SECTION 17: Wastewater Disposal

Kingfish Maine proposes to construct an enclosed recirculating aquaculture system (RAS) facility with multiple buildings, together with adjunct facilities and equipment on a property at 9 Mason Bay Road in Jonesport. This facility comprises facilities for staff and residential accommodations for staff. Appended to this section are designs for system 1 and system 2, including Subsurface Wastewater Disposal Design Applications (HHE 200 form) for the proposed subsurface wastewater disposal systems designed by Natalie Marceau, Licensed Site Evaluator #411 and by William T. Lane, PE 7577 for the engineered system. This submission includes the applications and supporting documentation.

APPENDIX 17A

WASTEWATER DISPOSAL SYSTEM 2 DESIGN

SUBSURFACE WASTEWATER DISPOSAL SYSTEM APPLICATION

Maine Dept. Health & Human Services
Division of Health Engineering, 10 SHS
(207) 287-2070 Fax: (207) 287-4172

PROPERTY LOCATION

City, Town, or Plantation	JONESPORT
Street or Road	DUN GARVIN ROAD
Subdivision, Lot #	

OWNER/APPLICANT INFORMATION

Name (last, first, MI): KINGFISH MAINE, INC. ■ Owner ☐ Applicant

Mailing Address of Owner/Applicant: 33 SALMON FARM ROAD, FRANKLIN, ME 04634

Daytime Tel. #: (502) 387-8673

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 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

Fee: $________ state min fee $________ Locally adopted fee copy [ ] Owner [ ] Town [ ] State

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 # 8 Lot # 23

CAUTION: INSPECTION REQUIRED

I have inspected the installation authorized 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

± 93.2 ☐ 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: STORE (BUILDING #12) (specify)

Current Use ☐ Seasonal ☐ Year Round ■ Undeveloped

TYPE OF WATER SUPPLY

☐ 1. Drilled Well ☐ 2. Dug Well ☐ 3. Private ■ 4. Public ☐ 5. Other PROPOSED PUBLIC DRILLED WELLS

DESIGN DETAILS (SYSTEM LAYOUT SHOWN ON PAGE 3)

TREATMENT TANK

- ■ 1. Concrete
  - ■ a. Regular
  - ☐ b. Low Profile
- ☐ 2. Plastic
- ☐ 3. Other: ________

CAPACITY: 1,500 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: ________ ☐ sq. ft. ☐ lin. ft.

type: 21 ELJEN GSF MODULES

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

385 gallons per day

BASED ON:

- ☐ 1. Table 4A (dwelling unit(s))
- ■ 2. Table 4C (other facilities)

SHOW CALCULATIONS for other facilities

1 PUBLIC TOILET @ 325 GPD
5 EMPLOYEES @ 12 GPD PER EMPLOYEE

- ☐ 3. Section 4G (meter readings)

ATTACH WATER METER DATA

SOIL DATA & DESIGN CLASS

PROFILE / CONDITION: 4 / D

at Observation Hole # 1

Depth 12"

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. 44 d 33 m 16.1 s
Lon. 67 d 34 m 38.2 s

if g.p.s, state margin of error: ________

SITE EVALUATOR STATEMENT

I certify that on 2/10/21 (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).

Natalie Marceau (signature) — Site Evaluator Signature
411 — SE #
3/1/21 — Date

Natalie Marceau (GARTLEY & DORSKY ENGINEERING & SURVEYING) — Site Evaluator Name Printed
(207) 236-4365 — Telephone Number
nmarceau@gartleydorsky.com — E-mail Address

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

HHE-200 Rev. 11/2013

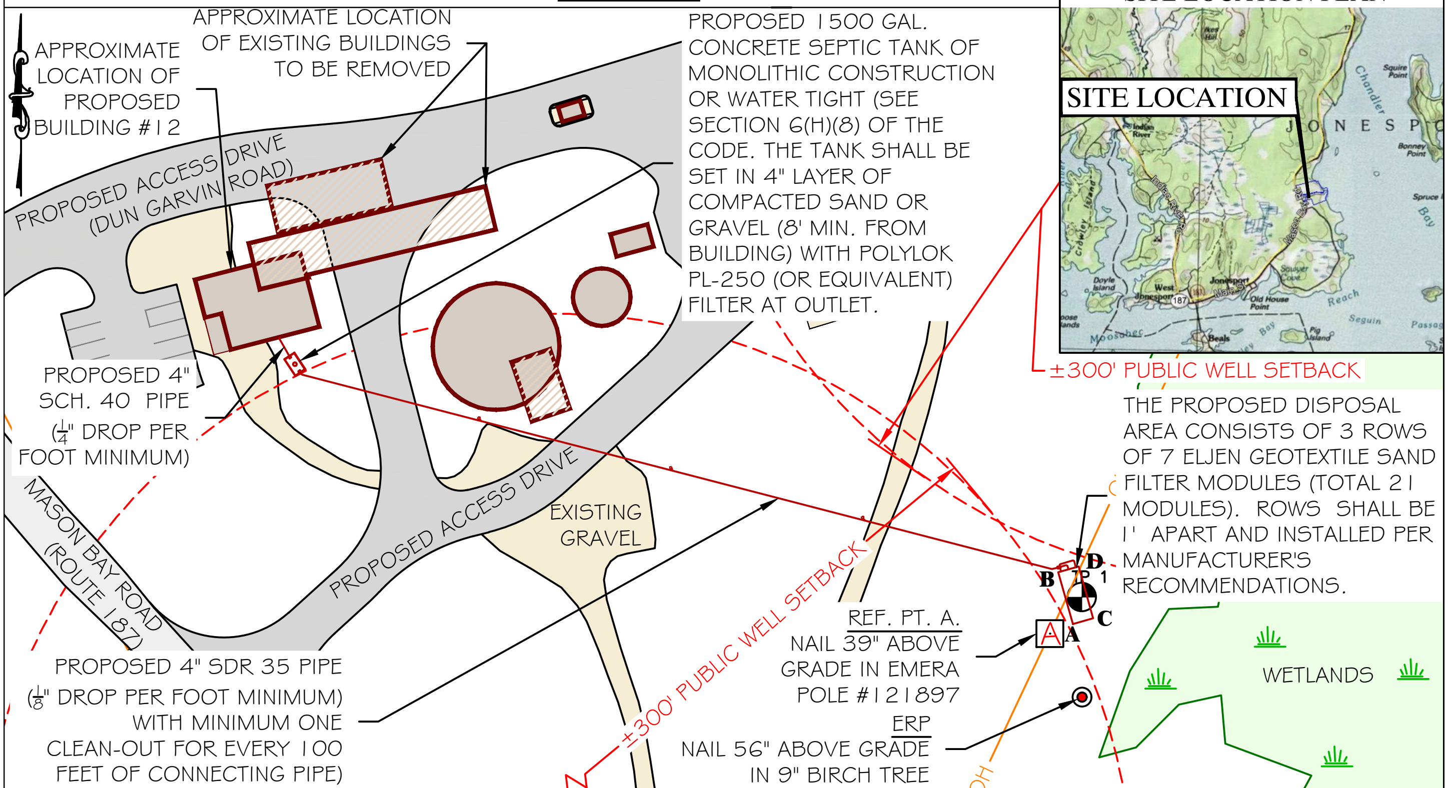
H:\Land Projects 3\19412 Kingfish\Drawings\Store septic\19412-HHE200 (for store).dwg

PROJ. NO.: 2019-412

SUBSURFACE WASTEWATER DISPOSAL SYSTEM APPLICATION	Department of Human Services Division of Health Engineering (207) 287-5672 Fax: (207) 287-3165

Town, City, Plantation	Street, Road, Subdivision	Owner's Name
JONESPORT	DUN GARVIN ROAD	KINGFISH MAINE, INC.

SITE PLAN Scale 1" = 100 ft. or as shown | **SITE LOCATION PLAN**



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

Observation Hole 1 ■ Test Pit ☐ Boring
0 " Depth of Organic Horizon Above Mineral Soil

Depth Below Mineral Soil Surface (inches)	Texture	Consistency	Color	Mottling
0–10	LOAM	FRIABLE	DARK BROWN	NONE
10–20	LOAMY SAND		STRONG BROWN	COMMON MEDIUM DISTINCT LIGHT OLIVE BROWN
20–26			LIGHT OLIVE BROWN	
26	BOTTOM OF TEST PIT			

Soil Classification	Slope	Limiting Factor	
4 Profile / D Condition	±4 %	12 "	■ Ground Water ☐ Restrictive Layer ☐ Bedrock ☐ Pit Depth

Observation Hole ____ ☐ Test Pit ☐ Boring
____ " Depth of Organic Horizon Above Mineral Soil

Depth Below Mineral Soil Surface (inches)	Texture	Consistency	Color	Mottling
0–50				

Soil Classification	Slope	Limiting Factor	
____ Profile / ____ Condition	____ %	____ "	☐ Ground Water ☐ Restrictive Layer ☐ Bedrock ☐ Pit Depth

Site Evaluator Signature	SE #	Date	
Natalie Marceau	411	3/1/21	Page 2 of 4 HHE-200 Rev. 8/01

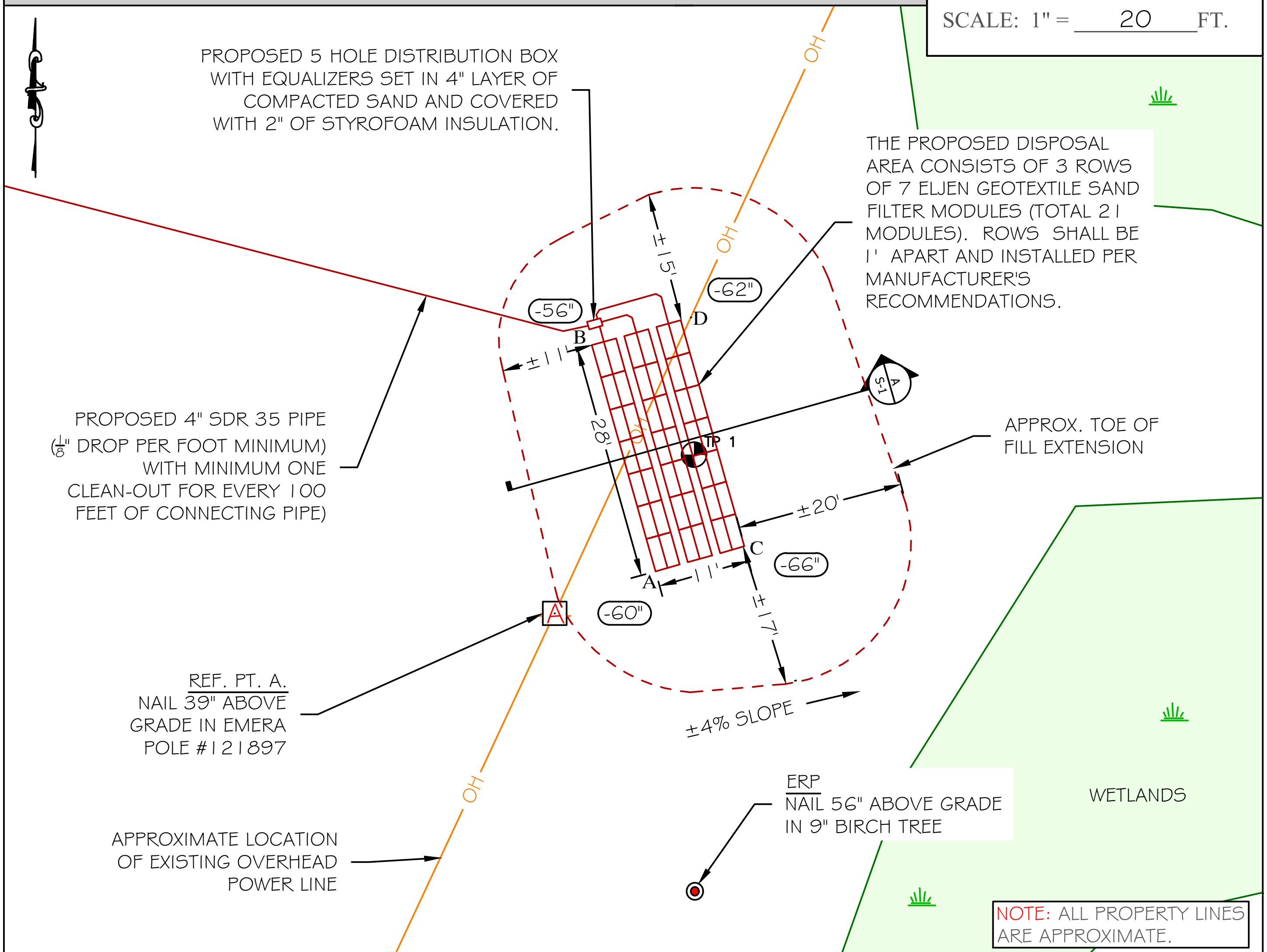
SUBSURFACE WASTEWATER DISPOSAL SYSTEM APPLICATION

Department of Human Services
Division of Health Engineering
(207) 287-5672 Fax: (207) 287-3165

Town, City, Plantation	Street, Road, Subdivision	Owner's Name
JONESPORT	DUN GARVIN ROAD	KINGFISH MAINE, INC.

SUBSURFACE WASTEWATER DISPOSAL PLAN

SCALE: 1" = 20 FT.



FILL REQUIREMENTS		CONSTRUCTION ELEVATIONS		ELEVATION REFERENCE POINT
Depth of Fill (Upslope)	31"-35"	Finished Grade Elevation	SEE SECTION-A	Location & Description: NAIL 56" ABOVE GRADE IN 9" BIRCH TREE
		Top of Distribution Pipe or Proprietary Device	SEE SECTION-A	
Depth of Fill (Downslope)	37"-41"	Bottom of Disposal Area	SEE SECTION-A	Reference Elevation: 0"

DISPOSAL AREA CROSS SECTION

SCALE
Horizontal 1" = N/A ft.
Vertical 1" = N/A ft.

(SEE ATTACHED SECTION)

DISTANCES:

ELEVATION REFERENCE POINT (ERP):
NAIL 56" ABOVE GRADE IN 9" BIRCH TREE

ERP TO A: 13'-1"
ERP TO B: 32'-7"
ERP TO C: 24'-1"
ERP TO D: 38'-3"

REFERENCE POINT A.:
NAIL 39" ABOVE GRADE IN EMERA POLE #121897

REFERENCE POINT A TO A: 38'-5"
REFERENCE POINT A TO B: 66'-2"
REFERENCE POINT A TO C: 41'-6"
REFERENCE POINT A TO D: 68'-1"

Natalie Marceau	411	3/1/21
Site Evaluator Signature	SE #	Date

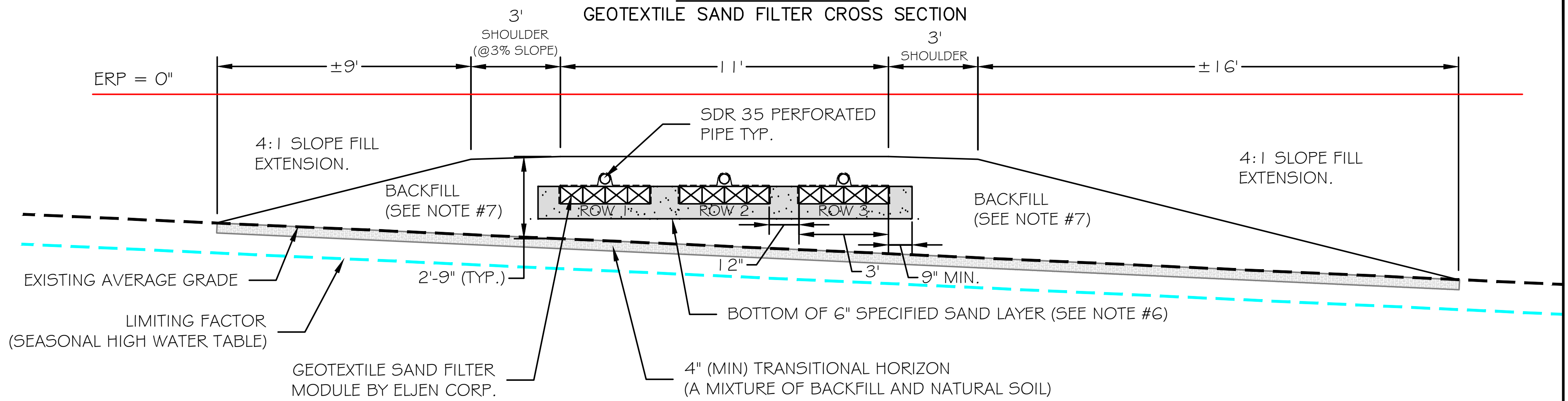
HHE-200 Rev. 8/01

H:\Land Projects 3\19412 Kingfish\Drawings\Store septic\19412-HHE200 (for store).dwg

PROJ. NO.: 2019-412

SECTION-A

GEOTEXTILE SAND FILTER CROSS SECTION



THE SYSTEM CONSISTS OF 3 ROWS OF 7 MODULES PER ROW, EACH ROW SEPARATED BY 1 FOOT.

GEOTEXTILE SAND FILTER NOTES:

1. THIS SYSTEM COMPLIES WITH AND MUST BE INSTALLED IN ACCORDANCE WITH THE GEOTEXTILE SAND FILTER DESIGN MANUAL (BY ELJEN CORPORATION), AND ALL MAINE SUBSURFACE RULES.
2. INSTALLATION SHALL NOT TAKE PLACE WHEN THE GROUND IS FROZEN OR SATURATED.
3. TOPSOIL OR ORGANICS MUST BE REMOVED FROM LEACH FIELD AND FILL SLOPE EXTENSIONS PRIOR TO FILL PLACEMENT.
4. THE AREA UNDER THE DISPOSAL AREA MUST BE THOROUGHLY SCARIFIED BY ROTOTILLER, HARROW OR BACKHOE TEETH. THE SOIL SHOULD BE BROKEN UP TO A DEPTH OF 6 INCHES.
5. THERE SHALL BE 4" MINIMUM TRANSITIONAL HORIZON BETWEEN BACKFILL AND THE NATURAL SOIL WHICH IS A MIXTURE OF BACKFILL AND NATURAL SOIL. THE TRANSITIONAL HORIZON SHALL BE UNDER THE DISPOSAL SYSTEM AND EXTEND FROM FILL EXTENSION TO FILL EXTENSION.
6. THE 6" SAND LAYER BELOW THE MODULES SHALL BE MEDIUM TO COARSE SAND MEETING ASTM C33 SPECIFICATIONS. FOR COMPLETE SPECIFICATIONS SEE GEOTEXTILE SAND FILTER DESIGN MANUAL.
7. BACKFILL SHALL BE GRAVELLY COARSE SAND AND SHALL MEET SPECIFICATIONS OF TABLE 11A OF THE SUBSURFACE RULES.
8. ANY SYSTEM WHICH IS MORE THAN 18" BELOW FINISH GRADE AS MEASURED FROM THE TOP OF THE MODULES SHALL BE VENTED.
9. FINAL GRADES SHALL BE LOAMED (4" MIN), MULCHED AND SEEDED.
10. SINGLE FAMILY DWELLINGS SHALL HAVE ACCESS OPENINGS FOR SEPTIC TANKS WITHIN 6 INCHES OF FINISHED GRADE AND BE WATERTIGHT, PER SECTION 6F(2) OF THE SUBSURFACE CODE. ALL OTHER FACILITIES SHALL HAVE ACCESS OPENINGS FOR TREATMENT TANKS AND PUMP STATION LOCATED AT FINISHED GRADE AND HAVE A WATER TIGHT RISER OF THE SAME MATERIALS AS THE TREATMENT TANK OR PUMP STATION. H-20 CONSTRUCTION IS REQUIRED IN TRAFFIC AREAS. SEE SECTION 6F(3) OF THE SUBSURFACE CODE.
11. THE DRILLING OF ANY WELL SHALL BE A MINIMUM OF 50' FROM ANY WATER TIGHT SEPTIC TANK AND 100' FROM ANY LEACH FIELD.
12. THIS SYSTEM IS NOT DESIGNED FOR BACKWASH FROM ANY WATER TREATMENT SYSTEM OR TO BE DRIVEN ON.

ELEVATIONS

ELEV. REF. PT. (ERP)	0"		
	ROW 1	ROW 2	ROW 3
FINISHED GRADE	-25"	-25"	-25"
TOP OF IN-DRAIN UNIT	-37"	-37"	-37"
BOTTOM OF IN-DRAIN UNIT	-44"	-44"	-44"
BOTTOM OF SAND	-50"	-50"	-50"

SUBSURFACE WASTEWATER DISPOSAL SYSTEM APPLICATION

[signature] — Site Evaluator Signature | 411 — SE # | 3/1/21 — Date

Owner/Applicant: KINGFISH MAINE, INC.
Town: JONESPORT
Street: DUN GARVIN ROAD
Detail Scale: 1"= 5'

Gartley & Dorsky
ENGINEERING SURVEYING
59B Union Street P.O. Box 1031 Camden, ME 04843-1031
Ph (207) 236-4365 Fax (207) 236-3055 Toll Free 1-888-282-4365
165 Main Street Suite 2F P.O. Box 1072 Damariscotta, Maine 04543
Ph. (207) 790-5005

S-1

HHE-200 Rev. 8/01

APPENDIX 17B

WASTEWATER DISPOSAL SYSTEM 1 DESIGN

Maine Department of Health and Human Services
Division of Environmental Health
Subsurface Wastewater Program

APPLICATION FOR ENGINEERED
SUBSURFACE WASTEWATER DISPOSAL SYSTEM

Please complete the following Sections. Please print or type.

Applicant/Owner

Company Name: Kingfish Maine, Inc.

Contact Person: Megan Sorby

Address: 33 Salmon Farm Road

Town/City: Franklin State/Province: ME Zip/Postal Code: 04634

Country: Washington

Telephone: (502) 387-8673 Fax:

e-mail: m.sorby@kingfish-maine.com

Design Engineer

Company Name: Gartley & Dorsky Engineering & Surveying

Contact Person: William Lane

Address: PO Box 1031

Town/City: Camden State: ME Zip Code: 04843

Telephone: (207) 236-4365 Fax: (207) 236-3055

e-mail: blane@gartleydorsky.com

1. Property Location

Town/City: Jonesport County: Washington

Tax Map and Lot Number: Map 8 Lot 23

Attach as **"Exhibit A"** a copy of the relevant section of the USGS 7.5' topographic map, if available, or 15' topographic map showing the location of the proposed engineered disposal system.

2. Project Description

Provide a brief written description of the proposal. Use a separate sheet if necessary.

Kingfish Maine, Inc. proposes to develop a land-based recirculating aquaculture system to grow Dutch Yellowtail at a 93 acre property on Mason Bay Road in Jonesport, Maine. The proposed engineered septic design serves 16 bedrooms for residential units and up to 128 employees. The design includes four 4000-gallon septic tanks (totaling 12000 gallons of tank compacity).

3. Design Flow

The design flow for this project is: ___4000___ gallons per day. Provide design flow calculations and assumptions used in the calculations. Use a separate sheet if necessary.

16 bedroom (within 4 buildings) at 90gpd per bedroom = 1440gpd;

128 employees (with shower) at 20gpd per employee = 2560 gpd

4. Mounding Analysis

Submit as **"Exhibit B"** an analysis of the proposed system design showing that there is adequate vertical separation between the bottom of the disposal field and any mounded water table. Include all calculations and assumptions used.

5. Transmissivity Analysis

Submit as **"Exhibit C"** an analysis of the proposed system design showing that there are sufficient suitable soils down-gradient to prevent the effluent from surfacing within 50 feet of the disposal field. Include all calculations and assumptions used.

6. HHE-200 and Variance Form(s)

Submit as **"Exhibit D"** a complete HHE-200 Form, and variance forms if applicable, signed by a Professional Engineer. The design engineer may reference associated plans and soil test pit logs on pages 2 and 3 of the HHE-200 Form.

This project requires:

[ ] a First Time System Variance to the Maine Subsurface Wastewater Disposal Rules.

[ ] a Replacement System Variance to the Maine Subsurface Wastewater Disposal Rules.

[X] no variance to the Maine Subsurface Wastewater Disposal Rules.

7. Operations and Maintenance Manual

Submit as **"Exhibit E"** an operations and maintenance manual for the owner with written recommendations for the operation and maintenance of the system, including inspection schedules, pumping schedules, and record keeping procedures.

8. Soil and Site Conditions

Submit as **"Exhibit F"** soil test pit logs prepared by a licensed Site Evaluator. The test pits shall be of sufficient number to accurately describe the site conditions under the proposed disposal area and the down gradient fill extension.

9. Plans

Submit as **"Exhibit G"** plans for the proposed engineered disposal system meeting provisions of Section 1102 of the Maine Subsurface Wastewater Disposal Rules. Two sets of plans are required, or one set of plans and one set of copies no larger than 11" x 17". Plans may be submitted for review purposes on a floppy disk or compact disc in *AutoDesk* AUTOCAD *.dwg format (rev. 14 or lower), but a signed and stamped hard copy will be required upon final approval.

The plans shall also specify the latitude and longitude of the center of the disposal area(s), expressed as degrees, minutes, and seconds. If this data is obtained from an electronic GIS device, provide the device's margin of error.

10. Review Fee

Submit a check or money order in the amount of $100.00 U.S. made payable to the Treasurer of the State of Maine.

I, William Lane, am the design engineer for the subject design.
(print name)

I state that the information submitted is correct to the best of my knowledge and understand that any falsification is reason for the Department to deny the project.

[signature]	7577	3/25/21
Signature of Design Engineer	P.E. License Number	Date

Please note: To ensure a timely review of the project, make sure that the application is complete when submitted to the Division of Health Engineering.

Incomplete applications can not be processed, and will be returned to the design engineer for completion, unprocessed.

EXHIBIT A

Topographic Location Map

Gartley & Dorsky
ENGINEERING SURVEYING
CAMDEN, MAINE (207) 236-4365
WWW.GARTLEYDORSKY.COM

SITE LOCATION MAP
KINGFISH MAINE
JONESPORT, MAINE

PROJ. NO 2019-412 EXHIBIT A

EXHIBIT B & C

Mounding Analysis & Transmissivity Analysis

Gartley & Dorsky
ENGINEERING SURVEYING

March 20, 2021

Megan Sorby
Tom Sorby
Kingfish Maine, Inc.
33 Salmon Farm Road
Franklin, ME 04

RE: Subsurface Wastewater Disposal System 1 – Mounding Analysis Project 2019-412
Kingfish Maine RAS Facility

Dear Megan and Tom:

We have completed a Mounding Analysis for the proposed primary wastewater disposal system at Kingfish Maine in Jonesport, Maine. The proposed system is are designated as Disposal Field 1 on the site plan enclosed. We also include copies of test pit logs with soil profile information.

The design flow for the systems is 4,000 gallons per day (gpd) which will be split between two discrete sections of the disposal field. The disposal fields sections are each 31 X 56 feet in size and utilize Eljen GSF standard modules arranged in 8 rows of 14 modules (total 224 units).

The mounding calculations are derived from the United States Geological Survey (USGS) Scientific Investigation Report 2010-5102. The analytical model is based on a Solution to the Hantush Equation (1967).

Input parameters to the model include recharge rate, specific yield, initial saturated thickness of the aquifer, field size, time and horizontal hydraulic conductivity. The values used for each input parameter are as follows:

The per field recharge rate is 0.154 feet per day based on 2,000 gpd (267 cubic feet per day) design flow and a field size of 1,736 square feet. The recharge rate is considered constant. If actual design flow is less, mounding predictions would be lower than predicted.

Specific yield is 0.26 (dimensionless) and reflects the ability of a soil to drain water and is a ratio of the volume of water that drains from a unit volume of the soil compared to the volume of soil. Reference values were derived from US Department of the Interior Geological Survey Water Supply Paper 1662-D.

Initial saturated thickness of the aquifer is on the order of 22 feet. These values are derived from the exploration data. Test pits (Nos. 16 to 21) encountered no limiting bedrock condition at depths of 34”. In the adjacent geotechnical investigation’s boring (B15), depth to bedrock in field was generally greater than 23 feet. In general, overburden in this section of the property is consistent with this finding. As a result, overburden is conservatively assigned to be 20 feet thick in the vicinity of the disposal field.

Test pit logs indicate variable depths to mottling (seasonal high water table) of 12 inches below ground surface. For mounding calculations, a depth to water table of 12 inches below ground surface (bgs) was assigned. Given a conservative overburden of 20 feet, an initial saturated thickness of 19 feet was used. A thicker overburden would result in less predicted mounding.

Field size is 56 X 31 feet. Time was set at 365 days (1 year). A 1-year timeframe allow sufficient time for the system to achieve a steady state.

Horizontal hydraulic Conductivity was varied between 1 and 10 feet per day as a sensitivity analysis of the predicted mounding values. Hydraulic conductivity of the material underlying the disposal field is the primary factor controlling the predicted height of the mound. As such, multiple sources of information were reviewed to develop an estimate of hydraulic conductivity. The model uses a 10:1 ratio of horizontal to vertical permeability.

Hydraulic conductivity values published in Groundwater and Wells, Second Edition, Driscoll, 1986 (Figure 5.14) were largely derived from water well testing data and are considered to represent horizontal hydraulic conductivity values for a range of geologic materials. Values of 3 to 30 feet per day overlap the descriptions of Glacial Till and fine Sand. Medium to coarse sand values are considerably higher.

Review of the test pits and boring indicate that for sizing purposes a profile 5D soil was used. In the geotechnical report, the native material is characterized as fluvial soils consisting of loose to dense sand and gravel with varying portions of silt. From a soil series perspective, the NRCS soil survey indicates the material is Kinsman sand. Published Ksat values are reported as moderately high to very high: 1.42 to 14.17 in/hr (2.8 to 28.3). More conservative published information for sands list "permeability" as 5 cm per hour (~4 feet per day). These values are likely partially derived from laboratory testing. Values may be biased to a vertical permeability related to infiltration of water vertically through the soil. For model input, these values appear to be applicable to vertical hydraulic conductivity values. Factored scaling for horizontal conductivity will be employed as enumerated in the protocol basis.

Simulations were run using horizontal hydraulic conductivity values of 30, 10 and 5 feet per day to assess the variation in predicted mounding. Other model parameters remained fixed in each of the simulations.

- Using a horizontal hydraulic conductivity of 30 feet per day (corresponding vertical hydraulic conductivity of 3 feet per day) and the most conservative thickness of overburden results in a predicted groundwater mound of approximately 0.35 feet above the initial groundwater level at the center of the disposal field.
- Similarly, using a horizontal hydraulic conductivity of 10 feet per day (corresponding vertical hydraulic conductivity of 1 foot per day), results in a predicted groundwater mound of approximately .9 feet above the initial groundwater level at the center of the disposal field.
- Using a horizontal hydraulic conductivity of 5 feet per day (corresponding vertical hydraulic conductivity of 0.5 feet per day), results in a very conservative predicted groundwater mound of approximately 1.55 feet above the initial groundwater level at the center of the disposal field.

Based on available information and interpretations of site conditions, the simulation using 30 feet per day as a horizontal hydraulic conductivity reasonably represents conditions for disposal field 1 to account for mounding effects and potential overlap of mounding effects between the adjacent fields. Subsurface rules require separations to seasonal groundwater, which in this instance control. In conformance with the subsurface rules, the Table 4F minimum 24 inch vertical separation must be maintained between the Seasonal High Water Table and Eljen InDrain units.

Very truly yours,
Gartley & Dorsky, Engineering & Surveying Inc.

William T. Lane, P.E.
Vice President

enclosure: Hantush spreadsheets

This spreadsheet will calculate the height of a groundwater mound beneath a stormwater infiltration basin. More information can be found in the U.S. Geological Survey Scientific Investigations Report 2010-5102 "Simulation of groundwater mounding beneath hypothetical stormwater infiltration basins".

The user must specify infiltration rate (R), specific yield (Sy), horizontal hydraulic conductivity (Kh), basin dimensions (x, y), duration of infiltration period (t), and the initial thickness of the saturated zone (hi(0), height of the water table if the bottom of the aquifer is the datum). For a square basin the half width equals the half length (x = y). For a rectangular basin, if the user wants the water-table changes perpendicular to the long side, specify x as the short dimension and y as the long dimension. Conversely, if the user wants the values perpendicular to the short side, specify y as the short dimension, x as the long dimension. All distances are from the center of the basin.
Users can change the distances from the center of the basin at which water-table aquifer thickness are calculated.
Cells highlighted in yellow are values that can be changed by the user. Cells highlighted in red are output values based on user-specified inputs. The user MUST click the blue "Re-Calculate Now" button each time ANY of the user-specified inputs are changed otherwise necessary iterations to converge on the correct solution will not be done and values shown will be incorrect. Use consistent units for all input values (for example, feet and days)

use consistent units (e.g. feet & days **or** inches & hours)

Input Values		
0.1540	***R***	**Recharge (infiltration) rate (feet/day)**
0.260	**Sy**	**Specific yield, Sy (dimensionless, between 0 and 1)**
5.00	**K**	**Horizontal hydraulic conductivity, Kh (feet/day)***
28.000	**x**	**1/2 length of basin (x direction, in feet)**
15.500	**y**	**1/2 width of basin (y direction, in feet)**
365.000	**t**	**duration of infiltration period (days)**
19.000	**hi(0)**	**initial thickness of saturated zone (feet)**

Conversion Table

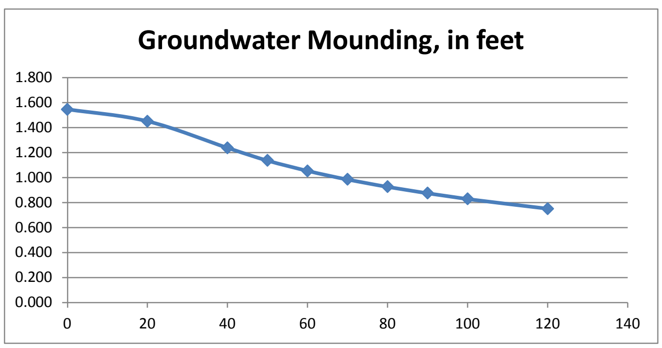
inch/hour	**feet/day**
0.67	1.33
2.00	4.00
hours	**days**
36	1.50

In the report accompanying this spreadsheet (USGS SIR 2010-5102), vertical soil permeability (ft/d) is assumed to be one-tenth horizontal hydraulic conductivity (ft/d).

20.547	**h(max)**	**maximum thickness of saturated zone (beneath center of basin at end of infiltration period)**
1.547	**Δh(max)**	**maximum groundwater mounding (beneath center of basin at end of infiltration period)**

Ground-water Mounding, in feet	**Distance from center of basin in x direction, in feet**
1.547	**0**
1.451	**20**
1.238	**40**
1.138	**50**
1.054	**60**
0.986	**70**
0.927	**80**
0.876	**90**
0.830	**100**
0.752	**120**

Re-Calculate Now



Disclaimer

This spreadsheet solving the Hantush (1967) equation for ground-water mounding beneath an infiltration basin is made available to the general public as a convenience for those wishing to replicate values documented in the USGS Scientific Investigations Report 2010-5102 "Groundwater mounding beneath hypothetical stormwater infiltration basins" or to calculate values based on user-specified site conditions. Any changes made to the spreadsheet (other than values identified as user-specified) after transmission from the USGS could have unintended, undesirable consequences. These consequences could include, but may not be limited to: erroneous output, numerical instabilities, and violations of underlying assumptions that are inherent in results presented in the accompanying USGS published report. The USGS assumes no responsibility for the consequences of any changes made to the spreadsheet. If changes are made to the spreadsheet, the user is responsible for documenting the changes and justifying the results and conclusions.

This spreadsheet will calculate the height of a groundwater mound beneath a stormwater infiltration basin. More information can be found in the U.S. Geological Survey Scientific Investigations Report 2010-5102 "Simulation of groundwater mounding beneath hypothetical stormwater infiltration basins".

The user must specify infiltration rate (R), specific yield (Sy), horizontal hydraulic conductivity (Kh), basin dimensions (x, y), duration of infiltration period (t), and the initial thickness of the saturated zone (hi(0), height of the water table if the bottom of the aquifer is the datum). For a square basin the half width equals the half length (x = y). For a rectangular basin, if the user wants the water-table changes perpendicular to the long side, specify x as the short dimension and y as the long dimension. Conversely, if the user wants the values perpendicular to the short side, specify y as the short dimension, x as the long dimension. All distances are from the center of the basin. Users can change the distances from the center of the basin at which water-table aquifer thickness are calculated.
Cells highlighted in yellow are values that can be changed by the user. Cells highlighted in red are output values based on user-specified inputs. The user MUST click the blue "Re-Calculate Now" button each time ANY of the user-specified inputs are changed otherwise necessary iterations to converge on the correct solution will not be done and values shown will be incorrect. Use consistent units for all input values (for example, feet and days)

use consistent units (e.g. feet & days **or** inches & hours)

Input Values

0.1540	***R***	**Recharge (infiltration) rate (feet/day)**
0.260	**Sy**	**Specific yield, Sy (dimensionless, between 0 and 1)**
10.00	**K**	**Horizontal hydraulic conductivity, Kh (feet/day)***
28.000	**x**	**1/2 length of basin (x direction, in feet)**
15.500	**y**	**1/2 width of basin (y direction, in feet)**
365.000	**t**	**duration of infiltration period (days)**
19.000	**hi(0)**	**initial thickness of saturated zone (feet)**

Conversion Table

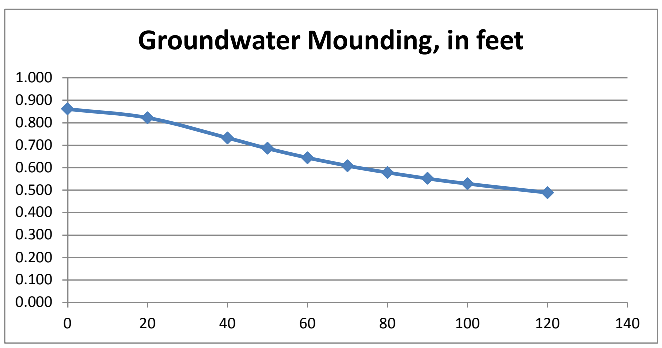
inch/hour	**feet/day**
0.67	1.33
2.00	4.00
hours	**days**
36	1.50

In the report accompanying this spreadsheet (USGS SIR 2010-5102), vertical soil permeability (ft/d) is assumed to be one-tenth horizontal hydraulic conductivity (ft/d).

19.862	**h(max)**	**maximum thickness of saturated zone (beneath center of basin at end of infiltration period)**
0.862	**Δh(max)**	**maximum groundwater mounding (beneath center of basin at end of infiltration period)**

Ground-water Mounding, in feet	**Distance from center of basin in x direction, in feet**
0.862	**0**
0.822	**20**
0.732	**40**
0.686	**50**
0.644	**60**
0.608	**70**
0.578	**80**
0.552	**90**
0.529	**100**
0.489	**120**

Re-Calculate Now



Disclaimer

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This spreadsheet will calculate the height of a groundwater mound beneath a stormwater infiltration basin. More information can be found in the U.S. Geological Survey Scientific Investigations Report 2010-5102 "Simulation of groundwater mounding beneath hypothetical stormwater infiltration basins".

The user must specify infiltration rate (R), specific yield (Sy), horizontal hydraulic conductivity (Kh), basin dimensions (x, y), duration of infiltration period (t), and the initial thickness of the saturated zone (hi(0), height of the water table if the bottom of the aquifer is the datum). For a square basin the half width equals the half length (x = y). For a rectangular basin, if the user wants the water-table changes perpendicular to the long side, specify x as the short dimension and y as the long dimension. Conversely, if the user wants the values perpendicular to the short side, specify y as the short dimension, x as the long dimension. All distances are from the center of the basin.
Users can change the distances from the center of the basin at which water-table aquifer thickness are calculated.
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use consistent units (e.g. feet & days **or** inches & hours)

Input Values

0.1540	***R***	**Recharge (infiltration) rate (feet/day)**
0.260	**Sy**	**Specific yield, Sy (dimensionless, between 0 and 1)**
30.00	**K**	**Horizontal hydraulic conductivity, Kh (feet/day)***
28.000	**x**	**1/2 length of basin (x direction, in feet)**
15.500	**y**	**1/2 width of basin (y direction, in feet)**
365.000	**t**	**duration of infiltration period (days)**
19.000	**hi(0)**	**initial thickness of saturated zone (feet)**

Conversion Table

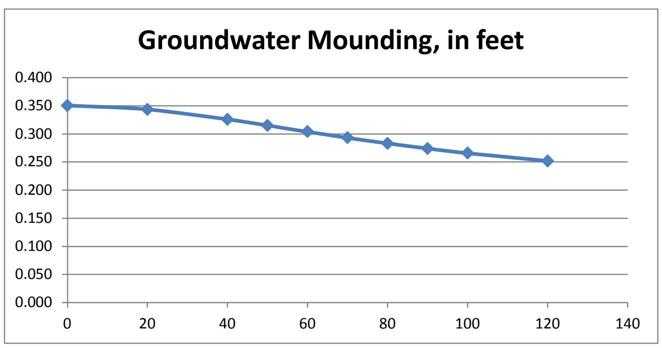
inch/hour	**feet/day**
0.67	1.33
2.00	4.00
hours	**days**
36	1.50

In the report accompanying this spreadsheet (USGS SIR 2010-5102), vertical soil permeability (ft/d) is assumed to be one-tenth horizontal hydraulic conductivity (ft/d).

19.350	**h(max)**	**maximum thickness of saturated zone (beneath center of basin at end of infiltration period)**
0.350	**Δh(max)**	**maximum groundwater mounding (beneath center of basin at end of infiltration period)**

Ground-water Mounding, in feet	**Distance from center of basin in x direction, in feet**
0.350	**0**
0.344	**20**
0.326	**40**
0.315	**50**
0.304	**60**
0.293	**70**
0.283	**80**
0.274	**90**
0.266	**100**
0.252	**120**

Re-Calculate Now



Disclaimer

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EXHIBIT D

HHE200 Form

SUBSURFACE WASTEWATER DISPOSAL SYSTEM APPLICATION

Maine Dept. Health & Human Services
Division of Health Engineering, 10 SHS
(207) 287-2070 Fax: (207) 287-4172

PROPERTY LOCATION

City, Town, or Plantation	JONESPORT
Street or Road	DUN GARVIN ROAD
Subdivision, Lot #	

>> CAUTION: LPI APPROVAL REQUIRED <<

Town/City ____________ Permit # ________

Date Permit Issued ___/___/___ Fee: $________ Double Fee Charged [ ]

________________ L.P.I. # ________

Local Plumbing Inspector Signature

Fee: $________ state min fee $________ Locally adopted
fee copy [ ] Owner [ ] Town [ ] State

OWNER/APPLICANT INFORMATION

Name (last, first, MI): KINGFISH MAINE, INC. ☐ Owner ■ Applicant

Mailing Address of Owner/Applicant: 33 SALMON FARM ROAD, FRANKLIN, ME 04634

Daytime Tel. #: (502) 387-8673

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 # 8 Lot # 23

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 of Owner or Applicant ________ Date

CAUTION: INSPECTION REQUIRED
I have inspected the installation authorized 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
± 93.2 ☐ 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: 4
- ■ 3. Other: AQUACULTURE (TOTAL 16 BEDROOMS) (specify)

Current Use ☐ Seasonal ☐ Year Round ■ Undeveloped

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

DESIGN DETAILS (SYSTEM LAYOUT SHOWN ON PAGE 3)

TREATMENT TANK
- ■ 1. Concrete
  - ■ a. Regular (3) 4,000 GAL
  - ☐ b. Low Profile
- ☐ 2. Plastic
- ☐ 3. Other: ________

CAPACITY: 12,000 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: ________ ☐ sq. ft. ☐ lin. ft.
type: 224 ELJEN GSF MODULES

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
4000 gallons per day
BASED ON:
- ■ 1. Table 4A (dwelling unit(s))
- ■ 2. Table 4C (other facilities)

SHOW CALCULATIONS for other facilities
16 BEDROOM (4 UNITS) @ 90 GPD
128 EMPLOYEES WITH SHOWER @ 20 GPD PER EMPLOYEE
- ☐ 3. Section 4G (meter readings)

ATTACH WATER METER DATA

SOIL DATA & DESIGN CLASS
PROFILE CONDITION
5 / D
at Observation Hole # 16-21
Depth 12"
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. 44 d 33 m 19.9 s
Lon. 67 d 34 m 18.0 s
if g.p.s, state margin of error: ________

SITE EVALUATOR STATEMENT

I certify that on 11/23/20 (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).

Site Evaluator Signature	SE #	Date
Natalie Marceau (signature)	411	3/25/21

Site Evaluator Name Printed	Telephone Number	E-mail Address
Natalie Marceau (GARTLEY & DORSKY ENGINEERING & SURVEYING)	(207) 236-4365	nmarceau@gartleydorsky.com

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

SUBSURFACE WASTEWATER DISPOSAL SYSTEM APPLICATION		Department of Human Services Division of Health Engineering (207) 287-5672 Fax: (207) 287-3165
Town, City, Plantation JONESPORT	Street, Road, Subdivision DUN GARVIN ROAD	Owner's Name KINGFISH MAINE, INC.

SUBSURFACE WASTEWATER DISPOSAL PLAN

SCALE: 1" = ___________FT.

SEE CIVIL SITE PLAN

FILL REQUIREMENTS	CONSTRUCTION ELEVATIONS	ELEVATION REFERENCE POINT
Depth of Fill (Upslope) __________	Finished Grade Elevation _______	Location & Description:
Depth of Fill (Downslope) __________	Top of Distribution Pipe or Proprietary Device _______	
	Bottom of Disposal Area _______	Reference Elevation: ___________

DISPOSAL AREA CROSS SECTION

SCALE

Horizontal 1" = _____ ft.
Vertical 1" = _____ ft.

SEE ATTACHED DETAIL SHEET

Site Evaluator Signature	SE #	Date
Natalie Marceau	411	3/25/21

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PROJ. NO.: 2019-412

EXHIBIT E

Operations & Maintenance Manual

ENGINEERED SEPTIC SYSTEM MAINTENANCE

Septic system 1 collects, distributes, and disposes of wastewater from the Kingfish Maine RAS Facility in Jonesport, Maine. This manual addresses the maintenance of the engineered septic system. Please refer to the Construction Plans, Sections and Details and the HHE 200 forms for this system.

PART 1: RESPONSIBILITY FOR MAINTENANCE

The Owner of the property, Kingfish Maine, Inc, is responsible for inspecting and maintaining the engineered septic system. For the purposes of this maintenance plan, the term 'owner' will be used for the responsible entity/entities accordingly. All components of the septic system must be kept in good working order. All specified maintenance must be completed by the designated party, and any/all cleaning and repair must be completed immediately upon detection.

PART 2: MAINTENANCE

The following tasks must be completed on a regular basis to maintain the system and fulfill the warranty requirements:

- Septic Tanks
  The three septic tanks (tanks 1-1 through 1-3) as shown on the plan should be inspected annually by a licensed septic waste removal contractor. The tanks should be pumped if the sludge in the bottom of the tank exceeds one foot in thickness.

- Distribution Boxes, Distribution Chamber, Pump Station, Manholes
  The distribution boxes, distribution chamber, pump station, and manholes should be inspected on an annual basis by the owner to make certain they are in good working order. These components should be cleaned, as needed.

- Septic Tank Filter
  The filters at the septic tank should be inspected on a quarterly basis by the owner. The filter should be cleaned on an annual basis, either by the owner or a licensed contractor.

- Field Perimeter
  The perimeter of leachfields 1A and 1B should be inspected at times of high usage, by the owner, to confirm that no breakthrough has occurred in the fill slope.

- Risers for System Components
  Risers to the septic tanks, pump chambers and distribution chambers should be inspected quarterly by the owner to determine if groundwater is infiltrating the system.

- Plugs in Wastewater lines
  Records should be kept of wastewater lines that become plugged. The cleanout that was used to access the plugged line and what was found in the line should be recorded whenever a line is plugged.

A record of inspections and maintenance or corrective measures (Part 3) shall be kept by the owner.

PART 3: RECORD KEEPING

The owner shall inspect and maintain the septic system as required by the following tables below. Any maintenance or inspections that are not performed puts the system at risk for failure. A maintenance contract shall be signed to maintain the components of the system that requires the expertise of a professional who understands the function of each system component as shown below.

Engineered septic System
MAINTENANCE LOG

How to Complete:

1. Complete the specified maintenance on the prescribed frequency
2. Initial all areas that are satisfactory or initial performed maintenance
3. Note any deficiencies or required maintenance items
4. Maintain this record on file for DHHS review, as requested
5. Contact Gartley & Dorsky for additional copies of these Maintenance Logs

MAINTENANCE TASKS

Work Task	**Frequency**	**By Whom**	**Date & Initials**	**Date & Initials**	**Date & Initials**	**Date & Initials**
Inspect Septic Tanks	Annually	Licensed Septic Tank Contractor				
Pump Septic Tanks	When sludge level exceeds 1' thick	Licensed Septic Tank Contractor				
Inspect Septic Tanks Filters	Quarterly	Owner				
Replace Septic Tanks Filters	As needed (annually at minimum)	Owner or Licensed Septic Tank Contractor				
Inspect the Grease Trap	Semi-annual	Owner or Licensed Septic Tank Contractor				
Keep Records of plugged wastewater lines	As needed	Owner and Septic Tank Contractor				
Inspect Distribution Boxes and drop boxes	Annually	Owner				
Risers to septic tanks, pump stations and distribution chambers	Quarterly	Owner				
Inspect Field Perimeter	Time of high usage	Owner				
Inspect for Potential Erosion or Crushing Problems	As Needed	Owner				

Notes: Gartley & Dorsky Engineering & Surveying shall be notified of any changes that affect design conditions.

REVIEWED AND ACKNOWLEDGED BY OWNER: BY:______________________________________

CONTACTS

DESIGN/INSPECTION

William Lane, P.E.
Vice President
Gartley & Dorsky Engineering & Surveying
PO Box 1031
Camden, ME 04843
Tel: 207.236.4365
Fax: 207.236.3055
Email: blane@gartleydorsky.com
Web: http://www.gartleydorsky.com

SITE EVALUATOR

Natalie Marceau
Gartley & Dorsky Engineering & Surveying
PO Box 1031
Camden, ME 04843
Tel: 207.236.4365
Fax: 207.236.3055
Email: nmarceau@gartleydorsky.com
Web: http://www.gartleydorsky.com

EARTHWORK CONTRACTOR/INSTALLER

TBD

EXHIBIT F

Soil & Site Conditions

SUBSURFACE WASTEWATER DISPOSAL SYSTEM APPLICATION	Department of Human Services Division of Health Engineering (207) 287-5672 Fax: (207) 287-3165

Town, City, Plantation	Street, Road, Subdivision	Owner's Name
JONESPORT	DUN GARVAN ROAD	KINGFISH MAINE, INC.

SOIL DESCRIPTION AND CLASSIFICATION

Observation Hole 16 ■ Test Pit ☐ Boring
1 " Depth of Organic Horizon Above Mineral Soil

Depth Below Mineral Soil Surface (inches): 0–50

Texture	Consistency	Color	Mottling
LOAMY SAND	FRIABLE	DARK BROWN	NONE
		STRONG BROWN	COMMON MEDIUM DISTINCT STRONG BROWN
SAND		YELLOWISH BROWN	
BOTTOM OF TEST PIT			

Soil Classification	Slope	Limiting Factor	
5 Profile, D Condition	±3 %	12 "	■ Ground Water ☐ Restrictive Layer ☐ Bedrock ☐ Pit Depth

Observation Hole 17 ■ Test Pit ☐ Boring
1 " Depth of Organic Horizon Above Mineral Soil

Depth Below Mineral Soil Surface (inches): 0–50

Texture	Consistency	Color	Mottling
LOAMY SAND	FRIABLE	DARK BROWN	NONE
		STRONG BROWN	COMMON MEDIUM DISTINCT STRONG BROWN
SAND		YELLOWISH BROWN	
BOTTOM OF TEST PIT			

Soil Classification	Slope	Limiting Factor	
5 Profile, D Condition	±3 %	12 "	■ Ground Water ☐ Restrictive Layer ☐ Bedrock ☐ Pit Depth

SOIL DESCRIPTION AND CLASSIFICATION

Observation Hole 18 ■ Test Pit ☐ Boring
1 " Depth of Organic Horizon Above Mineral Soil

Depth Below Mineral Soil Surface (inches): 0–50

Texture	Consistency	Color	Mottling
LOAMY SAND	FRIABLE	DARK BROWN	NONE
		STRONG BROWN	COMMON MEDIUM DISTINCT STRONG BROWN
SAND		YELLOWISH BROWN	
BOTTOM OF TEST PIT			

Soil Classification	Slope	Limiting Factor	
5 Profile, D Condition	±3 %	12 "	■ Ground Water ☐ Restrictive Layer ☐ Bedrock ☐ Pit Depth

Observation Hole 19 ■ Test Pit ☐ Boring
1 " Depth of Organic Horizon Above Mineral Soil

Depth Below Mineral Soil Surface (inches): 0–50

Texture	Consistency	Color	Mottling
LOAMY SAND	FRIABLE	DARK BROWN	NONE
		STRONG BROWN	COMMON MEDIUM DISTINCT STRONG BROWN
SAND		YELLOWISH BROWN	
BOTTOM OF TEST PIT			

Soil Classification	Slope	Limiting Factor	
5 Profile, D Condition	±3 %	12 "	■ Ground Water ☐ Restrictive Layer ☐ Bedrock ☐ Pit Depth

Natalie Marceau	411	3/25/21
Site Evaluator Signature	SE #	Date

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PROJ. NO.: 2019-412

SUBSURFACE WASTEWATER DISPOSAL SYSTEM APPLICATION		Department of Human Services Division of Health Engineering (207) 287-5672 Fax: (207) 287-3165
Town, City, Plantation: JONESPORT	Street, Road, Subdivision: DUN GARVAN ROAD	Owner's Name: KINGFISH MAINE, INC.

SOIL DESCRIPTION AND CLASSIFICATION

Observation Hole 20 ■ Test Pit ☐ Boring
1 " Depth of Organic Horizon Above Mineral Soil

Depth Below Mineral Soil Surface (inches)	Texture	Consistency	Color	Mottling
0–10	LOAMY SAND	FRIABLE	DARK BROWN	NONE
10–20			STRONG BROWN	COMMON MEDIUM DISTINCT STRONG BROWN
20–34	SAND		YELLOWISH BROWN	
34	BOTTOM OF TEST PIT			

Soil Classification	Slope	Limiting Factor	
5 Profile, D Condition	±3 %	12 "	■ Ground Water ☐ Restrictive Layer ☐ Bedrock ☐ Pit Depth

Observation Hole 21 ■ Test Pit ☐ Boring
1 " Depth of Organic Horizon Above Mineral Soil

Depth Below Mineral Soil Surface (inches)	Texture	Consistency	Color	Mottling
0–10	LOAMY SAND	FRIABLE	DARK BROWN	NONE
10–20			STRONG BROWN	COMMON MEDIUM DISTINCT STRONG BROWN
20–34	SAND		YELLOWISH BROWN	
34	BOTTOM OF TEST PIT			

Soil Classification	Slope	Limiting Factor	
5 Profile, D Condition	±3 %	12 "	■ Ground Water ☐ Restrictive Layer ☐ Bedrock ☐ Pit Depth

SOIL DESCRIPTION AND CLASSIFICATION

Observation Hole 22 ■ Test Pit ☐ Boring
1 " Depth of Organic Horizon Above Mineral Soil

Depth Below Mineral Soil Surface (inches)	Texture	Consistency	Color	Mottling
0–10	LOAMY SAND	FRIABLE	DARK BROWN	NONE
10–20			STRONG BROWN	COMMON MEDIUM DISTINCT STRONG BROWN
20–34	SAND		YELLOWISH BROWN	
34	BOTTOM OF TEST PIT			

Soil Classification	Slope	Limiting Factor	
5 Profile, D Condition	±3 %	12 "	■ Ground Water ☐ Restrictive Layer ☐ Bedrock ☐ Pit Depth

Observation Hole 23 ■ Test Pit ☐ Boring
1 " Depth of Organic Horizon Above Mineral Soil

Depth Below Mineral Soil Surface (inches)	Texture	Consistency	Color	Mottling
0–10	LOAMY SAND	FRIABLE	DARK BROWN	NONE
10–20			STRONG BROWN	COMMON MEDIUM DISTINCT STRONG BROWN
20–34	SAND		YELLOWISH BROWN	
34	BOTTOM OF TEST PIT			

Soil Classification	Slope	Limiting Factor	
5 Profile, D Condition	±3 %	12 "	■ Ground Water ☐ Restrictive Layer ☐ Bedrock ☐ Pit Depth

Site Evaluator Signature	SE #	Date
Natalie Marceau	411	3/25/21

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PROJ. NO.: 2019-412

EXHIBIT G

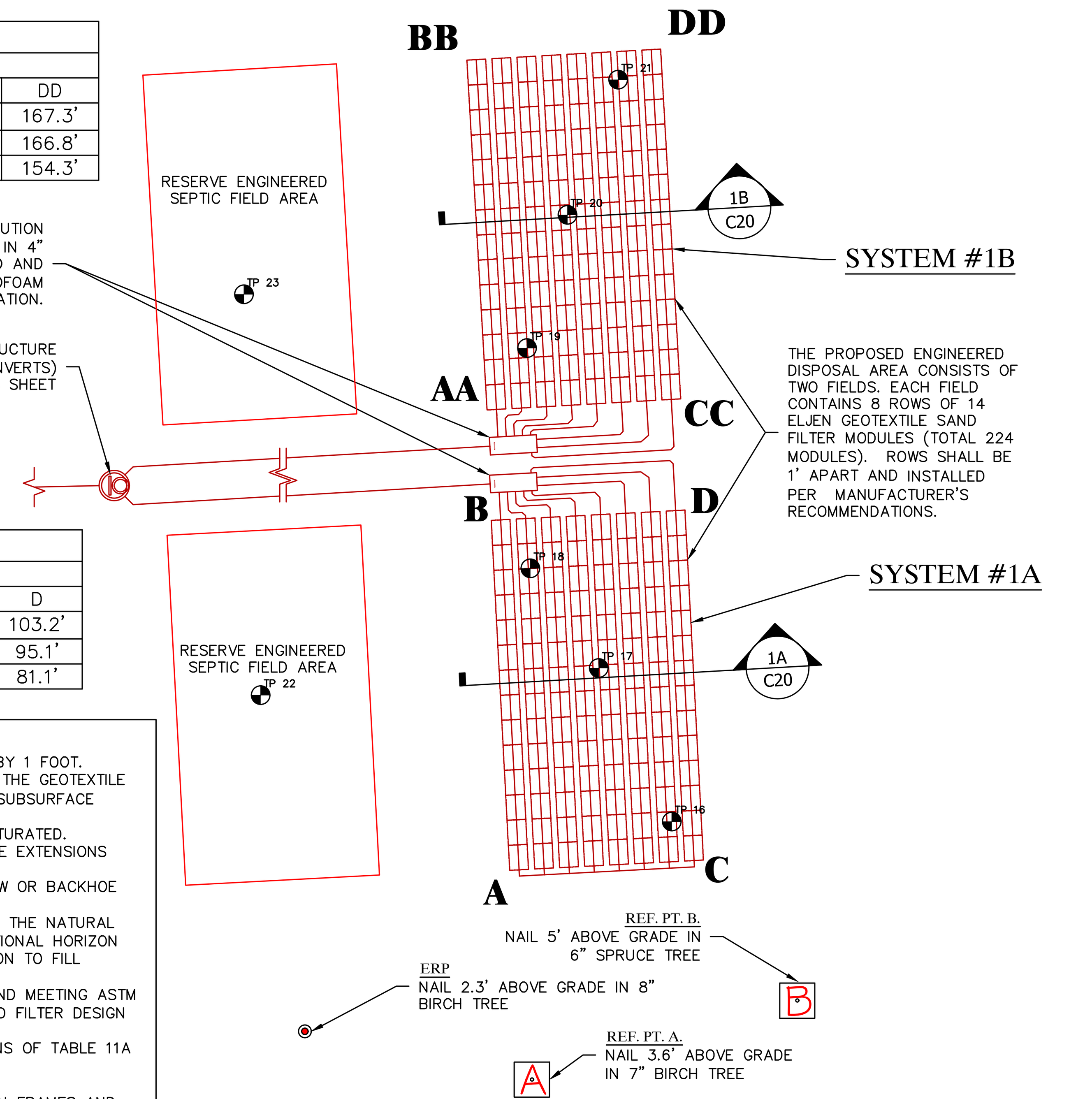
Engineered Disposal System Plans

SYSTEM 1B LOCATION

DISTANCES:				
	AA	BB	CC	DD
ELEVATION REFERENCE POINT (ERP)	104.1'	157.9'	117.8'	167.3'
REFERENCE POINT A	108.2'	164.0'	112.2'	166.8'
REFERENCE POINT B	107.3'	160.0'	98.7'	154.3'

SYSTEM 1A LOCATION

DISTANCES:				
	A	B	C	D
ELEVATION REFERENCE POINT (ERP)	41.5'	87.3'	68.9'	103.2'
REFERENCE POINT A	34.3'	90.3'	45.4'	95.1'
REFERENCE POINT B	50.9'	91.7'	27.7'	81.1'

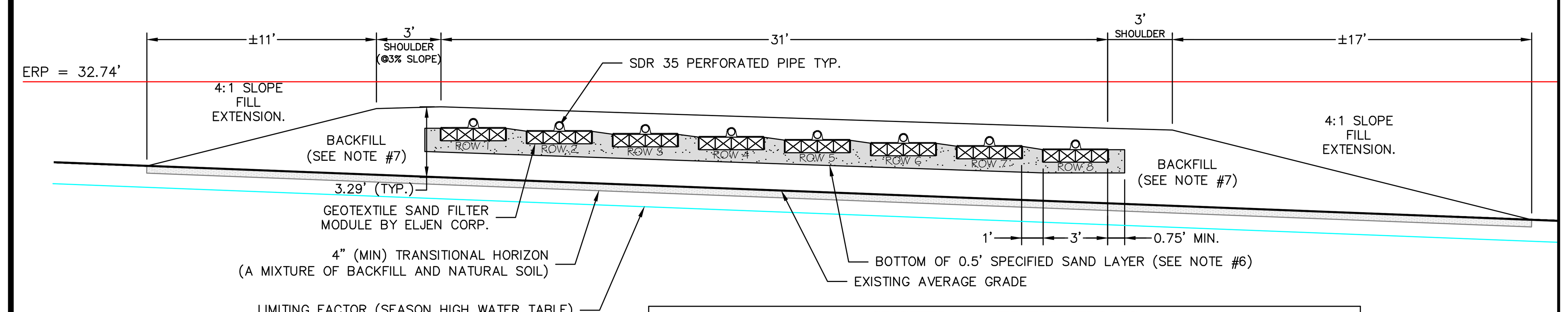


SEPTIC SYSTEM NOTES:

1. BOTH SYSTEMS CONSIST OF 11 ROWS GEOTEXTILE SAND FILTERS SEPARATED BY 1 FOOT.
2. THIS SYSTEM COMPLIES WITH AND MUST BE INSTALLED IN ACCORDANCE WITH THE GEOTEXTILE SAND FILTER DESIGN MANUAL (BY ELJEN CORPORATION), AND ALL MAINE SUBSURFACE RULES.
3. INSTALLATION SHALL NOT TAKE PLACE WHEN THE GROUND IS FROZEN OR SATURATED.
4. TOPSOIL OR ORGANICS MUST BE REMOVED FROM LEACH FIELD AND FILL SLOPE EXTENSIONS PRIOR TO FILL PLACEMENT.
5. THE TOP OF THE NATURAL SOIL SHALL BE SCARIFIED BY ROTOTILLER, HARROW OR BACKHOE TEETH.
6. THERE SHALL BE 4" MINIMUM TRANSITIONAL HORIZON BETWEEN BACKFILL AND THE NATURAL SOIL WHICH IS A MIXTURE OF BACKFILL AND NATURAL SOIL. THE TRANSITIONAL HORIZON SHALL BE UNDER THE DISPOSAL SYSTEM AND EXTEND FROM FILL EXTENSION TO FILL EXTENSION.
7. THE 6" SAND LAYER BELOW THE MODULES SHALL BE MEDIUM TO COARSE SAND MEETING ASTM C33 SPECIFICATIONS. FOR COMPLETE SPECIFICATIONS SEE GEOTEXTILE SAND FILTER DESIGN MANUAL.
8. BACKFILL SHALL BE GRAVELLY COARSE SAND AND SHALL MEET SPECIFICATIONS OF TABLE 11A OF THE SUBSURFACE RULES.
9. FINAL GRADES SHALL BE LOAMED (4" MIN), MULCHED AND SEEDED.
10. ALL SEPTIC TANKS SHALL HAVE ACCESS OPENINGS, CONSISTING OF CAST IRON FRAMES AND SOLID COVERS, LOCATED AT FINISHED GRADE AND HAVE A WATERTIGHT RISER (PER SECTION 6F(2) OF THE SUBSURFACE CODE) OF THE SAME MATERIALS AS THE SEPTIC TANK. H-20 CONSTRUCTION IS REQUIRED IN TRAFFIC AREAS. SEE SECTION 6F(3) OF THE SUBSURFACE CODE.
11. THE DRILLING OF ANY WELLS WITH WATER USAGE OF 2000 OR MORE GALLONS PER DAY OR PUBLIC WATER SYSTEM WELLS SHALL BE A MINIMUM OF 150' FROM ANY WATER TIGHT SEPTIC TANK AND 300' FROM ANY LEACH FIELD.
12. THE DRILLING OF ANY WELLS WITH WATER USAGE UNDER 2000 GALLONS PER DAY OR NOT PUBLIC WATER SYSTEM WELLS SHALL BE A MINIMUM OF 100' FROM ANY WATER TIGHT SEPTIC TANK AND 300' FROM ANY LEACH FIELD.
13. THIS SYSTEM IS NOT DESIGNED FOR BACKWASH FROM ANY WATER TREATMENT SYSTEM
14. THE SYSTEMS SHALL NOT BE DRIVEN ON.

ENGINEERED SEPTIC FIELD SCHEMATIC

SCALE: 1" = 20'



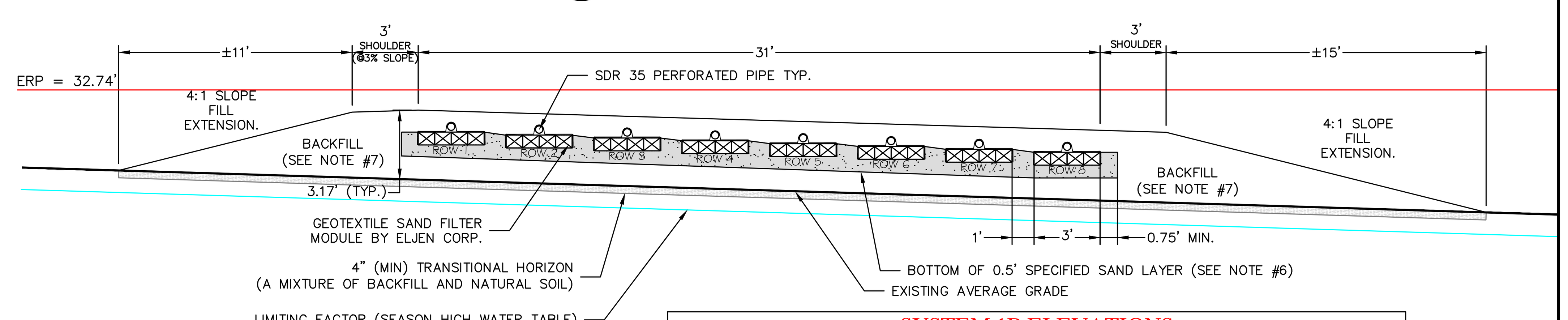
NOTE:
SYSTEM A, CONSISTS OF 8 ROWS OF 14 MODULES PER ROW, EACH ROW SEPARATED BY 1 FOOT

SYSTEM 1A ELEVATIONS								
ELEV. REF. PT. (ERP)	32.74'							
	ROW 1	ROW 2	ROW 3	ROW 4	ROW 5	ROW 6	ROW 7	ROW 8
FINISHED GRADE	31.57'	31.43'	31.29'	31.15'	31.01'	30.87'	30.73'	30.57'
TOP OF IN-DRAIN UNIT	30.57'	30.43'	30.29'	30.15'	30.01'	29.87'	29.73'	29.57'
BOTTOM OF IN-DRAIN UNIT	29.97'	29.83'	29.69'	29.55'	29.41'	29.27'	29.13'	28.97'
BOTTOM OF SAND	29.49'	29.33'	29.69'	29.05'	28.91'	28.77'	28.63'	28.47'

A / C20

SYSTEM 1A SCHEMATIC CROSS SECTION

SCALE: 1" = 20'



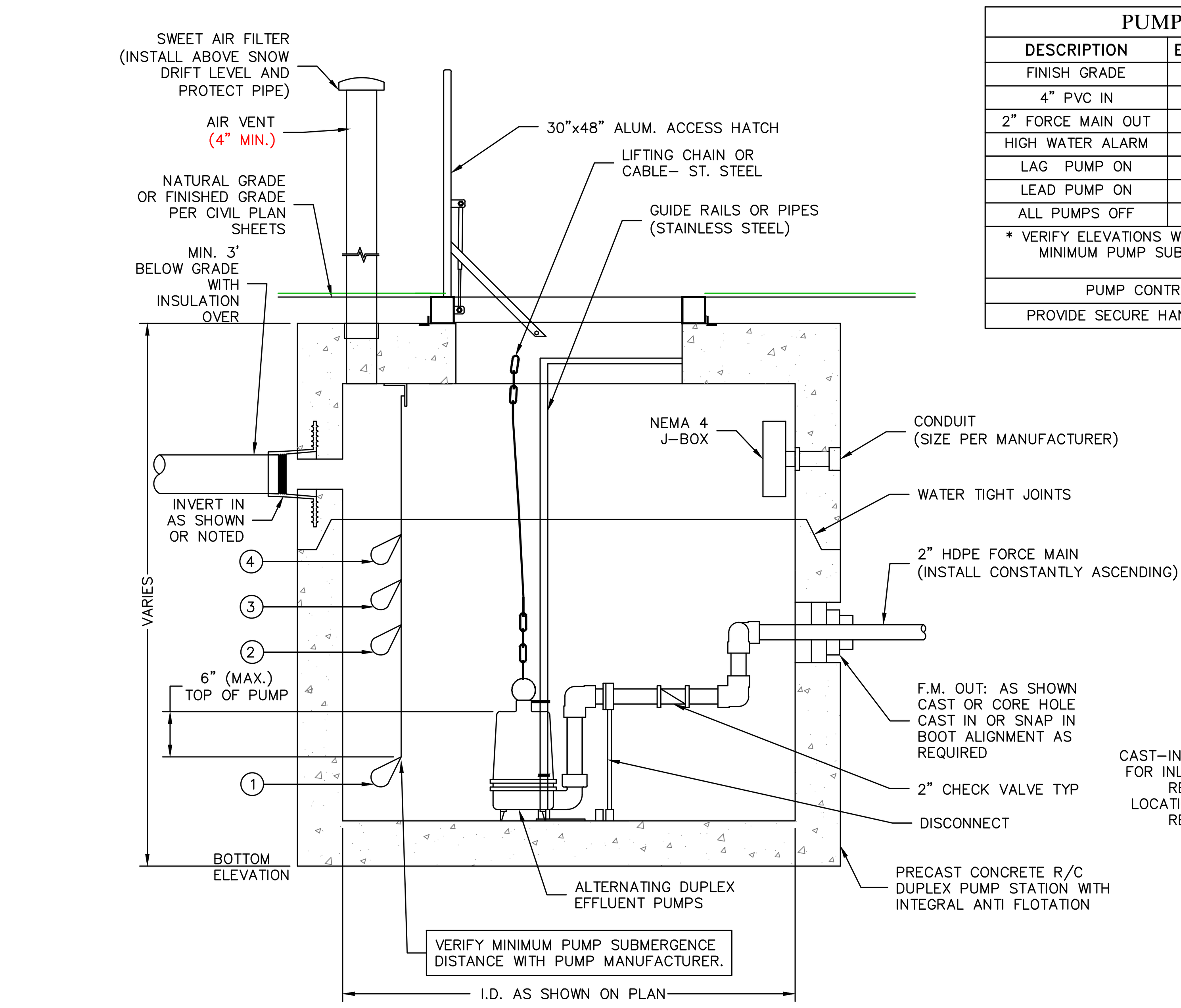
NOTE:
SYSTEM B, CONSISTS OF 8 ROWS OF 14 MODULES PER ROW, EACH ROW SEPARATED BY 1 FOOT

SYSTEM 1B ELEVATIONS								
ELEV. REF. PT. (ERP)	32.74'							
	ROW 1	ROW 2	ROW 3	ROW 4	ROW 5	ROW 6	ROW 7	ROW 8
FINISHED GRADE	31.82'	31.69'	31.56'	31.43'	31.3'	31.17'	31.04'	30.91'
TOP OF IN-DRAIN UNIT	30.82'	30.69'	30.56'	30.43'	30.3'	30.17'	30.04'	29.91'
BOTTOM OF IN-DRAIN UNIT	30.22'	30.09'	29.96'	29.83'	29.7'	29.57'	29.44'	29.31'
BOTTOM OF SAND	29.72'	29.59'	29.46'	29.33'	29.2'	29.07'	28.94'	28.81'

B / C20

SYSTEM 1B SCHEMATIC CROSS SECTION

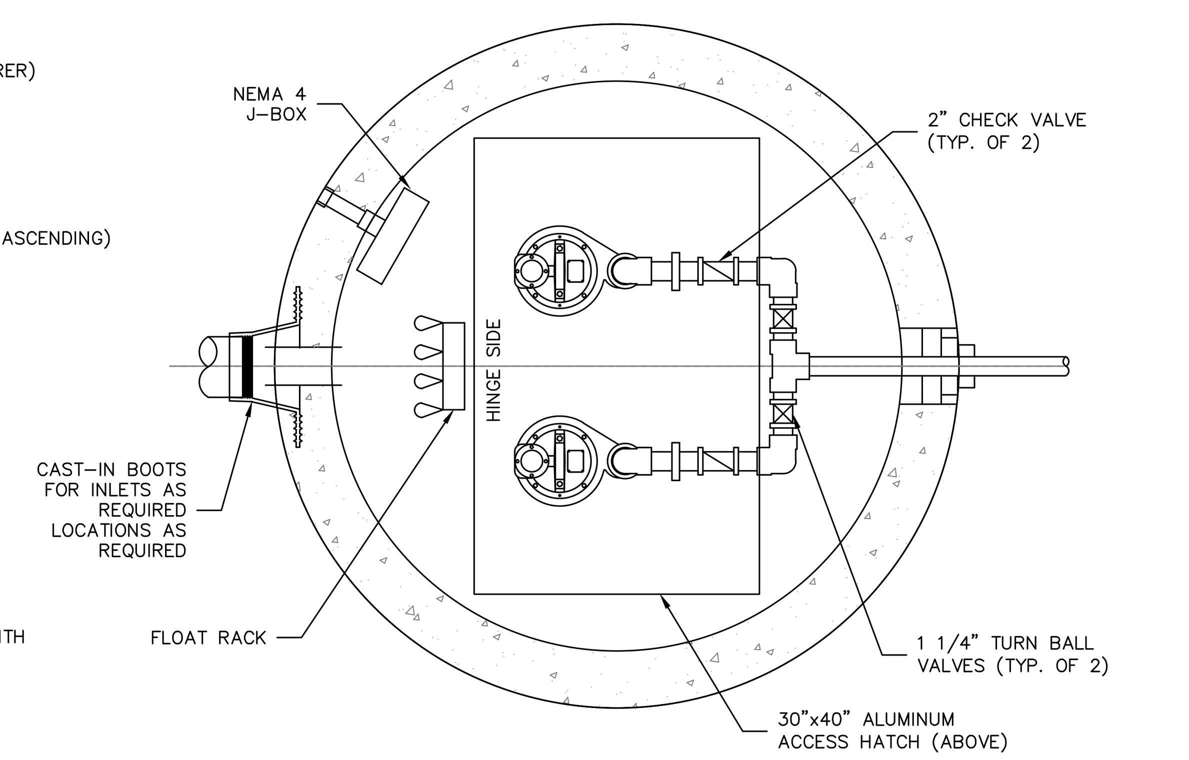
SCALE: 1" = 20'



SECTION VIEW

PUMP STATION SCHEDULE			
DESCRIPTION	ELEVATION*	FLOAT NO.	NOTES
FINISH GRADE	T.B.D.	---	
4" PVC IN	T.B.D.	---	
2" FORCE MAIN OUT	T.B.D.	---	
HIGH WATER ALARM	T.B.D.	④	
LAG PUMP ON	T.B.D.	③	
LEAD PUMP ON	T.B.D.	②	
ALL PUMPS OFF	T.B.D.**		
* VERIFY ELEVATIONS WITH FINAL SEPTIC SYSTEM DESIGN. ** VERIFY MINIMUM PUMP SUBMERGENCE OPERATION DEPTH WITH PUMP MANUFACTURER.			
PUMP CONTROL SCHEME: LEAD/LAG/ALTERNATE			
PROVIDE SECURE HANDS/OFF AUTO CONTROL FOR EACH MOTOR			

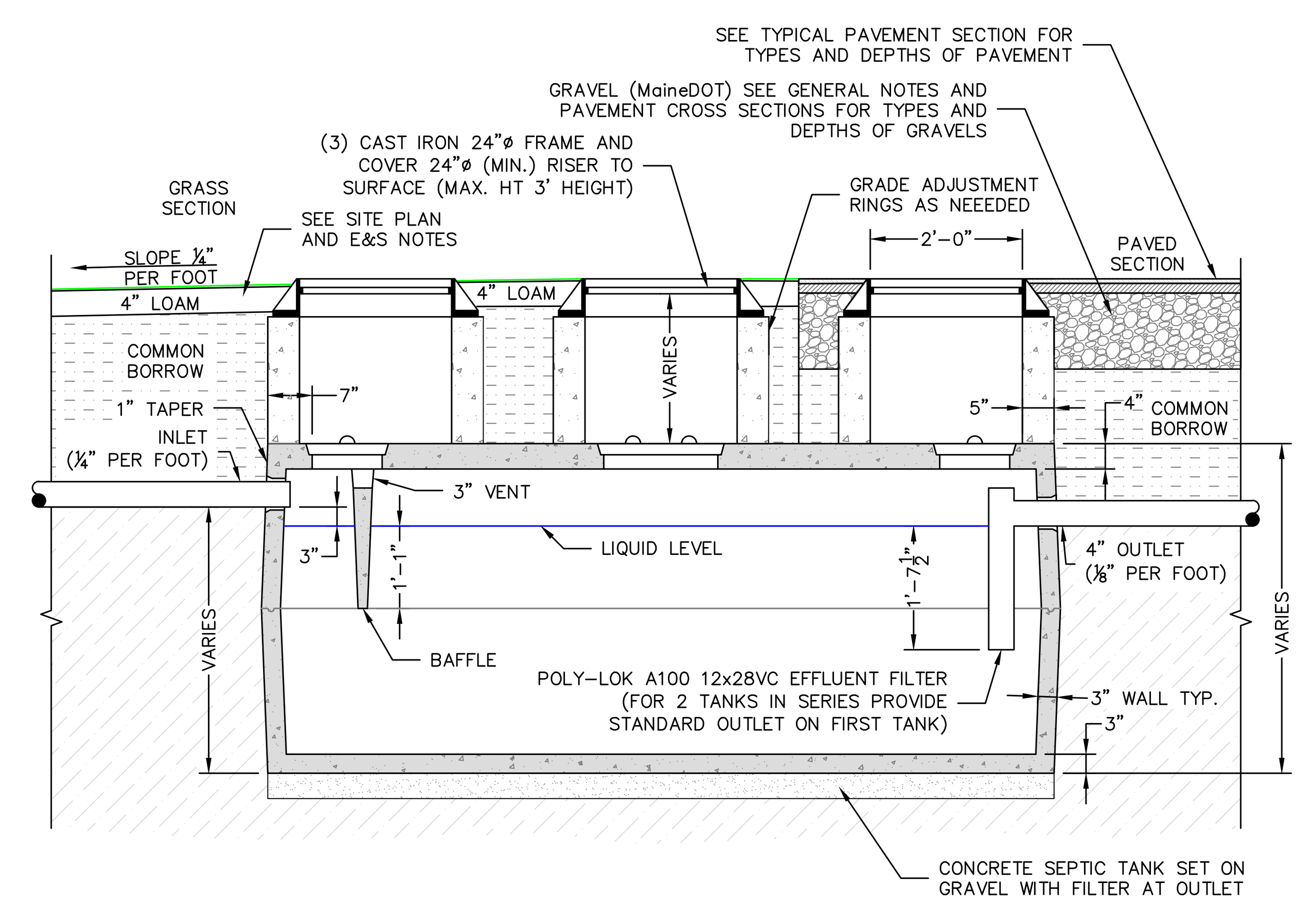
NOTE:
1. PROVIDE REMOTELY MOUNTED NEMA IV CONTROL PANEL (COORDINATE LOCATION WITH OWNER).
2. FURNISH PUMP MOTOR BRANCH PROTECTION, MOTOR STARTER, AND MOTOR OVERLOAD PROTECTION.
3. THIS PUMP STATION LAYOUT IS SCHEMATIC. SHOP DRAWINGS AND PUMP INFORMATION, INCLUDING PUMP CURVE GRAPH, SHALL BE PROVIDED TO ENGINEER FOR REVIEW PRIOR TO ORDERING THE PUMP STATION.
4. THE PUMP STATION SHALL BE INSPECTED PRIOR TO BACKFILLING.
5. LEAK TEST OR VACUUM TEST SHALL BE CONDUCTED IN ACCORDANCE WITH TESTING STANDARDS FOR MANHOLES.
6. IF INSPECTION INDICATES WORK DOES NOT MEET REQUIREMENTS, STATION SHALL BE REMOVED AND REPAIRED.



PLAN VIEW

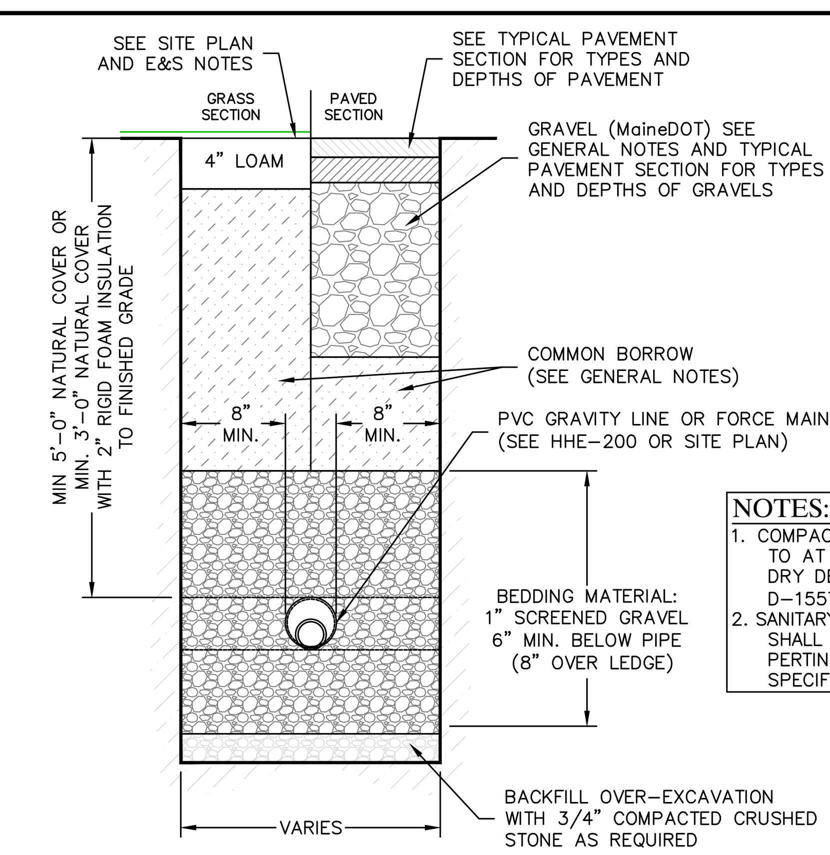
DUPLEX PUMP STATION

NO SCALE



SEPTIC TANK

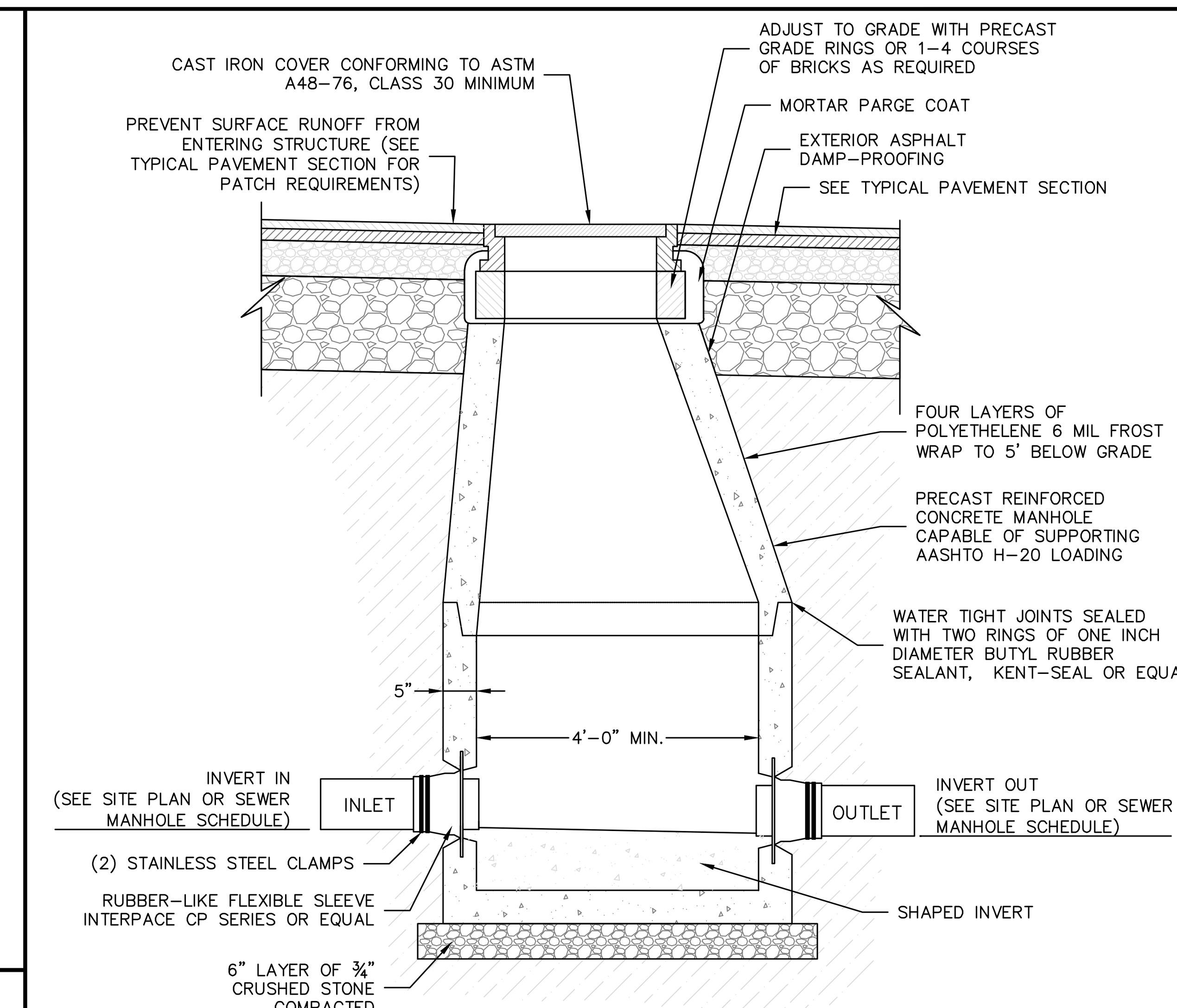
NO SCALE



NOTES:
1. COMPACT TRENCH BACKFILL IN 8" LIFTS TO AT LEAST 95% OF ITS MAXIMUM DRY DENSITY AS DETERMINED BY ASTM D-1557 "MODIFIED PROCTOR DENSITY".
2. SANITARY SEWER LINE AND MANHOLE SHALL CONFORM WITH THE PERTINENT MUNICIPAL ENGINEERING SPECIFICATIONS.

SANITARY GRAVITY & FORCE MAIN TRENCH SECTION

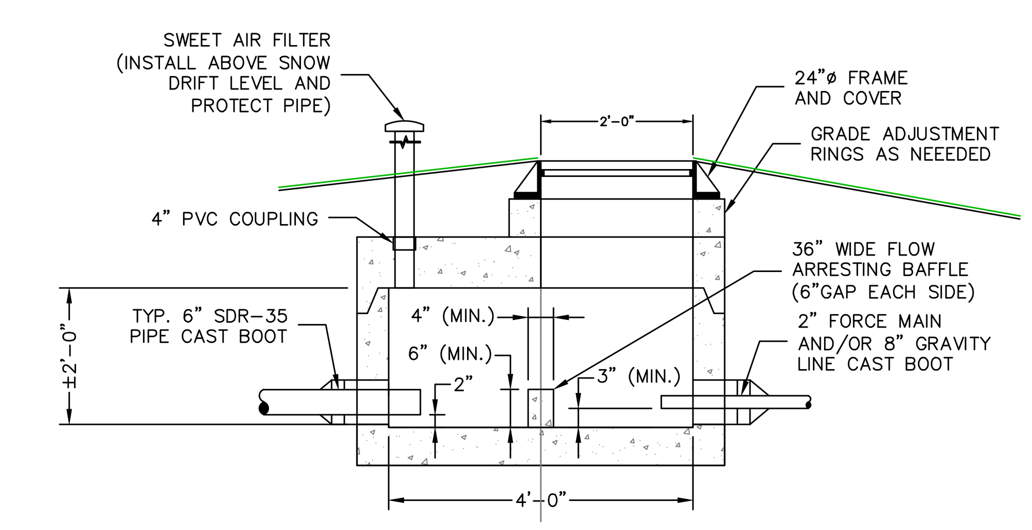
NO SCALE



NOTES:
- SANITARY SEWER MANHOLE SHALL CONFORM WITH LOCAL SEWER ORDINANCE SPECIFICATIONS.
- ALL PRECAST CONCRETE SHALL COMPLY WITH ASTM C913 "STANDARD SPECIFICATION FOR PRECAST CONCRETE WATER AND WASTEWATER STRUCTURES."
- PRECAST MANHOLE COMPONENTS: ASTM C478

STANDARD PRECAST MANHOLE WITH SANITARY GRAVITY LINE

NO SCALE



DISTRIBUTION STRUCTURE DETAIL

NO SCALE

SHEET TITLE: CIVIL DETAILS

SCALE: AS NOTED

DATE: MARCH 25, 2021

DRAWN BY: LP
CHECKED BY: WTL

DATE | REVISIONS | NO.

CLIENT/PROJECT: KINGFISH MAINE

LOCATION: DUN GARVIN ROAD

TOWN: JONESPORT COUNTY: WASHINGTON STATE: MAINE

Gartley & Dorsky ENGINEERING & SURVEYING
59 Union Street, Unit 1, P.O. Box 1031 Camden, ME 04843-1031
Ph (207) 236-4365 Fax (207) 236-3055 Toll Free 1-888-282-4365
165 Main Street Suite 2D P.O. Box 1072 Damariscotta, Maine 04543
Ph. (207) 790-5005

STATE OF MAINE WILLIAM LANE No. 7577 LICENSED PROFESSIONAL ENGINEER 3-25-2021

PROJ. NO. 2019-412

C20

APPENDIX 17C

Mounding Analysis

Gartley & Dorsky
ENGINEERING SURVEYING

March 20, 2021

Megan Sorby
Tom Sorby
Kingfish Maine, Inc.
33 Salmon Farm Road
Franklin, ME 04

RE: Subsurface Wastewater Disposal System 1 – Mounding Analysis Project 2019-412
Kingfish Maine RAS Facility

Dear Megan and Tom:

We have completed a Mounding Analysis for the proposed primary wastewater disposal system at Kingfish Maine in Jonesport, Maine. The proposed system is are designated as Disposal Field 1 on the site plan enclosed. We also include copies of test pit logs with soil profile information.

The design flow for the systems is 4,000 gallons per day (gpd) which will be split between two discrete sections of the disposal field. The disposal fields sections are each 31 X 56 feet in size and utilize Eljen GSF standard modules arranged in 8 rows of 14 modules (total 224 units).

The mounding calculations are derived from the United States Geological Survey (USGS) Scientific Investigation Report 2010-5102. The analytical model is based on a Solution to the Hantush Equation (1967).

Input parameters to the model include recharge rate, specific yield, initial saturated thickness of the aquifer, field size, time and horizontal hydraulic conductivity. The values used for each input parameter are as follows:

The per field recharge rate is 0.154 feet per day based on 2,000 gpd (267 cubic feet per day) design flow and a field size of 1,736 square feet. The recharge rate is considered constant. If actual design flow is less, mounding predictions would be lower than predicted.

Specific yield is 0.26 (dimensionless) and reflects the ability of a soil to drain water and is a ratio of the volume of water that drains from a unit volume of the soil compared to the volume of soil. Reference values were derived from US Department of the Interior Geological Survey Water Supply Paper 1662-D.

Initial saturated thickness of the aquifer is on the order of 22 feet. These values are derived from the exploration data. Test pits (Nos. 16 to 21) encountered no limiting bedrock condition at depths of 34”. In the adjacent geotechnical investigation’s boring (B15), depth to bedrock in field was generally greater than 23 feet. In general, overburden in this section of the property is consistent with this finding. As a result, overburden is conservatively assigned to be 20 feet thick in the vicinity of the disposal field.

Test pit logs indicate variable depths to mottling (seasonal high water table) of 12 inches below ground surface. For mounding calculations, a depth to water table of 12 inches below ground surface (bgs) was assigned. Given a conservative overburden of 20 feet, an initial saturated thickness of 19 feet was used. A thicker overburden would result in less predicted mounding.

Field size is 56 X 31 feet. Time was set at 365 days (1 year). A 1-year timeframe allow sufficient time for the system to achieve a steady state.

Horizontal hydraulic Conductivity was varied between 1 and 10 feet per day as a sensitivity analysis of the predicted mounding values. Hydraulic conductivity of the material underlying the disposal field is the primary factor controlling the predicted height of the mound. As such, multiple sources of information were reviewed to develop an estimate of hydraulic conductivity. The model uses a 10:1 ratio of horizontal to vertical permeability.

Hydraulic conductivity values published in Groundwater and Wells, Second Edition, Driscoll, 1986 (Figure 5.14) were largely derived from water well testing data and are considered to represent horizontal hydraulic conductivity values for a range of geologic materials. Values of 3 to 30 feet per day overlap the descriptions of Glacial Till and fine Sand. Medium to coarse sand values are considerably higher.

Review of the test pits and boring indicate that for sizing purposes a profile 5D soil was used. In the geotechnical report, the native material is characterized as fluvial soils consisting of loose to dense sand and gravel with varying portions of silt. From a soil series perspective, the NRCS soil survey indicates the material is Kinsman sand. Published Ksat values are reported as moderately high to very high: 1.42 to 14.17 in/hr (2.8 to 28.3). More conservative published information for sands list "permeability" as 5 cm per hour (~4 feet per day). These values are likely partially derived from laboratory testing. Values may be biased to a vertical permeability related to infiltration of water vertically through the soil. For model input, these values appear to be applicable to vertical hydraulic conductivity values. Factored scaling for horizontal conductivity will be employed as enumerated in the protocol basis.

Simulations were run using horizontal hydraulic conductivity values of 30, 10 and 5 feet per day to assess the variation in predicted mounding. Other model parameters remained fixed in each of the simulations.

- Using a horizontal hydraulic conductivity of 30 feet per day (corresponding vertical hydraulic conductivity of 3 feet per day) and the most conservative thickness of overburden results in a predicted groundwater mound of approximately 0.35 feet above the initial groundwater level at the center of the disposal field.
- Similarly, using a horizontal hydraulic conductivity of 10 feet per day (corresponding vertical hydraulic conductivity of 1 foot per day), results in a predicted groundwater mound of approximately .9 feet above the initial groundwater level at the center of the disposal field.
- Using a horizontal hydraulic conductivity of 5 feet per day (corresponding vertical hydraulic conductivity of 0.5 feet per day), results in a very conservative predicted groundwater mound of approximately 1.55 feet above the initial groundwater level at the center of the disposal field.

Based on available information and interpretations of site conditions, the simulation using 30 feet per day as a horizontal hydraulic conductivity reasonably represents conditions for disposal field 1 to account for mounding effects and potential overlap of mounding effects between the adjacent fields. Subsurface rules require separations to seasonal groundwater, which in this instance control. In conformance with the subsurface rules, the Table 4F minimum 24 inch vertical separation must be maintained between the Seasonal High Water Table and Eljen InDrain units.

Very truly yours,
Gartley & Dorsky, Engineering & Surveying Inc.

William T. Lane, P.E.
Vice President

enclosure: Hantush spreadsheets

This spreadsheet will calculate the height of a groundwater mound beneath a stormwater infiltration basin. More information can be found in the U.S. Geological Survey Scientific Investigations Report 2010-5102 "Simulation of groundwater mounding beneath hypothetical stormwater infiltration basins".

The user must specify infiltration rate (R), specific yield (Sy), horizontal hydraulic conductivity (Kh), basin dimensions (x, y), duration of infiltration period (t), and the initial thickness of the saturated zone (hi(0), height of the water table if the bottom of the aquifer is the datum). For a square basin the half width equals the half length (x = y). For a rectangular basin, if the user wants the water-table changes perpendicular to the long side, specify x as the short dimension and y as the long dimension. Conversely, if the user wants the values perpendicular to the short side, specify y as the short dimension, x as the long dimension. All distances are from the center of the basin. Users can change the distances from the center of the basin at which water-table aquifer thickness are calculated.
Cells highlighted in yellow are values that can be changed by the user. Cells highlighted in red are output values based on user-specified inputs. The user MUST click the blue "Re-Calculate Now" button each time ANY of the user-specified inputs are changed otherwise necessary iterations to converge on the correct solution will not be done and values shown will be incorrect. Use consistent units for all input values (for example, feet and days)

use consistent units (e.g. feet & days **or** inches & hours)

Input Values

0.1540	***R***	**Recharge (infiltration) rate (feet/day)**
0.260	**Sy**	**Specific yield, Sy (dimensionless, between 0 and 1)**
5.00	**K**	**Horizontal hydraulic conductivity, Kh (feet/day)***
28.000	**x**	**1/2 length of basin (x direction, in feet)**
15.500	**y**	**1/2 width of basin (y direction, in feet)**
365.000	**t**	**duration of infiltration period (days)**
19.000	**hi(0)**	**initial thickness of saturated zone (feet)**

Conversion Table

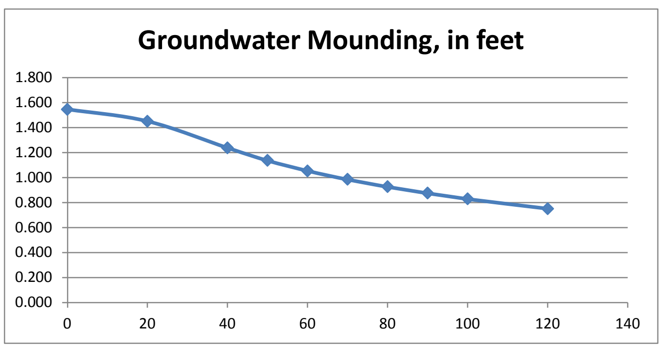
inch/hour	**feet/day**
0.67	1.33
2.00	4.00
hours	**days**
36	1.50

In the report accompanying this spreadsheet (USGS SIR 2010-5102), vertical soil permeability (ft/d) is assumed to be one-tenth horizontal hydraulic conductivity (ft/d).

20.547	**h(max)**	**maximum thickness of saturated zone (beneath center of basin at end of infiltration period)**
1.547	**Δh(max)**	**maximum groundwater mounding (beneath center of basin at end of infiltration period)**

Ground-water Mounding, in feet	**Distance from center of basin in x direction, in feet**
1.547	**0**
1.451	**20**
1.238	**40**
1.138	**50**
1.054	**60**
0.986	**70**
0.927	**80**
0.876	**90**
0.830	**100**
0.752	**120**

Re-Calculate Now



Disclaimer

This spreadsheet solving the Hantush (1967) equation for ground-water mounding beneath an infiltration basin is made available to the general public as a convenience for those wishing to replicate values documented in the USGS Scientific Investigations Report 2010-5102 "Groundwater mounding beneath hypothetical stormwater infiltration basins" or to calculate values based on user-specified site conditions. Any changes made to the spreadsheet (other than values identified as user-specified) after transmission from the USGS could have unintended, undesirable consequences. These consequences could include, but may not be limited to: erroneous output, numerical instabilities, and violations of underlying assumptions that are inherent in results presented in the accompanying USGS published report. The USGS assumes no responsibility for the consequences of any changes made to the spreadsheet. If changes are made to the spreadsheet, the user is responsible for documenting the changes and justifying the results and conclusions.

This spreadsheet will calculate the height of a groundwater mound beneath a stormwater infiltration basin. More information can be found in the U.S. Geological Survey Scientific Investigations Report 2010-5102 "Simulation of groundwater mounding beneath hypothetical stormwater infiltration basins".

The user must specify infiltration rate (R), specific yield (Sy), horizontal hydraulic conductivity (Kh), basin dimensions (x, y), duration of infiltration period (t), and the initial thickness of the saturated zone (hi(0), height of the water table if the bottom of the aquifer is the datum). For a square basin the half width equals the half length (x = y). For a rectangular basin, if the user wants the water-table changes perpendicular to the long side, specify x as the short dimension and y as the long dimension. Conversely, if the user wants the values perpendicular to the short side, specify y as the short dimension, x as the long dimension. All distances are from the center of the basin.
Users can change the distances from the center of the basin at which water-table aquifer thickness are calculated.
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use consistent units (e.g. feet & days **or** inches & hours)

Input Values		
0.1540	***R***	**Recharge (infiltration) rate (feet/day)**
0.260	**Sy**	**Specific yield, Sy (dimensionless, between 0 and 1)**
10.00	**K**	**Horizontal hydraulic conductivity, Kh (feet/day)***
28.000	**x**	**1/2 length of basin (x direction, in feet)**
15.500	**y**	**1/2 width of basin (y direction, in feet)**
365.000	**t**	**duration of infiltration period (days)**
19.000	**hi(0)**	**initial thickness of saturated zone (feet)**

Conversion Table

inch/hour	**feet/day**
0.67	1.33
2.00	4.00

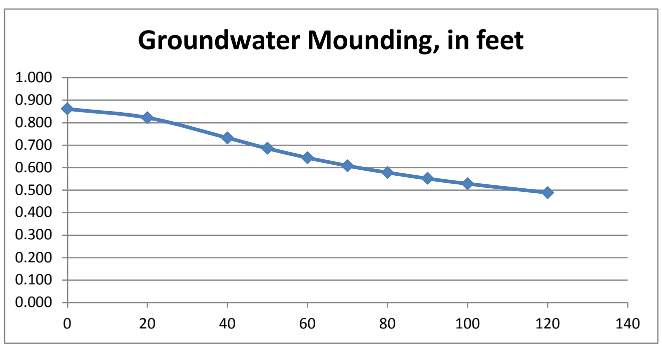
hours	**days**
36	1.50

In the report accompanying this spreadsheet (USGS SIR 2010-5102), vertical soil permeability (ft/d) is assumed to be one-tenth horizontal hydraulic conductivity (ft/d).

19.862	**h(max)**	**maximum thickness of saturated zone (beneath center of basin at end of infiltration period)**
0.862	**Δh(max)**	**maximum groundwater mounding (beneath center of basin at end of infiltration period)**

Ground-water Mounding, in feet	**Distance from center of basin in x direction, in feet**
0.862	**0**
0.822	**20**
0.732	**40**
0.686	**50**
0.644	**60**
0.608	**70**
0.578	**80**
0.552	**90**
0.529	**100**
0.489	**120**

Re-Calculate Now



Disclaimer

This spreadsheet solving the Hantush (1967) equation for ground-water mounding beneath an infiltration basin is made available to the general public as a convenience for those wishing to replicate values documented in the USGS Scientific Investigations Report 2010-5102 "Groundwater mounding beneath hypothetical stormwater infiltration basins" or to calculate values based on user-specified site conditions. Any changes made to the spreadsheet (other than values identified as user-specified) after transmission from the USGS could have unintended, undesirable consequences. These consequences could include, but may not be limited to: erroneous output, numerical instabilities, and violations of underlying assumptions that are inherent in results presented in the accompanying USGS published report. The USGS assumes no responsibility for the consequences of any changes made to the spreadsheet. If changes are made to the spreadsheet, the user is responsible for documenting the changes and justifying the results and conclusions.

This spreadsheet will calculate the height of a groundwater mound beneath a stormwater infiltration basin. More information can be found in the U.S. Geological Survey Scientific Investigations Report 2010-5102 "Simulation of groundwater mounding beneath hypothetical stormwater infiltration basins".

The user must specify infiltration rate (R), specific yield (Sy), horizontal hydraulic conductivity (Kh), basin dimensions (x, y), duration of infiltration period (t), and the initial thickness of the saturated zone (hi(0), height of the water table if the bottom of the aquifer is the datum). For a square basin the half width equals the half length (x = y). For a rectangular basin, if the user wants the water-table changes perpendicular to the long side, specify x as the short dimension and y as the long dimension. Conversely, if the user wants the values perpendicular to the short side, specify y as the short dimension, x as the long dimension. All distances are from the center of the basin.
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use consistent units (e.g. feet & days **or** inches & hours)

Conversion Table

inch/hour	feet/day
0.67	1.33
2.00	4.00
hours	**days**
36	1.50

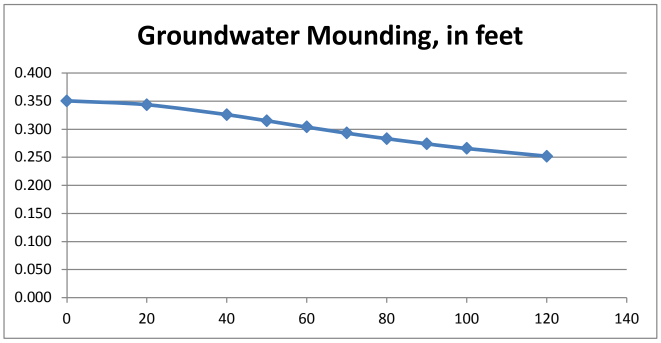
In the report accompanying this spreadsheet (USGS SIR 2010-5102), vertical soil permeability (ft/d) is assumed to be one-tenth horizontal hydraulic conductivity (ft/d).

Input Values

0.1540	***R***	**Recharge (infiltration) rate (feet/day)**
0.260	**Sy**	**Specific yield, Sy (dimensionless, between 0 and 1)**
30.00	**K**	**Horizontal hydraulic conductivity, Kh (feet/day)***
28.000	**x**	**1/2 length of basin (x direction, in feet)**
15.500	**y**	**1/2 width of basin (y direction, in feet)**
365.000	**t**	**duration of infiltration period (days)**
19.000	**hi(0)**	**initial thickness of saturated zone (feet)**
19.350	**h(max)**	**maximum thickness of saturated zone (beneath center of basin at end of infiltration period)**
0.350	**Δh(max)**	**maximum groundwater mounding (beneath center of basin at end of infiltration period)**

Ground-water Mounding, in feet	**Distance from center of basin in x direction, in feet**
0.350	**0**
0.344	**20**
0.326	**40**
0.315	**50**
0.304	**60**
0.293	**70**
0.283	**80**
0.274	**90**
0.266	**100**
0.252	**120**

Re-Calculate Now



Disclaimer

This spreadsheet solving the Hantush (1967) equation for ground-water mounding beneath an infiltration basin is made available to the general public as a convenience for those wishing to replicate values documented in the USGS Scientific Investigations Report 2010-5102 "Groundwater mounding beneath hypothetical stormwater infiltration basins" or to calculate values based on user-specified site conditions. Any changes made to the spreadsheet (other than values identified as user-specified) after transmission from the USGS could have unintended, undesirable consequences. These consequences could include, but may not be limited to: erroneous output, numerical instabilities, and violations of underlying assumptions that are inherent in results presented in the accompanying USGS published report. The USGS assumes no responsibility for the consequences of any changes made to the spreadsheet. If changes are made to the spreadsheet, the user is responsible for documenting the changes and justifying the results and conclusions.

APPENDIX 17D

Nitrate Study

Nitrate-Nitrogen Impact Assessment

In accordance with Department of Human Services Subsurface Waste Water Disposal Rules (10 CMR 241) requirements, Gartley & Dorsky has prepared this nitrate-nitrogen impact assessment for the wastewater disposal systems supporting the proposed Kingfish Maine RAS facility in Jonesport, Maine.

Topography slopes from a high point east of Mason Bay Road east to the waters of Chandler Bay.   Please refer to the Site Plan for the siting and facility layout.

Pertinent data for this assessment was obtained from the following sources:

1) On-site test pits,
2) Review of disposal system design by Natalie Marceau, Licensed Site Evaluator #411,
3) Geotechnical Report prepared by SW Cole
4) USGS topographical map
5) Maine Surficial Geology Map

Based on soil classifications made during excavation of test pits, native surficial geology is fluvial till. Test Pits 20-23 reported a medium sand loam to depths greater than 32 inches feet below ground surface (bgs). Bedrock was not encountered in any test pit. Test Pit logs are included in this section.

Several approaches have been developed to assess the potential impact of subsurface waste disposal systems with respect to nitrate concentrations in ground water. They range from simple loading calculations to dilution effects based on geology, recharge rates and water quality; to analytical dispersion calculations. We have evaluated potential nitrate impacts for based on each of these approaches.

<u>Screening/General Loading Assessment</u>

This assessment has been developed by the Department of Human Services, Division of Health Engineering. A copy of their guidance is included as Attachment 2. This approach uses a number of simplifying assumptions and utilizes a loading vs. overall site square footage matrix. Essentially, the approach determines a minimum area needed to allow attenuation of nitrate concentrations in effluent discharges from the system.

Based on the soil characteristics encountered in test pit excavations, a 5D soil profile/condition has been assigned to the disposal field sites. Using the matrix in Table F-1 of the Health Engineering guidance (Attachment 2), a minimum of 82 square feet of site area is needed per gallon of daily flow to reduce the concentration of nitrate in effluent from an average of 40 milligrams per liter (mg/l) to acceptable levels per the department – less than 10 mg/l. As the facility is adjacent to tidal waters, the value is conservative. Counting available area

Assuming that 4,385 gallons per day is the total design flow for the proposed disposal fields, a total site square footage of 353,570 sq. ft. or approximately 8.25 acres of land is required for nitrate attenuation. The actual site acreage 93.2 acres or approximately 11 times greater than the minimum. On this basis, the site is acceptable with respect to nitrate-nitrogen impacts.

Mixing/Dilution Assessment

A mixing/dilution calculation approach is described in Section 14.B.2.(d) of the Maine Department of Environmental Protection (DEP) Site Location Permit Application. This approach is used as an alternate method to evaluate nitrate-nitrogen impacts on development Sites that utilize on-site subsurface wastewater disposal systems. Kingfish Maine's project is subject to Site Location Permit requirements. Because of sufficient undeveloped and buffer area on the majority of the property nitrate evaluations by mixing/dilution are appropriate for assessment.

The following information was used in the calculation of mixing and dilution:

- The project area is 93 acres in size and contain slopes on the order of 3 to 8%.
- National Weather Service records indicate that average annual precipitation is approximately 46 inches. A conservative drought condition (60%) of 27.6 inches was assessed.
- Site soils were classified as hydrologic soil group A. Based on this classification and Table d(ii) of the Site Location Application, a recharge rate of 43% of average annual precipitation has been selected for the Site, conservatively applied to the area outside the development area, or 2,758,526 sf. Owing to provisions of the Site Law and Stormwater Law, the development footprint is diverted to stormwater features that effectively manage stormwater but may inhibit recharge. Conservatively, these areas are excluded.
- A design flow of 4,000 gpd has been established for system 1 and 385 gpd for system 2.
- Initial concentration of Nitrate-Nitrogen for effluent from the wastewater disposal system is assumed to be 40 mg/l, which is typical of domestic wastewater. Background is estimated at 2.0 mg/l.
- Concentration of Nitrate-Nitrogen in precipitation is assumed to be 0.5 mg/l as recommended by DEP.

$$Cd = \frac{Qe\ Ce + Qr\ Cr}{Qe + Qr}$$

Where:

Cd = the diluted nitrate concentration
Qe = volume of effluent in liters per year (6,058,643 liters)
Ce = nitrate concentration of effluent (40 mg/l)
Qr = volume of recharge over 2,758,526 sf from precipitation in liters (142,750,830 liters)
Cr = nitrate concentration in recharge (0.5 mg/l)

Systemwide Nitrate By Dilution	Waste Flow	Qe (Yearly)	Ce	Undeveloped Parcel Area	Drought Rainfall	Recharge	Qr (Yearly)	Cr
	GPD	Liters	mg/l	SF	Inches	Percent	Liters	mg/l
	4385	6,058,643	40	2,758,526	27.6	43%	77253390	0.5

$$Cd = \frac{QeCe + QrCr}{Qe + Qr} = \frac{280972429}{83312033} = 3.4$$

Cd = 3.4 mg/l, indicating diluted concentrations are at or below the review standard of 8 mg/l.