Type 3 System Similar to an inground mound

# FIELD EVALUATION SHEET

PRELIMINARY EVALUATION DATE August 2, 2023, FIELD EVALUATION DATE July 12, 2023
PROPERTY OWNER: Timothy & Pauline Anderson PHONE 218-838-9493
ADDRESS: 31901-416th Avenue CITY,STATE,ZIP: Aitkin, Mn. 56431
LEGAL DESCRIPTION:
PIN# 07-0-028802 SEC 14 T 46 R 27 TWP NAME Farm Island
FIRE# LAKE/RIVER Bachelor LAKE CLASS OHWL FT.

## DESCRIPTION OF SOIL TREATMENT AREAS

| | AREA #1 | AREA #2 |
|---|---|---|
| DISTURBED AREAS | YES NO | YES NO |
| COMPACTED AREAS | YES NO | YES NO |
| FLOODING | YES NO X | YES NO |
| RUN ON POTENTIAL | YES NO X | YES NO |
| SLOPE % | 1 | |
| DIRECTION OF SLOPE | E-W | |
| LANDSCAPE POSITION | N-S | |
| VEGETATION TYPES | Grass | |

REFERENCE BM ELEV. 100 FT.
REFERENCE BM DESCRIPTION Ground level by soil pit flag

DEPTH TO STANDING WATER OR MOTTLED SOIL: BORING# 1 pit 40"-48", 1A____, 2____, 2A____

BOTTOM ELEVATION–FIRST TRENCH OR BOTTOM OF ROCK BED: #1 99 FT., #2____FT.

SOIL SIZING FACTOR: SITE # 1 .83., SITE #2____

CONSTRUCTION RELATED ISSUES: Area must be dug out 48" and filled with 36" of washed sand and will have 12" of rock on top. Top of rock bed will be at the existing ground level or very close

LIC# L2132 SITE EVALUATOR SIGNATURE: Tom O'Neil

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

LUG REVIEW TO

DATE 8-18-23

Comments: When the house and garage were built, any dirt removed from their areas was spread over the original ground to blend in with the buildings and create a nicer area around them. That is why the dirt is to be dug out and replaced with washed sand. System must have a filter and alarm

SOIL BORING LOGS ON REVERSE SIDE

Existing tanks were pumped & inspected by Timber Lakes and found to be good. a larger pumptank will need to be added (600gal. minimum) for the new 4 bedroom system. The existing pumptank is only about a 350gallon or slightly larger

Form des 2/20/98

Scale: 1 square = _____

7/12/2023

CR 76 Almost across from Tim Wadsworth

Soil investigation w/ Jeff Brunner

Site 1 51491 190th Pl., McGregor Pit

A 0-4" 10YR3/2 LS 5-10% cf
Bw 4-30" 5YR 4/4/5 5-10% cf
C 30-59" 7.5YR4/6 S 5-10% cf.

Site 2 51767 186th Pl., McGregor

A 0-4" 10YR3/2 LS 10-15% cf
Bw 4-28" 7.5YR4/4

Tom O'Neil

7/12/2023 Tom O'Neil
31901 CR 76, Aitkin

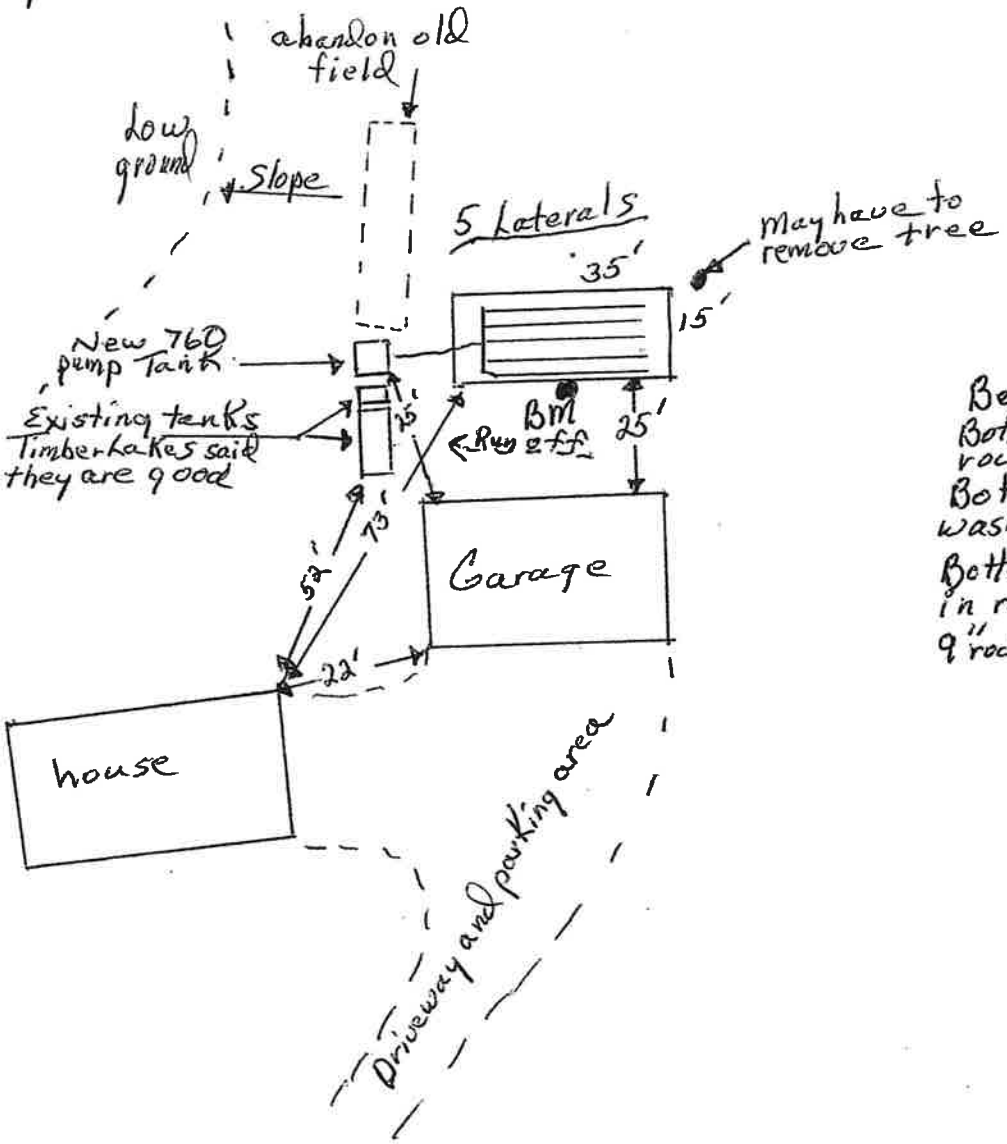
Site for possible septic system

Fill 0-26" Put in place in 1978
A 26-30" 10YR 2/2 SiL 10-15% cf
E 30-37" 10YR 5/3 SiL 5-10% cf
Bt1 37-40" 10YR 4/4 CL 5-10% cf
Bt2 40"+ 10YR 4/4 CL
7.5YR 5/6 + 6/2 mottles.

I suggested to Tom that he take out the upper 24-30" of material and replace with clean sand - kind of an inground mound - 12' wide and however long he needs for a 3BR requirement.

A pit was dug and Brian and I both did the soils

If homeowner would prefer, a new 1820 tank could replace everything




| | |
|---|---|
| Bench mark | 100 |
| Bottom of rock bed — | 99 |
| Bottom of washed sand — | 96 |
| Bottom of pipe in rock bed | 99.75 |

9" rock under pipe

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 5.
   b. Select perforation spacing = 3 ft.
   c. Subtract 2 ft from rock layer length:
   35 - 2 = 33 feet. (Length of Lateral)

**ROCK LAYER LENGTH**

   d. Determine the number of spaces between perfs:
   33 / 3 = 11 spaces
   (length of lateral) / (perf. spacing)
   e. 11 spaces + 1 = 12 perforations per lateral
   f. Multiply perforations per lateral by number of laterals to get total number of perforations:
   12 x 5 = 60
   (perfs/lateral) x (laterals) = (perforations)
   g. 60 X .74 = 45 GPM
   (Perforations) x (gpm/perfs)

**SELECTED PUMP CAPACITY 45 GPM**

B. Determine head requirements:

1. Elevation difference beteween pump & point of discharge:
   11 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. = 3.28 ft/100 of pipe
   b. Determine total pipe length from pump to discharge point. Add 25% to pipe length for fitting loss.
   35 length x 1.25 44 feet.
   c. Calculate total friction loss by multiplying friction loss in 100 ft. of pipe by equivalent pipe length (B):

Total friction loss = 3.28 x 44 /100 = 2 feet

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

11 (1) + 5 (2) + 2 (3c) **TOTAL HEAD** 18

**SELECT A PUMP TO DELIVER AT LEAST 45 GPM WITH AT LEAST 18 FEET OF TOTAL HEAD.**

If 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 use 1½" or 2"
For a center manifold system the values will be ½ of above.

Perforation Discharges in GPM

| Head (feet) | 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 |

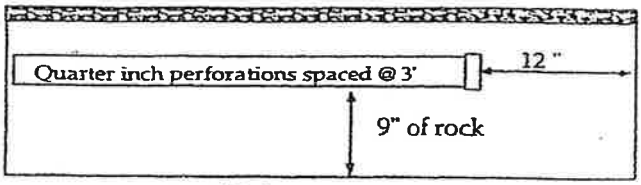
a. Use 1.0 foot single homes
b. Use 2.0 feet for anything else

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 1/4" | 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 |




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

1. Select number of perforated laterals 5

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.

$$\underset{\text{Rock layer length}}{35} - 2\text{ ft} = 33\text{ ft}$$

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 = 33 ft ÷ 3 ft = 11 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.*

11 spaces + 1 = 12 perforations/lateral

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

12 perfs/lat x 5 lat = 60 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)
15 ft x 35 ft = 500 sqft
Square foot per perforation = Rock bed area ÷ number of perfs (6)
500 sqft ÷ 60 perfs = 8 sqft/perf

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

60 perfs x .74 gpm/perfs = 45 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. use 1½ or 2"

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.

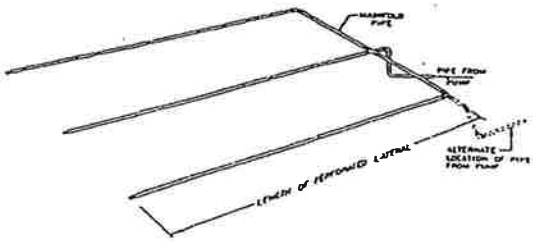
E-4: Maximum allowable number of 1/4-inch perforations per lateral to guarantee <10% discharge variation

| 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 |

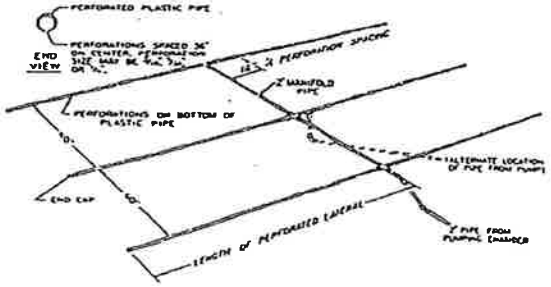
E-6: Perforation Discharge in gpm

| 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.




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 #) August 2, 2023 (date)

# TRENCH AND BED WORKSHEET

1. AVERAGE DESIGN FLOW

A. Estimated 600 gpd *(see figure A-1)*
or measured ___ x 1.5 *(safety factor)* = ___ gpd

B. Septic tank capacity 1,000 min. gal *(see figure C-1)*

2. SOILS *(Site evaluation data)*

C. Depth to restricting layer = 4 ft

D. Max depth of system Item 2C - 3 ft = 4 ft - 3 ft = 1 ft

E. Texture Washed Sand Percolation rate .83 MPI

F. Soil Sizing Factor (SSF) .83 sqft/gpd *(see figure D-15)*

G. % Land Slope 1 %

3. TRENCH or BED BOTTOM AREA

H. For trenches with 6 inches of rock below the pipe:
A x F = ___ gpd x ___ sqft/gpd = ___ sqft

I. For trenches with 12 inches of rock below the pipe:
A x F x 0.8 = ___ gpd x ___ sqft/gpd x 0.8 = ___ sqft

J. For trenches with 18 inches of rock below the pipe:
A x F x 0.66 = ___ gpd x ___ sqft/gpd x 0.66 = ___ sqft

K. For trenches with 24 inches of rock below the pipe:
A x F x 0.6 = ___ gpd x ___ sqft/gpd x 0.6 = ___ sqft

L. For gravity beds with 6 or 12 inches of rock below the pipe;
1.5 x A x F = 1.5 x ___ gpd x ___ sqft/gpd = ___ sqft
For pressure beds with 6 or 12 inches of rock below the pipe;
A x F = 600 gpd x .83 sqft/gpd = 500 sqft

4. DISTRIBUTION *(Check all that apply)*

- [X] Bed (< 6% slope)
- [ ] Trenches
- [X] Pressure
- [ ] Drop boxes (any slope)
- [ ] Distribution box (< 3%)
- [ ] Gravity
- [X] Rock
- [ ] Chamber
- [ ] Gravelless

5. SYSTEM WIDTH, LENGTH and VOLUME

M. Select trench width = 15 ft

N. If using rock, divide bottom area by width: (H, I, J,K or L) ÷ M =
500 sqft ÷ 15 ft = 35 lineal feet
Rock depth below distribution pipe plus 0.5 foot times bottom area:
Rock depth in feet + 0.5 feet x Area (H,I,J,K, or L)
(2.5 ft + 0.5 ft) x 500 sqft = 500 cuft
Volume in cubic yards = cuft ÷27
500 cuft ÷ 27 = 19 cuyds
Weight of rock in tons = cubic yds x 1.4
19 cuyds x 1.4 = 27 tons

O. If using 10" Gravelless Pipe, Flow (A) x Gravelless SSF *(see figure D-9)*
___ gpd x ___ lineal feet/gpd = ___ lineal feet

P. If using Chambers, H,I,J, or K(based on hieght of chamber slats) ÷ width of chamber in feet(M)
___ sqft ÷ ___ ft = ___ lineal ft

6. LAWN AREA

Q. Select trench spacing, center to center = 15 feet

R. Multiply trench spacing by lineal feet R x Q = sqft of lawn area
15 ft x 35 ft = 500 sqft

7. Include a drawing with scale (one inch = ___ ft). Show pertinent boundaries, right of way, easements, location of house, garage, driveway, all other imporvements, existing or proposed soil treatment system, well and dimensions of all elevations, setbacks and separation distances.

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

Tom O'Neil (signature) L2132 (license #) August 2, 2023 (date)

**A-1: Estimated Sewage Flows in Gallons per Day**

| number of bedrooms | Class I | Class II | Class III | Class IV 60% of the values in the Class I, II, or III columns. |
|---|---|---|---|---|
| 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 | |

**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 |

**D-15: Soil Characteristics and Soil:Sizing Factor (SSF) (> 3' separation)**

| Percolation Rate minutes per inch (mpi) | Soil Texture | Soil Sizing Factor square feet/gallon per day(sqft/gpd) |
|---|---|---|
| faster than 0.1* | Coarse sand | 0.83 |
| 0.1 to 5* | Medium sand<br>Loamy sand | 0.83 |
| 0.1 to 5** | Fine sand | 1.67 |
| 6 to 15 | Sandy loam | 1.27 |
| 16 to 30 | Loam | 1.67 |
| 31 to 45 | Silt loam<br>Silt | 2.00 |
| 46 to 60 | Clay loam<br>Sandy clay<br>Silty clay | 2.20 |
| over 61 to 120*** | Clay<br>Sandy clay<br>Silty clay | 4.20 |
| slower than 120**** | | |

*Use systems for rapidly permeable soils: pressure distribution or serial distribution with no trench >25% of the total system.
**Soil having 50% or more fine sand plus very fine sand
***A mound must be used.
****An other or performance system must be used

**D-9: Soil Characteristics and Soil sizing factors (SSF) for Gravelless Pipe**

| percolation rate (minutes/inch) | soil texture | lineal feet/ gallon/day |
|---|---|---|
| Faster than 0.1 * | Coarse Sand | — |
| 0.1 to 5 | Medium Sand<br>Loamy Sand | 0.28 |
| 0.1 to 5 | Fine Sand ** | 0.6 |
| 6 to 15 | Sandy Loam | 0.42 |
| 16 to 30 | Loam | 0.56 |
| 31 to 45 | Silt Loam<br>Silt | 0.67 |
| 46 to 60 | Clay Loam (CL)<br>Sandy CL | 0.74 |
| slower than 60*** | Silty CL<br>Clay<br>Sandy Clay<br>Silty Clay | — |

*Soil too coarse for sewage treatment. Use systems for rapidly permeable soils.
**Soil having 50% or more fine sand + very fine sand.
***Soil with too high a percentage of clay for installation of a standard inground system.