Koch's Soil Testing
P.O. Box 81
Loretto, MN 55357
Tel: (612) 479-2637

9/7/95

Bruce Kelly
2340 Fox St.
Orono, Minn.
Job Site; Above Address

Two sites were tested for the East lot (2340 Fox St.), the Site # 1 was tested on 5/26/95 and it was determine that a mound system would be needed due tto the mottled soil levels at 24-28 inches (ave. perc. rate--25.6 min/ While the Site # 2 area was tested on 8/4/95 and it was also determine that a mound system would be needed due to the mottled soil levels at 18-35 inch The ave. perc. rate in this area was 35 min/in.

* Mottled soil is consider the high seasonal saturated soil conditions that exist during the wet seasons(fall and spring). The City of Orono Codes require that the minnimum depth to mottled soil be at 48 inches or deeeper before a standard trench system can be installed. Therefore with the above information the only type of system that can be installed on this lot and still comply with the local codes is a pressurized mound system.

In Late August I mett with Mr. Steve Weckman (OronoCity Inspector) to look at the proposed mound system that were design in the 8/4/95 report.

After carefully determining the elevation of the propose mound system (mainly the Site # 2) it was determine that the Sites # 1 and # 2 mound system could be installed on this lot and still comply with the local Orono City Codes.

These proposed corner elevatioms of the proposed mound system were approved by Mr. Steve Weckman on the site in late August1995.

Site Evaluator
Robert A Koch M.P.C.A. # 1429

Robert A. Koch

*This report should be included in the Bruce Kelly Report dated 8/4/95 and the one dated 5/26/95.

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Bruce Kelly
2340 Fox St.
Orono, Minn.

8/4/95

Job Site ; Two lots at the above address

Two sites were tested to determine what type of drainfield could be installed and still comply with the local and the Minn. State Codes.

Tthe west lot In the Site 1A area had and average percolation rate of 42.5 min/in. and the depth to mottled soil was at23-24 inches. While in theSite-2A the ave. perc. rate was 39.2 min/in. and the depth mottled soil was at 24-28 inches.

The results of the east 1/2 lot indicated that the Site #1 (tested on 5/26/95) had an ave.perc. rate of 25.6 min/in. and the depth to mottled soil was at 24-28 inches.

While in the Site # -2 (tested7/25/95) had a average perc. rate of 35 min/in. and the depth to mottled soil was at 18-29 inches.

* Mottled soil is co nsider the seasonal saturated soil level that exist durng the wet seasons. The City of Orono Codes state that the minnmum depth to mottled soil be at 48 inches or deeper before a standard trench drainfield can be installed.
Therefore with the above information the only type of system that can be installed on these two lots is a pressurized mound system.

Site Evaluator

Robert A Koch

Robert A. Koch M.P.C.A# 1429

MPCA Certified

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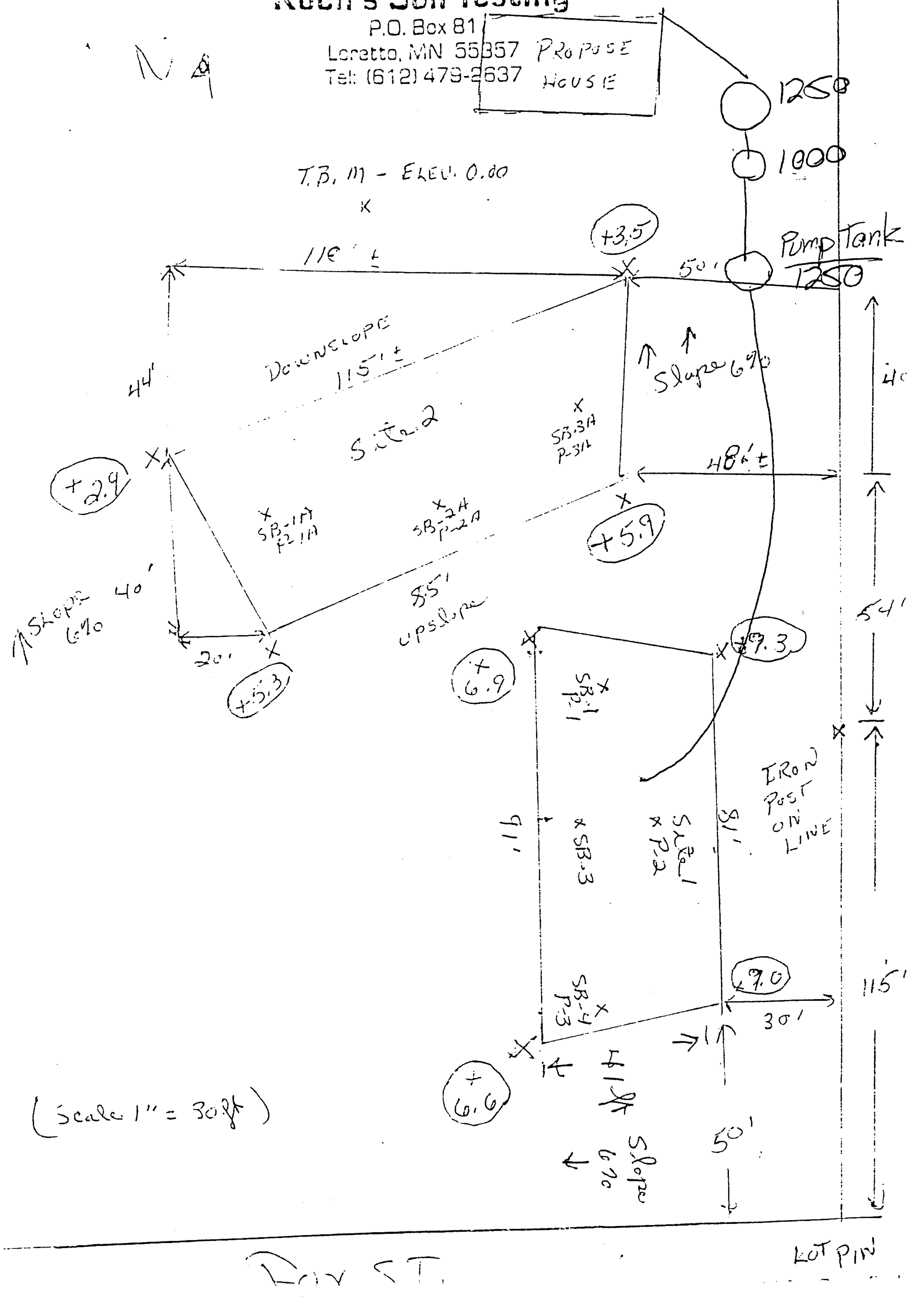


2340 Ford ST (East LOT)

MOUND DESIGN WORKSHEET
(For Flows up to 1200 gpd)

Site 1
Tested 5/14/95)

A. FLOW
Estimated 750 gpd (5 Bedroom)
or measured ______ x 1.5 = ______ gpd.

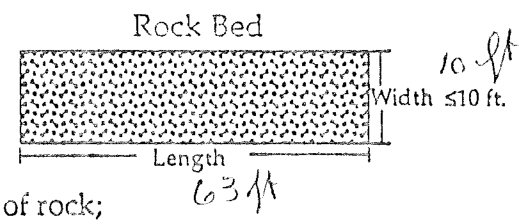
Estimated Sewage Flows in Gallons per day (gpd)				
Number of Bedrooms	Type I	Type II	Type III	Type IV
2	300	225	180	60% of the values in Type I, II or III columns
3	450	300	218	
4	600	375	256	
5	750	450	294	
6	900	525	332	
7	1050	600	370	
8	1200	675	408	

B. SEPTIC TANK LIQUID VOLUMES
2-1500 gallons

Septic Tank Capacities, in gallons		
Number of Bedrooms	Minimum Liquid Capacity	Liquid capacity with garbage disposal
2 or less	750	1125
3 or 4	1000	1500
5 or 6	1500	2250
7, 8 or 9	2000	3000
over 9		——

C. SOILS (refer to site evaluation)
1. Depth to restricting layer = 24-29 inches
2. Depth of percolation tests = 12 inches
3. Percolation rate 25.6 mpi
4. Land slope 8.0 %

D. ROCK LAYER DIMENSIONS
1. Multiply flow rate by 0.83 to obtain required area of rock layer: A x 0.83 =
   750 gpd x 0.83 sq. ft./gpd = 630 sq. ft.
2. Select width of rock layer (10 feet or less) = 10 ft.
3. Length of rock layer = area ÷ width =
   630 sq. ft. ÷ 10 ft. = 63 ft.



E. ROCK VOLUME
1. Multiply rock area by rock depth to get cubic feet of rock;
   630 sq. ft. x 1 ft. = 630 cu. ft.
2. Divide cu. ft. by 27 cu. ft./cu. yd. to get cubic yards;
   630 cu. ft. ÷ 27 = 24 cu. yd.
3. Multiply cubic yards by 1.4 to get weight of rock in tons;
   24 cu. yd. x 1.4 ton/cu. yd. = 34 tons.

F. ADSORPTION WIDTH
1. Percolation rate in top 12 inches of soil is 25.6 mpi
   Use 16-30 mpi Range (Loam)
2. Select allowable soil loading rate from table;
   0.60 gpd/ft²
3. Calculate adsorption width ratio by dividing rock layer loading rate of 1.20 gpd/ft2 by allowable soil loading rate;
   1.20 gpd/ft² ÷ 0.60 gpd/ft² = 2.00.
4. Multiply adsorption width ratio by rock layer width to get required adsorption width;
   2.00 x 10 ft = 20 ft

Absorption Width Sizing Table

Percolation Rate in Minutes per Inch (MPI)	Soil Texture	Gallons per day per square foot	Ratio of Absorption width to Rock Layer Width
Faster than 0.1 *	Coarse Sand	——	——
0.1 to 5	Sand	1.20	1.00
0.1 to 5 **	Fine Sand **	0.60	2.00
6 to 15	Sandy Loam	0.79	1.52
16 to 30	Loam	0.60	2.00
31 to 45	Silt Loam	0.50	2.40
46 to 60	Clay Loam	0.45	2.67
60 to 120	Clay	0.24	5.00
Slower than 120***	Clay	——	——

* Soil too coarse for installation of a standard system. See 7080.0170 Subp 2.G. 3, page 26.

** Soil having 50% or more of fine sand plus very fine sand.

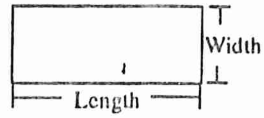
*** Soil too heavy for installation of a standard system. See 7080.0210 Subp 5.A, page 33.

Sizing of Pump Station

1. Determine Surface Area

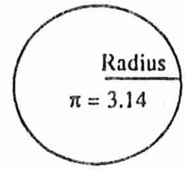
   Rectangle = Area = L x W

   ______ x ______ = ______ square feet



   Circle = Area = π x (Radius)²

   3.14 x ______ x ______ = ______ square feet



   Other = Get Surface Area from Manufacturer

   ______ square feet

2. Calculate Gallons Per Inch

   There are 7.5 gallons per cubic foot of volume, therefore you must multiply the area times the conversion factor and divide by 12 inches per foot to calculate gallons per inch

   Area x 7.5 gpft ³ ÷ 12 inchs per foot   1250 gal pump tank

   ______ x 7.5 ÷ 12 = ______ gallons/inch

3. Calculate Gallons to Cover Pump (with 2 inches of water covering pump)

   (Height (in) + 2 inches) x gallons/inch (#2)

   (10 + 2) x 25 = ~~300~~ gallons

   +2" Block   350

4. Calculate Total Pumpout Volume

   a. To maximize pump life select sump size for 4 to 5 pump operations per day.

   750 gpd ÷ 4 = 188 gallons per dose

   b. Calculate drainback

   1. Determine total pipe length, 100 feet.
   2. Determine liquid volume of pipe, 17.4 gallons per 100 feet.
   3. Multiply length by volume: Drainback quantity =

   100 feet x 17.4 gallons/100 ft. = 17.4 gallons.

Estimated Sewage Flows in Gallons per day (gpd)				
Number of Bedrooms	Type I	Type II	Type III	Type IV
2	300	225	180	60% of the values in Type I, II or III columns
3	450	300	218	
4	600	375	256	
5	750	450	294	
6	900	525	332	
7	1050	600	370	
8	1200	675	408	

   c. Total pump out volume equals dose volume + drainback

   188 gallons per dose + 17.4 gallons = 205 gallons

Pipe diameter (inches)	Gallons per 100 feet
1	4.49
1.25	7.77
1.5	10.58
2	17.43
2.5	24.87
3	38.4
4	66.1

5. Calculate Volume for Alarm (typically 2 to 3 inches)

   Depth (in) x gallons/inch (#2) =

   3 x 25 = 75 gallons

6. Calculate Reserve Capacity (75% the daily flow)

   Daily flow (see page D-7) x .75 =

   750 x .75 = ______ gallons

7. Calculate total gallons

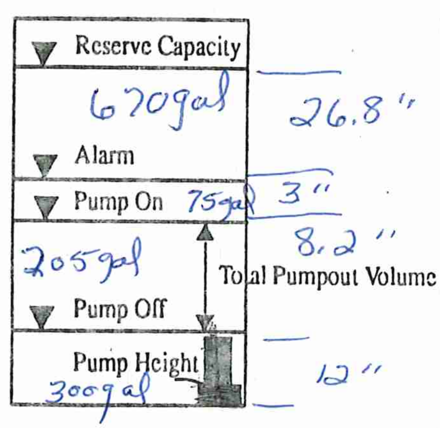
   gallons over pump + gallons pumpout +gallons alarm + gallons reserve capcity

   #3 + #4 c+# 5 +# 6

   ~~300~~ + 205 + 75 + 563 = ~~1143~~ 1193 gallons

   350

   USE 1250 gal Minn. Size



8. Total Depth (Total gallon divided by gallon per inch)

   Total Gallon (#7) ÷ gallon/inch (#2)

   1250 ÷ 25 = 50 inches

9. Float Separation Distance (equal total pumpout volume)

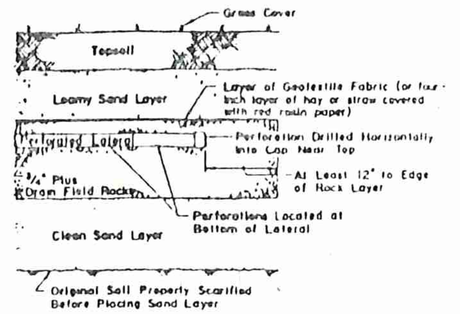
   Total pumpout volume (#4c) ÷ gallons/inch (#2)

   205 ÷ 25 = 8.2 inches

Site #1 (EAST LOT.)
2340 FOX ST.

PUMP SELECTION PROCEDURE

END PERFORATION OF A PERFORATED LATERAL



A. Determine pump capacity:

Gravity Distribution

1. Minimum suggested is 600 gallons per hour (10 gpm) to stay ahead of water use rate.
2. Maximum suggested for delivery to a drop box of a home system is 2,700 gallons per hour (45 gpm) to prevent build-up of pressure in drop box.

Pressure Distibution

3. a. Select number of perforated laterals 3
   b. Select perforation spacing = 3 feet.
   c. Subtract 2 ft. from the rock layer length.
      63 (Rock layer length) - 2 ft. = 61 feet.
   d. Determine the number of spaces between perforations.
      Length perf. spacing = 61 ft. + 3 ft. = 20 spaces
   e. 20 spaces + 1 = 21 perforations/lateral
   f. Multiply perforations per lateral by number of laterals to get total number of perforations. 3 (laterals) x 21 (perfs/lateral) = 63 perforations.
   g. 63 (perfs) x 0.74 (gpm/perf) = 47 gpm. = 50 gpm

SELECTED PUMP CAPACITY 50 gpm

TABLE OF PERFORATION DISCHARGES IN GPM

Head	Perforation diameter (inches)	
	7/32	1/4
1.0a	0.56	0.74
1.5	0.69	0.90
2.0b	0.80	1.04
2.5	0.89	1.17
3.0	0.98	1.28
4.0	1.13	1.47
5.0	1.26	1.65

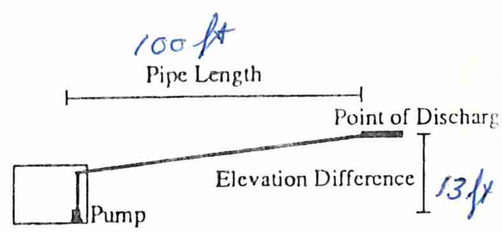
aUse 1.0 foot of head for residential systems.
bUse 2.0 feet of head for other establishments

B. Determine head requirements:

1. Elevation difference between pump and point of discharge.
   13 feet
2. If pumping to a pressure distribution system, five feet for pressure required at manifold if gravity system, zero.
   5 feet
3. Friction loss
   a. Enter friction loss table with gpm and pipe diameter. Read friction loss in feet per 100 feet from table.
      F.L. = 3.99 ft./100 ft of pipe
   b. Determine total pipe length from pump to discharge point. Add 25 percent to pipe length for fitting loss, or use a fitting loss chart. Equivalent pipe length - 1.25 times pipe length =
      100 x 1.25 = 125 feet
      Calculate total friction loss by multiplying friction loss in ft/100 ft by equivalent pipe length.
   Total friction loss = 125 x 3.99 ÷100 = 5 feet
4. Total head required is the sum of elevation difference, special head requirements, and total friction loss.

13 (1) + 5 (2) + 5 (3c)

TOTAL HEAD 23 feet



F-18b

gpm	1.5 inch	2.0 inch	3.0 inch
	Friction loss per 100 ft of pipe		
10	0.69	0.20	
12	0.96	0.28	
14	1.28	0.38	
16	1.63	0.48	
18	2.03	0.60	
20	2.47	0.73	0.11
25	3.73	1.11	0.16
30	5.23	1.55	0.23
35	7.90	2.06	0.30
40	11.07	2.64	0.39
45	14.73	3.28	0.48
50		3.99	0.58
55		4.76	0.70
60		5.60	0.82

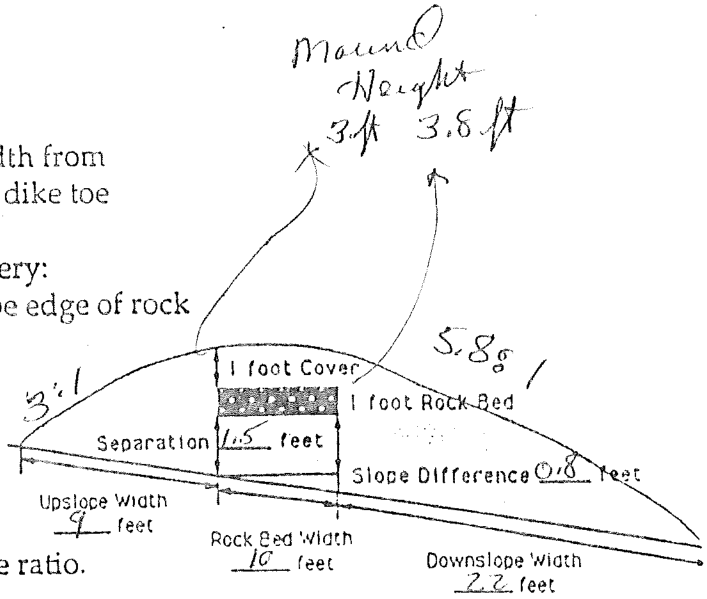
C. Pump selection

1. A pump must be selected to deliver at least 50 gpm (Step A) with at least 23 feet of total head (Step B).

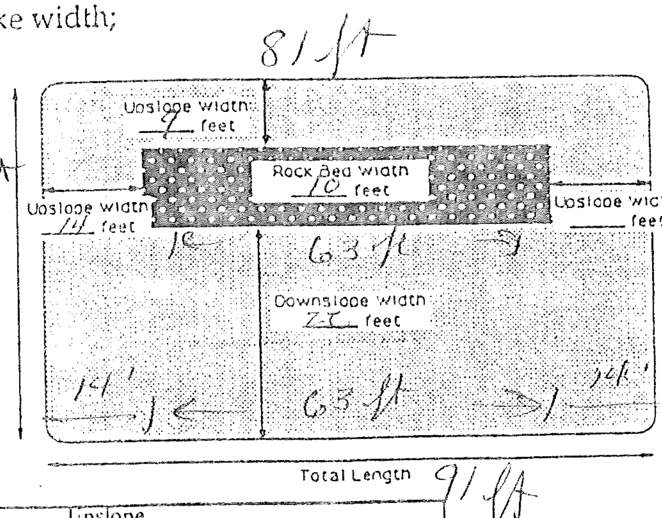
(Site 1)

G. DOWNSLOPE DIKE WIDTH

1. If landslope is 3% or more, subtract rock layer width from adsorption width to obtain minimum downslope dike toe
   20 ft - 10 ft = 10 feet
2. Calculate Minimum mound size based on geometery:
   a. Determine depth of clean sand fill at upslope edge of rock layer: *Separation* : 3 ft - 2 = 1 feet
   b. Add depth of clean sand for separation (2a) at upslope edge, depth of rock layer (1 foot) to depth of cover (1 foot) to find the mound height at the upslope edge of rock
      1 ft + 1ft + 1ft = 3.0 feet



   c. Enter table with landslope and upslope dike ratio. Select dike multiplier of 3.00.
   d. Multiply dike multiplier by upslope mound height to find upslope dike width: 3.00 x 3.0 = 9 feet
   e. Multiply rock layer width by landslopto determine drop in elevation; *Slope Difference*
      10 x 8 % ÷ 100 = 0.8 feet
   f. Add depth of clean sand for slope difference (2e) at downslope edge, to the mound height at the upslope edge of rock layer (2b) to find the downslope height;
      3.0 ft + 0.8 ft = 3.8 feet
   g. Enter table with landslope and downslope dike ratio. Select dike multiplier of 5.88.
   h. Multiply dike multiplier by downslope mound height (2f) to get downslope dike width: 3.8 x 5.88 = 22 feet
   i. Compare the values of step G.1 and Step G.2h Select the greater of the two values as the downslope dike width;
      22 feet
   j. Total mound width is the sum of upslope dike (G.2e) width plus rock layer width (D.2) plus downslope dike width(G.2i);
      9 ft + 10 ft + 22 ft = 41 feet
   k. Total mound length is the sum of upslope dike width (G.2e) plus rock layer length (D.3) plus upslope dike width (G.2e);
      9 ft + 63 ft + 9 ft = 81 feet
      14 ft + 63 ft + 14 ft = 91 ft



	Downslope					Upslope					
% slope	3:1	4:1	5:1	6:1	7:1	3:1	4:1	5:1	6:1	7:1	8:1
0	3.0	4.0	5.0	6.0	7.0	3.0	4.0	5.0	6.0	7.0	8.0
1	3.09	4.17	5.26	6.38	7.53	2.91	3.85	4.76	5.66	6.54	7.41
2	3.19	4.35	5.56	6.82	8.14	2.83	3.70	4.54	5.36	6.14	6.90
3	3.30	4.54	5.88	7.32	8.86	2.75	3.57	4.35	5.03	5.79	6.45
4	3.41	4.76	6.25	7.89	9.72	2.68	3.45	4.17	4.84	5.46	6.06
5	3.53	5.00	6.67	8.57	10.77	2.61	3.33	4.00	4.62	5.19	5.71
6	3.66	5.26	7.14	9.38	12.07	2.54	3.23	3.85	4.41	4.93	5.41
7	3.80	5.56	7.69	10.34	13.73	2.48	3.12	3.70	4.23	4.70	5.13
8	3.95	5.88	8.33	11.54	15.91	2.42	3.03	3.57	4.05	4.49	4.88
9	4.11	6.25	9.09	13.04	18.92	2.36	2.94	3.45	3.90	4.30	4.65
10	4.29	6.67	10.0	15.00	23.33	2.31	2.86	3.33	3.75	4.12	4.44
11	4.48	7.14	11.11	17.65	30.43	2.26	2.78	3.23	3.61	3.95	4.26
12	4.69	7.69	12.50	21.43	43.75	2.21	2.70	3.12	3.49	3.80	4.03

LOG OF SOIL BORINGS

Location or Project: 2340 Fox (Propose House)

Borings made by: R. Koch   Date: 5/4/95

Classification System: AASHO ___ ; USDA-SCS X ; Unified ___ ; other ___

Auger used (check two): Hand X or Power ___ ; Flight ___ , or Bucket X ; other ___

Depth, in feet	Boring number 1, Surface elevation 94.4 — Site 1	Depth, in feet	Boring number 2, Surface elevation 93.8 — Site 1
0	Topsoil Brown ~~Black~~ Loam	0	Topsoil Brown Loam
1	10"	1	7"
2	Brown Clay	2	Brown Clay
3		3	13" Brown Sandy Clay
4		4	22" Brown Clay
5	60"	5	60"
6		6	
7		7	
8		8	
9		9	
10		10	

Boring 1

End of boring at 5 feet.

Standing water table:
Present at ___ feet of depth, ___ hours after boring.
Not present in boring hole X.

Mottled soil:
Observed at 26" feet of depth.
Not present in boring hole ___.

Boring 2

End of boring at 5 feet.

Standing water table:
Present at ___ feet of depth, ___ hours after boring.
Not present in boring hole X.

Mottled soil:
Observed at 24" feet of depth.
Not present in boring hole ___.

LOGS OF SOIL BORINGS

Location or Project 2340 Fox ST (Proposed House)

Borings made by R. Koh Date 5/4/95

Classification System: AASHO ___ ; USDA-SCS X ; Unified ___ ; other ___

Auger used (check two): Hand X or Power ___ ; Flight ___ , or Bucket X other ___

Depth, in feet	Boring number 3 Surface elevation 94.6 Site 1	Depth, in feet	Boring number 4 Surface elevation 93.6 Site 1
0	Topsoil		Topsoil
1	BROWN CLAY LOAM	1	BROWN CLAY LOAM
2	9"	2	12"
	BROWN CLAY		BROWN CLAY
3	32"	3	
4	BROWN SANDY CLAY	4	48"
			BROWN SANDY Clay
5	38"	5	60"
6	BROWN CLAY	6	
7	60"	7	
8		8	
9		9	
10		10	

Boring 3

End of boring at 5 feet.

Standing water table:

Present at ___ feet of depth, ___ hours after boring.

Not present in boring hole X.

Mottled soil:

Observed at 24" ~~feet~~ of depth.

Not present in boring hole ___.

Boring 4

End of boring at 5 feet.

Standing water table:

Present at ___ feet of depth, ___ hours after boring.

Not present in boring hole X.

Mottled soil:

Observed at 28" feet of depth.

Not present in boring hole ___.

Proposed House - **PERCOLATION TEST SHEET** - Site 1

Test hole location 2340 Fox ST Hole # 1 Date test hole was prepared: 5/4/95

Depth of hole bottom: 12 inches Diameter of hole: 6 inches

Soil Data from test hole:

depth, inches	soil texture:	soil color
0 - 10	Loam Topsoil	Brown
10 - 12	Clay	Brown

Method of scratching sidewall: Nail Depth of pea size gravel in bottom of hole: 2 inches

Date and hour of initial water filling: 5/4/95 1pm Depth of initial water filling: 12 above hole bottom

Method used to maintain 12" of water depth in hole for 4 hours: Automatic Syphon

Percolation test conducted by: R. Koch Percolation test started at 10 (am)/ pm). 5/5/95

Maximum water depth above hole bottom during test: 6 inches

TIME	INTERVAL (MINUTES)	WATER DEPTH	WATER DROP (fraction)	WATER DROP (decimal)	PERC RATE CALCULATION		conversions
							1/16 = .06
10 — / 10 20	START 20	6 / 5	1	1	20 TIME ÷ 1 DROP (Decimal) - 20.0 PERC	A	1/8 = .13
							3/16 = .19
10 21 / 10 41	REFILL 20	6 / 5 1/16	15/16	0.94	20 TIME ÷ 0.94 DROP (Decimal) - 21.3 PERC	B	1/4 = .25
							5/16 = .31
10 42 / 11 02	REFILL 20	6 / 5 1/8	7/8	0.88	20 TIME ÷ 0.88 DROP (Decimal) - 22.7 PERC	C	3/8 = .38
							7/16 = .44
11 03 / 11 23	REFILL 20	6 / 5 1/8	7/8	0.88	20 TIME ÷ 0.88 DROP (Decimal) - 22.7 PERC	D	1/2 = .5
							9/16 = .56
— / —	REFILL				TIME ÷ DROP (Decimal) - PERC	E	5/8 = .63
							11/16 = .69
— / —	REFILL		Ave =	22.2 min/in	TIME ÷ DROP (Decimal) - PERC	F	3/4 = .75
							13/16 = .81
— / —	REFILL				TIME ÷ DROP (Decimal) - PERC	G	7/8 = .88
— / —	REFILL.				TIME ÷ DROP (Decimal) - PERC	H	15/16 = .94

Ten Percent Calculation *

A, B, C

22.7 (Largest # of ABC) - 20 (Smallest # of ABC) = 2.7

20 (Smallest # of ABC) × 0.10 = 2.0

B, C, D

22.7 (Largest # of BCD) - 21.3 (Smallest # of BCD) = 1.4

21.3 (Smallest # of BCD) × 0.10 = 2.1

C, D, E

Largest # of CDE - Smallest # of CDE = ______

Smallest # of CDE × 0.10 = ______

D, E, F

Ave = (21.3 + 22.7 + 22.7) / 3 = 22.2 min/in

Largest # of DEF - Smallest # of DEF = ______

Smallest # of DEF × 0.10 = ______

E, F, G

Largest # of EFG - Smallest # of EFG = ______

Smallest # of EFG × 0.10 = ______

F, G, H

Largest # of FGH - Smallest # of FGH = ______

Smallest # of FGH × 0.10 = ______

* If the top number in each set of boxes is larger than the bottom number then take another reading. If the top number is equal or smaller than bottom number, average the three numbers for the perc rate.

Propane House PERCOLATION TEST SHEET - Site 1

Test hole location 2340 Fox Hole # 2 Date test hole was prepared: 5/4/95

Depth of hole bottom: 12 inches Diameter of hole: 6 inches

Soil Data from test hole:

depth, inches	soil texture	soil color
0-10"	Loam Topsoil	Brown
10-12	Clay	Brown

Method of scratching sidewall: Nail Depth of pea size gravel in bottom of hole: 2 inches

Date and hour of initial water filling: 5/4/95 1Pm Depth of initial water filling: 12 above hole bottom

Method used to maintain 12" of water depth in hole for 4 hours: Automatic Siphon

Percolation test conducted by: R. Koch Percolation test started at 10 (am) pm. 5/5/95

Maximum water depth above hole bottom during test: 6 inches

TIME	INTERVAL (MINUTES)	WATER DEPTH	WATER DROP (fraction)	WATER DROP (decimal)	PERC RATE CALCULATION	conversions
1003 1023	START 20	6 5 1/8	7/8	0.88	20 TIME ÷ 0.88 DROP (Decimal) = 22.7 PERC A	1/16 = .06 1/8 = .13
1026 1046	REFILL 20	6 5 3/16	13/16	0.81	20 TIME ÷ 0.81 DROP (Decimal) = 24.7 PERC B	3/16 = .19 1/4 = .25
1048 1108	REFILL 20	6 5 1/4	3/4	0.75	20 TIME ÷ 0.75 DROP (Decimal) = 26.7 PERC C	5/16 = .31 3/8 = .38
1110 1130	REFILL 20	6 5 1/4	3/4	0.75	20 TIME ÷ 0.75 DROP (Decimal) = 26.7 PERC D	7/16 = .44 1/2 = .5
	REFILL				TIME ÷ DROP (Decimal) = PERC E	9/16 = .56 5/8 = .63
	REFILL		Ave =	26.0 min/in	TIME ÷ DROP (Decimal) = PERC F	11/16 = .69 3/4 = .75
	REFILL				TIME ÷ DROP (Decimal) = PERC G	13/16 = .81 7/8 = .88
	REFILL.				TIME ÷ DROP (Decimal) = PERC H	15/16 = .94

Ten Percent Calculation *

A, B, C
26.7 (Largest # of ABC) − 22.7 (Smallest # of ABC) = 4.0
22.7 (Smallest # of ABC) × 0.10 = 2.7

B, C, D
26.7 (Largest # of BCD) − 24.7 (Smallest # of BCD) = 2.0
24.7 (Smallest # of BCD) × 0.10 = 2.5

C, D, E
Largest # of CDE − Smallest # of CDE = ____
Smallest # of CDE × 0.10 = ____

D, E, F Ave = 24.7 + 26.7 + 26.7 / 3 = 26.0 min/in
Largest # of DEF − Smallest # of DEF = ____
Smallest # of DEF × 0.10 = ____

E, F, G
Largest # of EFG − Smallest # of EFG = ____
Smallest # of EFG × 0.10 = ____

F, G, H
Largest # of FGH − Smallest # of FGH = ____
Smallest # of FGH × 0.10 = ____

* If the top number in each set of boxes is larger than the bottom number then take another reading. If the top number is equal or smaller than bottom number, average the three numbers for the perc rate.

Propose Home **- PERCOLATION TEST SHEET -** Site 1

Test hole location: 2340 Fox St   Hole #: 3   Date test hole was prepared: 5/4/95

Depth of hole bottom: 12 inches   Diameter of hole: 6 inches

Soil Data from test hole:

depth, inches	soil texture:	soil color
0-12"	Loam Topsoil	Brown

Method of scratching sidewall: Nail   Depth of pea size gravel in bottom of hole: 2 inches

Date and hour of initial water filling: 5/4/95 PM   Depth of initial water filling: 12 above hole bottom

Method used to maintain 12" of water depth in hole for 4 hours: Automatic Syphon

Percolation test conducted by: R. Koch   Percolation test started at 10 (am)/ pm). 5/5/95

Maximum water depth above hole bottom during test: 12 inches

TIME	INTERVAL (MINUTES)	WATER DEPTH	WATER DROP (fraction)	WATER DROP (decimal)	PERC RATE CALCULATION
1006 1026	START 20	6 5 3/16	13/16	0.81	20 TIME ÷ 0.81 DROP (Decimal) = ~~23.6~~ 24.7 PERC A
1028 1048	REFILL 20	6 5 1/4	3/4	0.75	20 TIME ÷ 0.75 DROP (Decimal) = 26.7 PERC B
1050 1110	REFILL 20	6 5 5/16	11/16	0.69	20 TIME ÷ 0.69 DROP (Decimal) = 28.9 PERC C
1113 1133	REFILL 20	6 5 5/16	11/16	0.69	20 TIME ÷ 0.69 DROP (Decimal) = 28.9 PERC D
	REFILL				TIME ÷ DROP (Decimal) = PERC E
	REFILL		Ave =	28.2	TIME ÷ DROP (Decimal) = PERC F
	REFILL			min/in	TIME ÷ DROP (Decimal) = PERC G
	REFILL.				TIME ÷ DROP (Decimal) = PERC H

conversions: 1/16 = .06; 1/8 = .13; 3/16 = .19; 1/4 = .25; 5/16 = .31; 3/8 = .38; 7/16 = .44; 1/2 = .5; 9/16 = .56; 5/8 = .63; 11/16 = .69; 3/4 = .75; 13/16 = .81; 7/8 = .88; 15/16 = .94

Ten Percent Calculation *

A, B, C
28.9 (Largest # of ABC) − 24.7 (Smallest # of ABC) = 4.2
24.7 (Smallest # of ABC) × 0.10 = 2.5

B, C, D
28.9 (Largest # of BCD) − 26.7 (Smallest # of BCD) = 2.2
26.7 (Smallest # of BCD) × 0.10 = 2.7

C, D, E
Largest # of CDE − Smallest # of CDE = ______
Smallest # of CDE × 0.10 = ______

D, E, F Ave = 26.7 + 28.9 + 28.9 = 28.2 min/in
Largest # of DEF − Smallest # of DEF = ______
Smallest # of DEF × 0.10 = 3

E, F, G
Largest # of EFG − Smallest # of EFG = ______
Smallest # of EFG × 0.10 = ______

F, G, H
Largest # of FGH − Smallest # of FGH = ______
Smallest # of FGH × 0.10 = ______

* If the top number in each set of boxes is larger than the bottom number then take another reading. If the top number is equal or smaller than bottom number average the three numbers for th…

Propane Haus PERCOLATION TEST SHEET - Site P

Test hole location: 2340 Fox St Hole #: 4 Date test hole was prepared: 5/4/95

Depth of hole bottom: 12 inches Diameter of hole: 6 inches

Soil Data from test hole:

depth, inches	soil texture:	soil color
0-7"	Loam Topsoil	Brown
7-12	Clay	Brown

Method of scratching sidewall: Nail Depth of pea size gravel in bottom of hole: 2 inches

Date and hour of initial water filling: 5/4/95 1pm Depth of initial water filling: 12 above hole bottom

Method used to maintain 12" of water depth in hole for 4 hours: Automatic Siphon

Percolation test conducted by: R. Koch Percolation test started at 10 (am)(pm) 5/5/95

Maximum water depth above hole bottom during test: 6 inches

TIME	INTERVAL (MINUTES)	WATER DEPTH	WATER DROP (fraction)	WATER DROP (decimal)	PERC RATE CALCULATION	conversions
						1/16 = .06
1009 1029	START 20	6 5 1/16	15/16	0.94	20 TIME ÷ 0.94 DROP (Decimal) = 21.3 PERC A	1/8 = .13
						3/16 = .19
1037 1057	REFILL 20	6 5 3/16	13/16	0.81	20 TIME ÷ 0.81 DROP (Decimal) = 24.6 PERC B	1/4 = .25
						5/16 = .31
1053 1113	REFILL 20	6 5 1/4	3/4	0.75	20 TIME ÷ 0.75 DROP (Decimal) = 26.7 PERC C	3/8 = .38
						7/16 = .44
1116 1136	REFILL 20	6 5 1/4	3/4	0.75	20 TIME ÷ 0.75 DROP (Decimal) = 26.7 PERC D	1/2 = .5
	REFILL				TIME ÷ DROP (Decimal) = PERC E	9/16 = .56
						5/8 = .63
	REFILL		Ave =	26.0 MIN/IN	TIME ÷ DROP (Decimal) = PERC F	11/16 = .69
						3/4 = .75
	REFILL				TIME ÷ DROP (Decimal) = PERC G	13/16 = .81
						7/8 = .88
	REFILL.				TIME ÷ DROP (Decimal) = PERC H	15/16 = .94

Ten Percent Calculation *

A, B, C
26.7 (Largest # of ABC) − 21.3 (Smallest # of ABC) = 5.4
21.3 (Smallest # of ABC) × 0.10 = 2.1

B, C, D
26.7 (Largest # of BCD) − 24.6 (Smallest # of BCD) = 2.1
24.6 (Smallest # of BCD) × 0.10 = 2.5

C, D, E
Largest # of CDE − Smallest # of CDE = ____
Smallest # of CDE × 0.10 = ____

D, E, F
Ave = 24.6 + 26.7 + 26.7 = 26 MIN/IN
Largest # of DEF − Smallest # of DEF
Smallest # of DEF × 0.10 = 3

E, F, G
Largest # of EFG − Smallest # of EFG = ____
Smallest # of EFG × 0.10 = ____

F, G, H
Largest # of FGH − Smallest # of FGH = ____
Smallest # of FGH × 0.10 = ____

* If the top number in each set of boxes is larger than the bottom number then take another reading. If the top number is equal or smaller than bottom ...

2340 Fox St (East Lot)

MOUND DESIGN WORKSHEET Site 2
(For Flows up to 1200 gpd)

A. FLOW
Estimated 750 gpd (5 Bedroom)
or measured ______ x 1.5 = ______ gpd.

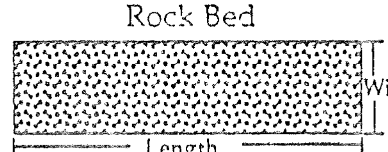
Estimated Sewage Flows in Gallons per day (gpd)				
Number of Bedrooms	Type I	Type II	Type III	Type IV
2	300	225	180	60% of the values in Type I, II or III columns
3	450	300	218	
4	600	375	256	
5	750	450	294	
6	900	525	332	
7	1050	600	370	
8	1200	675	408	

B. SEPTIC TANK LIQUID VOLUMES
2-1500 gallons

Septic Tank Capacities, in gallons		
Number of Bedrooms	Minimum Liquid Capacity	Liquid capacity with garbage disposal
2 or less	750	1125
3 or 4	1000	1500
5 or 6	1500	2250
7, 8 or 9	2000	3000
over 9		—

C. SOILS (refer to site evaluation)
1. Depth to restricting layer = 18-29 inches
2. Depth of percolation tests = 12 inches
3. Percolation rate 35.0 mpi
4. Land slope 6.0 %

D. ROCK LAYER DIMENSIONS
1. Multiply flow rate by 0.83 to obtain required area of rock layer: A x 0.83 =
750 gpd x 0.83 sq. ft./gpd = 630 sq. ft.
2. Select width of rock layer (10 feet or less) = 10 ft.
3. Length of rock layer = area ÷ width =
630 sq. ft. ÷ 10 ft. = 63 ft.



E. ROCK VOLUME
1. Multiply rock area by rock depth to get cubic feet of rock;
630 sq. ft. x 1 ft. = 630 cu. ft.
2. Divide cu. ft. by 27 cu. ft./cu. yd. to get cubic yards;
630 cu. ft. ÷ 27 = 24 cu. yd.
3. Multiply cubic yards by 1.4 to get weight of rock in tons;
24 cu. yd. x 1.4 ton/cu. yd. = 34 tons.

F. ADSORPTION WIDTH
1. Percolation rate in top 12 inches of soil is 35 mpi
use 31-45 mpi Range
2. Select allowable soil loading rate from table;
0.50 gpd/ft²
3. Calculate adsorption width ratio by dividing rock layer loading rate of 1.20 gpd/ft2 by allowable soil loading rate;
1.20 gpd/ft² ÷ 0.50 gpd/ft² = 2.4 .
4. Multiply adsorption width ratio by rock layer width to get required adsorption width;
2.4 x 10 ft = 24 ft

Absorption Width Sizing Table

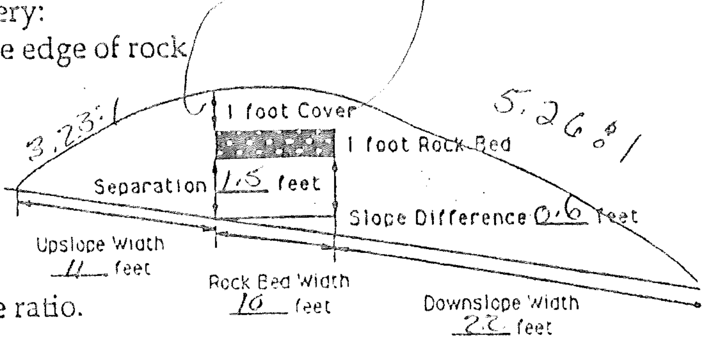
Percolation Rate in Minutes per Inch (MPI)	Soil Texture	Gallons per day per square foot	Ratio of Absorption width to Rock Layer Width
Faster than 0.1 *	Coarse Sand	—	—
0.1 to 5	Sand	1.20	1.00
0.1 to 5 **	Fine Sand **	0.60	2.00
6 to 15	Sandy Loam	0.79	1.52
16 to 30	Loam	0.60	2.00
31 to 45	Silt Loam	0.50	2.40
46 to 60	Clay Loam	0.45	2.67
60 to 120	Clay	0.24	5.00
Slower than 120***	Clay	—	—

* Soil too coarse for installation of a standard system. See 7080.0170 Subp 2.G. 3, page 26.
** Soil having 50% or more of fine sand plus very fine sand.
*** Soil too heavy for installation of a standard system. See 7080.0210 Subp 5.A, page 33.

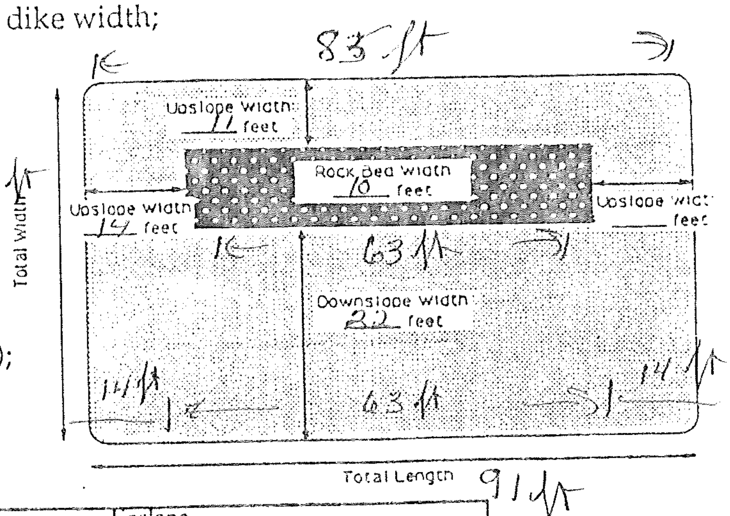
East lot – Site 2

G. DOWNSLOPE DIKE WIDTH

1. If landslope is 3% or more, subtract rock layer width from adsorption width to obtain minimum downslope dike toe
   24 ft - 10 ft = 14 feet
2. Calculate Minimum mound size based on geometery:
   a. Determine depth of clean sand fill at upslope edge of rock layer: *Separation* : 3 ft - 1.5 = 1.5 feet
   b. Add depth of clean sand for separation (2a) at upslope edge, depth of rock layer (1 foot) to depth of cover (1 foot) to find the mound height at the upslope edge of rock
      1.5 ft + 1ft + 1ft = 3.5 feet



   c. Enter table with landslope and upslope dike ratio. Select dike multiplier of 3.23.
   d. Multiply dike multiplier by upslope mound height to find upslope dike width: 3.5 x 3.23 = 11 feet
   e. Multiply rock layer width by landslopto determine drop in elevation; *Slope Difference*
      10 x 6 % ÷ 100 = 0.6 feet
   f. Add depth of clean sand for slope difference (2e) at downslope edge, to the mound height at the upslope edge of rock layer (2b) to find the downslope height;
      3.5 ft + 0.6 ft = 4.1 feet
   g. Enter table with landslope and downslope dike ratio. Select dike multiplier of 5.26.
   h. Multiply dike multiplier by downslope mound height (2f) to get downslope dike width: 4.1 x 5.26 = 22 feet
   i. Compare the values of step G.1 and Step G.2h Select the greater of the two values as the downslope dike width;
      22 feet
   j. Total mound width is the sum of upslope dike (G.2e) width plus rock layer width (D.2) plus downslope dike width(G.2i);
      11 ft + 10 ft + 22 ft = 43 feet
   k. Total mound length is the sum of upslope dike width (G.2e) plus rock layer length (D.3) plus upslope dike width (G.2e);
      11 ft + 63 ft + 11 ft = 85 feet
      14 ft + 63 ft + 14 ft = 91 ft



	Downslope					Upslope					
	3:1	4:1	5:1	6:1	7:1	3:1	4:1	5:1	6:1	7:1	8:1
% slope											
0	3.0	4.0	5.0	6.0	7.0	3.0	4.0	5.0	6.0	7.0	8.0
1	3.09	4.17	5.26	6.38	7.53	2.91	3.85	4.76	5.66	6.54	7.41
2	3.19	4.35	5.56	6.82	8.14	2.83	3.70	4.54	5.36	6.14	6.90
3	3.30	4.54	5.88	7.32	8.86	2.75	3.57	4.35	5.08	5.79	6.45
4	3.41	4.76	6.25	7.89	9.72	2.68	3.45	4.17	4.84	5.46	6.06
5	3.53	5.00	6.67	8.57	10.77	2.61	3.33	4.00	4.62	5.19	5.71
6	3.66	5.26	7.14	9.38	12.07	2.54	3.23	3.85	4.41	4.93	5.41
7	3.80	5.56	7.69	10.34	13.73	2.48	3.12	3.70	4.23	4.70	5.13
8	3.95	5.88	8.33	11.54	15.91	2.42	3.03	3.57	4.05	4.49	4.88
9	4.11	6.25	9.09	13.04	18.92	2.36	2.94	3.45	3.90	4.30	4.65
10	4.29	6.67	10.0	15.00	23.33	2.31	2.86	3.33	3.75	4.12	4.44
11	4.48	7.14	11.11	17.65	30.43	2.26	2.78	3.23	3.61	3.95	4.26
12	4.69	7.69	12.50	21.43	43.75	2.21	2.70	3.12	3.49	3.80	4.08

LOGS OF SOIL BORINGS

Location or Project 2340 Fox ST (East Lot) ORONO Site 2

Borings made by R. Koch   Date 7/25/95

Classification System: AASHO ___ ; USDA-SCS X ; Unified ___ ; other ___

Auger used (check two): Hand X or Power ___ ; Flight ___, or Bucket X other ___

Depth, in feet	Boring number 1A — Surface elevation ___ — Site 2
0	Topsoil Black Loam
1	12"
2	BROWN Sandy Clay
3	
4	
5	60"
6	
7	
8	
9	
10	

End of boring at 5 feet.

Standing water table:

Present at ___ feet of depth, ___ hours after boring.

Not present in boring hole X.

Mottled soil:

Observed at 29" feet of depth.

Not present in boring hole ___

Depth, in feet	Boring number 2A — Surface elevation ___ — Site 2
0	Topsoil Black Loam
1	6"
2	BROWN Clay
3	
4	
5	60"
6	
7	
8	
9	
10	

End of boring at 5 feet.

Standing water table:

Present at ___ feet of depth, ___ hours after boring.

Not present in boring hole X

Mottled soil:

Observed at 18" feet of depth.

Not present in boring hole ___

LOG OF SOIL BORINGS

Location or Project 2340 Fox ST. (East Lot) ORONO Site 2

Borings made by R. Koch   Date 7/25/95

Classification System: AASHO ___ ; USDA-SCS X ; Unified ___ ; other ___

Auger used (check two): Hand X or Power ___ ; Flight ___ , or Bucket X other ___

Depth, in feet	Boring number 3A / Surface elevation ___ / Site 2	Depth, in feet	Boring number ___ / Surface elevation ___
0			
1	Topsoil Black Loam		
2	18"		
3	Brown Clay		
4	30"		
5	Brown Sandy Clay	5	
6	34"		
6–7	Brown Clay		
7	60"		
8			
9			
10		10	

End of boring at 5 feet.
Standing water table:
Present at ___ feet of depth, ___ hours after boring.
Not present in boring hole X.

Mottled soil:
Observed at 26" feet of depth.
Not present in boring hole ___

End of boring at ___ feet.
Standing water table:
Present at ___ feet of depth, ___ hours after boring.
Not present in boring hole ___

Mottled soil:
Observed at ___ feet of depth.
Not present in boring hole ___

PERCOLATION TEST SHEET - Site 2

Test hole location 2340 Fox ST (Fox Lot Hole # 1A Date test hole was prepared: 7/25/95
Depth of hole bottom: 12 inches Diameter of hole: 6 inches
Soil Data from test hole:

depth, inches	soil texture:	soil color
0-12	Loam Topsoil	Black

Method of scratching sidewall: Nail Depth of pea size gravel in bottom of hole: 2 inches
Date and hour of initial water filling: 7/25/95 3pm Depth of initial water filling: 12 above hole bottom
Method used to maintain 12" of water depth in hole for 4 hours:
Percolation test conducted by: R. Koch Percolation test started at 1 (am/pm).
Maximum water depth above hole bottom during test: 6 inches 7/26/95

TIME	INTERVAL (MINUTES)	WATER DEPTH	WATER DROP (fraction)	WATER DROP (decimal)	PERC RATE CALCULATION		CONVERSIONS
							1/16 = .06
1 / 130	START 30	6 / 5 1/16	15/16	0.94	30 TIME ÷ 0.94 DROP (Decimal) = 31.9 PERC	A	1/8 = .13
							3/16 = .19
132 / 202	REFILL 30	6 / 5 1/16	15/16	0.94	30 TIME ÷ 0.94 DROP (Decimal) = 31.9 PERC	B	1/4 = .25
							5/16 = .31
204 / 234	REFILL 30	6 / 5 1/8	7/8	0.88	30 TIME ÷ 0.88 DROP (Decimal) = 34.1 PERC	C	3/8 = .38
							7/16 = .44
	REFILL				TIME ÷ DROP (Decimal) = PERC	D	1/2 = .5
							9/16 = .56
	REFILL				TIME ÷ DROP (Decimal) = PERC	E	5/8 = .63
							11/16 = .69
	REFILL		Ave =	32.6	TIME ÷ DROP (Decimal) = PERC	F	3/4 = .75
	REFILL			min/IN	TIME ÷ DROP (Decimal) = PERC	G	13/16 = .81
							7/8 = .88
	REFILL				TIME ÷ DROP (Decimal) = PERC	H	15/16 = .94

Ten Percent Calculation *

A, B, C
34.1 Largest # of ABC − 31.9 Smallest # of ABC = 2.2
31.9 Smallest # of ABC × 0.10 = 3.2

B, C, D
Largest # of BCD − Smallest # of BCD = ______
Smallest # of BCD × 0.10 = ______

C, D, E
Ave = 31.9 + 31.9 + 34.1 / 3 = 32.6 MPI
Largest # of CDE − Smallest # of CDE
Smallest # of CDE × 0.10 = ______

D, E, F
Largest # of DEF − Smallest # of DEF = ______
Smallest # of DEF × 0.10 = ______

F, G
Largest # of FGH − Smallest # of FGH = ______
Smallest # of FGH × 0.10 = ______

F, G, H
Largest # of FGH − Smallest # of FGH = ______
Smallest # of FGH × 0.10 = ______

PERCOLATION TEST SHEET - Site 2

Test hole location: 2340 FORST EAST LOT Hole #: 24 Date test hole was prepared: 7/25/95

Depth of hole bottom: 12 inches Diameter of hole: 6 inches

Soil Data from test hole:

depth, inches	soil texture:	soil color
0-6	Loam Topsoil	Black
6-12	CLAY	BROWN

Method of scratching sidewall: Nail Depth of pea size gravel in bottom of hole: 2 inches

Date and hour of initial water filling: 7/25/95 3pm Depth of initial water filling: 12 above hole bottom

Method used to maintain 12" of water depth in hole for 4 hours: Automatic Syphon

Percolation test conducted by: R. Koch Percolation test started at 1 (am/pm) 7/26/95

Maximum water depth above hole bottom during test: 6 inches

TIME	INTERVAL (MINUTES)	WATER DEPTH	WATER DROP (fraction)	WATER DROP (decimal)	PERC RATE CALCULATION		conversions
104 134	START 30	6 5 3/16	13/16	0.81	30 (TIME) ÷ 0.81 (DROP (Decimal)) = 37.0 (PERC)	A	1/16 = .06 1/8 = .13
137 207	REFILL 30	6 5 1/4	3/4	0.75	30 (TIME) ÷ 0.75 (DROP (Decimal)) = 40 (PERC)	B	3/16 = .19 1/4 = .25
210 240	REFILL 30	6 5 1/4	3/4	0.75	30 (TIME) ÷ 0.75 (DROP (Decimal)) = 40 (PERC)	C	5/16 = .31 3/8 = .38
	REFILL				TIME ÷ DROP (Decimal) = PERC	D	7/16 = .44 1/2 = .5
	REFILL		Ave =	39.0 min/in	TIME ÷ DROP (Decimal) = PERC	E	9/16 = .56 5/8 = .63
	REFILL				TIME ÷ DROP (Decimal) = PERC	F	11/16 = .69
	REFILL				TIME ÷ DROP (Decimal) = PERC	G	3/4 = .75 13/16 = .81
	REFILL				TIME ÷ DROP (Decimal) = PERC	H	7/8 = .88 15/16 = .94

Ten Percent Calculation *

A, B, C
40 (Largest # of ABC) − 37 (Smallest # of ABC) = 3
37 (Smallest # of ABC) × 0.10 = 3.7

B, C, D
Largest # of BCD − Smallest # of BCD = ______
Smallest # of BCD × 0.10 = ______

C, D, E
Ave = 37+40+40 = 39 min/in
Largest # of CDE − Smallest # of CDE =
Smallest # of CDE × 0.10 = 3

D, E, F
Largest # of DEF − Smallest # of DEF = ______
Smallest # of DEF × 0.10 = ______

E, F, G
Largest # of EFG − Smallest # of EFG = ______
Smallest # of EFG × 0.10 = ______

F, G, H
Largest # of FGH − Smallest # of FGH = ______
Smallest # of FGH × 0.10 = ______

PERCOLATION TEST SHEET - Site 2

Test hole location 2340 Fox ST (East Lot) Hole # 3A Date test hole was prepared: 7/25/95

Depth of hole bottom: 12 inches Diameter of hole: 6 inches

Soil Data from test hole:

depth, inches	soil texture:	soil color
0-18	Loam Topsoil	Black

Method of scratching sidewall: Nail Depth of pea size gravel in bottom of hole: 2 inches

Date and hour of initial water filling: 7/25/95 3pm Depth of initial water filling: 12 above hole bottom

Method used to maintain 12" of water depth in hole for 4 hours: Automatic Syphon

Percolation test conducted by: R. Koch Percolation test started at 1 (am/pm) 7/26/95

Maximum water depth above hole bottom during test 6 inches

TIME	INTERVAL (MINUTES)	WATER DEPTH	WATER DROP (fraction)	WATER DROP (decimal)	PERC RATE CALCULATION	conversions
108 138	START 30	6 5 1/16	15/16	0.94	30 TIME ÷ 0.94 DROP (Decimal) = 31.9 PERC A	1/16 = .06 1/8 = .13
140 210	REFILL 30	6 5 1/8	7/8	0.88	30 TIME ÷ 0.88 DROP (Decimal) = 34.1 PERC B	3/16 = .19 1/4 = .25
214 244	REFILL 30	6 5 1/8	7/8	0.88	30 TIME ÷ 0.88 DROP (Decimal) = 34.1 PERC C	5/16 = .31 3/8 = .38
	REFILL				TIME ÷ DROP (Decimal) = PERC D	7/16 = .44 1/2 = .5
	REFILL		Ave =	33.4	TIME ÷ DROP (Decimal) = PERC E	9/16 = .56 5/8 = .63
	REFILL			Min/in	TIME ÷ DROP (Decimal) = PERC F	11/16 = .69 3/4 = .75
	REFILL				TIME ÷ DROP (Decimal) = PERC G	13/16 = .81 7/8 = .88
	REFILL				TIME ÷ DROP (Decimal) = PERC H	15/16 = .94

Ten Percent Calculation *

A, B, C

34.1 (Largest # of ABC) − 31.9 (Smallest # of ABC) = 2.2

31.9 (Smallest # of ABC) × 0.10 = 3.2

B, C, D

Largest # of BCD − Smallest # of BCD = ______

Smallest # of BCD × 0.10 = ______

C, D, E

Ave = 31.9+34.1+34.1 (Largest # of CDE − Smallest # of CDE) = 33.4

Smallest # of CDE × 0.10 = 3 Min/in

D, E, F

Largest # of DEF − Smallest # of DEF = ______

Smallest # of DEF × 0.10 = ______

E, F, G

Largest # of EFG − Smallest # of EFG = ______

Smallest # of EFG × 0.10 = ______

F, G, H

Largest # of FGH − Smallest # of FGH = ______

Smallest # of FGH × 0.10 = ______