A. M. & Associates, Inc.

29465 442nd Lane
Palisade, MN 56469
(218) 768-4430

Michael D. O'Keeffe
SEPTIC SYSTEMS
DESIGNS * INSPECTIONS * MAINTENANCE
MPCA #1357

**THE ENCLOSED INDIVIDUAL SEWAGE TREATMENT SYSTEM (ISTS)
IS DESIGNED SPECIFICALLY FOR:**

DAVID SANNES
731 Marshall Avenue
St. Paul, MN 55104
(651) 329-8645

SIGN _____ DATE 5-4-16

NO ONSITE INSPECTION
ONSITE INSPECTION
APPROVED

For property located at:
47657 Nature Avenue
Palisade, MN 56469
Logan Township
Sec. 27, Twp. 49, Rge. 25
Parcel Number: 19-0-046901

April 28, 2016

A NEW ISTS SITE EVALUATION WILL BE REQUIRED IF SYSTEM IS NOT INSTALLED WITHIN 1 YEAR FROM ABOVE DATE

2 FOOT SANDBASE MOUND – SIZED FOR 2 BEDROOMS

Note to Installer:

1. **Licensed Installer *must* verify soils and *all* measurements *and* elevations on jobsite *prior* to installation.**
2. **ALL components of this system *must* be installed according to *current* Minnesota Chapter 7080 and Aitkin County's current ISTS & Wastewater Ordinance requirements.**
3. **Installer is to inform property owner of known supplies, contractors, and expenses required in order to make this ISTS operational -that is *not* covered in your contract.**
4. **Installer is to contact Designer for any questions and/or *prior* to making *any* changes to the enclosed designed tank(s) or drainfield.**

TANKS and LINES

1. **Pump & Inspect Out House Combination Tank - REUSE if Good
ELSE Install a 1650 Combination Tank.**
2. **Be sure the Sewer and Pump Lines are well supported to avoid bowing after ground settlement.**
3. **Install 2" "waterproof" styrofoam insulation on top of the Tank(s) to help prevent freezing problems.**

MOUND

1. **Construct a 44' x 53' 2 foot sandbase Mound with a 10' x 25' Rockbed.**

MOUND DESIGN SHEET

COUNTY: **Aitkin**

PROPERTY OWNER: **DAVID SANNES** TWP: **Logan**

PERMIT#: _____ PIN#: **19-0-046901** DATE: _____

DESIGNER NAME: **Michael D. and Annette M. O'Keeffe** LICENCE#: **1357**

SIGNATURE: _____ DATE: **4/28/2016**

OF BEDROOMS: **2** TYPE: **I** GARBAGE DISPOSAL: **No** AIR TEST **No**

WELL: Deep (50+) **x** Shallow _____ SETBACKS: Tank **60'** Drainfielc **150'** Sewer Line _____

FLOW

A. ESTIMATED **300** GPD OR MEASURED GPD
B. SEPTIC TANK VOLUME **EXISTING 1820** GALLONS
C. MIMINUM PUMP TANK VOLUME **667** GALLONS
C1. ALARM TYPE **Installer's Choice**

EST SEWAGE FLOW IN 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	372
8	1200	675	408

SOILS

D. DEPTH TO RESTRICTING LAYER = **1** FEET
E. DEPTH OF SAND ON UPSLOPE EDGE **2** FEET
F. SOIL TEXTURE = **Sandy Loam**
G. PERCOLATION RATE = **6 to 15** MPI
H. SOIL SIZING FACTOR = **1.27** SQ FT/GPD
I. LAND SLOPE % = **3** %

SEPTIC TANK CAPACITIES/VOLUME (gal)		
NUMBER OF BEDROOMS	MINIMUM CAPACITIES	
	TANK	GARBAGE DISPOSAL
2 OR LESS	**1000**	**1500**
3 OR 4	1000	1500
5 OR 6	1500	2250
7 OR 8	2000	3000
OVER 9	SEE FIG C-6	(x 1.5)____

ROCK LAYER DIMENSIONS

J. (A) **300** x 0.83 = **249.0** SQ FT
K. ROCK LAYER WIDTH = **10.0** FEET
L. LENGTH OF ROCK BED = (J) ÷ (K) = **25** FT (rounded up)

SIZING TABLE			
PERC RATE	SOIL TEXTURE	(SSF) SQ FT GAL/DAY	ABSORPTION WIDTH RATIO
< THAN 0.1	COARSE SAND	------	1.00
0.1 TO 5	SAND	0.83	1.00
0.1 TO 5	FINE SAND	1.67	2.00
6 TO 15	**SANDY LOAM**	**1.27**	**1.50**
16 TO 30	LOAM	1.67	2.00
31 TO 45	SILT LOAM	2.00	2.40
46 TO 60	CLAY LOAM	2.20	2.67
> THAN 60	CLAY	------	5.00
> THAN 120	CLAY	------	6.00

ROCK VOLUME

M. (J) **249** x 1 Ft. (Rock Depth) = **249.0** CU FT
N. (M) **249** ÷ 27 = **9.2** CU YD
O. (N) **9.2** x 1.4 = **12.9** TONS OF ROCK

ABSORPTION WIDTH

P. ABSORPTION WIDTH RATIO : **1.50**
Q. ABSORPTION WIDTH = (P) x (K)
(P) **1.50** x (K) **10** = **15** FEET

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4/28/2016

MOUND SIZE

Property Owner: DAVID SANNES

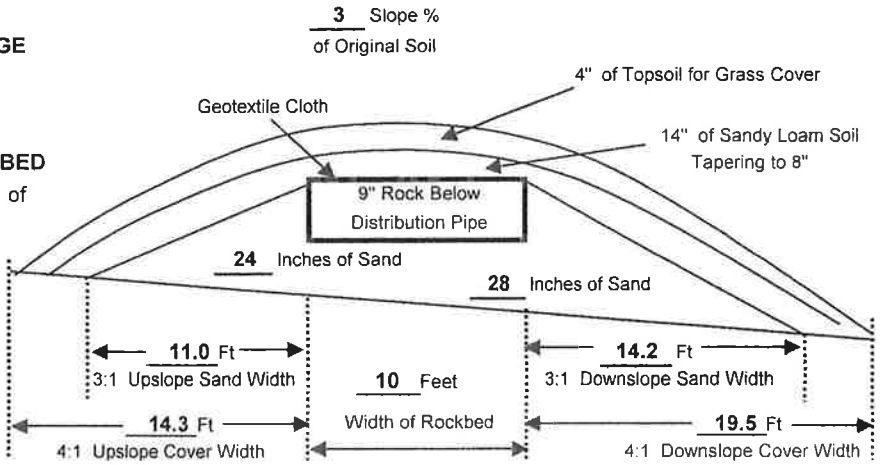
1. MINIMUM DOWNSLOPE BERM TOE
= Absorption Width (Q) - Rock Layer Width (K)
(Q) 15 - (K) 10 = 5 Feet

2. DEPTH OF CLEAN SAND FILL AT UPSLOPE EDGE OF ROCK LAYER
= Separation 3' - 1 ft = 2 Feet

3. MOUND HEIGHT AT UPSLOPE EDGE OF ROCK BED
= Depth of Clean Sand for Separation (2) + Depth of Rock Layer (1ft) + Depth of Cover (1ft)
(2) 2.0 + 1ft + 1ft = 4.0 Feet

4. 3:1 = UPSLOPE BERM MULTIPLIE 2.75
4:1 = UPSLOPE BERM MULTIPLIE 3.57

MOUND CROSS-SECTION



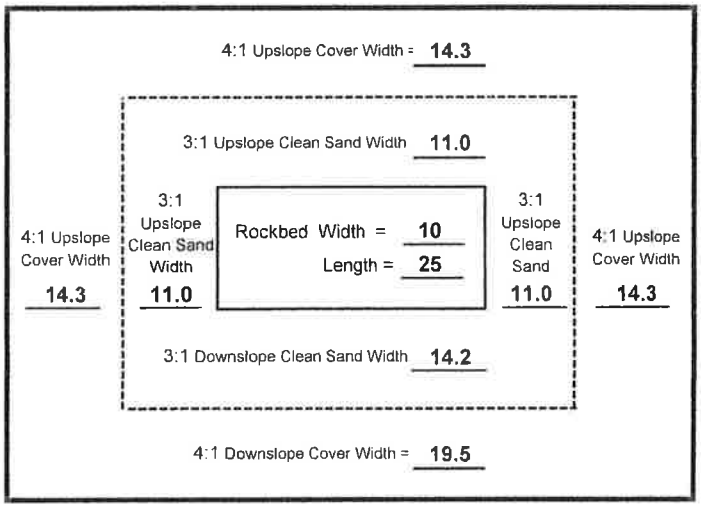
5. UPSLOPE BERM WIDTH
= Upslope Berm Multiplier (4) x Upslope Mound Height (3)
3:1 = (4) 2.75 x (3) 4 = 11.0 Feet
4:1 = (4) 3.57 x (3) 4 = 14.3 Feet

6. DROP IN ELEVATION
= Rock Layer Width (K) x Landslope % (I) ÷ 100
(K) 10 x (I) 3 ÷ 100 = 0.3 Feet

7. DOWNSLOPE HEIGHT
= Drop in Elevation (6) + Upslope Mound Height (3)
(6) 0.3 + (3) 4 = 4.3 Feet

8. 3:1 = DOWNSLOPE BERM MULTIPLIER 3.3
4:1 = DOWNSLOPE BERM MULTIPLIER 4.54

9. DOWNSLOPE BERM WIDTH
= Downslope Berm Multiplier (8) x Downslope Height (7)
3:1 = (8) 3.30 x (7) 4.3 = 14.2 Feet
4:1 = (8) 4.54 x (7) 4.3 = 19.5 Feet



Final Dimensions = Width 43.8 Ft x Length 53.6 Ft

10. ACTUAL DOWNSLOPE BERM WIDTH = Compare Step (1) 5.0
3:1 = with Step (9) 14.2
Select the Greater of the two values 14.2 Feet
4:1 = with Step (9) 19.5
Select the Greater of the two values 19.5 Feet

11. TOTAL MOUND WIDTH
= Upslope Berm Width (5) + Rock Layer Width (K) + Downslope Berm Width (10)
3:1 = (5) 11.0 + (K) 10 + (10) 14.2 = 35.2 Ft
4:1 = (5) 14.3 + (K) 10 + (10) 19.5 = 43.8 Ft

12. TOTAL MOUND LENGTH
= Upslope Berm Width (5) + Rock Layer Length (L) + Upslope Berm Width (5)
3:1 = (5) 11.0 + (L) 25 + (5) 11.0 = 47.0 Ft
4:1 = (5) 14.3 + (L) 25 + (5) 14.3 = 53.6 Ft

Land Slope %	Berm Multipliers for various berm slope ratios			
	DOWNSLOPE		UPSLOPE	
	3:1	4:1	3:1	4:1
0	3.00	4.00	3.00	4.00
1	3.09	4.17	2.91	3.85
2	3.19	4.35	2.83	3.70
3	3.30	**4.54**	2.75	**3.57**
4	3.41	4.76	2.68	3.45
5	3.53	5.00	2.61	3.33
6	3.66	5.26	2.54	3.23
7	3.80	5.56	2.48	3.12
8	3.95	5.88	2.42	3.03
9	4.11	6.25	2.36	2.94
10	4.29	6.67	2.31	2.86
11	4.48	7.14	2.26	2.78
12	4.69	7.69	2.21	2.70

FINAL DIMENSIONS

	Width		Length
3:1 Clean Sand =	35.2	x	47.0
4:1 Total Cover =	43.8	x	53.6

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SOIL BORING / PIT LOG

PROPERTY OWNER: **DAVID SANNES** PARCEL# **19-0-046901** **04/28/2016**

Depth **Color** **Texture**

SOIL BORING #1

0 - 2		Grass
2 - 12	10YR 2/2	Sandy Loam
12	**2.5YR /2**	**MOTTLES with 7.5YR 5/6**

SOIL BORING #2

0 - 2		Grass
2 - 12	10YR 2/2	Sandy Loam
12	**2.5YR /2**	**MOTTLES with 7.5YR 5/6**

SOIL BORING #3

0 - 2		Grass
2 - 14	10YR 2/2	Sandy Loam
14	**2.5YR /2**	**MOTTLES with 7.5YR 5/6**

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4/28/2016

PUMP SELECTION PROCEDURE

Property Owner: DAVID SANNES

A. Determine Pump Capacity:

Gravity Distrubution

1. Minimum suggested is 20 gpm
2. Maximum suggested is 45 gpm

Pressure Distribution

3. a. Select number of Perforated Laterals = 3
   b. Select Perforation Spacing = 3 feet
   c. Rock Layer Length 25 - 2 = 23 feet
   d. Determine the number of spaces between perforations:
   (c) 23.0 ÷ (b) 3 = 7 Spaces
   e. (d) 7 + 1 = 8 Perforations/Lateral
   f. (a) 3 x (e) 8 = 24 Total # of Perforations
   g. (f) 24 x gpm/perf 0.74 = 18 gpm

SELECTED PUMP CAPACITY = 18 gpm

Perforation Discharges (gpm)				
Head (feet)	Perforation diameter (inches)			
	1/8	3/16	7/32	1/4
1.0a	0.18	0.42	0.56	**0.74**
2.0b	0.26	0.59	0.80	1.04
5.0	0.41	0.94	1.26	1.65

a Use 1.0 foot residential systems
b Use 2.0 feet for other establishments
* Potential for plugging

B. MINIMUM Diameter for Perforated Laterals

1. If laterals are connected to header pipe as shown in Figure E-1, to select minimum required lateral diameter; enter Figure E-4 with perforation spacing (A3b) and number of perforations per lateral (A3e).
   The MINIMUM diameter for perforated laterals = 1 inches

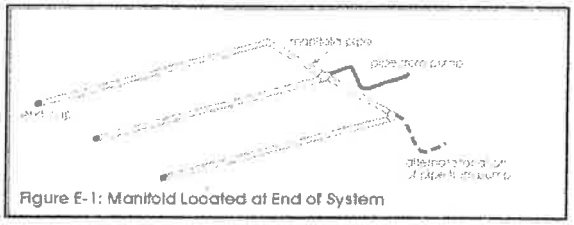

Figure E-1: Manifold Located at End of System

2. If perforated lateral system is attached to manifold pipe near the center, like Figure E-2, perforated lateral length (A3c) and number of perforations per lateral (A3e) will be approximately one half of that in Step B1. Using these values, select the MINIMUM diameter for perforated laterals = _____ inches

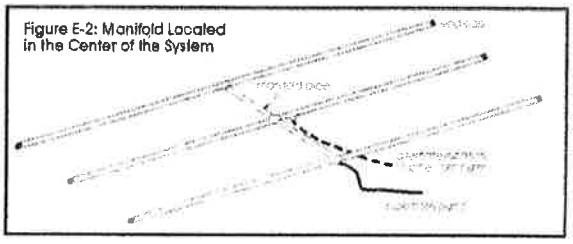

Figure E-2: Manifold Located in the Center of the System

C. Determine Head Requirements:

1. Elevation difference between pump and point of discharge
   = 14 feet **(contractor to verify in field)**

2. Feet of pressure at manifold = 5 feet
   5 ft - for pressure required at manifold
   0 ft - for gravity distribution

3. Friction Loss
   a. Enter friction loss table with gpm and pipe diameter
   F.L. = 0.73 ft./100 feet of pipe

   b. Determine Total Pipe Length from pump to discharge point
   Pipe length 185 x 1.25 = 231 feet

   c. Calculate Total Friction Loss
   (a) 0.73 x (b) 231 ÷ 100 = 1.70 feet

   d. Total Head Required
   (1) 14 + (2) 5 + (3c) 1.7 = 21 feet

E-4 Maximum number of quarter inch perforations per lateral to guarantee <10% discharge variation				
Perforation Spacing (feet)	Pipe Diameter			
	1	**1 ¼**	**1 ½**	**2**
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

Friction Loss in Plastic Pipe			
Flow Rate	Nominal pipe diameter		
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

D. Pump Selection

A pump must be selected to deliver at least
18 gpm with at least 21 feet of total head

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4/28/2016

SIZING OF DOSING CHAMBER

Property Owner: DAVID SANNES

Tank Size	gal/inch
2500	41
1960 Combo	43
1820 Combo	**15.8**
1650 Combo	12.7
1500	34.9
1650	12.7
1000	35
760	24.9
667	15.8
630	14.5
500	11.8
530	12.7
520	16.6

1. Select gallons per inch = 15.8

2. Calculate Gallons to cover pump (with 2 inches of water covering pump)

Height (in) + 2 x gallons per inch (1)

14 + 2 x 15.8 = 252.8 gallons

3. Calculate Total Pumpout Volume

A. To maximize pump life, select sump size for 4 to 5 pump operations per day. 300 gpd ÷ 4 = 75 gallon per dose.

B. Calculate Drainback

a. Determine total pipe length= 185 feet.

b. Determine liquid volume of pipe = 0.17 gallons per foot.

c. Drainback quantity =

Total Pipe Length (3Ba) x Pipe Liquid Volume (3Bb) ÷ 100

185 x 0.17 = 31 gallons

C. Total Pump out Volume

Gallons/dose (3A) + Drainback (3Bc)

75 + 31 = 106 **Total Gallons**

Liquid Volume of Pipe		
Pipe diamet (inches)	Gallons Per 100 ft.	Gallons Per foot
1	4.49	0.05
1.25	7.77	0.08
1.5	10.58	0.11
2	17.43	**0.17**
2.5	24.87	0.25
3	38.40	0.38
4	66.10	0.66

4. Float Separation Distance

Total Pumpout Volume (3c) ÷ Gallons/inch (1)

106 ÷ 15.8 = 7 inches

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

2 x Gallons/inch (1)

2 x 15.8 = 31.6 gallons

6. Calculate Total Gallons

Gallons to cover pump (2) + Total Pumpout Volume (3) + Alarm Volume (5)

252.8 + 106 + 31.6 = 391 Total Gallons

7. Total Depth

Total Gallons (6) ÷ Gallons/inch (1)

391 ÷ 15.8 = 25 inches

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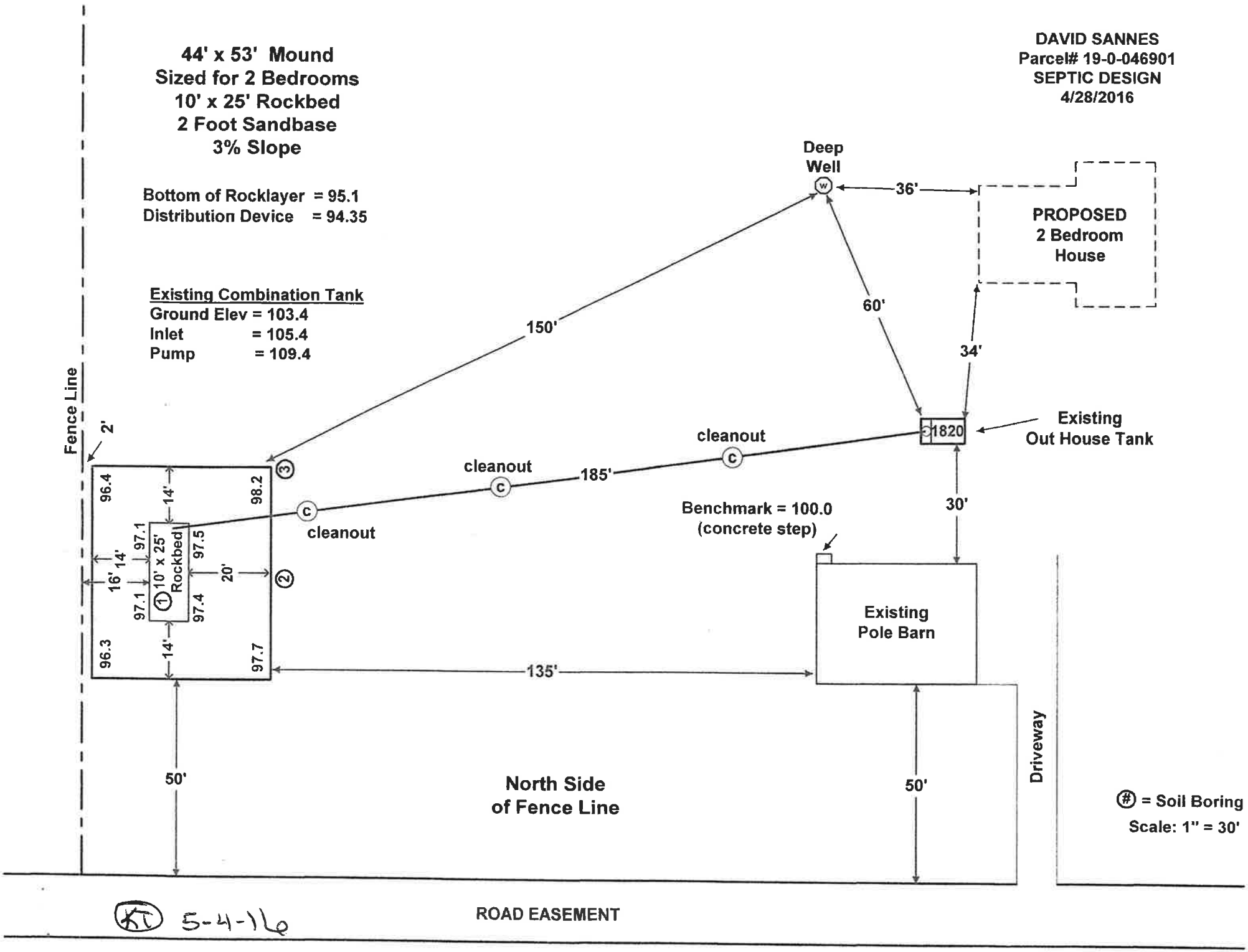
44' x 53' Mound
Sized for 2 Bedrooms
10' x 25' Rockbed
2 Foot Sandbase
3% Slope
Bottom of Rocklayer = 95.1
Distribution Device = 94.35
Existing Combination Tank
Ground Elev = 103.4
Inlet = 105.4
Pump = 109.4
DAVID SANNES
Parcel# 19-0-046901
SEPTIC DESIGN
4/28/2016
Deep Well
36'
PROPOSED 2 Bedroom House
150'
60'
34'
Fence Line
2'
1820
Existing Out House Tank
cleanout
cleanout
cleanout
185'
Benchmark = 100.0
(concrete step)
30'
96.4
14'
98.2
97.1
10' x 25' Rockbed
97.5
16'
14'
20'
97.1
97.4
96.3
14'
97.7
Existing Pole Barn
135'
50'
North Side of Fence Line
50'
Driveway
= Soil Boring
Scale: 1" = 30'
ROAD EASEMENT
5-4-16

Subsurface Sewage Treatment System Management Plan

Property Owner: DAVID SANNES Phone: (651) 329-8645 Date: 4/20/2016

Mailing Address: 731 Marshall Avenue City: St. Paul Zip: 55104

Site Address: 47657 Nature Ave City: Palisade Zip: 56469

This management plan will identify the operation and maintenance activities necessary to ensure long-term performance of your septic system. Some of these activities must be performed by you, the homeowner. Other tasks must be performed by a licensed septic service provider.

System Designer: check every _____ months.
Local Government: check every _____ months.
State Requirement: check every 36 months.

My System needs to be checked every 36 months.

Homeowner Management Tasks

Leaks - Check (look, listen) for leaks in toilets and dripping faucets. Repair leaks promptly.
Surfacing sewage - Regularly check for wet or spongy soil around your soil treatment area.
Effluent filter - Inspect and clean twice a year or more.
Alarms - Alarm signals when there is a problem. Contact a service provider any time an alarm signals.
Event counter or water meter - Record your water use.

-recommend meter readings be conducted *(circle one: DAILY WEEKLY MONTHLY)*

Professional Management Tasks

- ☒ Check to make sure tank is not leaking
- ☐ Check and clean the in-tank effluent filter
- ☒ Check the sludge/scum layer levels in all septic tanks
- ☒ Recommend if tank should be pumped
- ☒ Check inlet and outlet baffles
- ☒ Check the drainfield effluent levels in the rock layer
- ☒ Check the pump and alarm system functions
- ☒ Check wiring for corrosion and function
- ☐ Check dissolved oxygen and effluent temperature in tank
- ☒ Provide homeowner with list of results and any action to be taken
- ☐ Flush and clean latterals if cleanouts exist

"I understand it is my responsibility to properly operate and maintain the sewage treatment system on this property, utilizing the Management Plan. If requirements in the Management Plan are not met, I will promptly notify the permitting authority and take necessary corrective actions. If I have a new system, I agree to adequately protect the reserve area for future use as a soil treatment system."

Property Owner Signature: _____ Date: _____

Designer Signature: _____ Date: 4/28/2016

See Reverse Side for Management Log

Maintenance Log

Activity	Date Accomplished									
Check frequently:										
Leaks: check for plumbing leaks										
Soil treatment area check for surfacing										
Lint filter: check, clean if needed										
Effluent screen: if owner-maintained										
Water usage rate (monitor frequency _____)										
Check annually:										
Caps: inspect, replace if needed										
Sludge & Scum/Pump										
Inlet & Outlet baffles										
Drainfield effluent leaks										
Pump, alarm, wiring										
Flush & clean laterals if cleanouts exists										
Other:_____										
Other:_____										

Notes:_____

_____

_____

_____

Mitigation/corrective action plan:_____

_____

_____

_____

_____