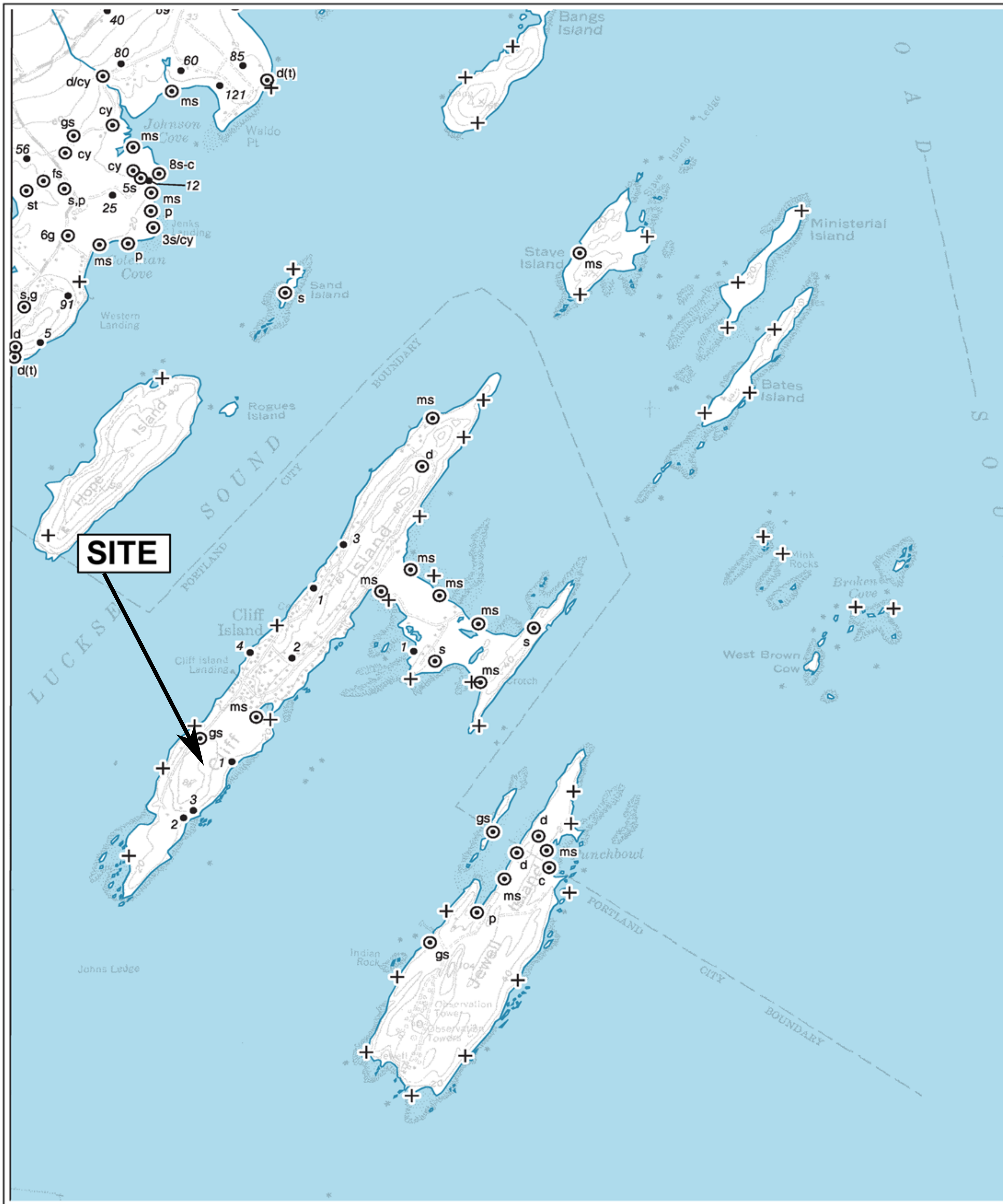
Hms

Marine shoreline deposits - Modern beach deposits consisting of sand, pebbles, and cobbles. Formed by the reworking of older surficial sediments by the ocean.

Ptd

Thin drift, undifferentiated - Thin, patchy cover of till and/or nearshore deposits overlying bedrock.

Thin drift area - Black areas are individual bedrock outcrops with little or n surficial sediment cover. Ruled pattern indicates areas of abundant bedroc outcrop and/or areas where the surficial sediments are generally less than 10 ft (m) thick.



0 2000 4000

Feet - 1:24,000

Surficial Materials
South Harpswell Quadrangle

Surficial Material Symbol Descriptions

This map shows the textures of surficial sediments in the quadrangle, independent of interpretations regarding their origin. For example, poorly sorted sediments deposited directly from glacial ice are shown here as "diamicton", although they may be genetically classified as "till".

The symbols listed below indicate materials observed in borrow pits and other surface exposures, as well as subsurface data from varius sources. Where more than one textural class is present, materials are separated by commas and listed in decreasing order of abundance (e.g. s, st, cy). Individual materials may occur in distinct layers, or they may be mixed. Hyphens show the ranges of particle sizes present where their relative abundances are uncertain (e.g. st-c). Slash marks indicate superposition of materials; thicknesses are in feet (e.g. 10s/3cy). "E" indicates a significant stratigraphic sequence of interbedded materials. Some bottow pits and other localities may be designated by numbers that refer to descriptions in the quadrangle text. Not all symbols will necessarily be found on the map.

g Undifferentiated gravel, used as a general term. Can be subdivided by size as follows:

b	Boulder gravel	>256 mm (10")
c	Cobble gravel	64-256 mm (2.5-10")
p	Pebble gravel	2-64 mm (0.1-2.5")

gs Gravelly sand (this is a special case for sand with lesser amounts of intermixed gravel, i.e. pebbly sand, cobbly sand, or bouldery sand)

sg Sand and gravel (used only to describe slumped face or other site where relative abundances of sand vs. gravel are unknown).

s Undifferentiated sand, used as a general term. Can be subdivided by size as follows:

vcs	Very coarse sand	(1-2 mm)
cs	Coarse sand	(0.5-1 mm)
ms	Medium sand	(0.25-0.5 mm)
fs	Fine sand	(0.125-0.25 mm)
vfs	Very fine sand	(0.0625-0.125 mm)

st Silt (0.002-0.0625 mm)

cy Clay (<0.002 mm)

og Organic-rich sediment (can be any organic material, including forest litter, wood, shells, etc.)

pt Peat (reserved for actual fibrous peat)

d Undifferentiated diamicton (poorly-sorted sediment in which particle sizes may range from clay to boulders). Used as a general term or subdivided as follows:

dg	Gravelly-matrix diamicton
ds	Sandy-matrix diamicton
dt	Silty-matrix diamicton
dy	Clayey-matrix diamicton

Note: Diamictons of glacial origin may be classified as one of the following varieties of till (shown on the map in parentheses):

- **t** Till, undifferentiated. Usually of late Wisconsinan age (deposited by the last glacial ice sheet).
- **ta** Ablation till. Deposited during retreat of the late Wisconsinan ice sheet. Typically sandy, stony, and not very compact.
- **tl** Lodgement till. Inferred to have been deposited at the base of the late Wisconsinan ice sheet. Usually very compact.
- **tf** Flowtill. Deposited by slumping adjacent to glacial ice.
- **T** Variably weathered till (usually a lodgment facies) of inferred pre-late Wisconsinan age.

af Artificial fill (e.g. road fills, building sites, dumps)

bd Scattered boulders; interpreted as till where followed by (t)

rk Bedrock (observed in pit floor, boring, or natural exposure)

rs Rottenstone, disintegrated or weathered bedrock, saprolite,

u Unknown (material unidentified)

R Refusal (in test boring or well)

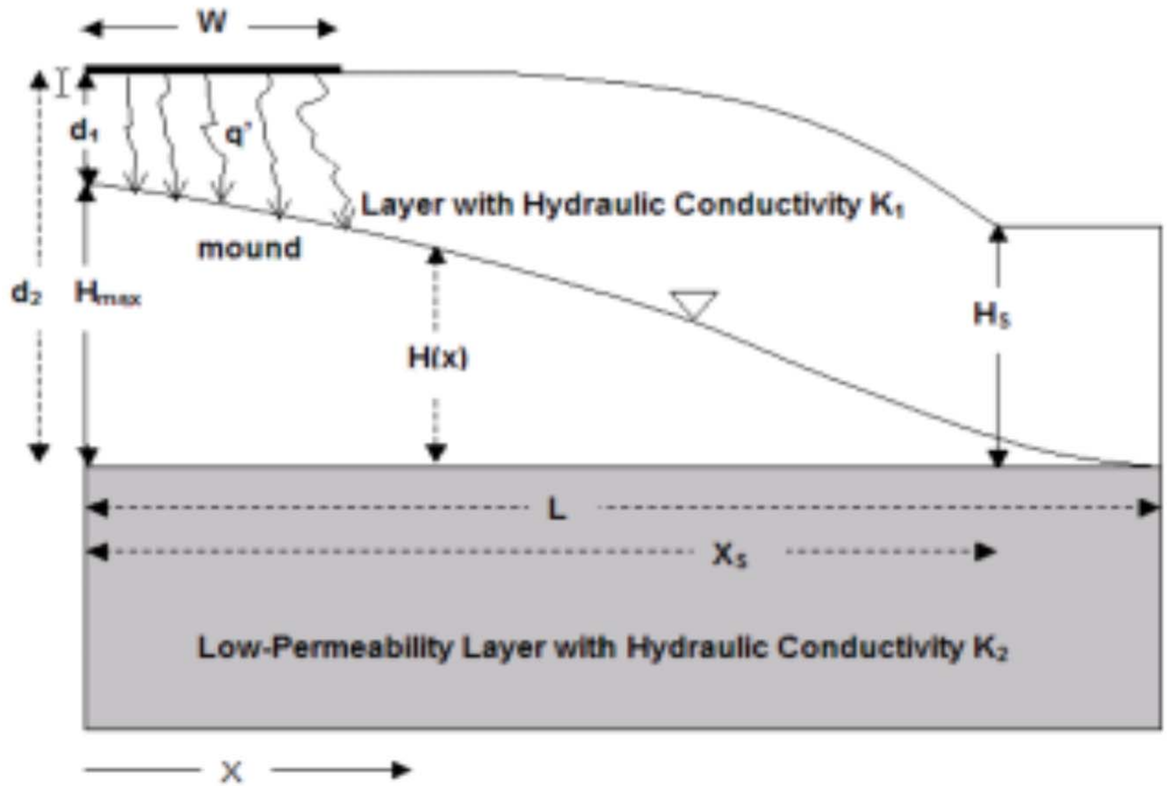
(f) Fossiliferous (used to indicate fossiliferous units within a sequence).

●	Bedrock well
⬢	Drilled overburden well
■	Dug well
↓	Driven point
+	Bedrock outcrop
⚒	Quarry
✦ **20fs,st**	Observation well with materials data
✧ **10gs/rk**	Test boring with materials data
⊙ **8s-b**	Materials data from shovel hole, hand-auger hole, natural exposure, or excavation (other than borrow pit).
56	Depth to bedrock from well (≥ is used to indicate minimum depth to bedrock), in feet below land surface
✕ **s-b**	Borrow pit, recently active at time of mapping, with materials data.
✕ **s-p**	Borrow pit, evidently abandoned or in long disuse at time of mapping, with materials data.
9	Location of site for which a data sheet is on file at the Maine Geological Survey.
● ***56***	Depth to bedrock from seismic line, in feet below land surface

Groundwater Impact Study, Nitrates
Model Input Parameters and Solution
Cliff Island
Summer/Winter Disposal Field

Annual rainfall (inches):	44
Hydrologic soil group* (above disposal field):	C (fine sandy loam)
% Slope (above disposal field):	12
% Infiltration* (into disposal field):	21
Assumed rainfall flow into disposal field (gal/day):	89.03
Assumed rainfall flow into disposal field during drought conditions^(gal/day):	53.42
Background NO3-N concentration (mg/L):	0
Assumed effluent NO3-N concentration (mg/L):	40
Assumed effuent flow into disposal field (gal/day):	5,120
Assumed NO3-N concentration in rainfall (mg/L):	0.5
Hydraulic conductivity of aquifer (ft/day):	1.2
Hydraulic gradient of aquifer (ft/ft):	0.060
Effective porosity of aquifer:	0.21
Seepage velocity of aquifer (ft/day):	0.34
Retardation factor	1
Half-Life (0 for no decay)	0
Simulation duration to reach NO3-N concentration equilibrium (days)	3,269
Longitudinal dispersivity at end of simulation duration (ft)	25.70
Lateral dispersivity at end of simulation duration (ft)	8.60
Vertical dispersivity at end of simulation duration (ft)	1.30
Disposal bed length (ft)	182
Disposal bed width (ft)	31
Corrected NO3-N concentration above disposal bed (mg/L)	39.59
Length of 13.69 mg/L plume during drought conditions (ft)	**340**

Notes:
* - from The State of Maine Department of Environmental Protection, 1991, The guidelines for expediating the processing of applications under the site location of development act.
^ - drought conditions equals 60% of average annual rainfall
% - percent
gal/day - gallons per day
ft - feet
mg/L - milligrams per liter
NO3-N - Nitrate-Nitrogen


W
d1
q'
Layer with Hydraulic Conductivity K1
mound
d2
Hmax
H(x)
HS
L
XS
Low-Permeability Layer with Hydraulic Conductivity K2
X

3312

PAGE ___ OF ___

FORM F Rev. 07/11

SOIL PROFILE / CLASSIFICATION INFORMATION

DETAILED DESCRIPTION OF SUBSURFACE CONDITIONS AT PROJECT SITES

Project Name:	Applicant Name:	Project Location (municipality):
Cliff Island C. Septic	Cliff Island Septic Assn	Portland

Exploration Symbol # TP3 — ■ Test Pit ☐ Boring ☐ Probe

___ " Organic horizon thickness — Ground surface elev. ___

___ " Depth of exploration or to refusal

Depth (inches)	Texture	Consistency	Color	Redox Features
0	Sandy loam	Friable	Pale Brown	
10	Sandy loam	Friable	Brown	none noted
~14	Ledge			

Soil Details by S.E.: Soil Classification 2 Profile, AII Condition; Slope 4 Percent; Limiting Factor 15" Depth; ■ Groundwater ☐ Restrictive Layer ■ Bedrock

S.S.: Soil Series/Phase Name: ___ ☐ Hydric ☐ Non-hydric; Hydrologic Soil Group ___

Exploration Symbol # TP4 — ■ Test Pit ☐ Boring ☐ Probe

___ " Organic horizon thickness — Ground surface elev. ___

___ " Depth of exploration or to refusal

Depth (inches)	Texture	Consistency	Color	Redox Features
0	Sandy loam	Friable	Dull Brown	
10	Sandy loam	Friable	Brown	none noted
~12	Ledge			

Soil Details by S.E.: Soil Classification 2 Profile, AII Condition; Slope 4 Percent; Limiting Factor 12" Depth; ☐ Groundwater ☐ Restrictive Layer ■ Bedrock

S.S.: Soil Series/Phase Name: ___ ☐ Hydric ☐ Non-hydric; Hydrologic Soil Group ___

Exploration Symbol # TP5 — ■ Test Pit ☐ Boring ☐ Probe

___ " Organic horizon thickness — Ground surface elev. ___

___ " Depth of exploration or to refusal

Depth (inches)	Texture	Consistency	Color	Redox Features
0	Sandy loam	Friable	Dark Brown	
10	Sandy loam	Friable	Brown	none noted
~16	Ledge			

Soil Details by S.E.: Soil Classification 2 Profile, AII Condition; Slope 4 Percent; Limiting Factor 16" Depth; ☐ Groundwater ☐ Restrictive Layer ■ Bedrock

S.S.: Soil Series/Phase Name: ___ ☐ Hydric ☐ Non-hydric; Hydrologic Soil Group ___

Exploration Symbol # TP6 — ■ Test Pit ☐ Boring ☐ Probe

___ " Organic horizon thickness — Ground surface elev. ___

___ " Depth of exploration or to refusal

Depth (inches)	Texture	Consistency	Color	Redox Features
0	Sandy loam	Friable	Dark Brown	
10	Sandy loam	Friable	Brown	none noted
~14	Ledge			

Soil Details by S.E.: Soil Classification 2 Profile, AII Condition; Slope 4 Percent; Limiting Factor 14" Depth; ☐ Groundwater ☐ Restrictive Layer ■ Bedrock

S.S.: Soil Series/Phase Name: ___ ☐ Hydric ☐ Non-hydric; Hydrologic Soil Group ___

INVESTIGATOR INFORMATION AND SIGNATURE

Signature: Mark J. Hampton	Date: 9/6/13
Name Printed: MARK J. Hampton	Cert/Lic/Reg. # 263

Title: ■ Licensed Site Evaluator ☐ Certified Soil Scientist ☐ Certified Geologist ☐ Professional Engineer

affix professional seal

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PAGE ____ OF ____

FORM F Rev. 07/11

SOIL PROFILE / CLASSIFICATION INFORMATION

DETAILED DESCRIPTION OF SUBSURFACE CONDITIONS AT PROJECT SITES

Project Name:	Applicant Name:	Project Location (municipality):
Cliff Island C Septic Sys	Cliff Island Septic Assn	Portland

Exploration Symbol # TP7 — ☒ Test Pit ☐ Boring ☐ Probe

______ " Organic horizon thickness Ground surface elev. ______

______ " Depth of exploration or to refusal

Depth below mineral soil surface (inches)	Texture	Consistency	Color	Redox Features
0	Sandy loam	Friable	Dark brown	None noted
10	Sandy loam	Friable	Brown	
20			Ledge	
30				
40				
50				
60				

Soil Details by S.E.: Soil Classification: Profile 2, Condition A III; Slope: Percent 4; Limiting Factor: Depth 14 "; ☐ Groundwater ☐ Restrictive Layer ☒ Bedrock

S.S.: Soil Series/Phase Name: ______ ☐ Hydric ☐ Non-hydric; Hydrologic Soil Group ______

Exploration Symbol # TP8 — ☒ Test Pit ☐ Boring ☐ Probe

______ " Organic horizon thickness Ground surface elev. ______

______ " Depth of exploration or to refusal

Depth below mineral soil surface (inches)	Texture	Consistency	Color	Redox Features
0	Sandy loam	Friable	Dark brown	None noted
10	Sandy loam	Friable	Brown	
20			Ledge	
30				
40				
50				
60				

Soil Details by S.E.: Soil Classification: Profile 2, Condition A III; Slope: Percent 4; Limiting Factor: Depth 15 "; ☐ Groundwater ☐ Restrictive Layer ☒ Bedrock

S.S.: Soil Series/Phase Name: ______ ☐ Hydric ☐ Non-hydric; Hydrologic Soil Group ______

Exploration Symbol # ______ — ☐ Test Pit ☐ Boring ☐ Probe

______ " Organic horizon thickness Ground surface elev. ______

______ " Depth of exploration or to refusal

Depth below mineral soil surface (inches)	Texture	Consistency	Color	Redox Features
0				
10				
20				
30				
40				
50				
60				

Soil Details by S.E.: Soil Classification: Profile ____ Condition ____; Slope: Percent ____; Limiting Factor: Depth ____ "; ☐ Groundwater ☐ Restrictive Layer ☐ Bedrock

S.S.: Soil Series/Phase Name: ______ ☐ Hydric ☐ Non-hydric; Hydrologic Soil Group ______

Exploration Symbol # ______ — ☐ Test Pit ☐ Boring ☐ Probe

______ " Organic horizon thickness Ground surface elev. ______

______ " Depth of exploration or to refusal

Depth below mineral soil surface (inches)	Texture	Consistency	Color	Redox Features
0				
10				
20				
30				
40				
50				
60				

Soil Details by S.E.: Soil Classification: Profile ____ Condition ____; Slope: Percent ____; Limiting Factor: Depth ____ "; ☐ Groundwater ☐ Restrictive Layer ☐ Bedrock

S.S.: Soil Series/Phase Name: ______ ☐ Hydric ☐ Non-hydric; Hydrologic Soil Group ______

INVESTIGATOR INFORMATION AND SIGNATURE

Signature: Mark J. Hampton (signed)	Date: 9/6/13
Name Printed: Mark J. Hampton	Cert/Lic/Reg. # 263

Title: ☒ Licensed Site Evaluator ☐ Certified Soil Scientist ☐ Certified Geologist ☐ Professional Engineer

affix professional seal

Maine Center for Disease Control and Prevention
An Office of the Department of Health and Human Services
Paul R. LePage, Governor
Mary C. Mayhew, Commissioner

Department of Health and Human Services
Maine Center for Disease Control and Prevention
286 Water Street
11 State House Station
Augusta, Maine 04333-0011
Tel.: (207) 287-8016; Fax: (207) 287-9058
TTY Users: Dial 711 (Maine Relay)

Tel. (207) 287-5672 Subsurface Wastewater Unit Fax (207) 287-4172

August 30, 2013

Pinkham & Greer Consulting Engineers
Attn.: Thomas Greer, P.E.
28 Vannah Avenue
Portland, ME 04019

Subject: Approval, Cliff Island Septic System Association, Cliff Island, Cumberland

Dear Mr. Greer:

The Division of Environmental Health has completed a review of a design for an engineered subsurface sewage disposal system design, to serve Cliff Island Septic System Association. The HHE-200 Form dated 09/27/12 was prepared by Mark Hampton, S.E. The system was designed by Pinkham & Greer Consulting Engineers, with plans signed and stamped by you. The application was complete for processing on 08/08/13.

Hereafter, the term "design engineer" must refer collectively to Pinkham & Greer Consulting Engineers, its staff, and its representatives unless otherwise specified; and the term "owner" must refer collectively to Cliff Island Septic System Association, its staff, and its representatives unless otherwise specified.

Design Flow

The design flow is 5,120 gallons per day (gpd), based upon 22 residences rated at 50 gpd/person, with 3 persons per residence. Water use is proposed to be monitored to document actual use. The design flow of 5,120 gpd is approved with the notation that the suitability of the design flow is the responsibility of the design engineer.

Treatment Tank(s)

The design includes individual septic tanks at each residence sized pursuant to the Subsurface Wastewater Disposal Rules (Rules). Effluent would be collected at a central lift station for transport to the proposed disposal area.

Disposal Areas

The proposed disposal area consists of two groups of Eljen GSF units. Each group would consist of 16 rows of 11 units arranged in trench configuration. The disposal areas would be covered with four to six inches of wood chips in lieu of standard cover soil.

Soils

The soils are shown as 2-AIII per the Rules on the HHE-200 Form prepared by Mark Hampton, S.E.

Well Setback

There are no potable water supply wells reported within 300 feet of the proposal.

Mounding Analysis

The proposed system will not result in groundwater mounding sufficient to intrude into the disposal area, according to the calculations provided by the design engineer.

Site Transmission Analysis

The proposed system design demonstrates that there are sufficient soils down-gradient to prevent the effluent from surfacing within 50 feet of the disposal field, according to the calculations provided by the design engineer. The design engineer proposes to extend the wood chip cover approximately 250 feet from Disposal bed #1 so-called, terminating at the edge of a wetland, to mitigate potential effluent surfacing. Two monitoring wells are also proposed.

Interagency Review

The Maine Department of Environmental Protection (MDEP) has reviewed the application and stated that no reason was found to believe the proposal would cause unreasonable adverse impact on resources and uses in the area likely to be affected; the project site is not located on a mapped sand and gravel aquifer; the project site is not located in the watershed of a waterbody most at risk from development, and no wetlands as mapped by the National Wetlands Inventory will be adversely affected. MDEP also provided comments regarding interpretation of the Subsurface Wastewater Disposal Rules.

MDEP commented that no bedrock depth/elevation data was found to verify there will be a 2.96-foot bedrock/disposal field bottom separation distance as recommended by the mounding analysis. Soil data from two test pits was provided, but locations of the pits are not identified in the plans - additional observation holes appear to be warranted at the uphill edge of the proposed disposal fields to determine bedrock depth/elevation. Due to results of the transmissivity analysis, it is critical to insure this separation distance is maintained to minimize potential of a down gradient effluent breakout.

Transmissivity analysis predicts the possibility of effluent surfacing within 310 feet of disposal field #1, the reason for placing a 1-foot layer of woodchips down gradient of the disposal field. To ensure that the woodchip layer will function as intended, and to avoid a possible violation of 38 MRS §413 or other applicable statutes/regulations, the O&M manual should include a provision for periodic inspection and maintenance of the woodchip area. In addition, the O&M manual should include protocols for groundwater monitoring, as was recommended by the mounding and transmission analysis report.

The nearest wetlands are located approximately 260 feet to the southeast of the proposed engineered disposal fields. It is not anticipated that wetlands will be adversely impacted or altered from installation of the engineered disposal system, provided that appropriate erosion control measures are employed during system construction to minimize any risk, and provided the woodchip layer functions as intended, and is inspected and maintained periodically.

Findings

The system meets the Rules, unless otherwise noted. Therefore, the design is approved with the following conditions and comments:

1. Prior to issuance of a permit to install the system, the design engineer must amend the site plan(s) to show that test pits are located within the disposal areas, and amend the O&M Manual to include periodic inspection and maintenance of the woodchip cover. Copies of these amended documents must be provided to the LPI and

Division.

2. The owner must retain the design engineer to oversee construction. The constructed system may not be used unless all pertinent requirements of the Rules have been met.

3. Construction must not commence until the owner has obtained the necessary plumbing permit from the Local Plumbing Inspector (LPI).

4. The design engineer must provide sufficient supervision to assure that the system is constructed as designed and in accordance with the code and other regulations. Attention must be given to site preparation, fill selection and placement, installation of pipes, mechanical and electrical systems.

5. The design engineer must provide the owner and this office with a brief report on the construction including any unexpected conditions encountered and any changes made from the approved drawings. The LPI must not issue the Certificate of Approval until the LPI has received the aforementioned report from the design engineer.

6. The design engineer must test all systems prior to acceptance by the owner. The testing must determine whether the components were correctly installed and whether they function as designed. This includes confirmation that flow dividing devices or configurations function as intended.

7. The design engineer, with the concurrence of the LPI must determine when the site conditions are suitable for construction.

8. Construction must cease whenever the design engineer determines that the site conditions, or workmanship, or materials are unacceptable.

9. The owner and design engineer must inform the LPI of the proposed construction schedule and must also inform the LPI of the progress of construction. They must cooperate fully with the LPI in scheduling any inspections and providing any equipment necessary for the inspection.

10. The design engineer must provide the owner with an Operations and Maintenance Manual containing written recommendations for the operation and maintenance of the system including inspection and pumping schedules and record keeping procedures.

11. The owner must operate the system within the requirements of Rules and the limitations of this design.

12. The owner must inform the LPI and the design engineer of any operational problem and/or malfunction.

13. The Local Plumbing Inspector must inspect the engineered disposal system in accordance with Section 10.D.2 of the Rules. In addition, the property owner must retain the design engineer to inspect the construction of the system. The inspection must be sufficient for the design engineer to determine that the system was installed as designed.

14. This approval is only for the rules administered by this office and it does not consider other federal, state or local regulations. The owner is responsible for compliance with any other pertinent regulations.

15. By accepting this approval and the associated plumbing permit, the owner agrees to comply fully with the conditions of approval and the Subsurface Wastewater Disposal Rules.

Based upon this approval of the design, the LPI may issue the permit required for an engineered system.

Because installation and owner maintenance has a significant effect on the working order of onsite sewage disposal systems, including their components, the Division makes no representation or guarantee as to the efficiency and/or operation of the system.

Should you have any questions, please feel free to contact me at (207) 287-5695, or by fax at (207) 287-4172.

Sincerely,

James A. Jacobsen
Project Manager, Webmaster
Division of Environmental Health
Drinking Water Program
Subsurface Wastewater Unit
http://www.mainepublichealth.gov/cemeteries e-mail: james.jacobsen@maine.gov

/jaj

xc: File
Cliff Island Septic System Association via e-mail
Jeanie Bourke, L.P.I. via e-mail
Mark Hamton, SE via e-mail
William Noble, MDEP via e-mail

SUBSURFACE WASTEWATER DISPOSAL SYSTEM

OPERATION AND MAINTENANCE MANUAL

Cliff Island Community Septic System Association
Cliff Island, Maine

September 2013

Prepared by:

Pinkham & Greer Consulting Engineers
28 Vannah Avenue
Portland, ME 04103

(207) 781-5242

PINKHAM & GREER

CONSULTING ENGINEERS

Introduction

The purpose of this document is to describe the basic operation and required maintenance procedures of the wastewater collection and disposal facilities and familiarize responsible personnel with the individual components. The material contained herein is intended to serve as a guide for the successful operation and maintenance of the overall wastewater facilities and not intended for individual pieces of equipment. These should be operated and maintained as recommended by the individual component manufacturers.

The wastewater disposal facility was designed utilizing best available technology, equipment and materials. The facility requires proper attention and maintenance to assure successful performance of the component parts of the system. This will require monitoring and inspection of system components; periodic maintenance; and data collection to assess system performance.

Operation

The subsurface disposal system is designed to capture the solids and dispose of 5,120 gallons per day of effluent from the Residences of Cliff Island. Solids are captured in the collection system tanks at each home through settling while the liquid effluent passes through to the pump station. When approximately 250 gallons of effluent has entered the pump station it is pumped through two 2 inch force mains to the disposal field.

Septic Tanks

The septic tank provides the initial treatment of the waste stream generated by the facility. The waste stream passes through the tank which is designed to capture the solid material. Wastewater velocity is slowed to a very low velocity for a period up to 24 hours to allow for removal of settleable solids. The solids are collected in each septic tank and must be periodically pumped out.

Avoid draining or flushing grease, oils, chemicals, paints solvents or other harmful substances into the system. The use of garbage grinders should be prohibited because the additional solids may overload the septic tank before cleaning is scheduled.

It is recommended that a contract be initiated with a private hauler to pump the tank and properly dispose of the solids on a regular basis not to exceed every ***three*** *years.*

Pump station

There are two pumps in the pump station and a force main that carry the settled effluent to the disposal beds. The pumps alternate when the sequence selector switch in the control panel is set to *Alternate*. Having two separate pumps allows for a complete shutdown of one system for maintenance and repair.

A control panel is mounted outside the pump station on the exterior panel board. The panel is equipped with a SEQUENCE SELECTOR SWITCH (Alternating relay) HANDS-OFF-AUTO SWITCH for each pump, lightning arrestor, run lights, elapsed time meters, seal leak indicator lights, an alarm horn and silence switch and alarm light. Under normal operation the SEQUENCE SELECTOR SWITH should be set so that the pumps run alternately and the HANS-OFF-AUTO switches should be set to AUTO.

The alarm light and horn mounted in the control panel will be activated by float switches in the pump station wet-well under two conditions: low water and high water levels. Since under normal conditions the pumps will be able to keep up with wastewater flow from the buildings the alarms indicate either mechanical or electrical problems.

It is recommended that the pump station be examined on a monthly basis.

Disposal Field

The disposal field contains Eljen In-drain plastic chambers distributed in two beds of 176 each. The purpose of the disposal field is to distribute the wastewater over the soil surface at a uniform rate to insure proper infiltration. The wastewater percolates through the soil material which filters out the remaining particulate matter. Bacteria and other organisms residing in the soil profile break down this material into substances that can be utilized by the organisms during its growth cycle.

To insure that the wastewater is distributed properly, the distribution boxes should be checked on an annual basis.

The soils below the system are shallow to bedrock. To ensure public safety, the area below the bed has been covered with wood chips. This area should be inspected at the end of the summer season, August, to ensure there is no breakout of the treated effluent. In the event breakout is occurring additional wood chips should be placed over the area. As the wood chips age additional wood chips may be required.

Maintenance

In order to avoid major problems and minimize down time due to normal wear and tear on the system the various components should be inspected periodically and maintained as described above and in the attached maintenance schedule. The elapsed time meters in the control panel must be read at least weekly and the reading recorded. These records must be made available to the LPI and the Maine Department of Human Services upon request.

Monitoring

The following is a description of the monitoring wells and sampling regimen:

The monitoring wells shall be installed prior to first use of the disposal fields. The wells shall be installed by backhoe or shall be hand dug and the bottom of the wells shall rest on bedrock. They shall be 2 to 4 inches in diameter with a minimum 6 inch slotted screen at the base. At least 12 inches of solid pipe shall project above ground and they shall be fitted with screw caps. The wells shall be located as described in the Mounding report. One well shall be located at the toe of the downslope fill from the northernmost disposal field and the second well shall be located 10 feet into the wetland located approximately 250 feet downslope from the first well.

Each well shall be sampled once per year in September except for the first samples which shall be taken before first use of the system for background purposes. Laboratory analysis of the samples shall be for nitrate-nitrogen and fecal coliform.

Safety

This manual is not intended to be a substitute for extensive safety training for individuals involved with the wastewater disposal system. It is the responsibility of the owners of the Cliff Island system to insure that the personnel working on the disposal system are fully qualified to do so and have all safety training necessary to operate in a safe and efficient manner. The individual's responsibility is to himself. He must take the precautions to insure his own safety at work by following basic safety precautions for the work involved.

ADDITIONAL CONSIDERATIONS

Grease Steps should be taken in the kitchen to minimize the volume of grease that is introduced into the septic system. It must be introduced only into those drains which are connected to the grease trap. Never introduce grease or wax into drains that do not pass through the grease trap.

Floor Wax Stripped floor wax must not be flushed down floor drains or introduced directly into the wastewater disposal system. Floor wax would pass easily through the septic tanks in suspension and be introduced to the disposal bed resulting in premature system failure. Floor wax may be discharged through the kitchen drain only where it will be subsequently collected in the external grease trap. As sign stating "Do not dispose of wax or grease residue here" should be placed above all drains that do not pass through the grease trap.

Degreasers These should not be used since this will put the grease into suspension in the water defeating the operation of the grease trap. This would allow grease to be transported to the disposal beds resulting in premature system failure.

Plumbing The entire plumbing system must be kept in good repair. One leaking faucet will introduce thousands of gallons of water into the system and may cause premature failure of the disposal beds.

Parking The disposal area is not intended to support vehicles on top of the chambers. Parking vehicles on the disposal area will cause permanent damage to the area and premature failure of the disposal beds.

Septic Tank Additives Additives are generally not necessary and may be harmful to the septic system. Avoid the introduction of any additives without the direction of the system designers.

Cleaners Dilute harsh or strong cleaners prior to disposing into the septic system. These cleaners at full strength may kill biologic components of the system.

LEGAL ADVERTISEMENT
CITY OF PORTLAND
APPLICATION FOR UNDERGROUND LOCATION

Cliff Island Septic System Association, a Maine corporation, hereby applies for permission, in accordance with law, to install and maintain buried sewer system as follows:

From the intersection of South Road and Wharf Road going south along South Road for a distance of approximately 633 feet will be a combination of gravity and forcemain sewer. It will be buried 48" below the road surface. Also a 6' diameter pump station will be installed approximately 84 feet south of Wharf Road on South Road.

From the intersection of Sunset Road and Wharf Road going north along Sunset Road for a distance of approximately 450 feet will be a gravity sewer. It will be buried 48" below the road surface.

From the intersection of Church Road and Wharf Road going south to private property for a distance of approximately 50 feet will be forcemain sewer. It will be buried 48" below the surface.

Any person, firm, or corporation, claiming to be adversely affected by this proposed location shall file a written objection with the City of Portland's Municipal Officer stating the cause of said objection within fourteen *(14)* days after the publication of this notice.

Public Notice of this Application has been given by publishing the text of the.same in the Portland Press Herald on ______________________________

Corporation: Cliff Island Septic System Association

Signature of Officer Title: ______________________________

Address: PO Box 78

City and State: Cliff Island, ME 04019

DATE: ______________________________

APPLICATION FOR UNDERGROUND LOCATION

TO THE MUNICIPAL OFFICERS OF THE CITY OF PORTLAND, MAINE:

Cliff Island Septic System Association hereby applies for permission pursuant to 23 M.R.S.SA. § 2483 to construct and maintain buried sewer pipes, manholes, and pump station together with other equipment therein, under, along, and across certain streets and highways in the City of Portland, Maine, as follows:

From the intersection of South Road and Wharf Road going south along South Road for a distance of approximately 633 feet will be a combination of gravity and forcemain sewer. It will be buried 48" below the road surface. Also a 6' diameter pump station will be installed approximately 84 feet south of Wharf Road on South Road.

From the intersection of Sunset Road and Wharf Road going north along Sunset Road for a distance of approximately 450 feet will be a gravity sewer. It will be buried 48" below the road surface.

From the intersection of Church Road and Wharf Road going south to private property for a distance of approximately 50 feet will be forcemain sewer. It will be buried 48" below the surface.

If the City of Portland deems it necessary, at any time, that the above described underground facilities be removed or altered, for any reason, removal or alteration shall be at the sole expense of the applicant.

Any person, firm or corporation claiming to be adversely affected by this proposed location shall file a written objection with the Municipal Officers stating the cause for said objection within fourteen (14) days after the publication of notice hereof.

No enjoyment by any company, person or association, for any length of time, of the privilege of having or maintaining its facilities, as defined in Section 2483, in the public way, may give a legal right to the continued use of such enjoyment or raise any presumption of a grant thereof.

Public Notice of this Application has been given by publishing the text of same in Portland Press Herald on ______________________

Company Name: Cliff Island Septic System Asso.
Company Officer: Steven Little
Of ______________________ Maine
Date ______________________

This petition does not create in the applicant any permission for him to enter or use the land of another property owner, either temporarily or permanently, for any purpose. Questions concerning such permission should be referred to Applicant's attorney.

SKETCH TO ACCOMPANY APPLICATION FOR UNDERGROUND LOCATIONS

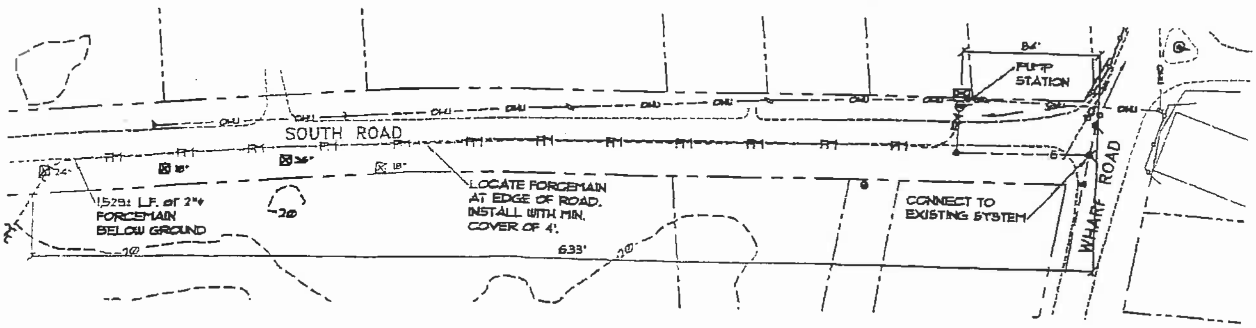
Company Requesting Permission: Cliff Island Septic System Association

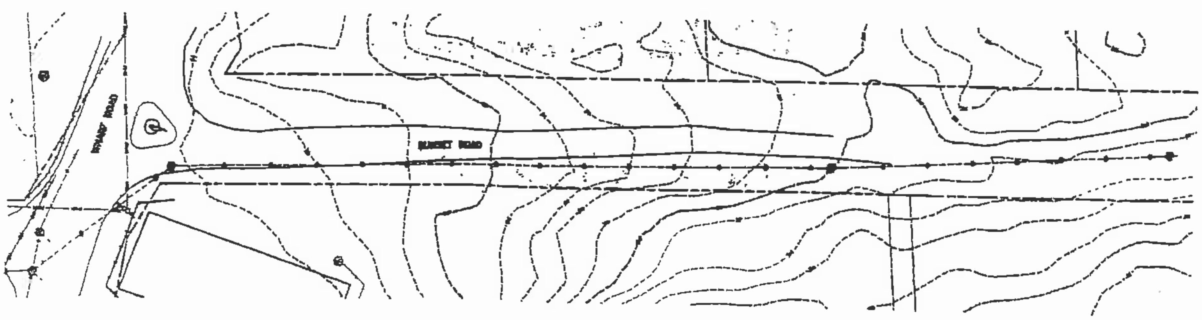
Name of Project: Wastewater Treatment

Location of Project: South Road , Cliff Island

The purpose of this underground installation is to provide sewer service to homes on Cliff Island.

Date: ________________ Submitted by: Cliff Island Septic System Association





UNDERGROUND LOCATION PERMIT

UPON THE APPLICATION OF Cliff Island Septic System Association dated _______ ___, 20____, Asking for permission, in accordance with law, to construct and maintain buried sewer pipes, manholes, and pump station together with other equipment therein, under, along and across certain highways and public roads in the location described in said application, it is hereby adjudicated that the *14* days public notice required by statute has been given and that no written objection has been filed during said period by residents and owners of property upon the highways to be affected thereby and permission is hereby given to said ________________________ , it's successors and assigns, to construct reconstruct, maintain and relocate in substantially the same location buried sewer pipes, manholes, and pump stations together with other equipment therein, under, along and across certain highways and public roads in the City of Portland approximately located as follows:

From the intersection of South Road and Wharf Road going south along South Road for a distance of approximately 633 feet will be a combination of gravity and forcemain sewer. It will be buried 48" below the road surface. Also a 6' diameter pump station will be installed approximately 84 feet south of Wharf Road on South Road.

From the intersection of Sunset Road and Wharf Road going north along Sunset Road for a distance of approximately 450 feet will be a gravity sewer. It will be buried 48" below the road surface.

From the intersection of Church Road and Wharf Road going south to private property for a distance of approximately 50 feet will be forcemain sewer. It will be buried 48" below the surface.

Michael J. Bobinsky Municipal Officers

[signature]

____

____

____

____

________________ Maine ____________________

8 26 ________ 2013 Office of the City Clerk

Received and Recorded in Book ________ Page _______

Attest Katherine L Jones

Clerk

DISPOSAL BED LOCATION PLAN

SCALE: 1"=50'

GENERAL NOTES

1. OWNER: CLIFF ISLAND SEPTIC SYSTEM ASSOCIATION, PO BOX 78, CLIFF ISLAND, MAINE, STEPHEN C. LITTLE, PRESIDENT, ROGER K. BERLE TREASURER.
2. ENGINEER: PINKHAM & GREER CONSULTING ENGINEERS, FALMOUTH, MAINE.
3. BOUNDARY INFORMATION: TAKEN FROM CITY OF PORTLAND RECORDS AND TAXMAPS.
4. TOPOGRAPHIC INFORMATION: TAKEN FROM MAINE OFFICE OF GIS DATA CATALOG, 2 FOOT CONTOURS. CONTOURS ARE APPROXIMATE ONLY, ACTUAL ELEVATIONS SHOULD BE VERIFIED IN THE FIELD PRIOR TO ANY INSATLLATIONS.
5. SOIL ANALYSIS: BY MARK HAMPTON ASSOCIATES, INC., PORTLAND, MAINE.
6. TAX MAP REFERENCE: MAP 109A/LOT C-1 AND MAP 109B/LOT C-1.
7. ALL CONSTRUCTION AND SITE ALTERATIONS SHALL BE DONE IN ACCORDANCE WITH THE "MAINE EROSION AND SEDIMENT CONTROL BMPS" PUBLISHED BY THE BUREAU OF LAND AND WATER QUALITY, MAINE DEPARTMENT OF ENVIRONMENTAL PROTECTION, LATEST EDITION, MARCH 2003.

LEGEND

EXISTING

- PROPERTY LINES
- BUILDING
- EDGE OF GRAVEL ROAD
- FLAGPOLE
- SANITARY SEWER
- CULVERT
- OVERHEAD UTILITY
- CONTOURS
- UTILITY POLE
- FENCE
- WELL

PROPOSED

- EDGE OF GRAVEL
- SANITARY SEWER
- FORCEMAIN
- SANITARY MANHOLE
- PUMP STATION

INSTALLATION NOTES FOR ELJEN IN-DRAIN BEDS

1. THIS SYSTEM IS NOT DESIGNED FOR THE USE OF A GARBAGE DISPOSAL.
2. THIS SYSTEM IS NOT DESIGNED FOR BACKWASH FROM A WATER SOFTENER.
3. STAKE CLEARING LIMITS SO THAT DISTURBANCE IS MINIMIZED.
4. CLEAR, GRUB AND STRIP TOPSOIL FROM THE DISPOSAL BED AREAS AND STOCKPILE MATERIAL FOR REUSE ON SITE.
5. ON RAISED SYSTEMS, THE ORGANIC LOAM LAYER MUST BE REMOVED FROM TRENCH OR BED AND SLOPE EXTENSION AREAS PRIOR TO FILL PLACEMENT. A BUCKET WITH TEETH IS BEST USED FOR THIS CONSTRUCTION STEP AS BUCKETS WITHOUT TEETH CAN COMPACT AND SMEAR THE UNDERLYING SOIL TO CREATE 6"-8" MIXING ZONE BENEATH BED AREA ALONG EXISTING SOIL INTERFACE.
6. SCARIFY SUBSOIL PRIOR TO FILL PLACEMENT.
7. SURFACE SLOPES OVER DISPOSAL BEDS SHALL NOT EXCEED 3:1 (H:V). SIDESLOPES OF DISPOSAL BEDS SHALL NOT EXCEED 4:1 (H:V).
8. BACKFILL MATERIAL SHALL MEET SECTION 8042 OF THE MAINE RULES. ALL BACKFILL MATERIAL SHALL BE CLEAN BANK RUN SAND, FREE OF TOPSOIL OR HUMUS AND DREDGING DIRECTLY BENEATH THE EDA.
9. THE 6" UNDERNEATH AND 3" SURROUNDING THE GSF MODULES SHALL BE INSTALLED USING A MEDIUM TO COARSE WASHED SAND WITH AN EFFECTIVE SIZE OF 0.25 TO 2.0 MM, NO GREATER THAN 10% PASSING A #100 SIEVE AND NO GREATER THAN 5% PASSING A #200 SIEVE, AND NO PARTICLES LARGER THAN .375", OR MATERIALS MEETING THE ASTM C33 SPECIFICATION WITH LESS THAN 10% PASSING A #100 SIEVE AND LESS THAN 5% PASSING A #200 SIEVE. WASHED CONCRETE SAND EASILY MEETS THE ABOVE SPECIFICATION AND IS A RELIABLE CHOICE. SUITABILITY OF BANK RUN SAND MUST BE VERIFIED.
10. FILL (COVER MATERIAL) AND BACKFILL MATERIAL (FILL ADDED BELOW AND AROUND THE GSF SPECIFIED SAND ENVELOPE) SHALL BE BANK RUN SAND WITH LESS THAN 4% TO 8% PASSING A #200 SIEVE AND CLAY LESS THAN 2% AND NO STONES LARGER THAN 3" IN ANY DIMENSION. THE TOTAL DEPTH ABOVE THE GSF MODULES SHALL BE BETWEEN 12" TO 18", AND CONSIST OF A BOTTOM LAYER OF BANK RUN SAND AND A 4" TO 6" TOP LAYER OF CLEAN LOAM. INSTALL BANK RUN SAND SO THAT A MINIMUM DEPTH OF 18" BELOW THE EXISTING GRADE AND BOTTOM OF THE GSF MODULES IN PROVIDED.
11. ANY SYSTEM WHICH IS MORE THAN 18" BELOW FINISH GRADE AS MEASURED FROM THE TOP OF THE MODULES SHALL BE VENTED.
12. THIS DESIGN COMPLIES WITH AND MUST BE INSTALLED IN ACCORDANCE WITH THE ELJEN DESIGN AND INSTALLATION MANUAL.
13. LOAM, SEED, OR WOOD CHIP OVER DISTURBED AREAS IN ACCORDANCE WITH THE EROSION AND SEDIMENT CONTROL NOTES ON SHEET C2.2. MAINTAIN UNTIL GRASS IS 85% TO 90% ESTABLISHED.
14. IF SEEDING CAN NOT OCCUR BETWEEN SPECIFIED DATES, WAIT UNTIL THE FOLLOWING SPRING TO APPLY PERMANENT SEED. DO NOT PERFORM DORMANT SEEDING, APPLY EROSION CONTROL MESH.

REV.	DATE	DESCRIPTION
2	6/25/13	RELOCATED FORCEMAIN
1	3/26/13	REVISED FORCEMAIN LOCATION

STATE OF MAINE · THOMAS S. GREER · No. 4206 · LICENSED · PROFESSIONAL ENGINEER

6/25/13

CLIFF ISLAND SEPTIC SYSTEM ASSOCIATION
P.O. BOX 78, CLIFF ISLAND, MAINE

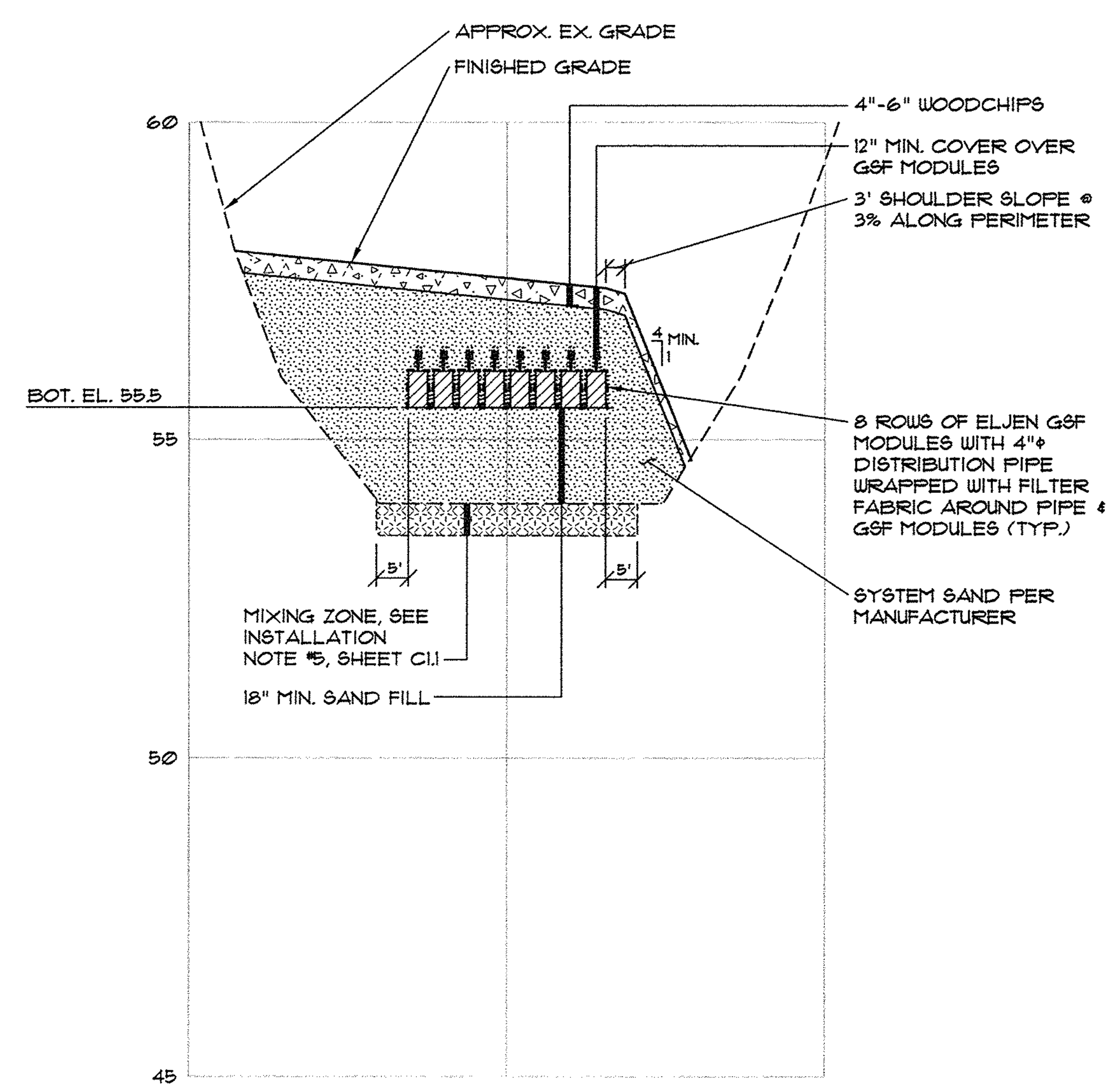
WASTEWATER TREATMENT
CLIFF ISLAND, PORTLAND MAINE

PINKHAM & GREER
CONSULTING ENGINEERS
28 VANNAH AVENUE
PORTLAND, MAINE

DISPOSAL BED SYSTEM LAYOUT

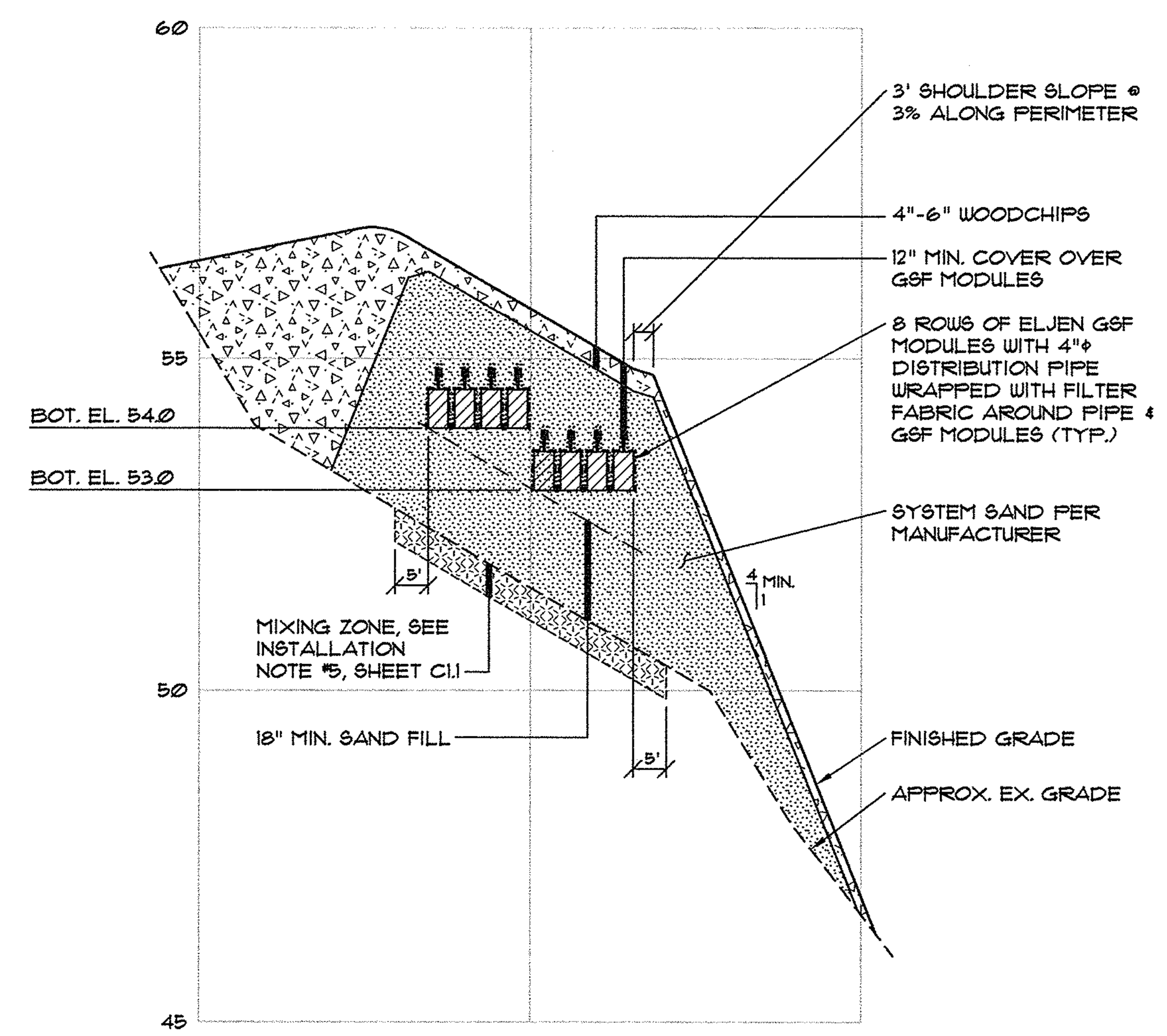
SCALE:	AS SHOWN	DRN BY:	JDC
DATE:	OCTOBER 5, 2012	DESG BY:	TSG
PROJECT:	11161	CHK BY:	TSG

C1.1



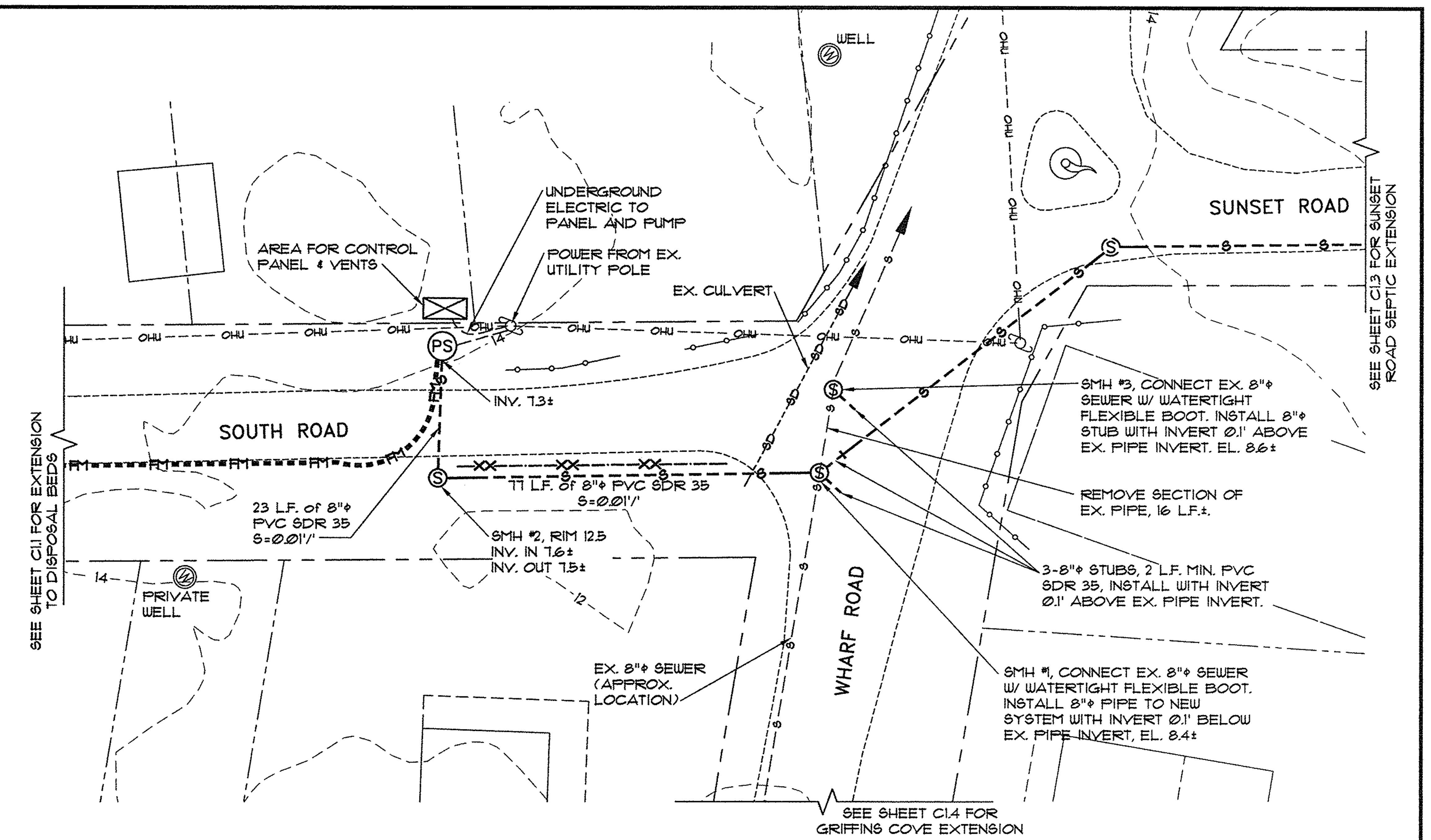
SECTION B–B

SCALE: HORIZ. 1"=20'
VERT. 1"=2'



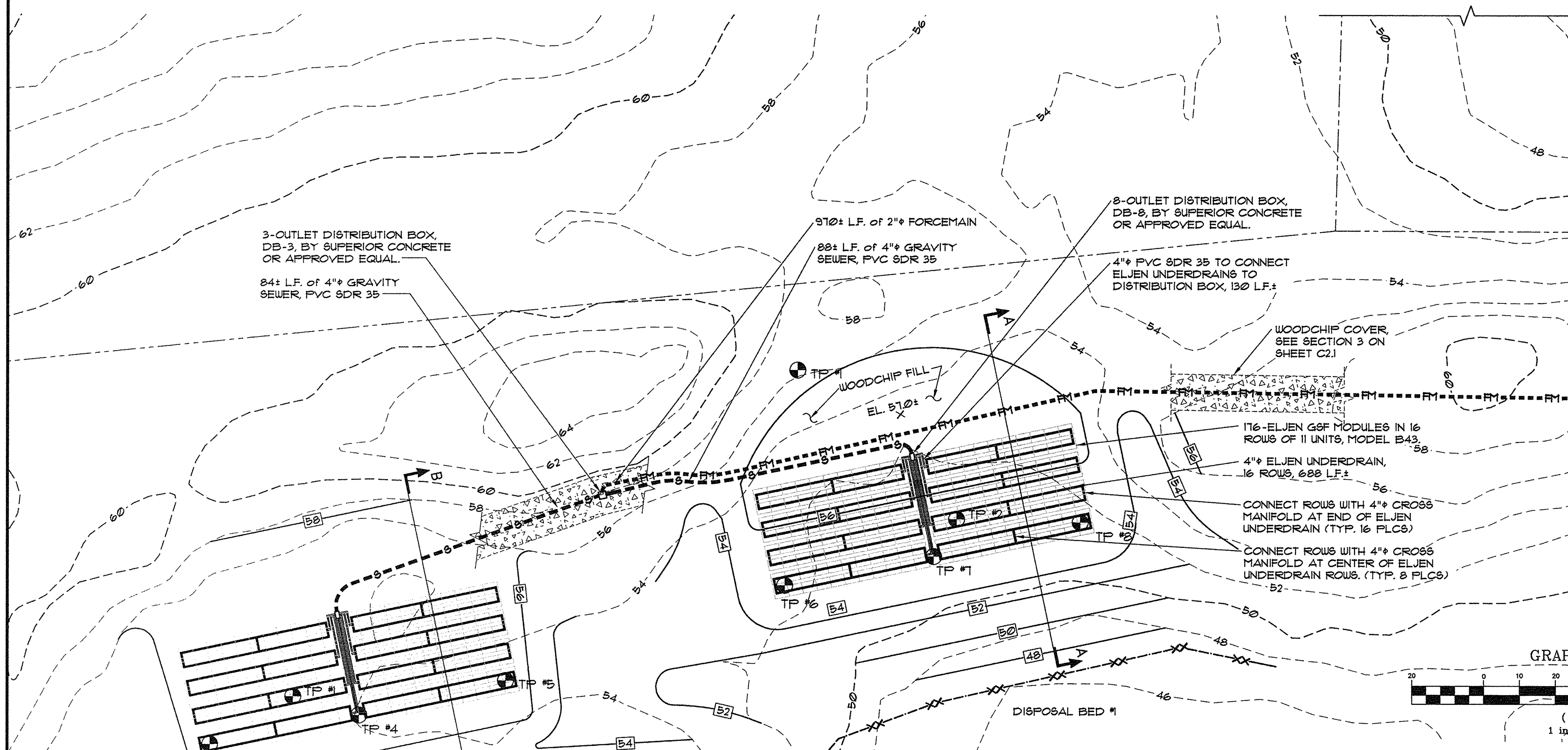
SECTION A–A

SCALE: HORIZ. 1"=20'
VERT. 1"=2'



PUMP STATION & EXISTING SYSTEM CONNECTIONS

SCALE: 1"=20'



DISPOSAL BEDS #1 & #2 PLAN

SCALE: 1"=20'

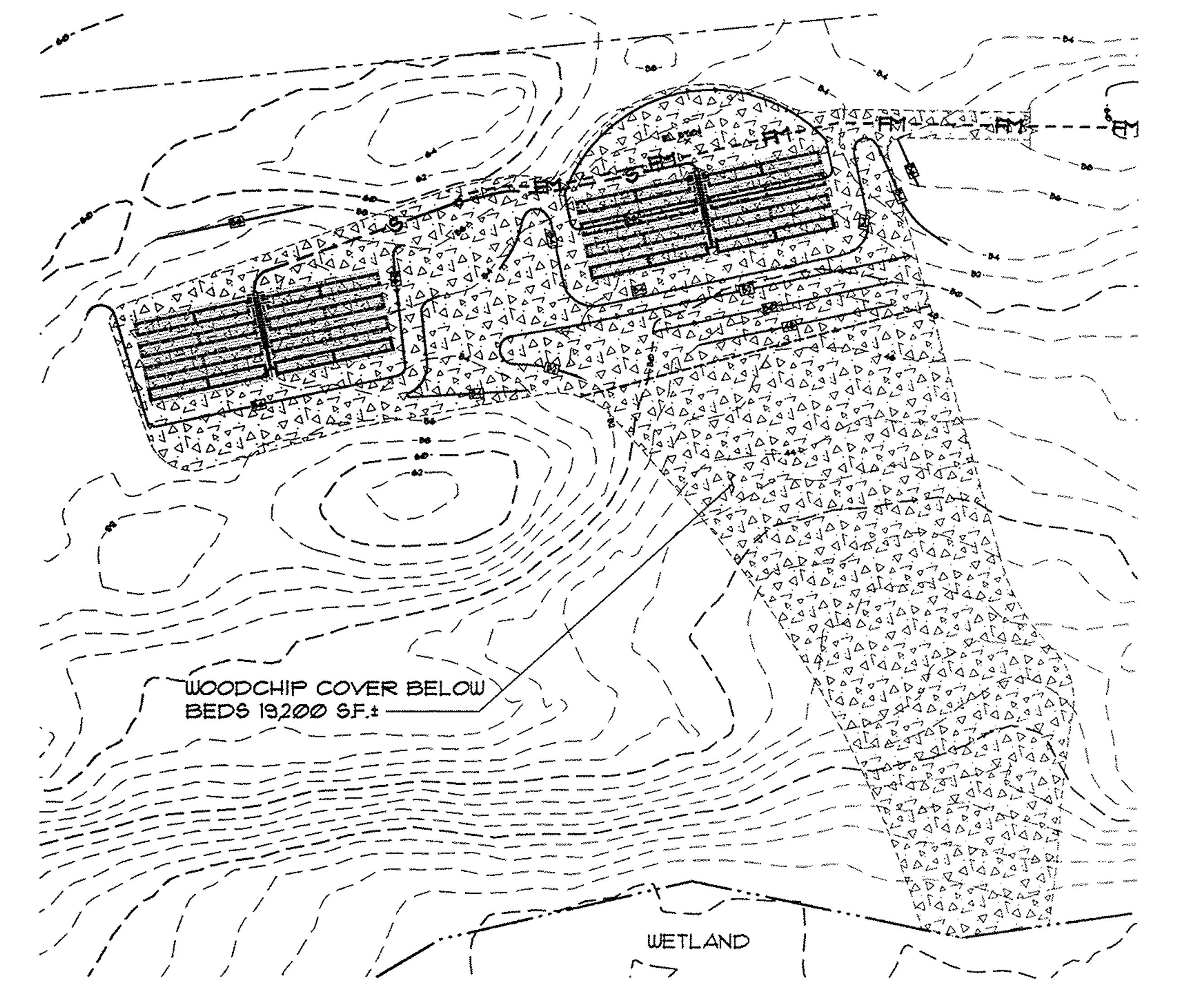
GRAPHIC SCALE

20 0 10 20 40 80

(IN FEET)
1 inch = 20 ft.

LEGEND

EXISTING		PROPOSED	
	BUILDING		EDGE OF GRAVEL
	EDGE OF GRAVEL ROAD	——S——	SANITARY SEWER
	FLAGPOLE	---FM---	FORCEMAIN
——S——	SANITARY SEWER	——UGU——	UNDERGROUND UTILITY
——8D——8D——	CULVERT	20	CONTOURS
——OHU——	OVERHEAD UTILITY	× 21.5	SPOT GRADE
——200——	CONTOURS	Ⓢ	SANITARY MANHOLE
	UTILITY POLE	PS	PUMP STATION
	FENCE	——XX——	SILT FENCE
Ⓦ	WELL		
TP #1	TEST PIT		



AREA OF WOODCHIP COVER

SCALE: 1"=50'

REV.	DATE	DESCRIPTION
4	9/23/13	ADDED TEST PITS BY MARK HAMPTON
3	6/25/13	RELOCATED FORCEMAIN
2	4/9/13	ADDED WOODCHIP COVER AREA
1	3/26/13	REVISED FORCEMAIN LOCATION

STATE OF MAINE
THOMAS S. GREER
No. 4206
LICENSED
PROFESSIONAL ENGINEER

9/23/13

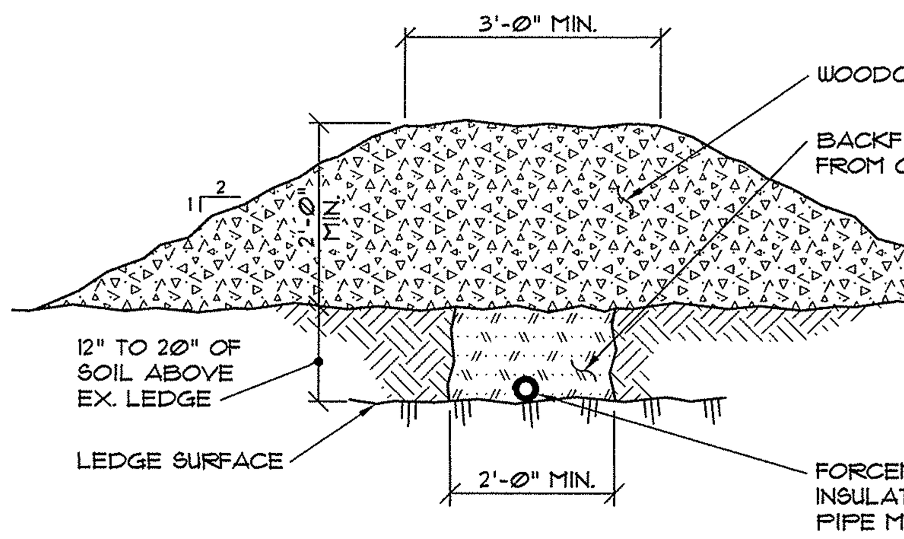
PINKHAM & GREER
CONSULTING ENGINEERS
28 VANNAH AVENUE
PORTLAND, MAINE

CLIFF ISLAND SEPTIC SYSTEM ASSOCIATION
P.O. BOX 78, CLIFF ISLAND, MAINE

WASTEWATER TREATMENT
CLIFF ISLAND, PORTLAND MAINE

SYSTEM LAYOUT DETAILS

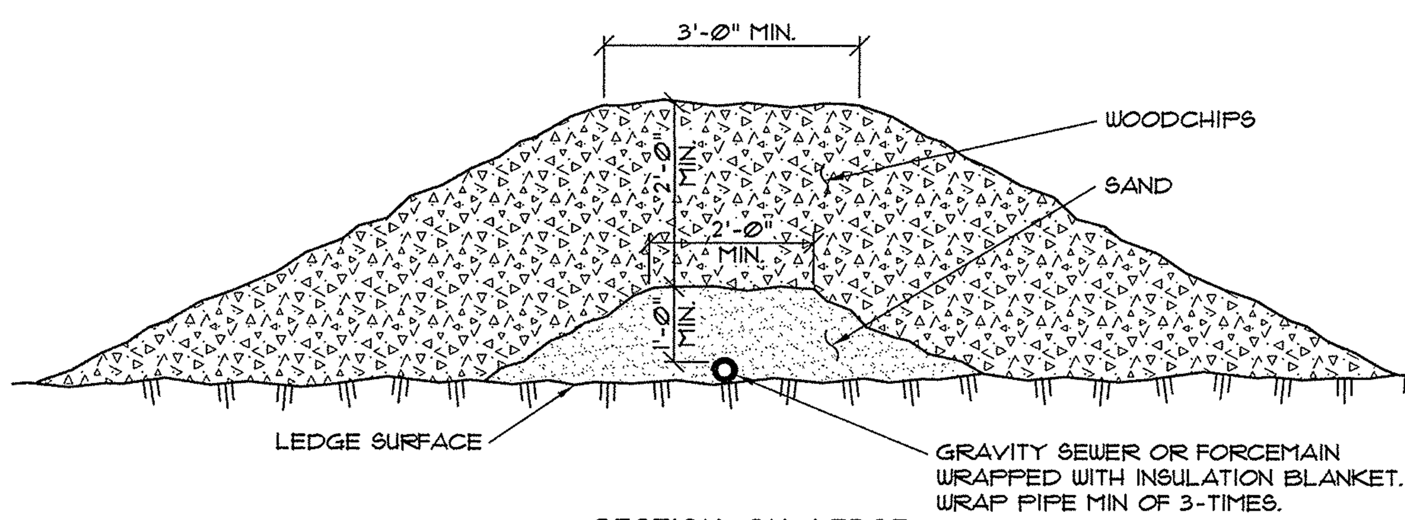
SCALE:	AS SHOWN	DRN BY:	JDC	C1.2
DATE:	OCTOBER 5, 2012	DESG BY:	TSG	
PROJECT:	11161	CHK BY:	TSG	



SECTION WITH 12" TO 20" SOIL OVER LEDGE

NOTES:

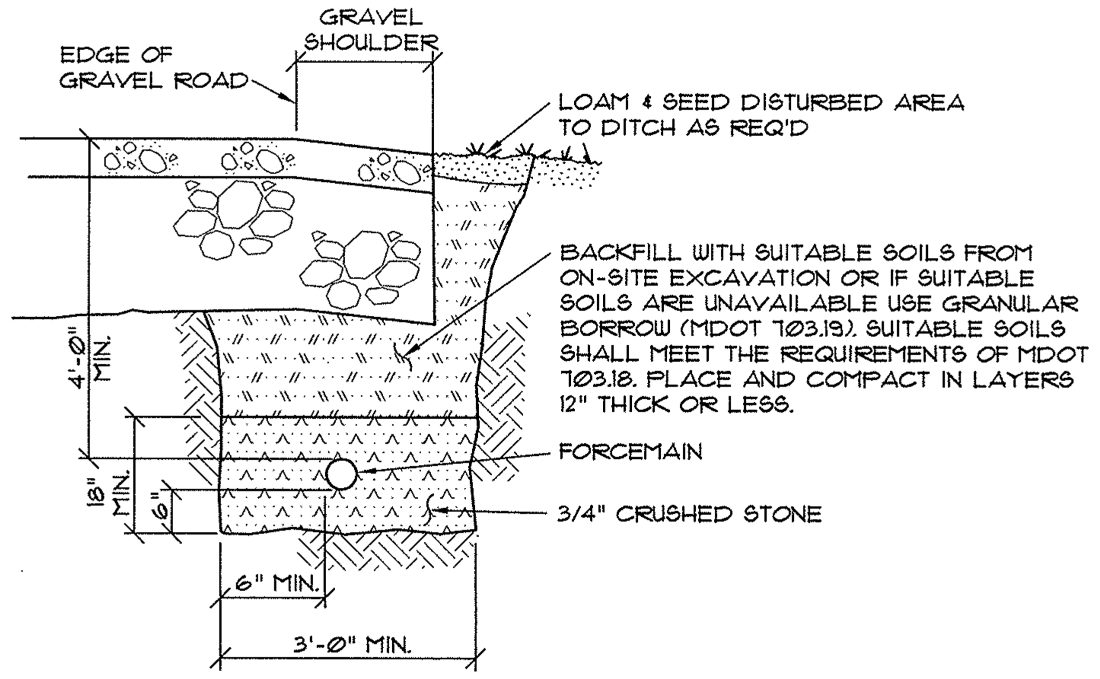
1. WHERE 2 PIPES SHARE A TRENCH MAINTAIN 18" MIN. SEPERATION BETWEEN THEM.
2. INSULATION: ESP BY LOW-E REFLECTIVE INSULATION. CUT 8' WIDE, ROLL IN HALF AND WRAP 4' WIDE STRIP AROUND THE PIPE. INSULATION COMES IN 60' LONG ROLLS. USE ZIP TIES EVERY 10 FEET TO KEEP WRAP TIGHT. OVER LAP ENDS BY 2' MINIMUM.



SECTION ON LEDGE

3 TRENCH SECTION ON LEDGE

NOT TO SCALE



2 TRENCH SECTION AT ROAD SHOULDER

NOT TO SCALE

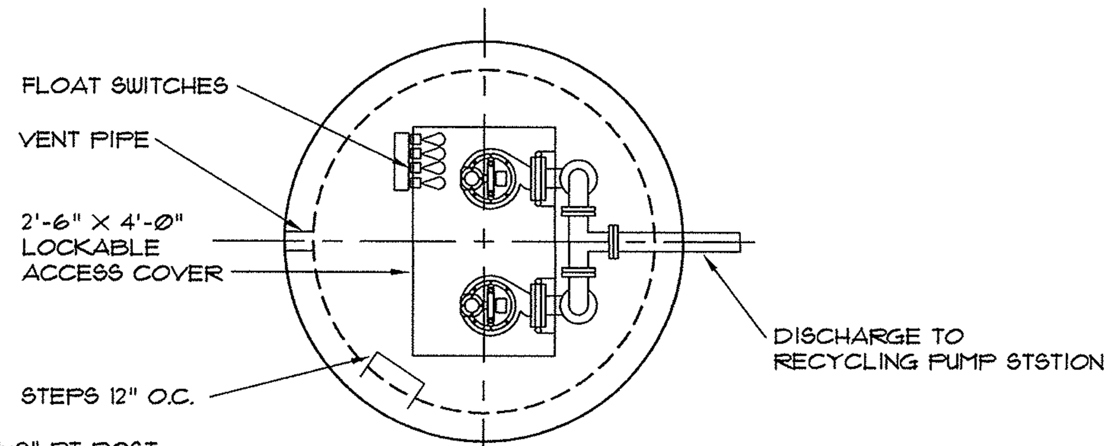
CONSTRUCTION	USE
4" COMPACTED AGGREGATE BASE, MDOT 703.06(a) TYPE A; 15" COMPACTED AGGREGATE SUBBASE, MDOT 703.06(b) TYPE D; COMPACTED SUBGRADE	GRAVEL — SOUTH STREET REPAIR
4" TOPSOIL, NO STONES OVER 3/4" DIA.; GRANULAR MATERIAL IN FILL AREAS; COMPACTED SUBGRADE	GRASS — ALL DISTURBED AREAS

NOTES:

1. MDOT = MAINE DEPARTMENT OF TRANSPORTATION.
2. ALL COURSE THICKNESS AFTER FINAL COMPACTION.

4 SCHEDULE OF SURFACE FINISHES

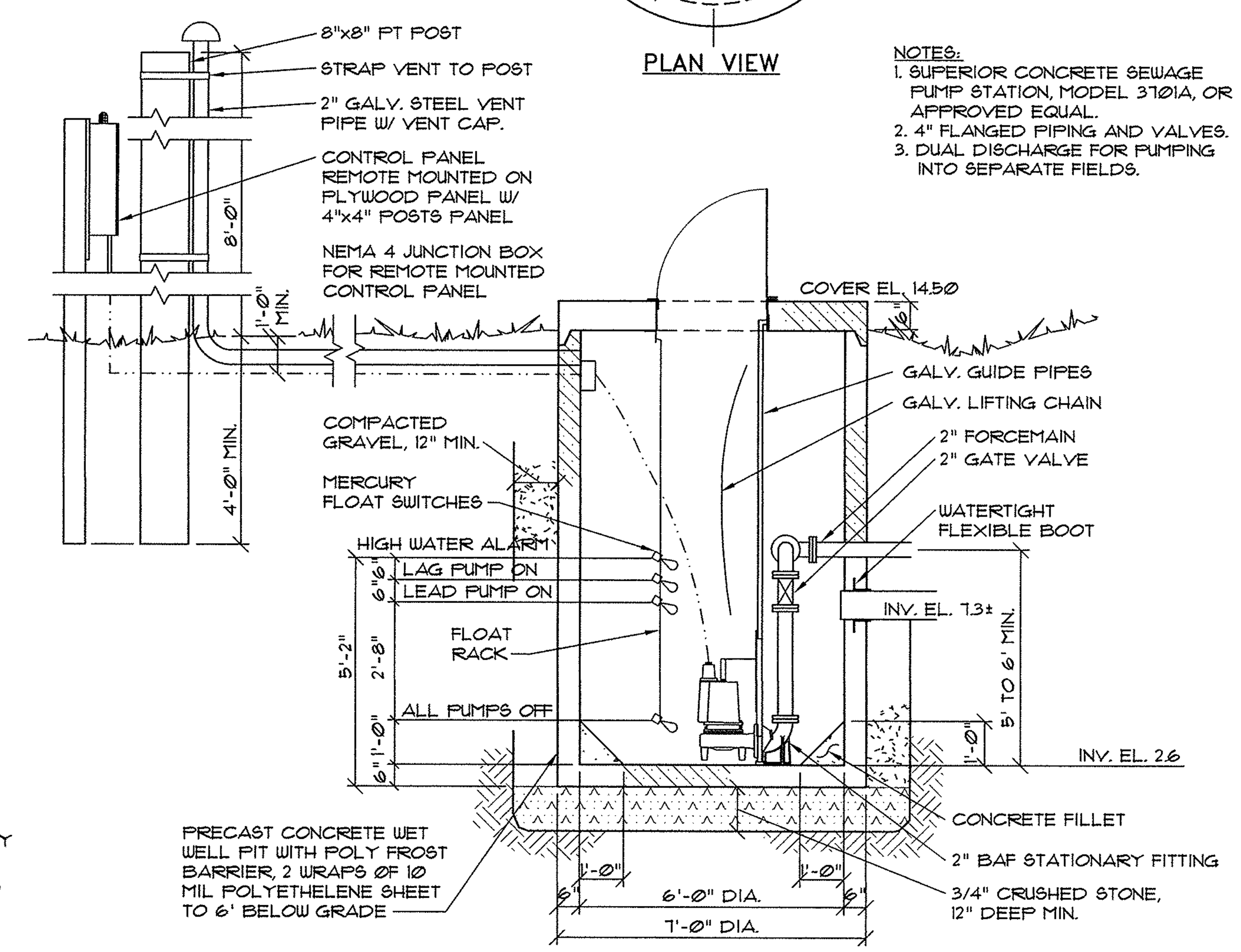
NOT TO SCALE



PLAN VIEW

NOTES:

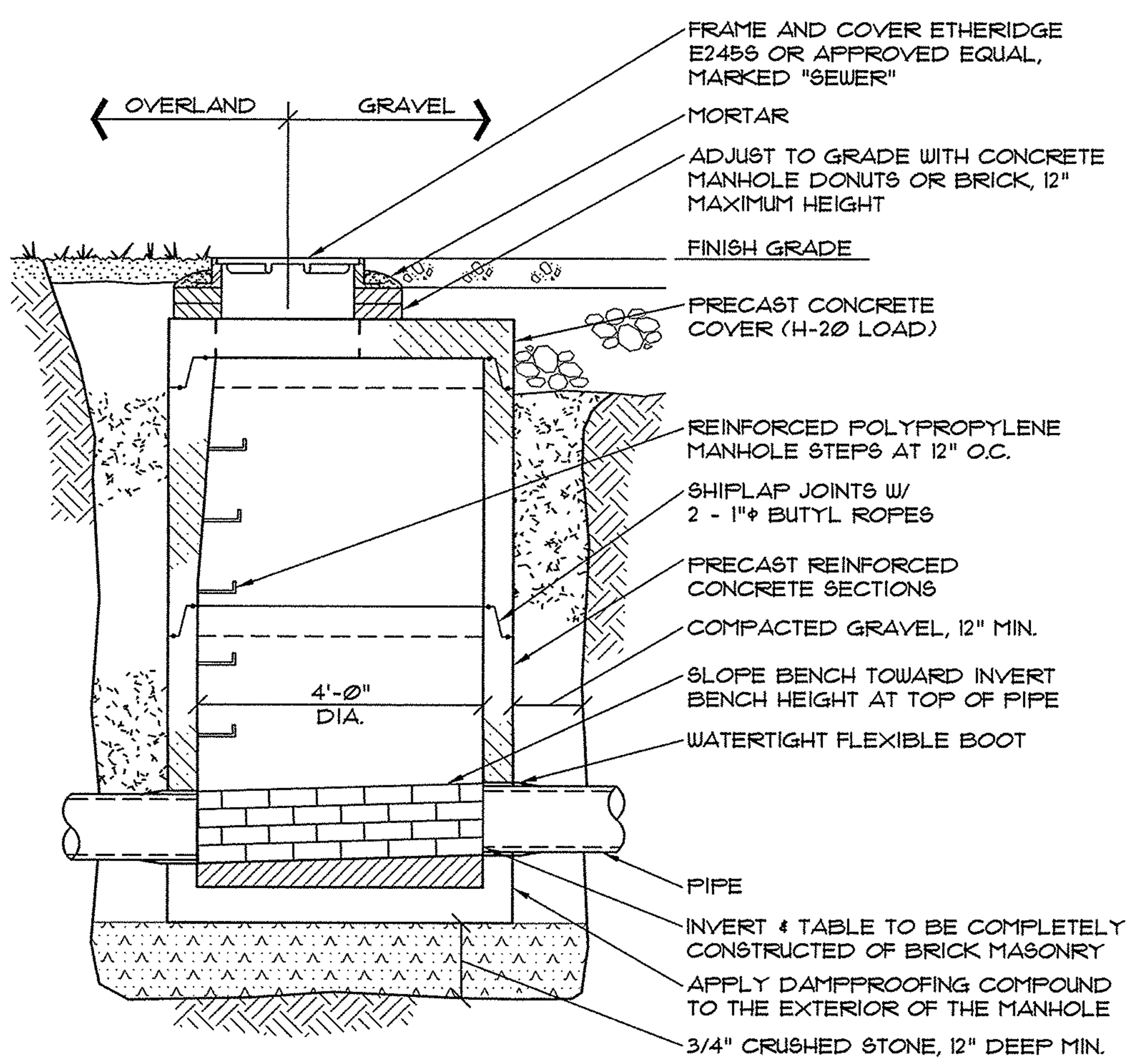
1. SUPERIOR CONCRETE SEWAGE PUMP STATION, MODEL 3701A, OR APPROVED EQUAL.
2. 4" FLANGED PIPING AND VALVES.
3. DUAL DISCHARGE FOR PUMPING INTO SEPARATE FIELDS.



SECTION

6 PUMP STATION

NOT TO SCALE



5 CONCRETE MANHOLE SECTION

NOT TO SCALE

EROSION CONTROL NOTES

GENERAL:

THE DRAWINGS DEPICT THE REQUIRED SOIL EROSION CONTROL MEASURES. THE CONTRACTOR IS RESPONSIBLE FOR MAINTAINING THE CONSTRUCTION SITE IN SUCH A MANNER THAT:

1. SOIL EROSION IS KEPT TO A MINIMUM.
2. NO SEDIMENT LEAVES THE CONSTRUCTION SITE PROPER.
3. ALL POSSIBLE MEASURES ARE EMPLOYED TO PREVENT SEDIMENT FROM ENTERING DRAINAGE COURSES AND WETLANDS EVEN BEYOND THE DETAILS SHOWN ON THIS PLAN IF NECESSARY.

1. ALL EROSION CONTROL MEASURES SHALL BE CONSTRUCTED AND MAINTAINED IN ACCORDANCE WITH THE MAINE EROSION AND SEDIMENT CONTROL BMPS PUBLISHED BY THE BUREAU OF LAND AND WATER QUALITY, MAINE DEPARTMENT OF ENVIRONMENTAL PROTECTION, MARCH 2003.
2. THE CONTRACTOR IS RESPONSIBLE FOR ALL FINES RESULTING FROM EROSION OR SEDIMENTATION FROM THE SITE TO SURROUNDING PROPERTIES, WATERBODIES, OR WETLAND AS A RESULT OF THIS PROJECT.
3. LOAM AND SEED OR COVER WITH WOOD CHIPS ALL DISTURBED AREAS AS SOON AS POSSIBLE AFTER DISTURBANCE, BUT NO LONGER THAN 7 DAYS. LOAM AND SEED ANY DISTURBED AREA WITHIN 75' OF WETLANDS OR WATERBODEIS WITHIN 48 HOURS OR PRIOR TO AND STORM EVENT. USE WINTER SEED RATES AND SPECIFICATIONS IF APPROPRIATE.
4. INSPECT SOIL EROSION MEASURES WEEKLY AND AFTER SIGNIFICANT STORM EVENTS. MAKE ALL NECESSARY REPAIRS TO FACILITIES AS SOON AS POSSIBLE, BUT NO LONGER THAN 2 DAYS. CLEAN AND RESET SILT FENCES AND STONE CHECK DAMS WHICH ACCUMULATE SEDIMENT AND DEBRIS.
5. PROTECT AND STABILIZE ALL AREAS NOT SCHEDULED FOR EROSION PREVENTION OR STABILIZATION BUT THAT SHOW SIGNS OF EROSION. NOTIFY OWNER OF ANY SIGNIFICANT EROSION PROBLEM.
6. APPLY MULCH TO BARE SOILS WITHIN 7 DAYS OF INITIAL DISTURBANCE OF SOILS, WITHIN 48 HOURS IF WITHIN 75' OF WETLAND OR WATERBODY, PRIOR TO ANY RAIN EVENT, OR PRIOR TO ANY WORK SHUTDOWN LASTING MORE THAN ONE DAY.
7. TEMPORARILY SEED WITHIN 7 DAYS ANY AREA WHICH WILL BE LEFT DISTURBED AND UNWORKED FOR MORE THAN 14 DAYS WITH THE TEMPORARY SEED MIX LISTED BELOW. IF AREA IS WITHIN 75' OF A WETLAND OR WATERBODY, SEED WITHIN 48 HOURS. PERMANENTLY SEED ANY AREA WHICH CAN BE LOAMED AS SOON AS POSSIBLE WITH THE PERMANENT SEED MIX LISTED BELOW. DO NOT USE PERMANENT SEED MIX AFTER SEPTEMBER 15.
8. MULCH ALL AREAS SEEDED SO THAT SOIL IS NOT VISIBLE THROUGH THE MULCH REGARDLESS OF THE APPLICATION RATE. DURING THE GROWING SEASON (APRIL 15 - SEPT. 30) USE EROSION CONTROL MESH (OR MULCH AND NETTING) ON:
   - THE BASE OF GRASSED WATERWAYS
   - SLOPES STEEPER THAN 15%
   - WITHIN 100 ft. OF STREAMS AND WETLANDS

   BETWEEN OCT. 1 AND APRIL 14 USE EROSION CONTROL MESH (OR MULCH AND NETTING) ON:
   - SIDE SLOPES OF GRASSED WATERWAYS
   - SLOPES STEEPER THAN 8%
9. FOLLOW SILT FENCE MANUFACTURER'S SPECIFICATIONS AND RECOMMENDATIONS FOR INSTALLATION OF SILT FENCE. SECURE ENTIRE BOTTOM OF FENCE EITHER BY BURYING BOTTOM OF FENCE IN A TRENCH OR BERMING WITH SOIL OR CHIPPED GRUBBINGS. REFER TO SILT FENCE DETAILS.
10. PLACE AND GRADE LOAM IN A REASONABLY UNIFORM MANNER. WORK LIME AND FERTILIZER INTO THE SOIL TO A DEPTH OF 4 INCHES WITH A DISC, SPRING TOOTH HARROW OR OTHER SUITABLE EQUIPMENT. CONTINUE TILLAGE UNTIL A REASONABLY UNIFORM SEED BED IS PREPARED. REMOVE FROM SURFACE ALL STONES LARGER THAN 2" AND ALL OTHER UNSUITABLE MATERIAL. LIME AND FERTILIZER SHOULD BE MIXED INTO SOIL PRIOR TO ROLLING EXCEPT IF INCLUDED IN HYDROSEED MIXTURE. PERMANENT STABLILIZATION OF REVEGETATED AREAS IS CONSIDERED AS 90% CATCH.
11. WATER FROM CONSTRUCTION TRENCH DEWATERING OR TEMPORARY STREAM DIVERSION WILL PASS FIRST THROUGH A FILTER BAG OR SECONDARY CONTAINMENT STRUCTURE (E.G. HAY BALE OR EROSION CONTROL MIX LINED POOL) PRIOR TO DISCHARGE. THE DISCHARGE SITE SHALL BE SELECTED TO AVOID FLOODING, ICING, AND SEDIMENT DISCHARGES TO A PROTECTED RESOURCE. IN NO CASE SHALL THE FILTER BAG OR CONTAINMENT STRUCTURE BE LOCATED WITHIN 100 FEET OF A PROTECTED NATURAL RESOURCE.

TOPSOIL:

1. SUITABLE TOPSOIL SALVAGED FROM SITE OR SCREENED, LOOSE AND FRIABLE SANDY LOAM OR LOAM AS DEFINED BY THE USDA SOIL CONSERVATION SERVICE CLASSIFICATION SYSTEM, FREE FROM ADMIXTURE OF SUBSOIL, REFUSE, LARGE STONES, CLODS, ROOTS, WEEDS, RHIZOMES OR OTHER UNDESIREABLE FOREIGN MATTER AS DETERMINED BY THE INSPECTING AUTHORITY. CONTRACTOR SHALL SUBMIT REPORTS OF LOAM TEST RESULTS PERFORMED BY AN INDEPENDENT TESTING LABORATORY FOR TOPSOIL FROM DIFFERENT SOURCES PRIOR TO PLACING. THE COST OF TESTING SHALL BE INCIDENTAL TO THE COST OF TOPSOIL. TOPSOIL SHALL MEET THE FOLLOWING SPECIFICATIONS:

2. MATERIAL

SAND - 0.08 IN. TO 0.002 IN. DIAMETER (% BY VOLUME) ...... 45 - 75
SILT - 0.002 IN. TO 0.00008 IN. DIAMETER (% BY VOLUME) .... 20 - 40
CLAY - LESS THAN 0.00008 IN. DIAMETER (% BY VOLUME) .... 5 - 15

ORGANICS (SHALL MEET THE REQUIREMENTS OF MDOT STANDARD SPECIFICATION 717.03 PEAT HUMUS) (% BY VOLUME) . 10 - 20

NUTRIENTS:
CALCIUM (CA) (% SATURATION) .... 60 - 80
MAGNESIUM (MG) (% SATURATION) .... 10 - 25
POTASSIUM (K) (% SATURATION) .... 2.1 - 3.0
PHOSPHORUS (P) (POUNDS/ACRE) ...... 10 - 40
PH .... 6.0 - 6.5

PERMEABILITY (INCHES PER HOUR) .... 3 - 10

MAXIMUM STONE SIZE (INCHES) 3/4

SEEDING:

USE PERMANENT SEED MIXES AND RATES BETWEEN 5/15 AND 9/30.
USE TEMPORARY SEED MIXES FOR PERIODS LESS THAN 12 MONTHS, IF USING TEMPORARY SEED MIXES AND RATES BETWEEN 10/1 AND 5/14, RE-SEED WITH PERMANENT SEED MIX AFTER 5/15.

PERMANENT SEED:

MDOT 717.03(a) METHOD NUMBER 2

TEMPORARY SEED:

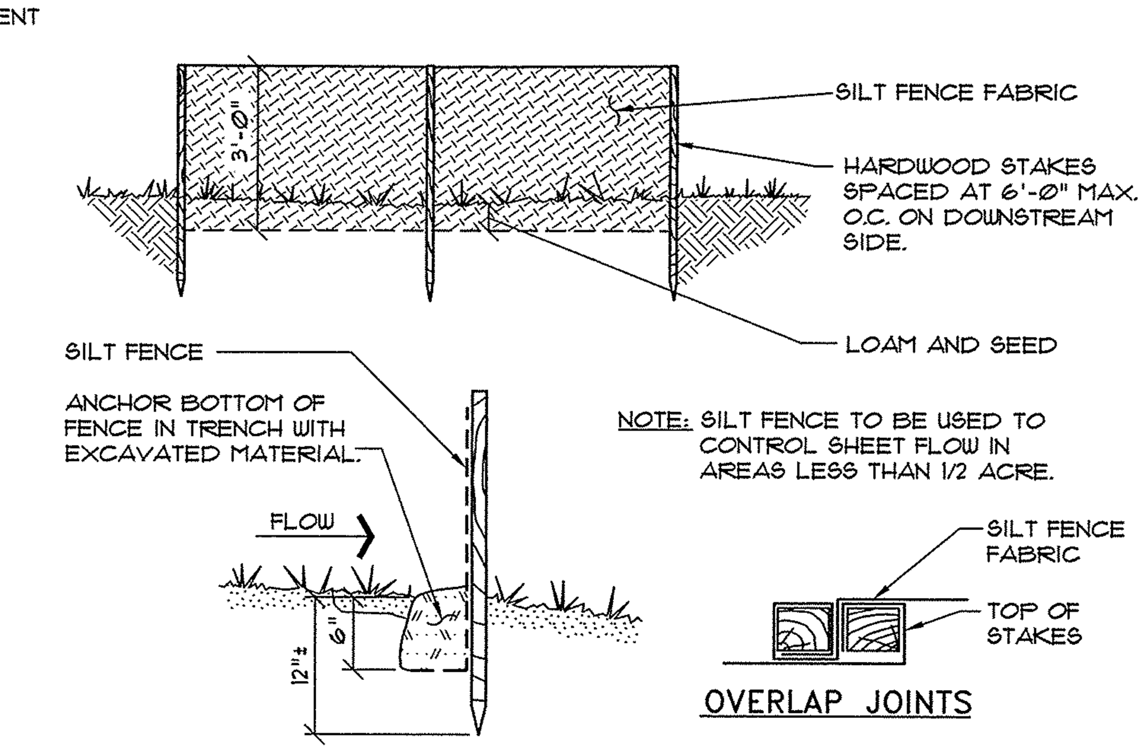
OATS	80.00 LBS/ACRE	4/01 - 5/14
ANNUAL RYEGRASS	40.00 LBS/ACRE	
SUDANGRASS	40.00 LBS/ACRE	5/15 - 8/14
ANNUAL RYEGRASS	80.00 LBS/ACRE	5/15 - 9/14
WINTER RYE	112.00 LBS/ACRE	9/15 - 9/30
WINTER RYE (W/ MULCH COVER)	112.00 LBS/ACRE	10/01 - 3/31

LIME AND FERTILIZER:

APPLY GROUND LIMESTONE (EQUIVALENT TO 50% CALCIUM PLUS MAGNESIUM OXIDE) AT A RATE OF 3 TONS PER ACRE (138 POUNDS PER 1000 SQUARE FEET). APPLY FERTILIZER (10-20-20) AT A RATE OF 800 POUNDS PER ACRE (18.4 POUNDS PER 1000 SQUARE FEET).

MULCH:

STRAW OR HAY (ANCHORED)	70 - 90 LBS	PROTECTED AREAS
STRAW OR HAY (ANCHORED)	185 - 275 LBS	WINDY AREAS
SHREDDED OR CHOPPED	185 - 275 LBS	
JUTE MESH	AS REQUIRED	MODERATE TO HIGH VELOCITY AREAS & STEEP SLOPES
EXCELSIOR MAT	AS REQUIRED	



NOTE: SILT FENCE TO BE USED TO CONTROL SHEET FLOW IN AREAS LESS THAN 1/2 ACRE.

1 SILT FENCE DETAIL

NOT TO SCALE

UNDERGROUND UTILITIES WARNING TAPE

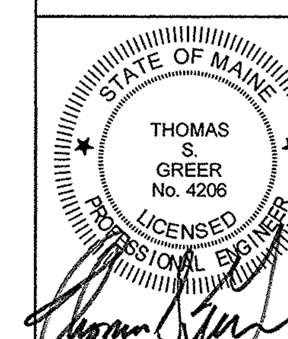
IDENTIFICATION TAPE TO BE INSTALLED ABOVE ALL NEW UNDERGROUND UTILITIES AND ABOVE ANY EXISTING UTILITIES THAT MAY BE EXPOSED BY THIS CONSTRUCTION.

DETECTABLE UNDERGROUND MARKING TAPE TO BE PERMANENT, BRIGHT-COLORED, CONTINUOUS-PRINTED PLASTICIZED ALUMINUM TAPE, INTENDED FOR DIRECT-BURIAL SERVICE NOT LESS THAN 3" WIDE X 5 MILS THICK. PROVIDE TAPE WITH BLACK PRINTING IDENTIFYING THE UTILITY. DETECTABLE WARNING TAPE REQUIRED OVER ALL WATER, SEWER, DRAINAGE, OR GAS UTILITIES. TAPE TO BE TERRA TAPE BY REEF INDUSTRIES, INC., www.reefindustries.com, OR EQUAL.

APWA UNIFORM COLOR CODE:

RED	ELECTRIC POWER LINES, CABLES, CONDUIT AND LIGHTING CABLES
ORANGE	COMMUNICATION, ALARM OR SIGNAL LINES, CABLES OR CONDUIT
GREEN	SEWERS AND DRAIN LINES

REV.	DATE	DESCRIPTION
2	6/25/13	RELOCATED FORCEMAIN
1	3/26/13	REVISED FORCEMAIN LOCATION & INSTALLATION



6/25/13

PINKHAM & GREER
CONSULTING ENGINEERS
28 VANNAH AVENUE
PORTLAND, MAINE

CLIFF ISLAND SEPTIC SYSTEM ASSOCIATION
P.O. BOX 78, CLIFF ISLAND, MAINE

WASTEWATER TREATMENT
CLIFF ISLAND, PORTLAND MAINE

DISPOSAL BED SYSTEM DETAILS

SCALE: AS SHOWN	DRN BY: JDC		C2.1
DATE: OCTOBER 5, 2012	DESG BY: TSG		
PROJECT: 11161	CHK BY: TSG		