FIELD EVALUATION SHEET

PRELIMINARY EVALUATION DATE _____, FIELD EVALUATION DATE 5-3-16
PROPERTY OWNER: William Fox PHONE _____
ADDRESS: 36474 452nd Place CITY, STATE, ZIP: Aitkin 56431
LEGAL DESCRIPTION: NE of SE
PIN# 01-0-040301 SEC 19 T 47 R 22 TWP NAME Aitkin
FIRE# _____ LAKE/RIVER Cedar Creek LAKE CLASS _____ OHWL _____ FT

DESCRIPTION OF SOIL TREATMENT AREAS

	AREA #1	AREA #2
DISTURBED AREAS	YES ___ NO X	YES ___ NO ___
COMPACTED AREAS	YES ___ NO X	YES ___ NO ___
FLOODING	YES X NO ___	YES ___ NO ___
RUN ON POTENTIAL	YES ___ NO X	YES ___ NO ___
SLOPE %	0	0
DIRECTION OF SLOPE	0	
LANDSCAPE POSITION	Level	
VEGETATION TYPES	grass yard	

REFERENCE BM ELEV. 1200.3 F
REFERENCE BM DESCRIPTION NW corner of ft

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

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

SOIL SIZING FACTOR: SITE # 1 2.00, SITE #2 _____

CONSTRUCTION RELATED ISSUES: 1820 combo to 10'x38' Rock Bed o.c. 2.6' Sand Base

LIC# 2088 SITE EVALUATOR SIGNATURE: B & B Built

SITE EVALUATOR NAME: B & B TELEPHONE# 831-6430

LUG REVIEW KT DATE 5-5-16

Comments: Rock bed has been elevated to meet 10 year floodplain requirement

SOIL BORING LOGS ON REVERSE SIDE

APPROVED
___ ONSITE INSPECTION
X NO ONSITE INSPECTION soils to be verified at time of installation

Form des 2/20/98 SIGN KT DATE 5-5-16

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SOILS CHARTS FOR BOTH PROPOSED AND ALTERNATE SITES

1 (PROPOSED) SOILS DATA

DEPTH (INCHES)	TEXTURE	MUNSELL COLOR
5"	Topsoil	10yr 3/3
14"	Loamy Clay	7.5yr 4/4
C		7.5yr 4/2

2 (PROPOSED) SOILS DATA

DEPTH (INCHES)	TEXTURE	MUNSELL COLOR
SAME		

1 (ALTERNATE) SOILS DATA

DEPTH (INCHES)	TEXTURE	MUNSELL COLOR

2 (ALTERNATE) SOILS DATA

DEPTH (INCHES)	TEXTURE	MUNSELL COLOR

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ADDITIONAL SOIL BORINGS MAY BE REQUIRED

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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

1820 combo gallons *(see figure C-1)*

C. SOILS *(refer to site evaluation)*

1. Depth to restricting layer = 14" feet
2. Depth of percolation tests = ____ feet
3. Texture Loamy Clay
   Percolation rate _____ mpi
4. Soil loading rate .60 gpd/sqft *(see figure D-33)*
5. Percent land slope 0 %

C-1: Septic Tank Capacities (in gallons)

Number of Bedrooms	Minimum Liquid Capacity	Liquid capacity with garbage disposal	Liquid capacity with disposable liner 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

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 = 380 sqft
2. Determine rock layer width = 0.83 sqft/gpd x linear Loading Rate (LLR)
   0.83 sqft/gpd x _____ gpd/sqft = _____ ft
3. Length of rock layer = area ÷ width =
   380 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
   _____ sqft x 1 ft = 380 cuft
2. Divide cuft by 27 cuft/cuyd to get cubic yards
   380 cuft ÷ 27 cuyd/cuft = 14 cuyd
3. Multiply cubic yards by 1.4 to get weight of rock in tons
   14 cuyd x 1.4 ton/cuyd = 20 tons

F. SEWAGE ABSORPTION WIDTH

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

10 x 2.00 ft = 20 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	0.34	3.00
Slower than 120*			

*System designed for these soils must meet the criteria of publication

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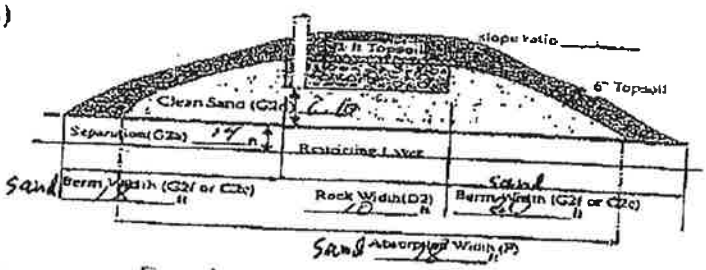
G. **Mound Slope Width and Length (landslope less than or equal to 1%)**

<=1% land slope



1. Absorption width (F) 20 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 = 2.6 ft - see note on field evaluation sheet.

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)

2.6 ft + 1ft + 1ft = 4.6 ft

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

4.6 x 4 = 18.4 ft

d. The total landscape width is the sum of berm (G2c) width plus rock layer width (D2) plus berm w (G2c): 18 ft + 10 ft + 18 ft = 46 ft

e. Additional width necessary for absorption = absorption width (F) minus the landscape width (G2c

20 ft - 18 ft = 2 ft, *if number is negative (<0) skip to g*

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

2 ft + 18 ft = 20 ft

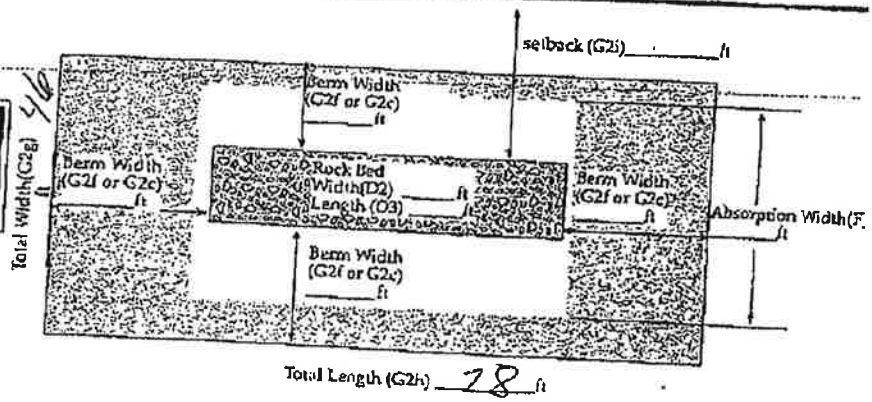
g. Total mound width is the sum of berm width (G2f or G2c) plus rock layer width (D2) plus berm width (G2f or G2c): 20 ft + 10 ft + 20 ft = 50 ft

h. Total mound length is the sum of berm (G2f or G2c) plus rock layer length (D3) plus berm (G2f or G2c): 20 ft + 38 ft + 20 ft = 78 ft

i. Setbacks from the rockbed are calculated as follows: the absorption width (F) minus the rock bed wi (D2) divided by 2: (20 ft - 10 ft) ÷ 2 = 5 ft

Final Dimensions:

46 x 95



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

Bob Bartell (signature) 2088 (license #) 5-3-16 (date)

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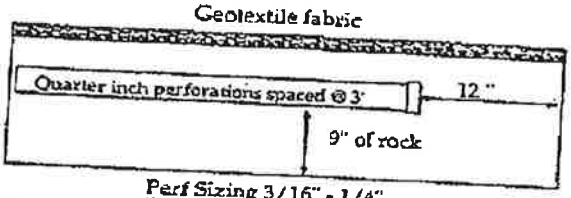
PRESSURE DISTRIBUTION SYSTEM



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 = 9.7 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 = 13 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 = _____ inches.

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

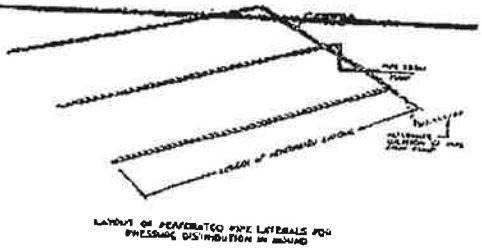
perforation spacing (feet)	1 inch	1.25 inch	1.5 inch	2.0 inch
2.5	8	14	18	28
3.0	8	13	17	26
3.3	7	12	16	25
4.0	7	11	15	23
5.0	6	10	14	22

E-6: Perforation Discharge in gpm

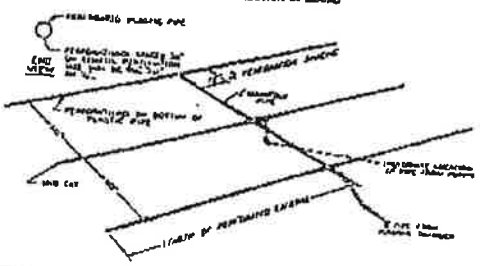
head (feet)	perforation diameter (inches) 1/8	3/16	7/32	1/4
1.0[a]	0.18	0.42	0.56	0.74
2.0[b]	0.26	0.59	0.80	1.04
5.0	0.41	0.94	1.26	1.65

[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 SYSTEMS



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PUMP SELECTION PROCEDURE

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

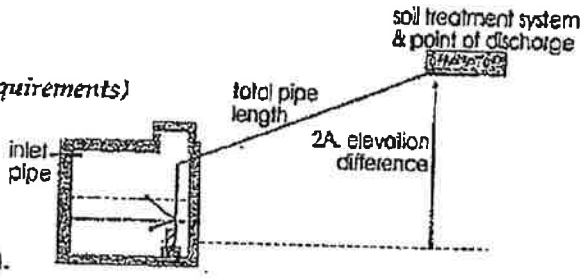
See pressure distribution work sheet

From A or B Selected pump capacity: 29 gpm

2. Determine pump head requirements:

A. Elevation difference between pump and point of discharge?
8 feet

B. Special head requirement? *(See Figure at right - Special Head Requirements)*
5 feet 13



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 = 1.53 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
   70 feet x 1.25 = 87.5 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.
   = 1.53 ft/100ft x 70 ÷100 = 1.3 ft

D. Total head required is the sum of elevation difference (A), special head requirements (B), and total friction loss (C4)
8 ft + 5 ft + 1.3 ft =

Total head: 14 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	0.68
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 14 feet of total head (2D)

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

Bob Bartlett (signature) 2088 (license #) 5-3-16 (date)

KT 5-5-16

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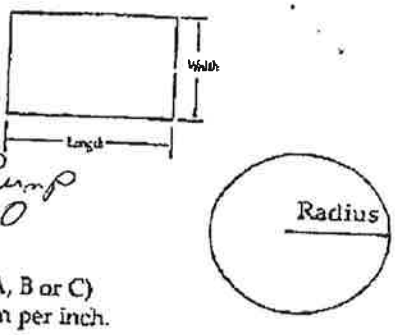
DOSING CHAMBER SIZING

1. Determine area
   A. Rectangle area = L x W
   _____ x _____ = _____ square feet
   B. Circle area = π (3.14) x radius in feet x radius in feet
   3.14 x _____ ft x _____ ft = _____ sqft
   C. Get area from manufacturer 1220 - 1160 = 60 sqft Trash Pump



2. Calculate gallons per inch
   There are 7.5 gallons per cubic foot of volume, therefore multiply the area (1A, B or C) times the conversion factor and divide by 12 inches per foot to calculate gallon per inch.
   Area x 7.5 ÷ 12 = _____ sqft x 7.5 ÷ 12 in/ft = 15.86 gallon per inch

3. Calculate total tank volume 59" x 12.1 long x 6'6" wide
   A. Depth from bottom of inlet pipe to tank bottom 48.6 in
   B. Total tank volume = depth from bottom of inlet pipe to tank bottom (3A) x gal/in (2)
   = 48.6 in x 15.86 gal/in = 770.60 gal

Legal Tank:
500 gallons or
100% the Daily flow
or
Alternating Pumps

4. Calculate gallons to cover pump (with 2-3 inches of water covering pump)
   (Pump and block height (inch) + 2 inch) x gallon/inch
   (22 in +2 in) x 15.86 gal/in = 349 gallon

5. Calculate total pumpout volume
   A. Select pump size for 4-5 does per day. Gallon per dose = gpd (see *figure A-1*)
   / doses per day = 450 gpd ÷ 4 doses/day = 113 gallons
   B. Calculate drainback
      1. Determine total pipe length, 70 feet
      2. Determine liquid volume of pipe, .12 gal per ft (see *figure E-20*)
      3. Drainback quantity = 70 ft (5B1) x .12 gal per ft (5B2) = 12 gal
   C. Total pump out volume = dose volume (5A) + drainback (5B3)
   113 gal + 12 gal = 125 Total gallon

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	255	
5	750	450	294	
6	900	525	332	
7	1050	600	370	
8	1200	675	408	

E-20: Volume of Liquid in Pipe

Pipe Diameter inches	Gallons per foot
1	0.045
1.25	0.078
1.5	0.11
2	0.17
2.5	0.25
3	0.38
4	0.66

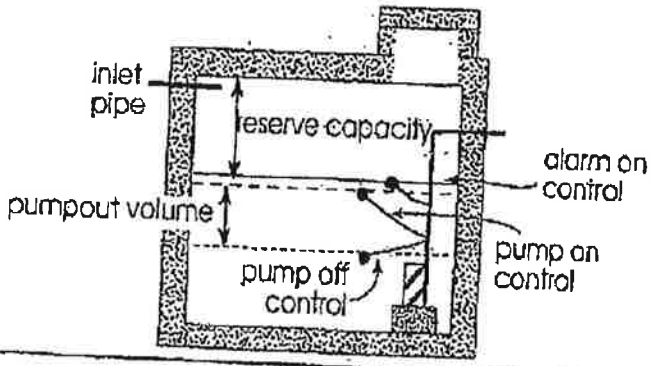
6. Float separation distance (using total pumpout volume)
   Total pumpout volume (5C) ÷ gal/inch (2)
   125 gal ÷ 15.86 gal/in = 8 inch

7. Calculate volume for alarm (typically 2 to 3 inches)
   Alarm depth (inch) x gallon/inch (2) = 2 in x 15.86 gal/in) = 32 gal

8. Calculate total gallon = gallons over pump (4) + gallons pumpout (5C) + gallons alarm (7)
   349 gal + 125 gal + 32 gal = 526 gallons

9. Total Tank Depth = total gallon (8) ÷ gallon/inch (2)
   526 gal ÷ 2 gal/in = 263 in

Recommended:
Calculate reserve capacity (75% the daily flow)
Daily flow x .75 = 450 x .75 = 338 gallons



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Bob Bould (signature) 2088 (license #) 5-3-16 (date)

KT 5-5-16

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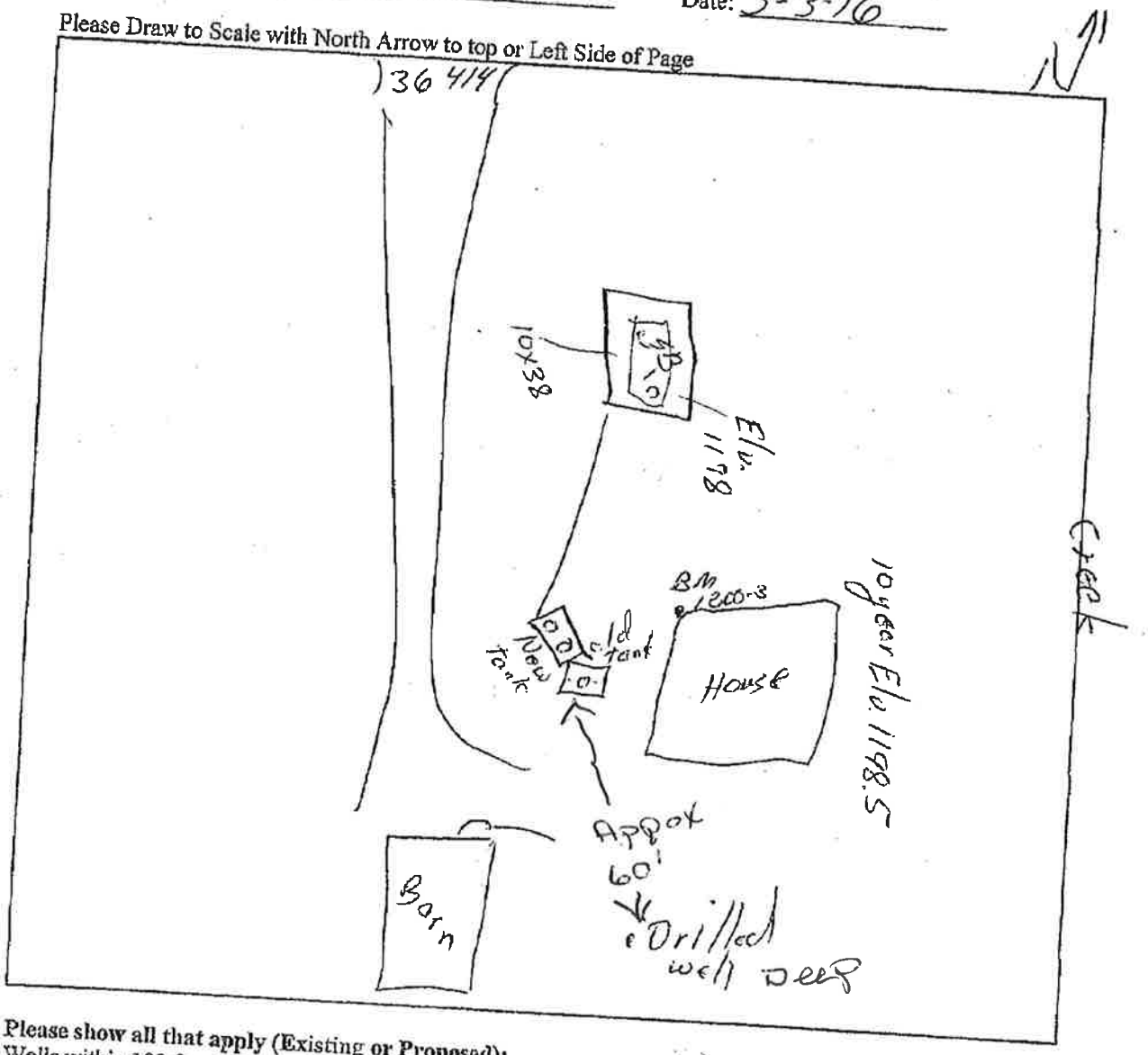
Mound Design

Property Owner: William Fox Date: 5-3-16

Please Draw to Scale with North Arrow to top or Left Side of Page



Please show all that apply (Existing or Proposed):

Wells within 100 ft. of a Drainfield
Water lines within 10 ft. of a Drainfield
Disturbed/Compacted Areas
Drainfield Areas
Boring Locations
Component Location
OHW
Lot Easements
Access Route for Tank Maintenance
Property Lines
Structures
Setbacks

Elevations:

1200.3 Benchmark Elevation
1197 Elevation of Sewer Line at House
1196.4 Tank Inlet Elevation
1200.9 Drainfield Elevation
1192.4 Pump Elevation
1201 Pump Discharge Elevation
1197 Restricting Layer Elevation

Designer Signature: Bob Ravold Date: 5-3-16
License Number: 20858 Page 5 of 5

KT 5-5-16