FIELD EVALUATION SHEET

PRELIMINARY EVALUATION DATE March 26, 2016, FIELD EVALUATION DATE March 26, 2016
PROPERTY OWNER: Jordan Keil PHONE
ADDRESS: CITY,STATE,ZIP: Aitkin, Mn. 56431
LEGAL DESCRIPTION:
PIN# SEC 4 T 47 R 22 TWP NAME Aitkin
FIRE# LAKE/RIVER LAKE CLASS OHWL FT.

DESCRIPTION OF SOIL TREATMENT AREAS

	AREA #1	AREA #2
DISTURBED AREAS	YES NO X	YES NO X
COMPACTED AREAS	YES NO X	YES NO X
FLOODING	YES NO X	YES NO X
RUN ON POTENTIAL	YES NO X	YES NO X
SLOPE %	0	0
DIRECTION OF SLOPE	—	—
LANDSCAPE POSITION	N-S	N-S
VEGETATION TYPES	Hayfield - grass	Hayfield - grass

REFERENCE BM ELEV. 100 FT.
REFERENCE BM DESCRIPTION

DEPTH TO STANDING WATER OR MOTTLED SOIL: BORING# 1 13, 1A 14, 2 13, 2A 13

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

SOIL SIZING FACTOR: SITE # 1 1.22, SITE #2 1.27

CONSTRUCTION RELATED ISSUES:

LIC# L2132 SITE EVALUATOR SIGNATURE: Tom O'Neil

SITE EVALUATOR NAME: Tom O'Neil TELEPHONE# 218-927-6070

LUG REVIEW PA DATE 3/30/16

Comments: Ats Soils For Split

SOIL BORING LOGS ON REVERSE SIDE

Form des 2/20/98

Very Consistent
Sandy Soils on top

Boring 1

SOILS DATA

DEPTH (INCHES)	TEXTURE	MUNSELL COLOR
0-9	Sandy Loam	10yr 3/3 - 4/3
9-13	Loamy Sand	10yr 4/4
13-17	Loamy Sand	10yr 5/4

Mottles at 13"

Boring 2

SOILS DATA

DEPTH (INCHES)	TEXTURE	MUNSELL COLOR
0-9	Sandy Loam	10yr 3/3 - 4/3
9-14	Loamy Sand	10yr 4/4
14-18	Loamy Sand	10yr 5/4

Mottles at 14"

Boring 3

SOILS DATA

DEPTH (INCHES)	TEXTURE	MUNSELL COLOR
0-8	Sandy loam	10yr 3/3 - 4/3
8-12	Loamy Sand	10yr 4/4
12-15	Loamy Sand	10yr 5/4

Mottles at 13"

Boring 4

SOILS DATA

DEPTH (INCHES)	TEXTURE	MUNSELL COLOR
0-8	Sandy loam	10yr 3/3 - 4/3
8-13	Loamy Sand	10yr 4/4
13-17	Loamy Sand	10yr 5/4

Mottles at 13"

MOUND DESIGN WORK SHEET (For Flows up to 1200 gpd)

A. Average Design FLOW

Estimated 450 gpd *(see figure A-1)*
or measured _____ x 1.5 (safety *factor*) = _____ gpd

A-1: Estimated Sewage Flows in Gallons per Day

number of bedrooms	Class I	Class II	Class III	Class IV
2	300	225	180	60% of the values in the Class 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 Capacity

1,000 min. gallons *(see figure C-1)*
use 1650 combo

C-1: Septic Tank Capacities (in gallons)

Number of Bedrooms	Minimum Liquid Capacity	Liquid capacity with garbage disposal	Liquid capacity with disposal& lift inside
2 or less	750	1125	1500
3 or 4	1000	1500	2000
5 or 6	1500	2250	3000
7, 8 or 9	2000	3000	4000

C. SOILS *(refer to site evaluation)*

1. Depth to restricting layer = 1 feet
2. Depth of percolation tests = _____ feet
3. Texture Sandy-loamy Sand 6-15
   Percolation rate 1.27 mpi
4. Soil loading rate .79 gpd/sqft *(see figure D-33)*
5. Percent land slope 0 %

D. ROCK LAYER DIMENSIONS

1. Multiply average design flow (A) by 0.83 to obtain required rock layer area.
   450 gpd x 0.83 sqft/gpd = 375 sqft
2. Determine rock layer width = 0.83 sqft/gpd x linear Loading Rate (LLR)
   0.83 sqft/gpd x 12 gpd/sqft = 10 ft
3. Length of rock layer = area ÷ width =
   375 sqft (D1) ÷ 10 ft (D2) = 38 ft

Mound LLR	
< 120 MPI	≤12
≥ 120 MPI	≤ 6

E. ROCK VOLUME

1. Multiply rock area (D1) by rock depth of 1 ft to get cubic feet of rock
   380 sqft x 1 ft = 380 cuft
2. Divide cuft by 27 cuft/cuyd to get cubic yards
   380 cuft ÷ 27 cuyd/cuft = 15 cuyd
3. Multiply cubic yards by 1.4 to get weight of rock in tons
   15 cuyd x 1.4 ton/cuyd = 21 tons

F. SEWAGE ABSORPTION WIDTH

Absorption width equals absorption ratio (See Figure D-33) times rock layer width (D2)

1.50 x 10 ft = 15.00 ft

D-33: Absorption Width Sizing Table

Percolation Rate in Minutes per Inch (MPI)	Soil Texture	Loading Rate Gallons per day per square foot	Absorption Ratio
Faster than 5	Coarse Sand Medium Sand Loamy Sand Fine Sand	1.20	1.00
6 to 15	Sandy Loam	0.79	1.50
16 to 30	Loam	0.60	2.00
31 to 45	Silt Loam Silt	0.50	2.40
46 to 60	Sandy Clay Loam Silty Clay Loam Clay Loam	0.45	2.67
61 to 120	Silty Clay Sandy Clay Clay	0.24	5.00
Slower than 120*			

*System designed for these soils must be other or performance

ONSITE SEWAGE TREATMENT PROGRAM

G. Mound Slope Width and Length (landslope less than or equal to 1%)

<=1% land slope

1. Absorption width (F) 15 ft

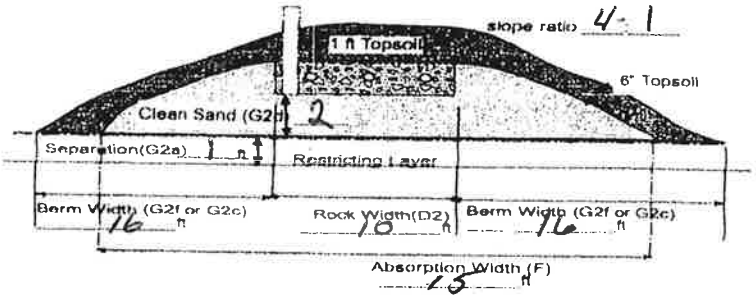
2. Calculate mound size

a. Determine depth of clean sand fill

at upslope edge of rock layer = 3 ft

minus the distance to restricting layer (C1)

3 ft - 1 ft = 2 ft



b. Mound height at the upslope edge of rock layer = depth of clean sand for separation (G2a) at upslope edge plus depth of rock layer (1 ft) plus depth of cover (1 ft)

2 ft + 1ft + 1ft = 4 ft

c. Berm width = upslope mound height (G2b) times 4 *(4 is recommended, but could be 3-12)*

4 x 4 = 16 ft

d. The total landscape width is the sum of berm (G2c) width plus rock layer width (D2) plus berm width (G2c): 16 ft + 10 ft + 16 ft = 42 ft

e. Additional width necessary for absorption = absorption width (F) minus the landscape width (G2d)

_____ ft - _____ ft = _____ ft, *if number is negative (<0) skip to g*

f. Final berm width = additional width (G2e) plus the berm width (G2c)

_____ ft + _____ ft = _____ ft

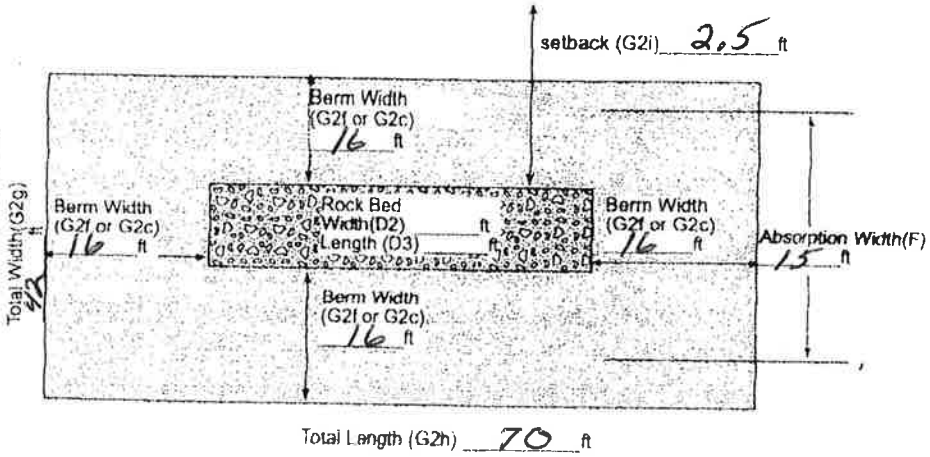
g. Total mound width is the sum of berm width (G2f or G2c) plus rock layer width (D2) plus berm width (G2f or G2c): 16 ft + 10 ft + 16 ft = 42 ft

h. Total mound length is the sum of berm (G2f or G2c) plus rock layer length (D3) plus berm (G2f or G2c): 16 ft + 38 ft + 16 ft = 70 ft

i. Setbacks from the rockbed are calculated as follows: the absorption width (F) minus the rock bed width (D2) divided by 2: (15 ft - 10 ft) ÷ 2 = 2.5 ft

Final Dimensions:

42 x 70



I hereby certify that I have completed this work in accordance with applicable ordinances, rules and laws.

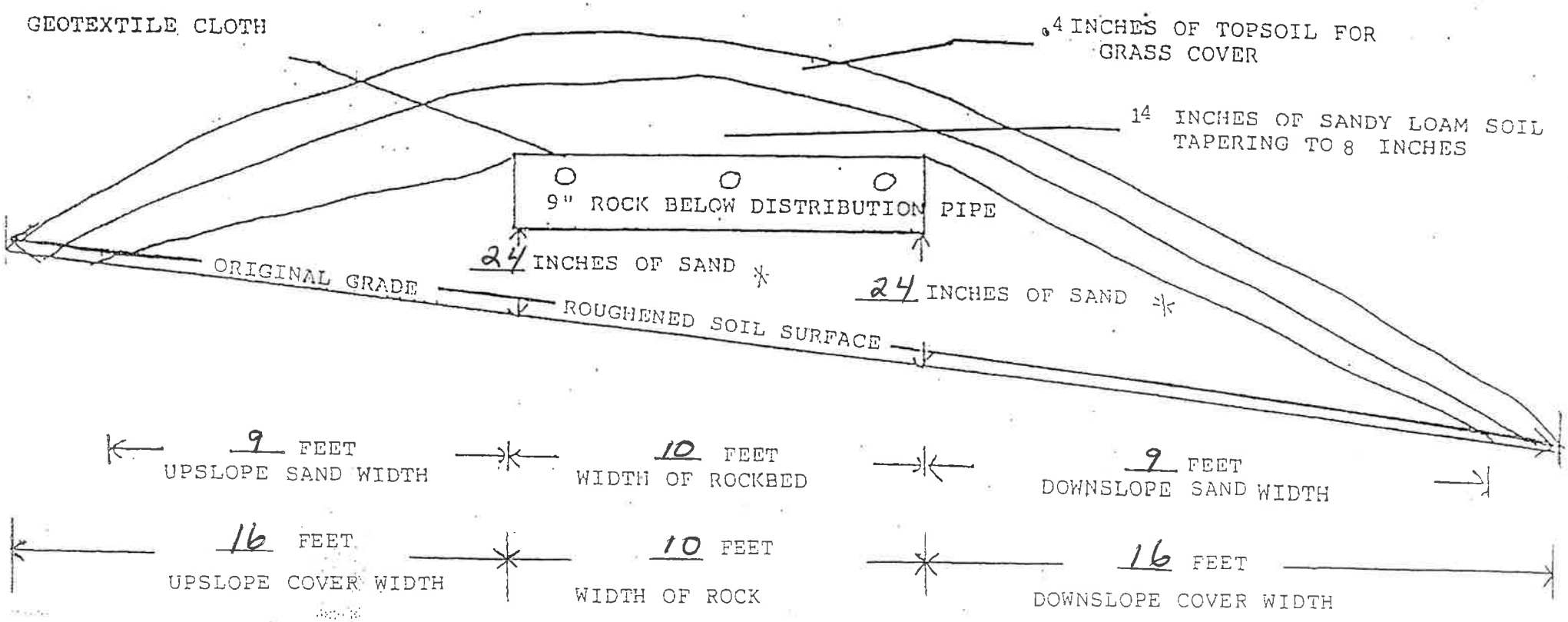
Tom Dixon (signature) L2132 (license #) 3/26/2016 (date)

MOUND CROSS-SECTION

0 PERCENT SLOPE OF ORIGINAL SOIL

10 FT. x 38 FT. SIZE OF ROCKBED

28 FT. x 56 FT. SIZE OF SANDBASE (washed)



9 FEET
UPSLOPE SAND WIDTH

10 FEET
WIDTH OF ROCKBED

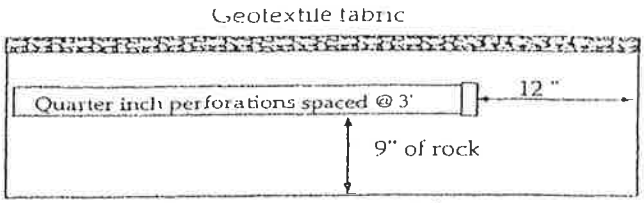
9 FEET
DOWNSLOPE SAND WIDTH

16 FEET
UPSLOPE COVER WIDTH

10 FEET
WIDTH OF ROCK

16 FEET
DOWNSLOPE COVER WIDTH

PRESSURE DISTRIBUTION SYSTEM



Perf Sizing 3/16" - 1/4"
Perf Spacing 1.5'- 5'

1. Select number of perforated laterals 3

2. Select perforation spacing = 3 ft

3. Since perforations should not be placed closer than 1 foot to the edge of the rock layer (see diagram), subtract 2 feet from the rock layer length.

   38 (Rock layer length) - 2 ft = 36 ft

4. Determine the number of spaces between perforations. Divide the length (3) by perforation spacing (2) and round down to nearest whole number.

   Perforation spacing = 36 ft ÷ 3 ft = 12 spaces

5. Number of perforations is equal to one plus the number of perforation spaces(4). *Check figure E-4 to assure the number of perforations per lateral guarantees <10% discharge variation.*

   12 spaces + 1 = 13 perforations/lateral

6. A. Total number of perforations = perforations per lateral (5) times number of laterals (1)

   13 perfs/lat x 3 lat = 39 perforations

   B. Calculate the square footage per perforation.
   Should be 6-10 sqft/perf. *Does not apply to at-grades.*
   Rock bed area = rock width (ft) x rock length (ft)
   10 ft x 38 ft = 380 sqft
   Square foot per perforation = Rock bed area ÷ number of perfs (6)
   380 sqft ÷ 39 perfs = 9.75 sqft/perf

7. Determine required flow rate by multiplying the total number of perforations (6A) by flow per perforation *(see figure E-6)*

   39 perfs x .74 gpm/perfs = 29 gpm

8. If laterals are connected to header pipe as shown on upper example, to select minimum required lateral diameter; enter figure E-4 with perforation spacing (2) and number of perforations per lateral (5) Select minimum diameter for perforated lateral = 1.25 inches.

9. If perforated lateral system is attached to manifold pipe near the center, lower diagram, perforated lateral length (3) and number of perforations per lateral (5) will be approximately one half of that in step 8. Using these values, select minimum diameter for perforated lateral = 1 inches.

E-4: Maximum allowable number of 1/4-inch perforations per lateral to guarantee <10% discharge variation

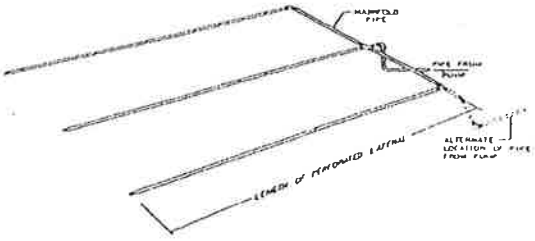
perforation spacing (feet)	1 inch	1.25 inch	1.5 inch	2.0 inch
2.5	8	14	18	28
3.0	8	13	17	26
3.3	7	12	16	25
4.0	7	11	15	23
5.0	6	10	14	22

E-6: Perforation Discharge in gpm

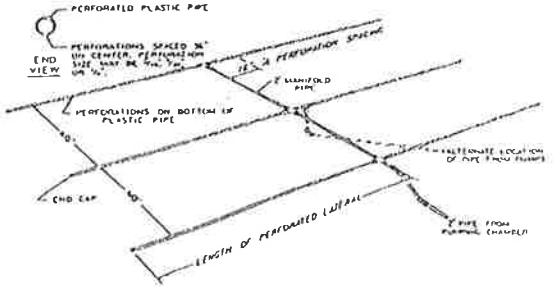
head (feet)	perforation diameter (inches) 1/8	3/16	7/32	1/4
1.0[a]	0.18	0.42	0.56	0.74
2.0[b]	0.26	0.59	0.80	1.04
5.0	0.41	0.94	1.26	1.65

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

MANIFOLD LOCATED AT END OF PRESSURE DISTRIBUTION SYSTEM



LAYOUT OF PERFORATED PIPE LATERALS FOR PRESSURE DISTRIBUTION IN MOUND



I hereby certify that I have completed this work in accordance with applicable ordinances, rules and laws.

Tom O'Neil (signature) L2132 (license #) 3/24/2016 (date)

PUMP SELECTION PROCEDURE

Approximate Elevations:

Bench Mark	100
Tank inlet	97.5
Pump elevation	94
Bottom of rock	102
manifold	102.75

1. Determine pump capacity:

A. Gravity distribution

1. Minimum required discharge is 10 gpm
2. Maximum suggested discharge is 45 gpm. For other establishments at least 10% greater than the water supply rate, but no faster than the rate at which effluent will flow out of the distribution device.

B. Pressure distribution

See pressure distribution work sheet

From A or B Selected pump capacity: 29 gpm

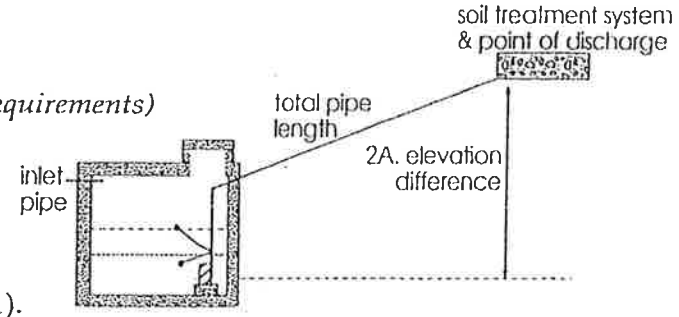
2. Determine pump head requirements:

A. Elevation difference between pump and point of discharge?

9 feet

B. Special head requirement? *(See Figure at right - Special Head Requirements)*

5 feet



Special Head Requirements	
Gravity Distribution	0 ft
Pressure Distribution	5 ft

C. Calculate Friction loss

1. Select pipe diameter 2 in
2. Enter *Figure E-9* with gpm (1A or B) and pipe diameter (C1).

   Read friction loss in feet per 100 feet from Figure E-9

   Friction Loss = 1.55 ft/100ft of pipe
3. Determine total pipe length from pump discharge to soil treatment discharge point. Estimate by adding 25 percent to pipe length for fitting loss. Total pipe length times 1.25 = equivalent pipe length

   40 feet x 1.25 = 50 feet
4. Calculate total friction loss by multiplying friction loss (C2) in ft/100 ft by the equivalent pipe length (C3) and divide by 100.

   = 1.55 ft/100ft x 50 ÷100 = 1 ft

D. Total head required is the sum of elevation difference (A), special head requirements (B), and total friction loss (C4)

9 ft + 5 ft+ 1 ft =

Total head: 15 feet

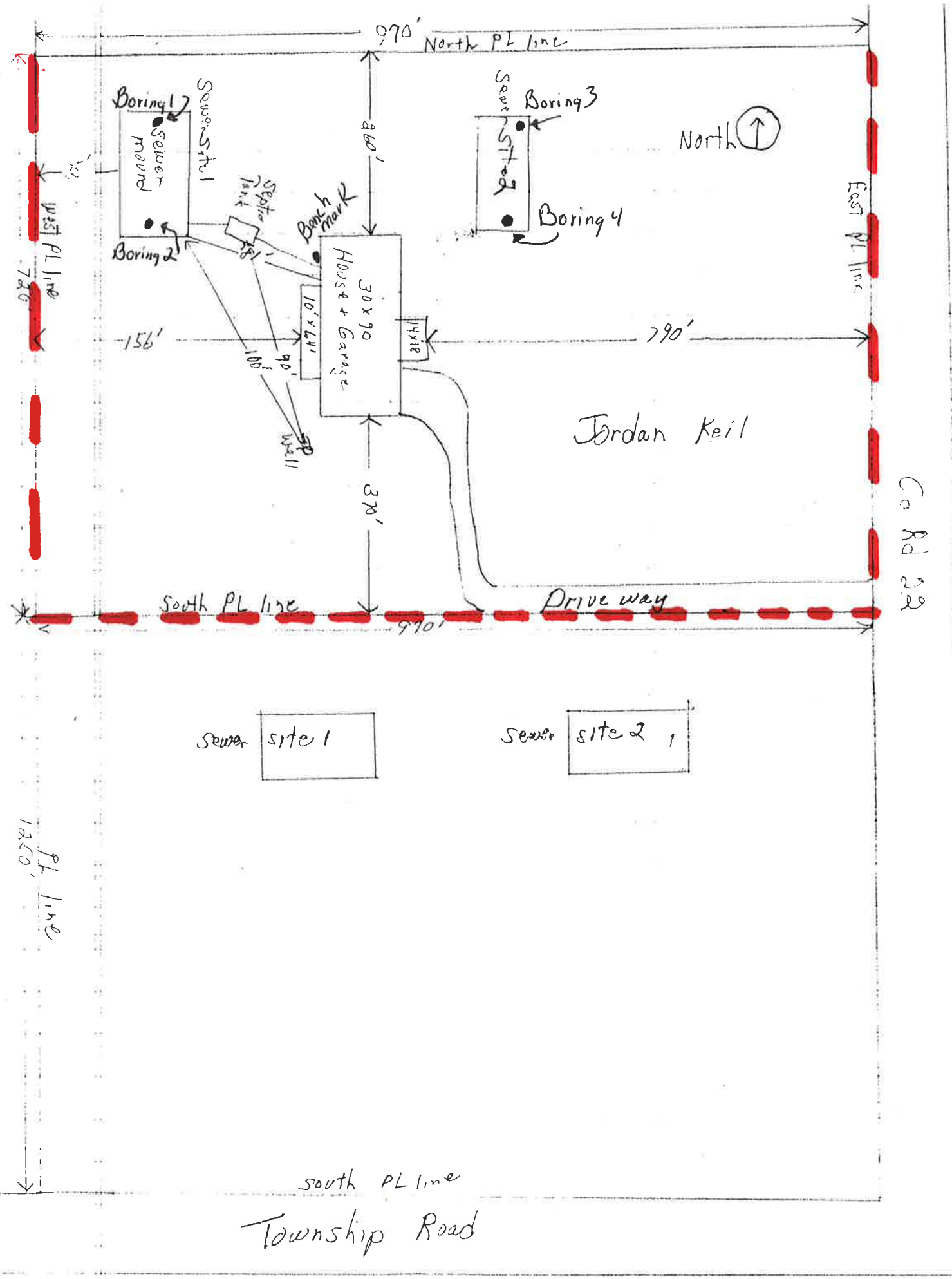
E-9: Friction Loss in Plastic Pipe Per 100 feet			
	nominal pipe diameter		
flow rate gpm	1.5"	2"	3"
20	2.47	0.73	0.11
25	3.73	1.11	0.16
30	5.23	1.55	0.23
35	6.96	2.06	0.30
40	8.91	2.64	0.39
45	11.07	3.28	0.48
50	13.46	3.99	0.58
55		4.76	0.70
60		5.60	0.82
65		6.48	0.95
70		7.44	1.09

3. Pump selection

A pump must be selected to deliver at least 29 gpm (1A or B) with at least 15 feet of total head (2D)

I hereby certify that I have completed this work in accordance with applicable ordinances, rules and laws.

Tom O'Brien (signature) L2132 (license #) 3/26/2016 (date)


970'
North PL line
Boring 1
Sewer Syst 1
Sewer main
Boring 2
Septic Tank
Bench mark
660'
Sewer Syst 2
Boring 3
Boring 4
North
East PL line
West PL line
720'
156'
10'x16'
30'x90'
House + Garage
14'x18'
790'
100'
90'
well
370'
Jordan Keil
South PL line
Drive way
990'
Co Rd 22
Sewer site 1
Sewer site 2
1250'
PL line
south PL line
Township Road

01-0-007702

FIELD EVALUATION SHEET

PRELIMINARY EVALUATION DATE March 26, 2016, FIELD EVALUATION DATE March 26, 2016
PROPERTY OWNER: _____ PHONE _____
ADDRESS: _____ CITY,STATE,ZIP: Aitkin, Mn. 56431
LEGAL DESCRIPTION: _____
PIN# _____ SEC 4 T 47 R 27 TWP NAME Aitkin
FIRE# _____ LAKE/RIVER _____ LAKE CLASS _____ OHWL _____ FT.

DESCRIPTION OF SOIL TREATMENT AREAS

	AREA #1	AREA #2
DISTURBED AREAS	YES___ NO X	YES___ NO X
COMPACTED AREAS	YES___ NO X	YES___ NO X
FLOODING	YES___ NO X	YES___ NO X
RUN ON POTENTIAL	YES___ NO X	YES___ NO X
SLOPE %	0	0
DIRECTION OF SLOPE	—	—
LANDSCAPE POSITION	E-W	E-W
VEGETATION TYPES	Hayfield - grass	Hayfield - grass

REFERENCE BM ELEV. _____ FT.
REFERENCE BM DESCRIPTION _____

DEPTH TO STANDING WATER OR MOTTLED SOIL: BORING# 1 13, 1A 13, 2 14, 2A 13

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: Ground is flat There should be many possible sites

LIC# L2132 SITE EVALUATOR SIGNATURE: Tom O'Neil

SITE EVALUATOR NAME: Tom O'Neil TELEPHONE# 218-927-6070

LUG REVIEW _____ DATE _____

Comments: _____

SOIL BORING LOGS ON REVERSE SIDE

Form des 2/20/98

Very Consistent Sandy Soils on top

Boring 1

SOILS DATA

DEPTH (INCHES)	TEXTURE	MUNSELL COLOR
0-10	Sandy Loam	10yr 3/3 - 4/3
10-14	Loamy Sand	10yr 5/4

Mottles at 13"

Boring 2

SOILS DATA

DEPTH (INCHES)	TEXTURE	MUNSELL COLOR
0-10	Sandy Loam	10yr 3/3 - 4/3
10-15	Loamy Sand	10yr 5/4

Mottles at 13"

Boring 3

SOILS DATA

DEPTH (INCHES)	TEXTURE	MUNSELL COLOR
0-8	Sandy Loam	10yr 3/3-3/4
8-12	Loamy Sand	10yr 4/4
12-16	Loamy Sand	10yr 5/4

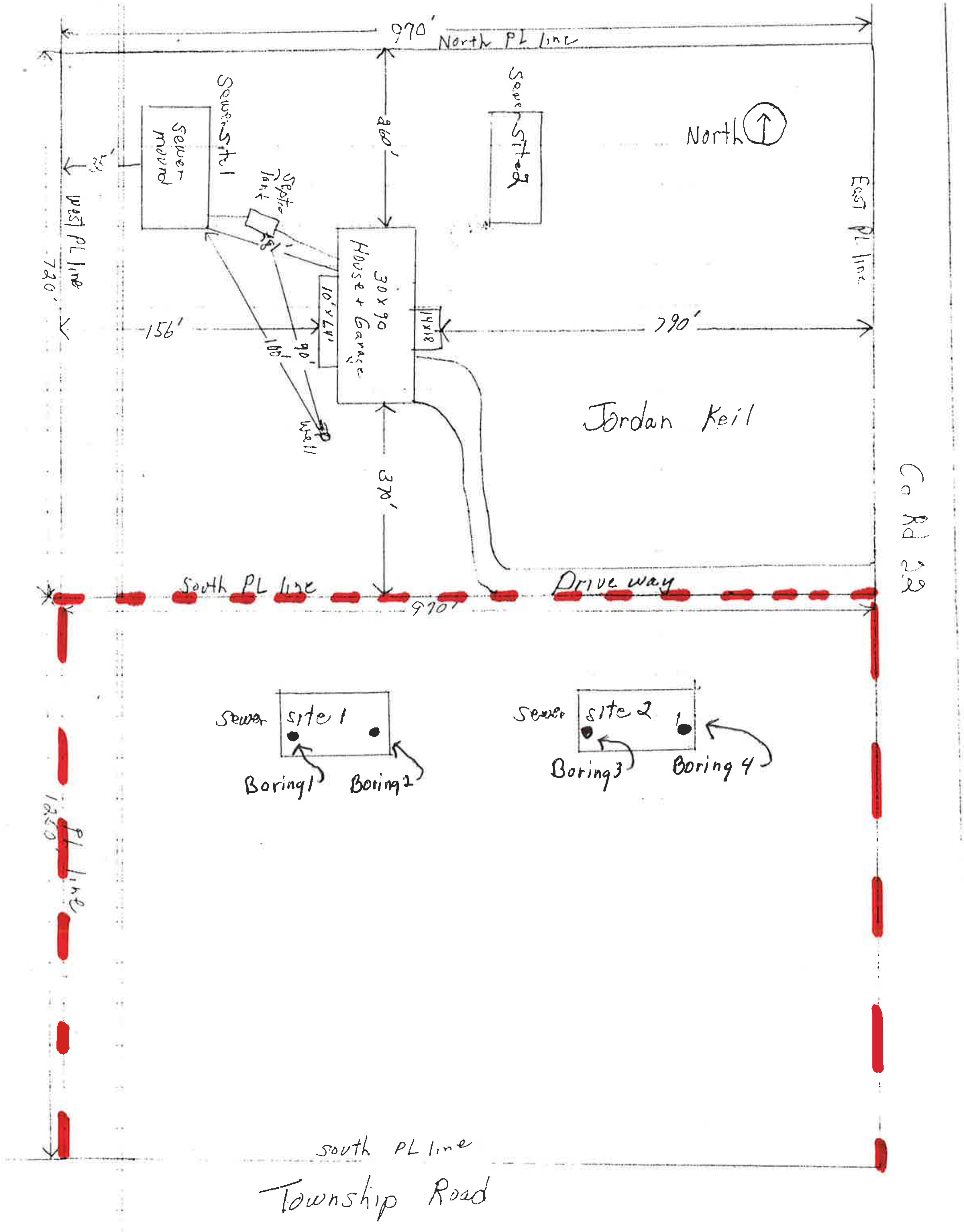
Mottles at 14"

Boring 4

SOILS DATA

DEPTH (INCHES)	TEXTURE	MUNSELL COLOR
0-8	Sandy Loam	10yr 3/3 - 4/3
8-11	Loamy Sand	10yr 4/4
11-17	Loamy Sand	10yr 5/4

Mottles at 13"


970'
North PL line
Sewer Site 1
Sewer mound
Septic Tank
260'
Sewer Site 2
North
West PL line
720'
156'
10'x24'
30x90 House + Garage
14x18
790'
East PL line
90'
100'
Well
Jordan Keil
370'
Co Rd 22
South PL line
Drive way
970'
Sewer site 1
Sewer site 2
Boring 1
Boring 2
Boring 3
Boring 4
1320
PL line
South PL line
Township Road