

- WELL MARK ——— 100
- v. Septic Line @ House — 97
- v. TANK INLET — 96
- Bottom of ROCK LAYER — 99
- RESTRICTING LAYER — 96
- l. of Pump ——— 92
- l. Distribution Device — 100

(KT) 10-28-15

PUMP SELECTION PROCEDURE

- A. Determine pump capacity
 Gravity distribution
 1. Minimum is 10 GPM
 2. Maximum is 45 GPM
 Pressure Distribution
 3. a. Select number of perforated laterals = 3
 b. Select perforation spacing = 3 ft.
 c. Subtract 2 ft from rock layer length:
50 - 2 = 48 feet. (length of laterals)
ROCK LAYER LENGTH
 d. Determine the number of spaces between perforations:

$$\frac{\text{length of lateral}}{\text{perf. spacing}} = \frac{48}{3} = 16 \text{ spaces}$$
 e.
$$16 \text{ spaces} + 1 = 17 \text{ perforations per lateral}$$
 f. Multiply perforations per lateral by number of laterals to get total number of perforations:

$$17 \text{ (perfs/lateral)} \times 3 \text{ (laterals)} = 51 \text{ (perforations)}$$
 g.
$$51 \text{ (Perforations)} \times 1.74 \text{ (gpm/perfa)} = 37.74 \text{ GPM}$$

SELECTED PUMP CAPACITY 38 GPM

- B. Determine head requirements:
 i. Elevation difference between pump & point of discharge:
8 feet
 2. If pumping to a pressure distribution system, add 5 feet; for gravity add zero: 5 feet
 3. Friction Loss
 a. Enter friction loss table with GPM and pipe diameter. Read friction loss in feet per 100 ft in table.

$$F.L. = 1.55 \text{ ft/100 of pipe}$$
 b. Determine total pipe length from pump to discharge point. Add 25% to pipe length for fitting loss.

$$15 \text{ length} \times 1.25 = 18.75 \text{ feet.}$$
 c. Calculate total friction loss by multiplying friction loss in 100 ft. of pipe by equivalent pipe length (B):

$$\text{Total friction loss} = 1.55 \times 19 / 100 = .29 \text{ feet}$$

i. Total head required is the sum of the elevation difference, special head requirements and total friction loss:

$$\frac{8}{(1)} + \frac{5}{(2)} + \frac{.29}{(3c)} \text{ TOTAL HEAD } 13.29$$

SELECT A PUMP TO DELIVER AT LEAST 38 GPM WITH AT LEAST 13.29 FEET OF TOTAL HEAD.

Laterals are connected to a header pipe in a pressure system, select the minimum size lateral diameter; enter the table with perforation spacing and the number of perforations per lateral.

Select minimum size of lateral 1 1/2"

Perforation Discharges in GPM

Head (feet)	Perforation diameter (inches)	
1.0a	7/32	1/4
	0.56	0.74
1.5	0.69	0.90
2.0b	0.80	1.04

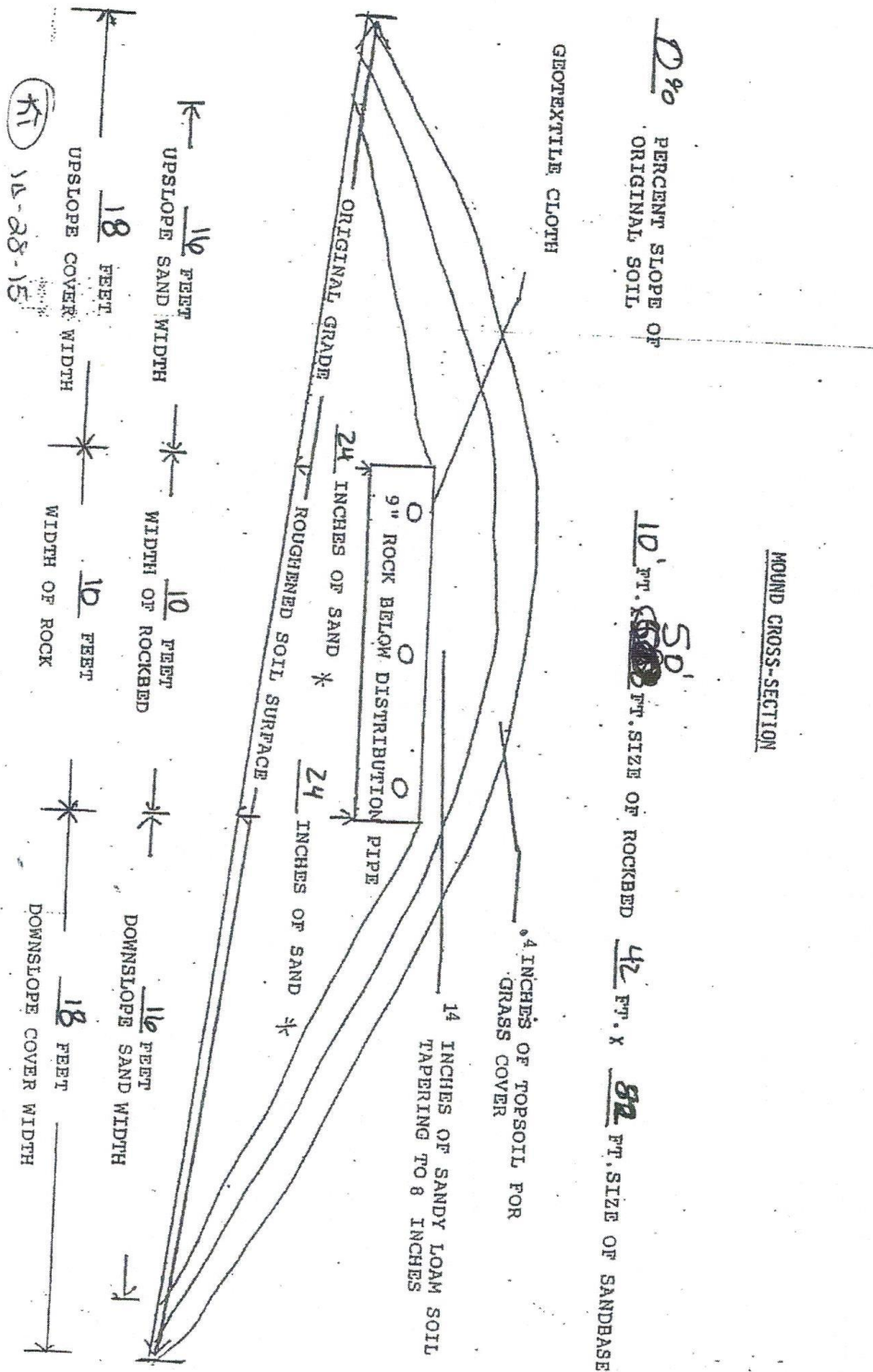
- a. Use 1.0 foot single homes
 b. Use 2.0 feet for anything else

FRICTION LOSS IN PLASTIC PIPE

Flow Rate GPM	1.5"	2"	3"
20	2.47	0.73	0.11
25	3.73	1.11	0.16
30	5.23	1.55	0.23
35	6.96	2.06	0.30
40	8.91	2.64	0.39
45	11.07	3.28	0.48
50	13.46	3.99	0.58
55		4.76	0.70
60		5.60	0.82
65		6.48	0.95
70		7.44	1.09

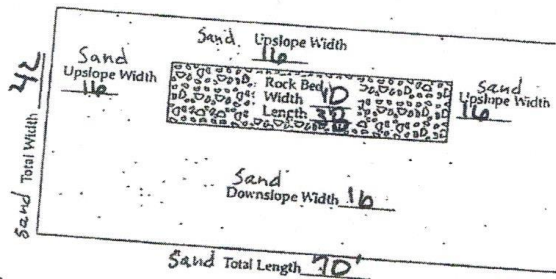
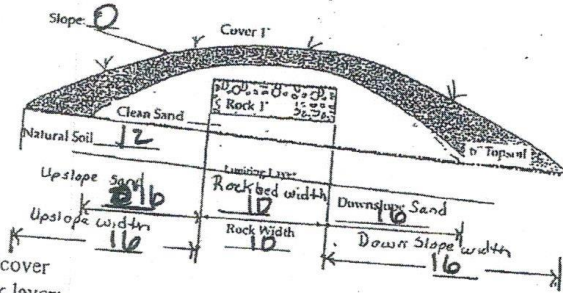
Max. No. of 1/4" perfs per lateral. (10% var)

Perforation spacing (feet)	1/4" perfs		
	1	1 1/2"	2"
2.5 feet	14	18	28
3.0 feet	13	17	26
3.3 feet	12	16	25
4.0 feet	11	15	23
5.0 feet	10	14	22



MINIMUM MOUND SIZE

1. Subtract rock layer width from absorption width to obtain minimum downslope berm toe
 $10 \text{ ft} - 15 \text{ ft} = 5 \text{ feet}$
2. Determine depth of clean sand fill at upslope edge of rock layer:
Separation 3' - $1 \text{ ft} = 2 \text{ feet}$
3. Add depth of clean sand for separation (2) at upslope edge, depth of rock layer (1 ft) to depth of cover (1 ft) to find the mound height at upslope edge of rock layer:
 $2 \text{ ft} + 1 \text{ ft} + 1 \text{ ft} = 4 \text{ feet}$
4. Enter table with landslope and upslope berm ratio. Select berm multiplier 4 .
5. Multiply berm multiplier by upslope mound height to find upslope berm width:
 $4 \times 4 = 16 \text{ feet}$
6. Multiply rock layer width (K) by landslope to determine drop in elevation:
 $10 \times 0 \% \div 100 = 0 \text{ feet}$
7. Add depth of clean sand for slope difference (6) at downslope edge to the mound height at the upslope edge of rock layer (3) to find the downslope height:
 $4 \text{ ft} + 0 \text{ ft} = 4 \text{ feet}$
8. Enter table with landslope and downslope berm ratio. Select berm multiplier of 4 .
9. Multiply berm multiplier by downslope mound height to get downslope berm width:
 $4 \times 4 = 16 \text{ feet}$
10. Compare the values of Step (1) 5 and Step(9) 16 . Select the greater of the two values as the downslope berm width: 16 feet
11. Total mound width is the sum of upslope berm (5): width plus rock layer width (K) plus downslope berm width (9):
 $16 \text{ ft} + 10 \text{ ft} + 16 \text{ ft} = 42 \text{ feet}$
12. Total mound length is the sum of upslope berm width (5) plus rock layer length (L) plus upslope berm width (5):
 $16 \text{ ft} + 50 \text{ ft} + 16 \text{ ft} = 82 \text{ feet}$



BERM SLOPE MULTIPLIERS

Land Slope, in %	DOWNSLOPE berm multipliers for various berm slope ratios					UPSLOPE berm multipliers for various berm slope ratios				
	3:1	4:1	5:1	6:1	7:1	3:1	4:1	5:1	6:1	7:1
0	3.0	4.0	5.0	6.0	7.0	3.0	4.0	5.0	6.0	7.0
1	3.09	4.17	5.26	6.35	7.53	2.91	3.85	4.76	5.66	6.54
2	3.19	4.35	5.56	6.82	8.14	2.83	3.70	4.54	5.36	6.14
3	3.30	4.54	5.88	7.32	8.86	2.75	3.57	4.35	5.08	5.79
4	3.41	4.76	6.25	7.89	9.72	2.68	3.45	4.17	4.84	5.46
5	3.53	5.00	6.67	8.57	10.77	2.61	3.33	4.00	4.62	5.19
6	3.66	5.26	7.14	9.38	12.07	2.54	3.23	3.85	4.41	4.93
7	3.80	5.56	7.69	10.34	13.73	2.48	3.12	3.70	4.23	4.70
8	3.95	5.88	8.33	11.54	15.91	2.42	3.03	3.57	4.05	4.48
9	4.11	6.25	9.09	13.04	18.92	2.36	2.94	3.45	3.90	4.30
10	4.29	6.67	10.00	15.00	23.33	2.31	2.86	3.33	3.75	4.12
11	4.48	7.14	11.11	17.65	30.43	2.26	2.78	3.23	3.61	3.95
12	4.69	7.69	12.50	21.43	43.75	2.21	2.70	3.13	3.49	3.80

Note: The product of the multiplier and the height results in the horizontal distance to where the berm meets the original land slope. Example: Height at upper edge of rock layer is 3.0 feet, rock layer is 10 feet wide, land slope is 6% and berm slope ratio is 4:1. Upslope berm width is $3.23 \times 3.0 = 9.7 \text{ ft}$; height at lower edge of rock layer is $3.0 \times 10 \times 0.6 = 3.6 \text{ ft}$ and downslope berm width is $3.26 \times 3.6 = 11.9 \text{ ft}$.

Final Cover Dimension
 $42' \times 82'$

KT 12-28-15

MOUND DESIGN SHEET

PROPERTY OWNER MARK TOWNSHIP Noordland FIRE# _____
 PERMIT# _____ PIN# _____ DATE _____
 DESIGNER NAME _____ LICENSE # _____
 DESIGNER SIGNATURE: _____ DATE _____

WATER USE APPLIANCES (CHECK ALL THAT APPLY)
 CLOTHES WASHER _____ WATER SOFTNER _____ DISHWASHER _____ WHIRLPOOL _____ HUMIDIFIER _____
 NUMBER OF BEDROOMS 24 TYPE: 1 GARBAGE DISPOSAL: YES _____ NOX _____ AIR TEST YES _____ NOX _____
 WELL: DEEP (50'+) SHALLOW _____ SETBACKS: TANK 50' DRAINFIELD 50' SEWER LINE 50'

FLOW
 A. ESTIMATED 680 GPD OR MEASURED GPD _____
 B. SEPTIC TANK VOLUME 1230 GALLONS
 C. MINIMUM PUMP TANK VOLUME 630 GALLONS
 C1. ALARM TYPE Electric

SOILS
 D. DEPTH TO RESTRICTING LAYER 1.3 FEET
 E. DEPTH OF SAND ON UPSLOPE EDGE 2 FEET
 F. SOIL TEXTURE Sandy Loam
 G. PERCOLATION RATE 6.15 MPI
 H. SOIL SIZING FACTOR 1.27 SQ FT/GPD
 I. LAND SLOPE 0 %

ROCK LAYER DIMENSIONS
 J. (A) x 0.83 = 500 = SQ FT
 K. SELECT ROCK LAYER WIDTH 10 FT.
 L. LENGTH OF ROCK BED = (J) ÷ (K) = 50.50 FT.

ROCK VOLUME
 M. MULTIPLY ROCK AREA BY ROCK DEPTH = (J) x 1 FT = 500 FT x 1 FT = 500 CU. FT.
 N. DIVIDE (M) BY 27 = CU YD. = 500 CU FT ÷ 27 = 19 CU YD.
 O. MULTIPLY (N) 19 x 1.4 = 27 TONS OF ROCK

ABSORPTION WIDTH
 P. FOR TEXTURE, PERC. RATE, OR SOIL SIZING FACTOR IN (F) (G) OR (H) ABOVE, SELECT ABSORPTION WIDTH RATIO FROM TABLE 3 1.52
 Q. MULTIPLY ABSORPTION WIDTH RATIO (P) BY ROCK LAYER WIDTH (K) = 10 x 1.52 = 15.2 FT.
 ABSORPTION WIDTH

 UG APPROVAL: (KT) 10-28-15 DATE: _____

TABLE 1

EST SEWAGE FLOW IN GALLONS/ DAY (GPD)

NUMBER OF BEDROOMS	TYPE I	TYPE II	TYPE III
2	300	225	180
3	450	300	218
4	600	375	256
5	750	450	294
6	900	525	332
7	1050	600	370
8	1200	675	408

TABLE 2

NUMBER OF BEDROOMS	MINIMUM TANK CAPACITY GALLONS	MINIMUM CAPACITY GARBAGE DISPOSAL
2 OR LESS	1000	1500
3 OR 4	1000	1500
5 OR 6	1500	2250
7 OR 8	2000	3000
OVER 8	SEE FIG C-6	(x 1.5)

TABLE 3

PERC RATE P1	SOIL TEXTURE	SOFT GALLONS /DAY	GALLONS /SOFT.	ABSORPTION WIDTH RATIO
< THAN 0.1	COARSE SAND	---	---	1.00
0.1 TO 5	SAND	0.83	1.20	1.00
0.1 TO 5	FINE SAND	1.67	0.60	2.00
6 TO 15	SANDY LOAM	1.27	0.78	1.52
16 TO 20	LOAM	1.67	0.60	2.00
31 TO 45	SILT LOAM	2.00	0.50	2.40
46 TO 60	CLAY LOAM	2.20	0.45	2.67
> THAN 60	CLAY	---	(0.24)	5.00
> THAN 120	CLAY	---	---	6.00

SOILS CHARTS FOR BOTH PROPOSED AND ALTERNATE SITES

1 (PROPOSED) SOILS DATA

DEPTH (INCHES)	TEXTURE	MUNSELL COLOR
0-8"	Top soil	
8"-17"	Sandy Loam	10YR 5/4
17"-24"	Clay Loam	10YR 5/3
Mottling @ 15"		

2 (PROPOSED) SOILS DATA

DEPTH (INCHES)	TEXTURE	MUNSELL COLOR
0-7"	Top soil	
7"-16"	Sandy Loam	10YR 5/4
16"-28"	Clay Loam	10YR 5/3
Mottling @ 16"		

1 (ALTERNATE) SOILS DATA

DEPTH (INCHES)	TEXTURE	MUNSELL COLOR
0-8"	Top soil	
8"-15"	Sandy Loam	10YR 5/4
15"-23"	Clay Loam	10YR 5/3
Mottling @ 12"		

2 (ALTERNATE) SOILS DATA

DEPTH (INCHES)	TEXTURE	MUNSELL COLOR
0-6"	Top soil	
6"-15"	Sandy Loam	10YR 5/4
15"-23"	Clay Loam	10YR 5/4
Mottling @ 13"		

(KT) 12-28-15

ADDITIONAL SOIL BORINGS MAY BE REQUIRED

0602

FIELD EVALUATION SHEET

PRELIMINARY EVALUATION DATE 9-20-15 FIELD EVALUATION DATE 10-10-15
PROPERTY OWNER: Mark & Nancy Fisher ADDRESS: _____ PHONE: _____
LEGAL DESCRIPTION: _____ CITY, STATE, ZIP: _____
PINE 24-0-058404 SEC T R _____ TWP NAME NORDLAND
FIRE# LAKERIVER LAKE CLASS RA - OHWL
Long Lake

DESCRIPTION OF SOIL TREATMENT AREAS

DISTURBED AREAS	AREA #1	AREA #2	REFERENCE BM ELEV. <u>110</u>
YES <input type="checkbox"/> NO <input checked="" type="checkbox"/>	YES <input type="checkbox"/> NO <input checked="" type="checkbox"/>	YES <input type="checkbox"/> NO <input checked="" type="checkbox"/>	REFERENCE BM DESCRIPTION
COMPACTED AREAS	YES <input type="checkbox"/> NO <input checked="" type="checkbox"/>	YES <input type="checkbox"/> NO <input checked="" type="checkbox"/>	_____
FLOODING	YES <input type="checkbox"/> NO <input checked="" type="checkbox"/>	YES <input type="checkbox"/> NO <input checked="" type="checkbox"/>	_____
RUN ON POTENTIAL	YES <input type="checkbox"/> NO <input checked="" type="checkbox"/>	YES <input type="checkbox"/> NO <input checked="" type="checkbox"/>	_____
SLOPE %	YES <input type="checkbox"/> NO <input checked="" type="checkbox"/>	YES <input type="checkbox"/> NO <input checked="" type="checkbox"/>	_____
DIRECTION OF SLOPE	<u>090</u>	YES <input type="checkbox"/> NO <input checked="" type="checkbox"/>	_____
LANDSCAPE POSITION	_____	_____	_____
VEGETATION TYPES	<u>LAWN / FIELD</u>	_____	_____

DEPTH TO STANDING WATER OR MOTTLED SOIL - BORINGS 1 15", 1A 12", 2 15", 2A 12"

BOTTOM ELEVATION - FIRST TRENCH OR BOTTOM OF ROCK BED: #1 _____ FT., #2 _____ FT.

SOIL SIZING FACTOR: SITE #1 1.27, SITE #2 1.27

CONSTRUCTION RELATED ISSUES:

ICE 910 SITE EVALUATOR SIGNATURE: [Signature]
SITE EVALUATOR NAME: Ernie Dorian TELEPHONE# _____
UG REVIEW: (KT) 10-28-15 DATE _____

SOIL BORING LOGS ON REVERSE SIDE