ENVIRONMENTAL SYSTEMS LLC.

2358 HWY# 23
MORA MN. 55051
Ph. 320-241-7036
07/10/2024

TIMED DOSE TYPE III DESIGN

LOCATION: 32586 HWY 123
SANDSTONE MN.
PID; R30.0461.001
S13-TWP042-R020

OWNER: RUSSELL and KAREN THOMAS

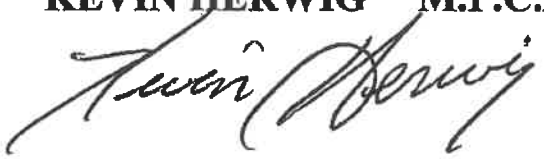
SYSTEM TYPE: TYPE III MOUND

DESIGN FLOW: 5 BEDROOM DESIGNED @ 638 GPD

TREATMENT AREA: 850 SQ.FT. ROCK BED

SLOPE: 7 %

KEVIN HERWIG M.P.C.A #3945



ENVIRONMENTAL SYSTEMS LLC.

DESIGN-INSPECTION

07/10/2024

CONSTRUCTION NOTES & MATERIALS

PRODUCT BRAND & MODEL LISTED IN DESIGN MUST BE USED:

BROWN-WILBERT 2500 SPLIT SEPTIC TANK

BROWN-WILBERT 2000 PUMP TANK
GOULDS WE511HH PUMP

EFFLUENT FILTER POLYLOK #PL-122 W/ALARM
INSTALL A TWO-WAY CLEANOUT IS TO BE INSTALLED 1 FOOT OUTSIDE HOME

FLOW CONTROL, TIMED DOSE, AND ALARM: SJE RHOMBUS MOD# IFS11W114H-8AC17G1J

IT IS THE DESIGNER'S DISCRETION TO APPROVE OR DISAPPROVE SUBSTITUTIONS.THE INSTALLER WILL BE RESPONSIBLE FOR DESIGN CHANGE FEE.

KEVIN HERWIG LIC # 3945

MOUND SYSTEM EXPANSION AND UPGRADE ON EXISTING SITE
TYPE III MOUND

The existing mound including the topsoil, loam cover, rock bed and sand will be removed down to an elevation of 97.60 (any existing sand is to be jar tested. If the sand does not pass the jar test the old sand must be removed, surface roughed up and new send added to elevation)
The elevation of new rock and sand interface 100.60
The sand depth will be verified at the time of removal.
New washed sand will be added to achieve a minimum of 3' on upslope side of rock bed.
The elevation of top of sand will be 100.60
This mound expansion is to the east and to the north
New washed rock will be added (6" depth) approximate lateral elevation 101.10
3 new 2" laterals 83' long with 7/32" holes spaced at 3' will be placed on rock bed.
12" of loam and 6" of topsoil, seed and mulch to finish.
The existing septic tank is to be pumped and used as a holding tank during the drying period and construction of the mound.
The area **must be allowed** to dry to as long as necessary after removal and before new construction will begin.
Extreme care must be taken to protect this site!
All work will be completed to 7080 rule.

All rock, pipe, and debris removed from the mound is to be disposed of off-site.

Benchmark is the bottom of the house siding Elevation. 100.00

KEVIN HERWIG M.P.C.A. Lic # 3945

TANK INSTALLATION AND CONSTRUCTION SPECIAL NOTES

THE SEPTIC TANK AND PUMP TANK ON THIS SITE MAY NEED TO BE ANCHORED

SEE OPTIONAL ANCHORING DETAIL INCLUDED IN THIS DESIGN

TANKS SPECS.

SEPTIC TANK- BROWN WILBERT 2500 GAL.

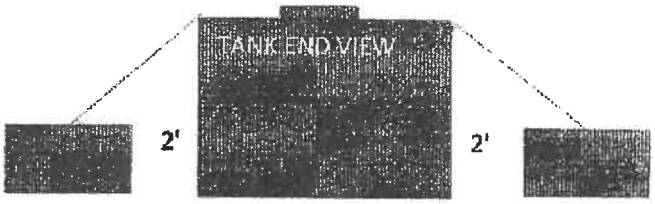
PUMP TANK- BROWN WILBERT 2000 GAL

ANCHOR BLOCK SPECS.

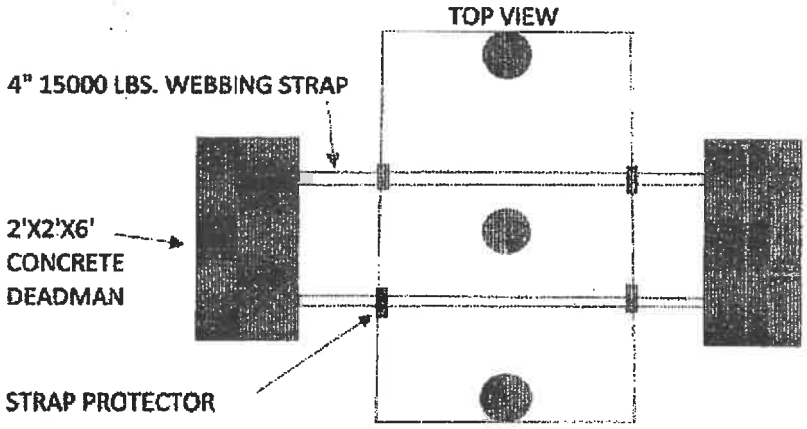
2'X2'X6' CONCRETE ANCHOR BLOCKS APROX WEIGHT 3700 LB
(USE AS MANY AS REQUIRED TO OFF SET BUOYANCY OF TANK A MINIMUM OF 2 PER TANK 1 ON EACH SIDE)

TANK ANCHORING DETAIL

MATERIAL LIST PER TANK:
2-'DEADMAN BLOCKS CEMSTONE PRODUCT # 9557017
2- 4" X 27' 15000 LBS. NYLON RATCHET STRAPS
4- STRAP PROTECTORS



COMPACT MATERIAL TO 95% STANDARD PROCTOR DENSITY
(EXISTING OR IMPORTED MATERIAL)
BETWEEN AND ABOVE DEADMAN BLOCKS TO TOP OF FINAL GRADE



MONITORING AND MITIGATION

SEPTIC SYSTEM CLASSIFIED AS TYPE III

Should the system fail a new site for the septic system may be considered or the owner agrees to repair the septic system if it is possible. If the septic system is not repairable the homeowner agrees to disconnect the septic tanks from the septic system and use and maintain the septic tanks as holding tanks.

PINE COUNTY ZONING, MILLE LACS BAND OF OJIBWE and ENVIRONMENTAL SYSTEMS are to be notified as soon as possible about any operational problems. If a failure occurs the septic pump must be disconnected immediately and remain disconnected until all repairs are completed. A pumping contract will need to be set up with a septic maintenance contractor. A copy of all documents must be submitted to the county.

The system must be monitored for a minimum of three years. The mound system is to be inspected by the homeowner for leaks or saturated areas. Inspections are to be done every month for 36 months. Any leaks or failures in the system must be reported to the county within 24 hours.

All expenses for repair or replacement are the homeowner's responsibility.

Type III systems are not warranted by the Inspector, Designer, or Installer

I Russell Thomas property owner of 32586 Hwy 123 Sandstone Mn.

Hereby agree that if I am the owner of the property, to accept all legal and financial responsibility for future system repair and/or replacement expenses in the event that failure of the system on the above referenced property occurs.

_____

Owner

_____

Date

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Septic System Management Plan for Above Grade Systems

The goal of a septic system is to protect human health and the environment by properly treating wastewater before returning it to the environment. Your septic system is designed to kill harmful organisms and remove pollutants before the water is recycled back into our lakes, streams and groundwater.

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 maintainer or service provider. However, it is **YOUR** responsibility to make sure all tasks get accomplished in a timely manner.

The University of Minnesota's *Septic System Owner's Guide* contains additional tips and recommendations designed to extend the effective life of your system and save you money over time.

Proper septic system design, installation, operation and maintenance means safe and clean water!

Property Owner Russell Thomas	Email
Property Address 32586 Hwy 123 Sandstone Mn.	Property ID R30.0461.001
System Designer Environmental Systems	Contact Info 320-241-7036
System Installer	Contact Info
Service Provider/Maintainer	Contact Info
Permitting Authority Pine County	Contact Info
Permit #	Date Inspected

Keep this Management Plan with your Septic System Owner's Guide. The Septic System Owner's Guide includes a folder to hold maintenance records including pumping, inspection and evaluation reports. Ask your septic professional to also:

- Attach permit information, designer drawings and as-built of your system, if they are available.
- Keep copies of all pumping records and other maintenance and repair invoices with this document.
- Review this document with your maintenance professional at each visit; discuss any changes in product use, activities, or water-use appliances.

For a copy of the *Septic System Owner's Guide*, visit www.bookstores.umn.edu and search for the word "septic" or call 800-322-8642.

For more information see http://septic.umn.edu

Version: August 2015

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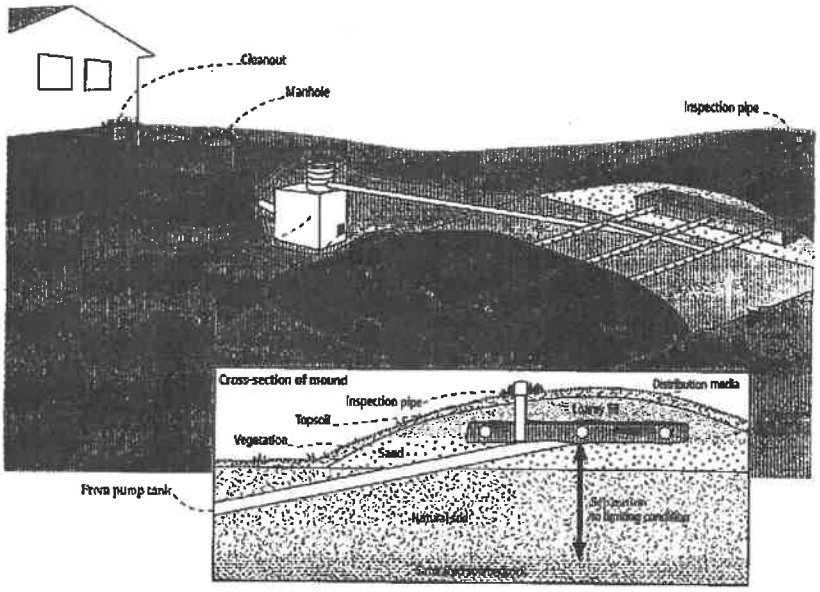
Septic System Management Plan for Above Grade Systems

Your Septic System



Septic System Specifics

System Type: ○ I ○ II ◉ III ○ IV* ○ V*

(Based on MN Rules Chapter 7080.2200 – 2400)

**Additional Management Plan required*

☐ System is subject to operating permit*

☐ System uses UV disinfection unit*

Type of advanced treatment unit _____

Dwelling Type

Number of bedrooms: 5

System capacity/ design flow (gpd): 638

Anticipated average daily flow (gpd): 500

Comments _____

Business? : ○ Y ◉ N What type? _____

Well Construction

Well depth (ft): Deep >55'

- ☐ Cased well Casing depth: _____
- ☐ Other (specify): _____

Distance from septic (ft): _____

Is the well on the design drawing? ○ Y ○ N

Septic Tank

- ☐ First tank *Tank volume:* 2500 *gallons*
  Does tank have two compartments? ◉ Y ○ N
- ☐ Second tank *Tank volume:* _____ *gallons*
- ☐ Tank is constructed of concrete
- ☐ Effluent screen: ◉ Y ○ N Alarm ◉ Y ○ N

- ☐ Pump Tank _____ *gallons*
- ☐ Effluent Pump *make/model:* _____
  Pump capacity _____ GPM
  TDH _____ Feet of head
- ☐ Alarm location _____

Soil Treatment Area (STA)

Mound/At-Grade area (width x length): 44.1 ft x 119 ft

Rock bed size (width x length): 10 ft x 85 ft

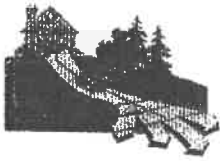
Location of additional STA: _____

Type of distribution media: rock

☑ Inspection ports ☑ Cleanouts

☐ Surface water diversions

☐ Additional STA not available



Homeowner Management Tasks

These o*peration and maintenance ac*tivities are your responsibility. *Chart on page 6 can help track your activities.*

Your toilet is not a garbage can. Do not flush anything besides human waste and toilet paper. No wet wipes, cigarette butts, disposal diapers, used medicine, feminine products or other trash!

The system and septic tanks needs to be checked every 12 months

Your service provider or pumper/maintainer should evaluate if your tank needs to be pumped more or less often.

Seasonally or several times per year

- *Leaks.* Check (listen, look) for leaks in toilets and dripping faucets. Repair leaks promptly.
- *Soil treatment area.* Regularly check for wet or spongy soil around your soil treatment area. If surfaced sewage or strong odors are not corrected by pumping the tank or fixing broken caps and leaks, call your service professional. *Untreated sewage may make humans and animals sick.* Keep bikes, snowmobiles and other traffic off and control borrowing animals.
- *Alarms.* Alarms signal when there is a problem; contact your service professional any time the alarm signals.
- *Lint filter.* If you have a lint filter, check for lint buildup and clean when necessary. If you do not have one, consider adding one after washing machine.
- *Effluent screen.* If you do not have one, consider having one installed the next time the tank is cleaned along with an alarm.

Annually

- *Water usage rate.* A water meter or another device can be used to monitor your average daily water use. Compare your water usage rate to the design flow of your system (listed on the next page). Contact your septic professional if your average daily flow over the course of a month exceeds 70% of the design flow for your system.
- *Caps.* Make sure that all caps and lids are intact and in place. Inspect for damaged caps at least every fall. Fix or replace damaged caps before winter to help prevent freezing issues.
- *Water conditioning devices.* See Page 5 for a list of devices. When possible, program the recharge frequency based on *water demand (gallons)* rather than *time (days).* Recharging too frequently may negatively impact your septic system. Consider updating to demand operation if your system currently uses time,
- *Review your water usage rate.* Review the Water Use Appliance chart on Page 5. Discuss any major changes with your service provider or pumper/maintainer.

During each visit by a service provider or pumper/maintainer

- Make sure that your service professional services the tank through the manhole. (NOT though a 4" or 6" diameter inspection port.)
- Ask how full your tank was with sludge and scum to determine if your service interval is appropriate.
- Ask your pumper/maintainer to accomplish the tasks listed on the Professional Tasks on Page 4.

Professional Management Tasks

These are the operation and maintenance activities that a pumper/maintainer performs to help ensure long-term performance of your system. At each visit a written report/record must be provided to homeowner.

Plumbing/Source of Wastewater

- Review the Water Use Appliance Chart on Page 5 with homeowner.
  Discuss any changes in water use and the impact those changes may have on the septic system.
- Review water usage rates (if available) with homeowner.

Septic Tank/Pump Tanks

- *Manhole lid.* A riser is recommended if the lid is not accessible from the ground surface. Insulate the riser cover for frost protection.
- *Liquid level.* Check to make sure the tank is not leaking. The liquid level should be level with the bottom of the outlet pipe. (If the water level is below the bottom of the outlet pipe, the tank may not be watertight. If the water level is higher than the bottom of the outlet pipe of the tank, the effluent screen may need cleaning, or there may be ponding in the soil treatment area.)
- *Inspection pipes.* Replace damaged or missing pipes and caps.
- *Baffles.* Check to make sure they are in place and attached, and that inlet/outlet baffles are clear of buildup or obstructions.
- *Effluent screen.* Check to make sure it is in place; clean per manufacturer recommendation. Recommend retrofitted installation if one is not present.
- *Alarm.* Verify that the alarm works.
- *Scum and sludge.* Measure scum and sludge in each compartment of each septic and pump tank, pump if needed.

Pump

- *Pump and controls.* Check to make sure the pump and controls are operating correctly.
- *Pump vault.* Check to make sure it is in place; clean per manufacturer recommendations.
- *Alarm.* Verify that the alarm works.
- *Drainback.* Check to make sure it is draining properly.
- *Event counter or elapsed time meter.* Check to see if there is an event counter or elapsed time meter for the pump. If there is one or both, calculate the water usage rate and compare to the anticipated use listed on Design and Page 2. Dose Volume: _____ gallons: Pump run time: _____ Minutes

Soil Treatment Area

- *Inspection pipes.* Check to make sure they are properly capped. Replace caps and pipes that are damaged.
- *Surfacing of effluent.* Check for surfacing effluent or other signs of problems.
- *Lateral flushing.* Check lateral distribution; if cleanouts exist, flush and clean at recommended frequency.
- *Vegetation* - Check to see that a good growth of vegetation is covering the system.

All other components – evaluate as listed here:

Water-Use Appliances and Equipment in the Home

Appliance	Impacts on System	Management Tips
Garbage disposal	• Uses additional water. • Adds solids to the tank. • Finely-ground solids may not settle. Unsettled solids can exit the tank and enter the soil treatment area.	• Use of a garbage disposal is not recommended. • Minimize garbage disposal use. Compost instead. • To prevent solids from exiting the tank, have your tank pumped more frequently. • Add an effluent screen to your tank.
Washing machine	• Washing several loads on one day uses a lot of water and may overload your system. • Overloading your system may prevent solids from settling out in the tank. Unsettled solids can exit the tank and enter the soil treatment area.	• Choose a front-loader or water-saving top-loader, these units use less water than older models. • Limit the addition of extra solids to your tank by using liquid or easily biodegradable detergents. Limit use of bleach-based detergents and fabric softeners. • Install a lint filter after the washer and an effluent screen to your tank • Wash only full loads and think even – spread your laundry loads throughout the week.
Dishwasher	• Powdered and/or high-phosphorus detergents can negatively impact the performance of your tank and soil treatment area. • New models promote "no scraping". They have a garbage disposal inside.	• Use gel detergents. Powdered detergents may add solids to the tank. • Use detergents that are low or no-phosphorus. • Wash only full loads. • Scrape your dishes anyways to keep undigested solids out of your septic system.
Grinder pump (in home)	• Finely-ground solids may not settle. Unsettled solids can exit the tank and enter the soil treatment area.	• Expand septic tank capacity by a factor of 1.5. • Include pump monitoring in your maintenance schedule to ensure that it is working properly. • Add an effluent screen.
Large bathtub (whirlpool)	• Large volume of water may overload your system. • Heavy use of bath oils and soaps can impact biological activity in your tank and soil treatment area.	• Avoid using other water-use appliances at the same time. For example, don't wash clothes and take a bath at the same time. • Use oils, soaps, and cleaners in the bath or shower sparingly.
Clean Water Uses	**Impacts on System**	**Management Tips**
High-efficiency furnace	• Drip may result in frozen pipes during cold weather.	• Re-route water directly out of the house. Do not route furnace discharge to your septic system.
Water softener Iron filter Reverse osmosis	• Salt in recharge water may affect system performance. • Recharge water may hydraulically overload the system.	• These sources produce water that is not sewage and should not go into your septic system. • Reroute water from these sources to another outlet, such as a dry well, draintile or old drainfield. • When replacing, consider using a demand-based recharge vs. a time-based recharge. • Check valves to ensure proper operation; have unit serviced per manufacturer directions
Surface drainage Footing drains	• Water from these sources will overload the system and is prohibited from entering septic system.	

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Septic System Management Plan for Above Grade Systems

Homeowner Maintenance Log

Track maintenance activities here for easy reference. See list of management tasks on pages 3 and 4.

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)***										
Alarm**										
Check annually:										
Water usage rate (maximum gpd _____)										
Caps: inspect, replace if needed										
Water use appliances – review use										
Other:										

*Monthly

**Quarterly

***Bi-Annually

Notes: A visual inspection of the mound for leaks to be done every 30 days for first 36 months . If grounded soggy at the base of the mound the power to the septic pumped is to be shut off. A septic maintenance contractor is to be contacted to pump your septic tanks. The tanks are to be used as holding tanks until mound has recovered and dryed. The tanks should be used as holding tanks for a minimum of 30 days to let the mound rest and recover. If this is a reoccurring problem other action may be need. (As in longer rest periods, lower water usage or increase the size of the system)

"As the owner of this SSTS, 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 this 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 _____

Management Plan Prepared By: Kevin Herwig Certification # 3659

Permitting Authority: _____

University of Minnesota Onsite Sewage Treatment Program

Preliminary Evaluation Worksheet

MINNESOTA POLLUTION CONTROL AGENCY

1. Contact Information

v 04.02.2024

Property Owner/Client:	Russell and Karen Thomas	Date Completed:	7/10/2024
Site Address:	32586 STATE 123 SANDSTONE MN. 55072	Project ID:	
Email:	russandkaren73@gmail.com	Phone:	320-372-0795
Mailing Address:	same	Alt Phone:	
Legal Description:			

Parcel ID: R30.0461.001 SEC: 13 TWP: 042 RNG: 020

2. Flow and General System Information

A. Client-Provided Information

Project Type: ☐ New Construction ☑ Replacement ☐ Expansion ☐ Repair

Project Use: ☑ Residential ☐ Other Establishment:

Residential use: # Bedrooms: 5 Dwelling sq.ft.: Unfinished sq.ft.:

Adults: 2 # Children: 7 # Teenagers:

In-home business (Y/N): No If yes, describe:

Water-using devices: *(check all that apply)*

- ☑ Garbage Disposal/Grinder
- ☐ Dishwasher
- ☐ Hot Tub*
- ☑ Sewage pump in basement
- ☐ Water Softener*
- ☐ Sump Pump*
- ☐ Large Bathtub >40 gallons
- ☐ Iron Filter*
- ☐ Self-Cleaning Humidifier*
- ☐ Clothes Washing Machine
- ☐ High Eff. Furnace*
- ☐ Other:

* Clear water source - should not go into system

Additional current or future uses:

Anticipated non-domestic waste:

The above is complete & accurate: *Client signature & date*

B. Designer-determined Flow and Anticipated Waste Strength Information

Attach additional information as necessary.

Design Flow: 750 GPD Anticipated Waste Type: Residential

Maximum Concentration BOD: 170 mg/L TSS 60 mg/L Oil & Grease 25 mg/L

3. Preliminary Site Information

A. Water Supply Wells

#	Description	Mn. ID#	Well Depth (ft.)	Casing Depth (ft.)	Confining Layer	STA Setback	Source
1	deep						
2							
3							
4							

Additional Well Information:

University of Minnesota Onsite Sewage Treatment Program

Preliminary Evaluation Worksheet

MINNESOTA POLLUTION CONTROL AGENCY

Site within 200' of noncommunity transient well (Y/N)	No	Yes, source:	
Site within a drinking water supply management area (Y/N)	No	Yes, source:	
Site in Well Head Protection inner wellhead management zone (Y/N)		Yes, source:	
Buried water supply pipes within 50 ft of proposed system (Y/N)	No		
B. Site located in a shoreland district/area?	No	Yes, name:	N/A
Elevation of ordinary high water level:	N/A ft	Source:	N/A
Classification: N/A	Tank Setback: N/A ft.	STA Setback: N/A ft.	
C. Site located in a floodplain?	No	Yes, Type(s):	N/A
Floodplain designation/elevation (10 Year):	N/A ft	Source:	N/A
Floodplain designation/elevation (100 Year):	N/A ft	Source:	N/A

D. Property Line Id / Source: ☐ Owner ☐ Survey ☐ County GIS ☑ Plat Map ☐ Other:

E. ID distance of relevant setbacks on map: ☐ Water ☐ Easements ☑ Well(s) ☑ Building(s) ☑ Property Lines ☐ OHWL ☐ Other:

4. Preliminary Soil Profile Information From Web Soil Survey (attach map & description)

Map Units: c39a c22d Slope Range: %

List landforms:

Landform position(s): Shoulder

Parent materials: Outwash

Depth to Bedrock/Restrictive Feature: in Depth to Watertable: in

Map Unit Ratings

Septic Tank Absorption Field- At-grade:	
Septic Tank Absorption Field- Mound:	Extremely Limited
Septic Tank Absorption Field- Trench:	

5. Local Government Unit Information

Name of LGU:	PINE COUNTY
LGU Contact:	
LGU-specific setbacks:	
LGU-specific design requirements:	
LGU-specific installation requirements:	

Notes:

ONSITE SEWAGE TREATMENT PROGRAM

Field Evaluation Worksheet

MINNESOTA POLLUTION CONTROL AGENCY

1. Project Information

v 04.02.2024

Property Owner/Client: Russell and Karen Thomas | **Project ID:**

Site Address: 32586 STATE 123 SANDSTONE MN. 55072 | **Date Completed:** 7/10/2024

2. Utility and Structure Information

Utility Locations Identified ☐ Gopher State One Call # ☐ Any Private Utilities:

Locate and Verify (*see Site Evaluation map*) ☑ Existing Buildings ☐ Improvements ☐ Easements ☐ Setbacks

3. Site Information

Vegetation type(s): Grass | Landscape position:

Percent slope: 7.0 % | Slope shape: Linear, Linear | Slope direction: north

Describe the flooding or run-on potential of site: May have seasonal ponding on West end

Describe the need for Type III or Type IV system: Redox and water with in 4"of surface

Note:

Proposed soil treatment area protected? (Y/N): Yes | If yes, describe: staked

4. General Soils Information

Filled, Compacted, Disturbed areas (Y/N): No

If yes, describe:

Soil observations were conducted in the proposed system location (Y/N): Yes

A soil observation in the most limiting area of the proposed system (Y/N): Yes

Number of soil observations: 4 | Soil observation logs attached (Y/N): Yes

Percolation tests performed & attached (Y/N): No

5. Phase I. Reporting Information

	Depth		Elevation		
Limiting Condition*:	0	in	97.60	ft	**Most Restrictive Depth Identified from List Below*
Periodically saturated soil:	0	in	97.60	ft	Soil Texture: Fine Sandy Loam
Standing water:		in		ft	Percolation Rate: min/inch
Bedrock:		in		ft	Soil Hyd Loading Rate: 0.60 gpd/sq.ft

Benchmark Elevation: 100.0 ft | Elevations and Benchmark on map? (Y/N):

Benchmark Elevation Location: Bottom of house siding

Differences between soil survey and field evaluation: Colors, redox and water features

Site evaluation issues / comments:

Anticipated construction issues: Old mound leaking area and will need time to dry septic tanks should be used as holding tanks during the drying in construction period.

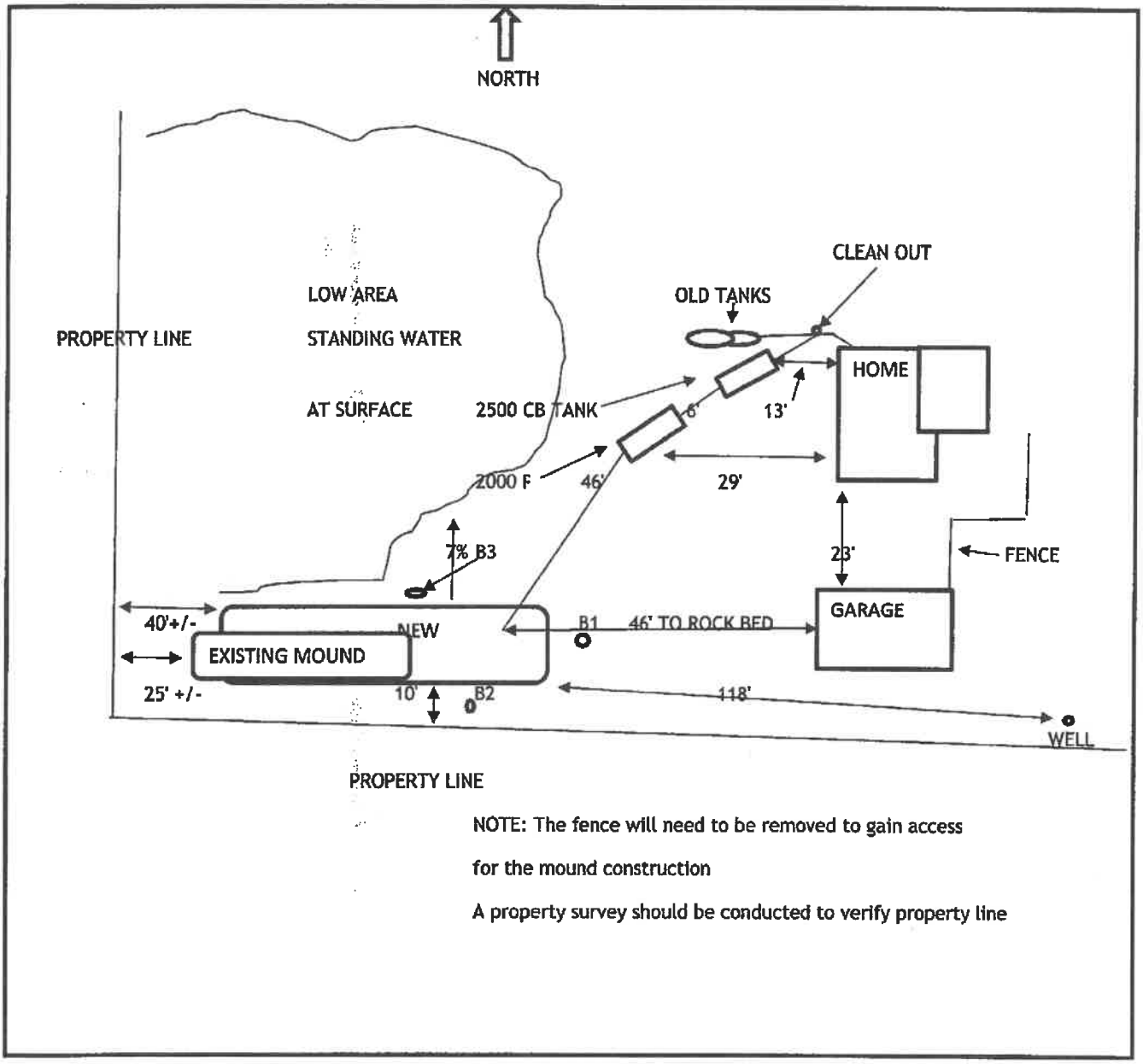
University of Minnesota Onsite Sewage Treatment Program

Proposed Design Map

MINNESOTA POLLUTION CONTROL AGENCY

Project ID: v 04.02.2024

Property Owner/Client: Russell and Karen Thomas



NOTE: The fence will need to be removed to gain access for the mound construction

A property survey should be conducted to verify property line

Map scale: NONE ☑ Indicated north ☐ Show slope/contours

Elevations in feet

Benchmark Elev: 100 ft Benchmark Location: BOTTOM HOUSE SIDING

System Corners:		Soil Observation:			
Corner 1	99.65 ft	#1:	97.4 ft	TANK INLET	95.6 ft
Corner 2	96.95 ft	#2:	98.5 ft	Other:	
Corner 3	100.25 ft	#3:	95.8 ft	PUMP TANK INLET	94.8 ft
Corner 4	97.6 ft	#4:	ft		ft

System Corners

1 2

3 4 N

Date Completed: 7/10/2024

University of Minnesota
ONSITE SEWAGE TREATMENT PROGRAM

Soil Observation Log

Project ID:

v 04.02.2024

Client:	Russell and Karen Thomas			Location / Address:	32586 STATE 123 SANDSTONE MN. 55072
Soil parent material(s): (Check all that apply)	☑ Outwash	☐ Lacustrine	☐ Loess	☑ Till	☐ Alluvium ☐ Bedrock ☐ Organic Matter ☐ Disturbed/Fill
Landscape Position:	Shoulder	Slope %: 7.0	Slope shape:	Linear, Linear	Flooding/Run-On potential: Yes
Vegetation:	Grass	Soil survey map units:	c39a c22d		Surface Elevation-Relative to benchmark: 97.40
Date/Time of Day/Weather Conditions:	10am	overcast			Limiting Layer Elevation: 97.15
Observation #/Location:	1	east center		Observation Type:	Pit

Depth (in)	Texture	Rock Frag. %	Matrix Color(s)	Mottle Color(s)	Redox Kind(s)	Indicator(s)	Structure: Shape	Structure: Grade	Structure: Consistence
0-4	Fine Sandy Loam	5	10YR 3/2				Granular	Weak	Friable
4-16	Fine Sandy Loam	5	10YR 4/4	10YR 5/6	Concentrations	S2	Blocky	Weak	Friable

Comments:

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

KEVIN HERWIG		3945	7/10/2024
(Designer/Inspector)	(Signature)	(License #)	(Date)

Optional Verification: I hereby certify that this soil observation was verified according to Minn. R. 7082.0500 subp. 3 A. The signature below represents an infield verification of the periodically saturated soil or bedrock at the proposed soil treatment and dispersal site.

(LGU/Designer/Inspector)	(Signature)	(Cert #)	(Date)

University of Minnesota
Onsite Sewage Treatment Program

Soil Observation Log

Project ID:

v 04.02.2024

Client:	Russell and Karen Thomas			Location / Address:	32586 STATE 123 SANDSTONE MN. 55072
Soil parent material(s): (Check all that apply)	☑ Outwash	☐ Lacustrine	☐ Loess	☑ Till	☐ Alluvium ☐ Bedrock ☐ Organic Matter ☐ Disturbed/Fill
Landscape Position:	Shoulder	Slope %:	7.0	Slope shape:	Linear, Linear
Flooding/Run-On potential:	Yes				
Vegetation:	Grass	Soil survey map units:	c39a c22d	Surface Elevation-Relative to benchmark:	98.50
Date/Time of Day/Weather Conditions:	10am	overcast		Limiting Layer Elevation:	98.25
Observation #/Location:	2	South center		Observation Type:	Pit

Depth (in)	Texture	Rock Frag. %	Matrix Color(s)	Mottle Color(s)	Redox Kind(s)	Indicator(s)	Structure: Shape	Structure: Grade	Structure: Consistence
0-4	Fine Sandy Loam	5	10YR 3/2				Granular	Weak	Friable
4-16	Fine Sandy Loam	5	10YR 4/4	10YR 5/4	Concentrations	S2	Blocky	Weak	Friable
				10YR 5/6	Concentrations	S2			

Comments:

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

KEVIN HERWIG		3945	7/10/2024
(Designer/Inspector)	(Signature)	(License #)	(Date)

Optional Verification: I hereby certify that this soil observation was verified according to Minn. R. 7082.0500 subp. 3 A. The signature below represents an infield verification of the periodically saturated soil or bedrock at the proposed soil treatment and dispersal site.

(LGU/Designer/Inspector)	(Signature)	(Cert #)	(Date)

ONSITE SEWAGE TREATMENT PROGRAM

Soil Observation Log

Project ID:

v 04.02.2024

Client:	Russell and Karen Thomas			Location / Address:	32586 STATE 123 SANDSTONE MN. 55072
Soil parent material(s): (Check all that apply)	☑ Outwash	☐ Lacustrine	☐ Loess	☑ Till	☐ Alluvium ☐ Bedrock ☐ Organic Matter ☐ Disturbed/Fill
Landscape Position:	Shoulder	Slope %:	7.0	Slope shape:	Linear, Linear
Flooding/Run-On potential:	Yes				
Vegetation:	Grass	Soil survey map units:	c39a c22d	Surface Elevation-Relative to benchmark:	95.80
Date/Time of Day/Weather Conditions:	10am	overcast		Limiting Layer Elevation:	95.50
Observation #/Location:	3	North center		Observation Type:	Pit

Depth (in)	Texture	Rock Frag. %	Matrix Color(s)	Mottle Color(s)	Redox Kind(s)	Indicator(s)	Structure: Shape	Structure: Grade	Structure: Consistence
0-1	Organic		10YR 2/2			T3	Granular	Weak	Friable
1-5	Very Fine Sandy Loam	0	10YR 2/2	10YR 4/6	Concentrations	T5	Granular	Weak	Friable
				10YR 6/2	Depletions	T5			
5-10	Loamy Fine Sand	1	10YR 5/2	10YR 4/6	Concentrations	S2	Blocky	Weak	Friable

Comments: WATER @ 3"

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

KEVIN HERWIG		3945	7/10/2024
(Designer/Inspector)	(Signature)	(License #)	(Date)

Optional Verification: I hereby certify that this soil observation was verified according to Minn. R. 7082.0500 subp. 3 A. The signature below represents an infield verification of the periodically saturated soil or bedrock at the proposed soil treatment and dispersal site.

(LGU/Designer/Inspector)	(Signature)	(Cert #)	(Date)

University of Minnesota Onsite Sewage Treatment Program

Design Summary Page

MINNESOTA POLLUTION CONTROL AGENCY

1. PROJECT INFORMATION

v 04.02.2024

Property Owner/Client:	Russell and Karen Thomas	Project ID:	
Site Address:	32586 STATE 123 SANDSTONE MN. 55072	Date:	07/10/24
Email Address:	russandkaren73@gmail.com	Phone:	320-372-0795

2. DESIGN FLOW & WASTE STRENGTH

Design Flow: 750 GPD Anticipated Waste Type: Residential

BOD: 170 mg/L TSS: 60 mg/L Oil & Grease: 25 mg/L

Treatment Level: C *Select Treatment Level C for residential septic tank effluent*

3. HOLDING TANK SIZING *Holding Tank Sizing: see 7080.2290*

Code Minimum **Holding Tank Capacity:** ____ Gallons with ____ Tanks or Compartments

Recommended **Holding Tank Capacity:** ____ Gallons with ____ Tanks or Compartments

The holding tank(s) will be: ____ *Existing tank reuse requires a tank integrity assessment*

Type of High Level Alarm: ____

(Alarm Set @ 75% tank capacity measured from inlet to bottom)

Comments: ____

4. SEPTIC TANK SIZING *Sizing: See 7080.1930*

A. Residential dwellings:

Number of Bedrooms (Residential): 5

Code Minimum **Septic Tank Capacity:** 1500 Gallons with 1 Tanks or Compartments

Recommended **Septic Tank Capacity:** 2500 Gallons with 2 Tanks or Compartments

The septic tank(s) will be: All New *Existing tank reuse requires a tank integrity assessment*

Comments: Take anchoring maybe needed

Effluent Screen & Alarm (Y/N): Yes Model/Type: POLYLOK PL-122

B. Other Establishments:

Waste received by: ____ ____ GPD x ____ Days Hyd. Retention Time

7080 Minimum **Septic Tank Capacity:** ____ Gallons with ____ Tanks or Compartments

Designed **Septic Tank Capacity:** ____ Gallons with ____ Tanks or Compartments

The septic tank(s) will be: ____ *Existing tank reuse requires a tank integrity assessment*

Comments: ____

Effluent Screen & Alarm (Y/N): ____ Model/Type: ____

*** Other Establishments Require Department of Labor and Industry Approval and Inspection for Building Sewer ***

University of Minnesota Onsite Sewage Treatment Program

Design Summary Page

Minnesota Pollution Control Agency

5. PUMP TANK SIZING *Sizing: see 7080.2100*

Soil Treatment Dosing Tank				Other Component Dosing Tank:			
Pump Tank Capacity (7080 Minimum):	750 Gal			Pump Tank Capacity (7080 Minimum):	Gal		
Pump Tank Capacity (Designed):	2000 Gal			Pump Tank Capacity (Designed):	Gal		
Pump Req:	48.0 GPM	Total Head	20.3 ft	Pump Req:	GPM	Total Head	ft
Supply Pipe Dia.	2.00 in	Dose Vol:	187.0 gal	Supply Pipe Dia.	in	Dose Vol:	Gal

* Flow measurement device must be incorporated for any system with a pump *

6. SYSTEM AND DISTRIBUTION TYPE

Project ID:

Soil Treatment Type:	Mound	Distribution Type:	Pressure Distribution-Level
Elevation Benchmark:	100.00 ft	Benchmark Location:	Bottom of house siding
MPCA System Type:	Type III	Distribution Media:	Rock
Type III/IV/V Details:	timed		

7. SITE EVALUATION SUMMARY:

Describe Limiting Condition: Redoximorphic Features/Saturated Soils

Layers with >35% Rock Fragments? (yes/no) No If yes, describe below: % rock and layer thickness, amount of soil credit and any additional information for addressing the rock fragments in this design.

Note:

	Depth		Depth		Elevation	
Limiting Condition:	0.0	inches	0.00	ft	97.60	ft
Minimum Req'd Separation:	36	inches	3.00	ft		
Distribution Media Bottom*:	Mound	inches	-3.00	ft	100.60	ft

Elevations are critical for system compliance.

Media Bottom Elevation OK

*This is the maximum depth to the bottom of the distribution media for required separation. Negative Depth (ft) requires a mound.

Designed Distribution Bottom Elevation: 100.60 ft Mound Minimum Sand Depth: 36 inches

A. Soil Texture: Fine Sandy Loam

B. Soil Hyd. Loading Rate: 0.60 GPD/ft^2 C: Percolation Rate: MPI

D. Contour Loading Rate: 12.0 Note:

E. Measured Land Slope: 7.0 % Note:

Comments:

8. SOIL TREATMENT AREA DESIGN SUMMARY

Trench:

Dispersal Area	sq.ft	Sidewall Depth	in	Trench Width	ft
Total Lineal Feet	ft	No. of Trenches		Code Max. Trench Depth	in
Contour Loading Rate	ft	Minimum Length	ft	Designed Trench Depth	in

Bed:

Dispersal Area	sq.ft	Sidewall Depth	in	Maximum Bed Depth	in
Bed Width	ft	Bed Length	ft	Designed Bed Depth	in

ONSITE SEWAGE TREATMENT PROGRAM

Design Summary Page

MINNESOTA POLLUTION CONTROL AGENCY

Project ID:

Mound:

Dispersal Area	850.0	sq.ft	Bed Length	85.0	ft	Bed Width	10.0	ft
Absorption Width	20.0	ft	Clean Sand Lift	3.0	ft	Berm Width (0-1%)		ft
Upslope Berm Width	12.4	ft	Downslope Berm	21.7	ft	Endslope Berm Width	17.1	ft
Total System Length	119.2	ft	System Width	44.1	ft	Contour Loading Rate	12.0	gal/ft

At-Grade:

Dispersal Area		sq.ft	Bed Length		ft	Bed Width		ft
Upslope Berm		ft	Downslope Berm		ft	Finished Height		ft
System Length		ft	Endslope Berm		ft	System Width		ft

Level & Equal Pressure Distribution Soil Treatment Area

No. of Laterals	3		Lateral Diameter	2.00	in	Lateral Spacing	3.2	ft
Perforation Spacing	3.0	ft	Perforation Diameter	7/32	in	Drainback Volume	7.8	gal
Min Dose Volume	169.3	gal	Max Dose Volume	187.5	gal	Total Dosing Volume	194.8	gal

Non-Level and Unequal Pressure Distribution Soil Treatment Area

	Elevation (ft)	Pipe Size (in)	Pipe Volume (gal/ft)	Pipe Length (ft)	Perf Size (in)	Spacing (ft)	Spacing (in)
Lateral 1							
Lateral 2							
Lateral 3							
Lateral 4							
Lateral 5							
Lateral 6							

Minimum Dose Volume: gal

Maximum Dose Volume: gal

Total Dosing Volume: gal

9. Organic Loading and Additional Info for HSW or Type IV/V Design - See Organic Loading tab

Organic Loading to Soil Treatment (Based on Waste Strength Data and Organic Loading Design)

A. Organic Loading Based on: B. Minumum required area sq.ft

Technology Strength Reduction (Tretment Level or HSW)

A. Starting Waste Strength Treatment desinged to meet:

Pretreatment Technology: *Must Meet or Exceed Target Level

Model: Units:

Disinfection Technology: *Required for Levels A & B

Model: Units:

10. Comments/Special Design Considerations:

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

KEVIN HERWIG		3945	7/10/2024

ONSITE SEWAGE TREATMENT PROGRAM

Mound Design Worksheet
≥1% Slope

MINNESOTA POLLUTION CONTROL AGENCY

1. SYSTEM SIZING: Project ID: v 04.02.2024

A. Design Flow:	750	GPD
B. Soil Loading Rate:	0.60	GPD/sqft
C. Depth to Limiting Condition		ft
D. Percent Land Slope:	7.0	%
E. Media (Sand) Loading Rate:	1.2	GPD/sqft
F. Mound Absorption Ratio:	2.00	

Table I
MOUND CONTOUR LOADING RATES:

Measured Perc Rate	← OR →	Texture - derived mound absorption ratio	→	Contour Loading Rate:
≤ 60mpi	← OR →	1.0, 1.3, 2.0, 2.4, 2.6	→	≤12
61-120 mpi		5.0	→	≤12
≥ 120 mpi*		>5.0*	→	≤6*

TABLE IXa
LOADING RATES FOR DETERMINING BOTTOM ABSORPTION AREA AND ABSORPTION RATIOS USING PERCOLATION TESTS

Percolation Rate (MPI)	Treatment Level C: Absorption Area Loading Rate (gpd/ft²)	Treatment Level C: Mound Absorption Ratio	Treatment Level A, A-2, B: Absorption Area Loading Rate (gpd/ft²)	Treatment Level A, A-2, B: Mound Absorption Ratio
<0.1	-	1	-	1
0.1 to 5	1.2	1	1.6	1
0.1 to 5 (fine sand and loamy fine sand)	0.6	2	1	1.6
6 to 15	0.78	1.5	1	1.6
16 to 30	0.6	2	0.78	2
31 to 45	0.6	2.4	0.78	2
46 to 60	0.45	2.6	0.6	2.6
61 to 120	-	5	0.3	5.3
>120	-	-	-	-

*Systems with these values are not Type I systems. Contour Loading Rate (linear loading rate) is a recommended value.

2. DISPERSAL MEDIA SIZING

A. Hydraulic Absorption Required Bottom Area: Design Flow (1A) ÷ Design Media Loading Rate(1E)

750 GPD ÷ 1.20 GPD/sqft = 625.0 sq.ft

Optional Upsizing of Dispersal Media Area

B. Larger Bed Area Size or Organic Sizing of Bed Area *[see organic loading sheet(2G)]* 850.0 sq.ft

C. Designed Dispersal Media Area: 850.0 sq.ft *Larger of 2A or 2B*

D. Enter Dispersal Bed Width: 10.0 ft *Can not exceed 10 feet*

E. Calculate Contour Loading Rate: Bed Width(2D) X Design Media Loading Rate(1E)

10.0 ft X 1.2 GPD/sqft = 12.0 gal/ft *Can not exceed Table 1*

F. Calculate Minimum Dispersal Bed Length: Dispersal Bed Area(2C) ÷ Bed Width(2D)

850 sqft ÷ 10.0 ft = 85.0 ft

If a larger dispersal media Length is desired, enter Length(ft): ft

3. ABSORPTION AREA SIZING

A. Calculate Absorption Width: Bed Width(2D) X Mound Absorption Ratio(1F)

10.0 ft X 2.0 = 20.0 ft

B. For slopes >1%, the Absorption Width is measured downhill from the upslope edge of the Bed.

Calculate Downslope Absorption Width: Absorption Width(3A) - Bed Width(2D)

20.0 ft - 10.0 ft = 10.0 ft

4. DISTRIBUTION MEDIA:

Project ID:

Select Dispersal Media: Rock — Enter Either 4A or 4B

A. Rock Depth Below Distribution Pipe

6 in

B. Registered Media

Registered Media Depth in

Check registered product information for specific application details and design

Specific Media Comments:

5. MOUND SIZING

Project ID:

A. Clean Sand Lift: Required Separation - Depth to Limiting Condition = Clean Sand Lift (1 ft minimum)

3.00 ft - ft = 3.00 ft Design Sand Lift (optional): 3 ft

B. Upslope Height: Clean Sand Lift(5A) + Depth of Media(4AorB) +Depth to Cover Pipe+ Depth of Cover (1 ft)

3.00 ft + 0.50 ft + 0.50 ft + 1.00 ft = 5.00 ft

Landslope %		0	1	2	3	4	5	6	7	8	9	10	11	12
Upslope Berm Ratio	3:1	3.00	2.91	2.83	2.75	2.68	2.61	2.54	2.48	2.42	2.36	2.31	2.26	2.21
	4:1	4.00	3.85	3.70	3.57	3.45	3.33	3.23	3.12	3.03	2.94	2.86	2.78	2.70

C. Select Upslope Berm Multiplier (based on land slope): 2.48

D. Calculate Upslope Berm Width: Multiplier (5C) X Upslope Mound Height (5B)

2.48 X 5.00 ft = 12.40 ft

E. Calculate Drop in Elevation Under Bed: Bed Width(2D) X Land Slope(1D) ÷ 100 = Drop (ft)

10.00 ft X 7.0 % ÷ 100 = 0.70 ft

F. Calculate Downslope Mound Height: Upslope Height(5B) + Drop in Elevation(5E)

5.00 ft + 0.70 ft = 5.70 ft

Landslope %		0	1	2	3	4	5	6	7	8	9	10	11	12
Downslope Berm Ratio	3:1	3.00	3.09	3.19	3.30	3.41	3.53	3.66	3.80	3.95	4.11	4.29	4.48	4.69
	4:1	4.00	4.17	4.35	4.54	4.76	5.00	5.26	5.56	5.88	6.25	6.67	7.14	7.69

G. Select Downslope Berm Multiplier (based on land slope): 3.80

H. Calculate Downslope Berm Width: Downslope Multiplier(5G) X Downslope Height (5F)

3.80 x 5.70 ft = 21.66 ft

I. Calculate Minimum Berm to Cover Absorption Area: Downslope Absorption Width(3B) + 4 feet

10.00 ft + 4.00 ft = 14.00 ft

J. Design Downslope Berm = greater of 5H and 5I: 21.66 ft

K. Select Endslope Berm Multiplier: 3.0 *(usually 3.0 or 4.0)*

L. Calculate Endslope Berm Width = Endslope Berm Multiplier(5K) X Downslope Mound Height(5F)

3.00 X 5.7 ft = 17.10 ft

M. Calculate Mound Width: Upslope Berm Width(5D) + Bed Width(2D) + Downslope Berm Width(5J)

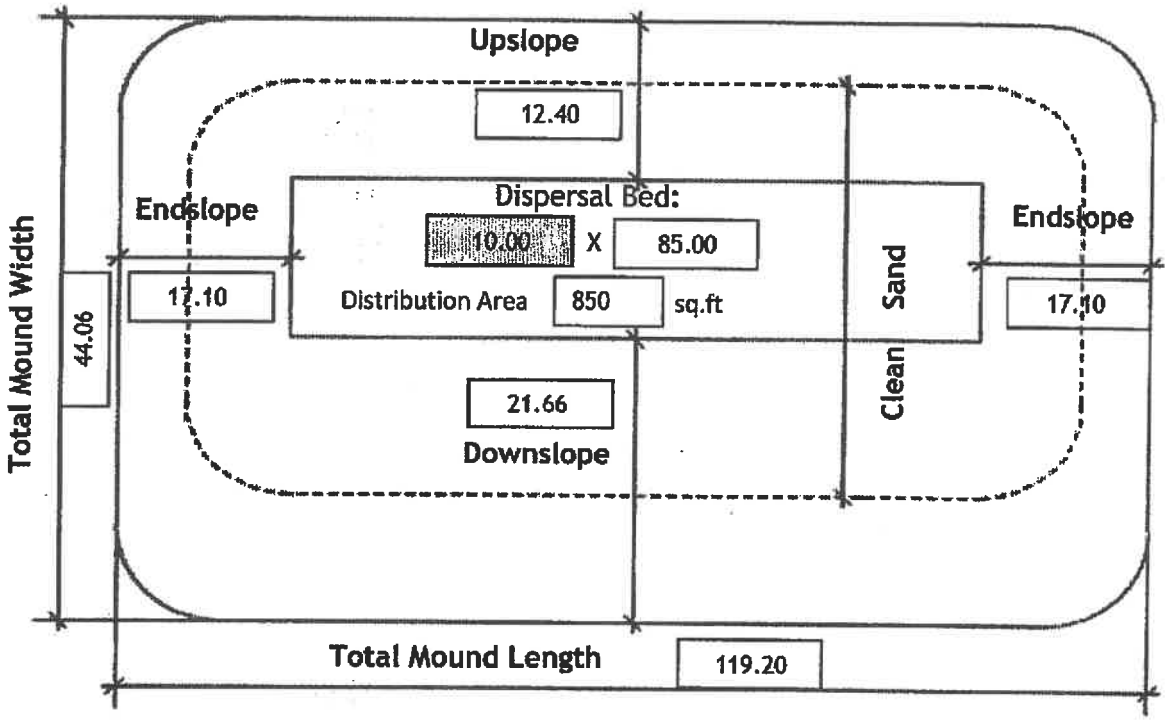
12.40 ft + 10.00 ft + 21.66 ft = 44.06 ft

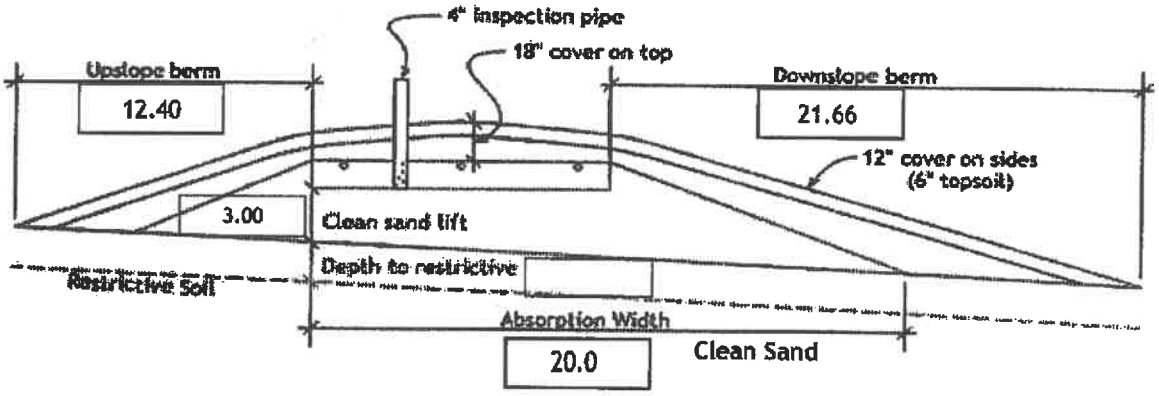
N. Calculate Mound Length: Endslope Berm Width (5L) + Bed Length(2F) + Endslope Berm Width(5L)

17.10 ft + 85.00 ft + 17.10 ft = 119.20 ft

6. MOUND DIMENSIONS (Feet)

Project ID:





Elevation to Benchmark

Required Separation: 36.0 (in)

Elevation Limiting Layer: 97.60 ft

Distribution Media: Rock

Elevation required Separation: 100.60 ft

Media Depth *Below Pipe*: 6 (in)

Elevation Distribution Media Bottom: 100.60 ft

Manifold Connection: END

Lateral Pipe Diameter: 2.00 (in)

Perforation Size: 7/32 (In)

Perforation Spacing: 36.0 (in)

If Split and Non-Level Pressure Distribution Used: See Non-Level Pressure Distribution Form

Comments:

University of Minnesota Onsite Sewage Treatment Program

Estimated Mound Materials Worksheet

MINNESOTA POLLUTION CONTROL AGENCY

Mound to be constructed to dimensions in design. This is an estimate of materials needed.
Individual construction practices may vary quantities.

Project ID:

v 04.02.2024

A. Rock *Volume*: (Rock Below Pipe + Rock to cover pipe (*pipe outside dia + ~2 inch*)) X *Bed Length* X *Bed Width* = *Volume*

(6 in + 5.0 in) ÷ 12 X 85.0 ft X 10.0 ft = 779.2 cu.ft

Divide cu.ft by 27 cu.ft/cu.yd to calculate cubic yards: 779.2 cu.ft ÷ 27 = 28.9 cu.yd

Add 30% for constructability: 28.9 cu.yd X 1.3 = 37.5 cu.yd

B. Calculate *Clean Sand Volume:*

Volume Under Rock bed: *Average Sand Depth* x *Media Width* x *Media Length* = cubic feet

3.4 ft X 10.0 ft X 85 ft = 2848 cu.ft

For a Mound on a slope from 0-1%

Volume from Length = ((Upslope Mound Height - 1) X Absorption Width Beyond Bed X Media Bed Length)

ft - 1) X X ft =

Volume from Width = ((Upslope Mound Height - 1) X Absorption Width Beyond Bed X Media Bed Width)

ft - 1) X X ft =

Total Clean Sand Volume: *Volume from Length* + *Volume from Width* + *Volume Under Media*

cu.ft + cu.ft + cu.ft = cu.ft

For a Mound on a slope greater than 1%

Upslope Volume: ((*Upslope Mound Height - 1*) x 3 x *Bed Length*) ÷ 2 = cubic feet

((5.0 ft - 1) X 3.0 ft X 85.0) ÷ 2 = 510.0 cu.ft

Downslope Volume: ((*Downslope Height - 1*) x Downslope Absorption Width x *Media Length*) ÷ 2 = cubic feet

((5.7 ft - 1) X 10.0 ft X 85.0) ÷ 2 = 1997.5 cu.ft

Endslope Volume: (*Downslope Mound Height - 1*) x 3 x *Media Width* = cubic feet

(5.7 ft - 1) X 3.0 ft X 10.0 ft = 141.0 cu.ft

Total Clean Sand Volume: *Upslope Volume* + *Downslope Volume* + *Endslope Volume* + *Volume Under Media*

510.0 cu.ft + 1997.5 cu.ft + 141.0 cu.ft + 2847.5 cu.ft = 5496.0 cu.ft

Divide cu.ft by 27 cu.ft/cu.yd to calculate cubic yards: 5496.0 cu.ft ÷ 27 = 203.6 cu.yd

Add 30% for constructability: 203.6 cu.yd X 1.3 = 264.6 cu.yd

C. Calculate *Sandy Berm Volume:*

Total Berm Volume (approx.): ((Avg. Mound Height - 0.5 ft topsoil) x Mound Width x Mound Length) ÷ 2

(5.4 - 0.5)ft X 44.1 ft X 119.2) ÷ 2 = 12736.0 cu.ft

Total Mound Volume - Clean Sand volume -Rock Volume = cubic feet

12736.0 cu.ft - 5496.0 cu.ft - 779.2 cu.ft = 6460.8 cu.ft

Divide cu.ft by 27 cu.ft/cu.yd to calculate cubic yards: 6460.8 cu.ft ÷ 27 = 239.3 cu.yd

Add 30% for constructability: 239.3 yd^3 x 1.3 = 311.1 cu.yd

D. Calculate *Topsoil Material Volume: Total Mound Width X Total Mound Length X .5 ft*

44.1 ft X 119.2 ft X 0.5 ft = 2626.0 cu.ft

Divide cu.ft by 27 cu.ft/cu.yd to calculate cubic yards: 2626.0 cu.ft ÷ 27 = 97.3 cu.yd

Add 30% for constructability: 97.3 cu.yd X 1.3 = 126.4 cu.yd

University of Minnesota Onsite Sewage Treatment Program

Pressure Distribution Design Worksheet

MINNESOTA POLLUTION CONTROL AGENCY

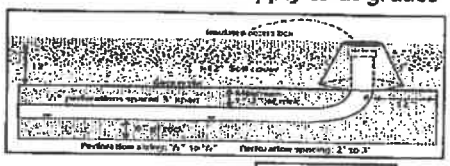
Project ID:

v 04.02.2024

1. Media Bed Width: 10.0 ft
2. Media Bed Length: 85.0 ft
3. Minimum Number of Laterals in system/zone = Rounded up number of [(Media Bed Width(1.) - 4) ÷ 3] + 1.

   [(10 - 4) ÷ 3] + 1 = 3 laterals *Does not apply to at-grades*
4. Designer Selected *Number of Laterals*: 3 laterals

   Cannot be less than line 2 (Except in at-grades)



5. Lateral spacing in Bed; *Must be greater than 1 foot and no more than 2 feet from Edge*: 3.20 ft
6. *Length of Laterals* = Media Bed Length(2.) - 2 Feet.

   85.0 - 2ft = 83.0 ft *Perforation can not be closer then 1 foot from edge.*
7. Select *Perforation Spacing*: 3.0 ft
8. Determine the *Number of Perforation Spaces*. Divide the *Length of Laterals(6.)* by the *Perforation Spacing* (7.) and round down to the nearest whole number.

   Number of Perforation Spaces = 83.0 ft ÷ 3.0 ft = 27 Spaces
9. *Number of Perforations per Lateral* is equal to 1.0 plus the *Number of Perforation Spaces(8.)*. Check table below to verify the number of perforations per lateral guarantees less than a 10% discharge variation. The value is double with a center manifold.

   Perforations Per Lateral = 27 Spaces + 1 = 28 Perfs. Per Lateral
10. Select *Perforation Diameter Size:* 7/32 in 0.21875
11. *Select Lateral Diameter (See Table)*: 2.00 in
12. Select *Manifold Connection* (End or Center): END

If Center Manifold Connection the max number of perfs per lateral in the table can be doubled.

Maximum Number of Perforations Per Lateral to Guarantee <10% Discharge Variation

¼ Inch Perforations

Perforation Spacing (Feet)	Pipe Diameter (Inches)				
	1	1¼	1½	2	3
2	10	13	18	30	50
2½	8	12	16	28	54
3	8	12	16	28	52

7/32 Inch Perforations

Perforation Spacing (Feet)	Pipe Diameter (Inches)				
	1	1¼	1½	2	3
2	11	16	21	34	68
2½	10	14	20	32	64
3	9	14	19	30	60

3/16 Inch Perforations

Perforation Spacing (Feet)	Pipe Diameter (Inches)				
	1	1¼	1½	2	3
2	12	15	20	40	87
2½	12	17	24	40	80
3	12	16	22	37	75

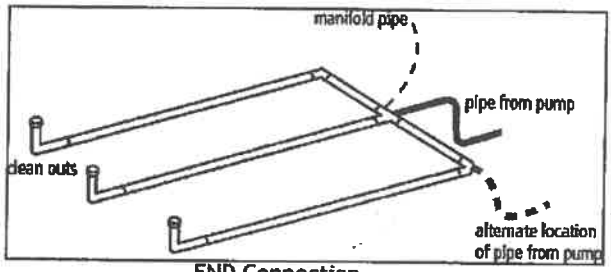
1/8 Inch Perforations

Perforation Spacing (Feet)	Pipe Diameter (Inches)				
	1	1¼	1½	2	3
2	21	33	44	74	149
2½	20	30	41	69	135
3	20	29	38	64	126

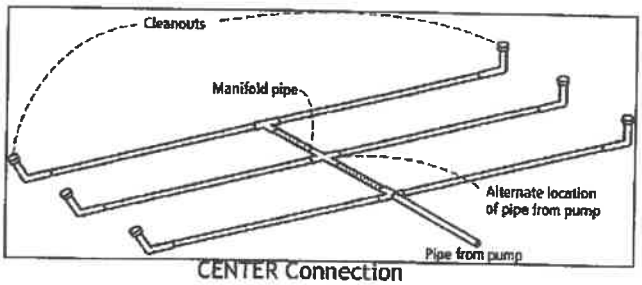
University of Minnesota Onsite Sewage Treatment Program

Pressure Distribution Design Worksheet

MINNESOTA POLLUTION CONTROL AGENCY



END Connection



CENTER Connection

Perf Per Lateral: 28

Perf Per Lateral Equal Split: 14 | 14

OPTIONAL Perf Per Lateral Non-Equal Split*: ____ | ____

* must not exceed maximum number perfs per lateral in table

End Feed Lateral Min Diameter: 2.00

Center Feed Lateral Min Diameter: ____

13. *Total Number of Perforations* equals the *Number of Perforations per Lateral (9.)* multiplied by the *Number of Perforated Laterals.(4.)*

28 Perf. Per Lat. X 3 Number of Perf. Lat. = 84 Total Number of Perf.

14. Calculate the *Square Feet per Perforation.*

Recommended value is 4-11 ft2 per perforation, Does not apply to At-Grades

a. *Bed Area* = Bed Width (ft)(1.) X Bed Length (ft)(2.)

10.00 ft X 85.00 ft = 850 sq.ft

b. *Square Foot per Perforation = Bed Area (14a) ÷ by Total Number of Perfs (13)*

850 sqft ÷ 84 perf = 10 sq.ft/perf

15. Select *Minimum Average Head*: 1.0 ft

16. Select *Perforation Discharge* based on Table: 0.56 GPM per Perf

17. *Flow Rate = Total Number of Perfs(13.) X Perforation Discharge(16.)*

84 Perfs X 0.56 GPM per Perforation = 48.0 GPM

18. *Volume of Liquid Per Foot of Distribution Piping (Table II)*: 0.170 Gallons/ft

19. *Volume of Distribution Piping = Number of Perforated Laterals(4.) X Length of Laterals(6.) X Volume of Liquid Per Foot of Distribution Piping (18.)*

3 X 83.0 ft X 0.170 gal/ft = 42.3 Gallons

20. Minimum Delivered Volume = Volume of Distribution Piping (19.) X 4

42.3 gal X 4 = 169.3 Gallons

21. Maximum Delivered Volume = Design flow x 25%

750 gpd X 25% = 187.5 Gallons

22. Minimum Delivered vs Maximum Delivered evaluation: Volume ratio correct

Perforation Discharge (GPM)

Head (ft)	Perforation Diameter 1/8	5/16	7/32	1/4
1.0*	0.18	0.41	0.54	0.74
1.5	0.22	0.51	0.69	0.9
2.0*	0.26	0.59	0.80	1.04
2.5	0.29	0.65	0.89	1.17
3.0	0.32	0.72	0.98	1.28
4.0	0.37	0.83	1.13	1.47
5.0*	0.41	0.93	1.26	1.65

1 foot	Dwellings with 3/16 inch to 1/4 inch perforations
2 feet	Dwellings with 1/8 inch perforations
	Other establishments and MSTS with 3/16 inch to 1/4 inch perforations
5 feet	Other establishments and MSTS with 1/8 inch perforations

Table II Volume of Liquid in Pipe

Pipe Diameter (inches)	Liquid Per Foot (Gallons)
1	0.045
1.25	0.078
1.5	0.110
2	0.170
3	0.380
4	0.661

Comments/Special Design Considerations:

Onsite Sewage Treatment Program

Basic STA Pump Selection Design Worksheet

MINNESOTA POLLUTION CONTROL AGENCY

1. PUMP CAPACITY

Project ID:

v 04.02.2024

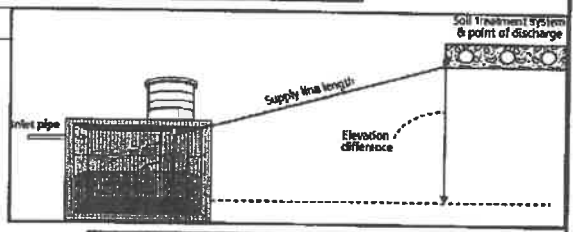
Pumping to Gravity or Pressure Distribution: Pressure

A. If pumping to gravity enter the gallon per minute of the pump: ____ GPM *(10 - 45 gpm)*

B. If pumping to a pressurized distribution system: 48.0 GPM

C. Enter pump description: Equalization/Time Dosing

2. HEAD REQUIREMENTS



A. Elevation Difference between pump and point of discharge: 12.0 ft

B. Distribution Head Loss: 5 ft

C. Additional Head Loss*: ____ ft (due to special equipment, etc.)

* Common additional head loss: gate valve = 1 ft each, globe valve = 1.5 ft each, splitter valve = see manufacturers details

Distribution Head Loss

Gravity Distribution = 0ft

Pressure Distribution based on Minimum Average Head Value on Pressure Distribution Worksheet:

Minimum Average Head	Distribution Head Loss
1ft	5ft
2ft	6ft
5ft	10ft

D. 1. Supply Pipe Diameter: 2.0 in

2. Supply Pipe Length: 46 ft

E. Friction Loss in Plastic Pipe per 100ft from Table I:

Friction Loss = 5.7 ft per 100ft of pipe

Table I. Friction Loss in Plastic Pipe per 100ft

Flow Rate (GPM)	Pipe Diameter (inches) 1	1.25	1.5	2
10	9.1	3.1	1.3	0.3
12	12.8	4.3	1.8	0.4
14	17.0	5.7	2.4	0.6
16	21.8	7.3	3.0	0.7
18		9.1	3.8	0.9
20		11.1	4.6	1.1
25		16.8	6.9	1.7
30		23.5	9.7	2.4
35			12.9	3.2
40			16.5	4.1
45			20.5	5.0
50				6.1
55				7.3
60				8.6
65				10.0
70				11.4
75				13.0
85				16.4
95				20.1

F. Determine *Equivalent Pipe Length* from pump discharge to soil dispersal area discharge point. Estimate by adding 25% to supply pipe length for fitting loss. *Supply Pipe Length* X 1.25 = *Equivalent Pipe Length*

46 ft X 1.25 = 57.5 ft

G. Calculate *Supply Friction Loss* by multiplying *Friction Loss Per 100ft(E.)* by the *Equivalent Pipe Length(F.)* and divide by 100.

Supply Friction Loss =

5.7 ft per 100ft X 57.5 ft ÷ 100 = 3.3 ft

H. *Total Head* requirement is the sum of the *Elevation Difference(2A)* + Distribution Head Loss(2B) + Additional Head Loss(2C) + Supply Friction Loss(2G)

12 ft + 5.0 ft + ____ ft + 3.3 ft = 20.3 ft

3. PUMP SELECTION

A pump must be selected to deliver at least **48.0** GPM with at least **20.3** feet of total head.

Comments:

ONSITE SEWAGE TREATMENT PROGRAM

STA Dosing Pump Tank Design Worksheet (Time Dose)

MINNESOTA POLLUTION CONTROL AGENCY

Project ID: v 04.02.2024

DETERMINE TANK CAPACITY AND DIMENSIONS

1. A. Design Flow: 750 GPD B. Tank Use: Equalization
   C. Percentage of Design Flow 85 % 638 Gal Up to 75% design flow is normal for Design percentage
   D. Code minimum pump tank capacity: 750 Gal E. Recommended capacity: 2000 Gal

2. A. Tank Manufacturer: BROWN WILBERT B. Tank Model: 2000
   C. Capacity from manufacturer: 2510 Gallons
   D. Liquid depth of tank from manufacturer: 48.0 inches
   E. Gallons per inch: 52.3 Gallons per inch

Note: Design calculations are based on this specific tank. Substituting a different tank model will change the pump float or timer settings. Contact designer if changes are necessary.

DETERMINE DOSING VOLUME

3. *Volume to Cover Pump* (The inlet of pump should be 4 inches from the bottom of the tank & 2 inches covering the pump recommended)

   (Pump and block height + 2 inches) X *Gallons Per Inch* (2E)

   (12 in + 2 inches) X 52.3 Gallons Per Inch = 732.2 Gallons

4. *Minimum Delivered Volume* = 4 X Volume of Distribution Piping:

   -Item 19 of the Pressure Distribution or Item 11 of Non-level 169.3 Gallons (minimum dose) 3.24 inches/dose

5. Calculate *Maximum Pumpout Volume* (25% of Design Flow)

   Design Flow: 750 GPD X 0.25 = 187.5 Gallons (maximum dose) 3.59 inches/dose

6. *Select a pumpout volume that meets both Minimum and Maximum:* 187.0 Gallons

7. Calculate *Doses Per Day* = Percentage Design Flow(1C) ÷ *Delivered Volume(6.)*

   638 gpd ÷ 187.0 gal = 3.4 *Doses*

8. Calculate Drainback:

   A. *Diameter of Supply Pipe* = 2 inches
   B. Length of Supply Pipe = 46 feet
   C. *Volume of Liquid Per Lineal Foot of Pipe* = 0.170 Gallons/ft
   D. *Drainback = Length of Supply Pipe(8B) X Volume of Liquid Per Lineal Foot of Pipe(8C)*

   46 ft X 0.170 gal/ft = 7.8 Gallons

9. *Total Dosing Volume = Delivered Volume(6.) + Drainback(8D)*

   187.0 gal + 7.8 gal = 194.8 Gallons

10. Working Storage Volume = Tank Volume (2C) - Volume to Cover Pump(3.) - Reserve Capacity (22.)

    2510.0 gal - 732.2 gal - 251.0 = 1526.8 Gallons

Volume of Liquid in Pipe	
Pipe Diameter (inches)	Liquid Per Foot (Gallons)
1	0.045
1.25	0.078
1.5	0.110
2	0.170
3	0.380
4	0.661

11. Required *Flow Rate*:

    A. From Pump Curve - Must verify after Install: 50 GPM*

    B. Calculated GPM = Change in Depth (in) x Gallons Per Inch(2E) / Time Interval in Minutes

    3.74 in X 52.3 gal/in ÷ 3 min = 65.2 GPM

12. Select Flow Rate from 11 A or B: 50.0 GPM*

**Note: This value must be adjusted after installation based on pump calibration.*

University of Wisconsin Onsite Sewage Treatment Program

STA Dosing Pump Tank Design Worksheet (Time Dose)

MINNESOTA POLLUTION CONTROL AGENCY

NORMAL OPERATION TIMER SETTINGS*

13. Calculate TIMER ON setting*:

Total Dosing Volume(9.) ÷ GPM(12.)

195 gal ÷ 50.0 gpm = 3.9 Minutes ON*

HR	MIN	SEC	
0	3.0	53	ON Time

14. Calculated TIMER OFF setting*:

Minutes Per Day (1440)/*Doses Per Day(7.)* - Minutes On(13.)

1440 min ÷ 3 doses/day - 3.9 min = 418.5 Minutes OFF*

HR	MIN	SEC	
6	58.0	30	OFF Time

OPTIONAL PEAK ENABLE DOSING* - *Designers option for peak flow operation*

15. Peak Percentage of Design Flow ____ %

16. Peak Pump Volume that meets both Minimum and Maximum Volume ____ gal + Drainback 7.8 gal

17. Peak Dose Volume ____ gal

18. Peak TIMER ON ____ gal ÷ ____ gpm = ____ min ON

HR	MIN	SEC	
			Peak ON

**Note: This value must be adjusted after installation based on pump calibration.*

19. Peak TIMER OFF:1440 min ÷ ____ doses/day - ____ min On ____ min Off

HR	MIN	SEC	
			Peak OFF

FLOAT SETTINGS

Alarm and Pump are to be wired on separate circuits and inspected by the electrical inspector

20. Pump Off Float - Measuring from bottom of tank:

Distance to set Pump Off Float=Gallons to Cover Pump(3.) ÷ Gallons Per Inch(2E):

732 gal ÷ 52.3 gal/in = 14.0 inches

Reserve Capacity 251 Gal

Alarm Depth 43.2 in

21. Alarm Float - Measuring from bottom of tank (90% recommended):

Distance to set Alarm Float = Tank Depth(2D) X % of Tank Depth (90% recommended)

48.0 in X 90 % = 43.2 inches

Storage Capacity 1527 Gal

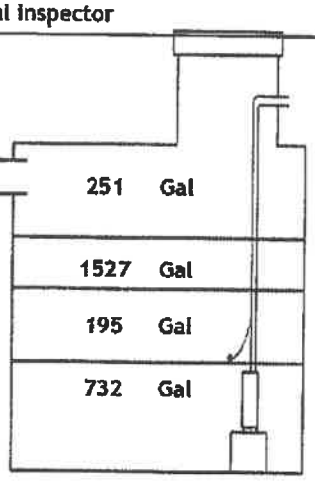
Normal Dose Volume 195 Gal

Pump Off 14.0 in

732 Gal

22. Reserve Capacity in gallons = Tank Depth(2D) - Alarm Depth(21.) X Gallons Per Inch(2E)

(48.0 in - 43.2 in) X 52.3 = 251.0 gallons



Onsite Sewage Treatment Program

Tank Buoyancy Worksheet

Minnesota Pollution Control Agency

1. Tank Specifications

Project ID:

v 04.02.2024

A. Tank Manufacturer: BROWN WILBERT

Tank Model: 2000

B. Outside Tank Dimensions and Specifications:

Tank Use: Equalization

Length: 144 in Width: 81 in Height: 65 in Diameter: in

Length: 12.0 ft Width: 6.8 ft Height: 5.4 ft Radius of Tank: in

2. Outside Volume of Tank

Rectangular Tank	Circular Tank
A. Area of Tank = Length (ft) X Width (ft)	A. Area of Tank = πr^2 = (3.14 X (Radius of Tank)^2)
12.0 ft X 6.8 ft = 81.0 sq.ft	3.14 X (ft)^2 = sq.ft
B. Volume of Tank = Area of Tank (2.A) X Height (ft)	B. Volume of Tank = Area of Tank X Height (ft)
81.0 sq.ft X 5.4 ft = 438.8 cu.ft	sq.ft X ft = cu.ft

3. Force of Tank Weight (F_{TW})

Weight of Tank (provided by manufacturer) 11550 lbs

4. Force of Soil Weight Over Tank (F_{SW})

A. Depth of Cover Over Tank: 27 in 2.3 ft

B. Weight of Soil Per Cubic Foot: 100 lbs/cu.ft

C. Volume of Soil Over Tank = Depth of Cover(4A) (ft) X Area of Tank(2A) (ft^2)

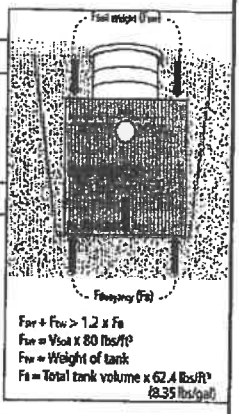
2.3 ft X 81.0 sq.ft = 182.3 cu.ft

D. Weight of Soil Over Tank = Volume of Soil Over Tank(4C) X Weight of Soil Per Cubic Foot

182.3 cu.ft X 100 lbs/cu.ft = 18,225.0 lbs

Note: Assumes saturation does not get over the lid of the tank

Soil Type	Weight of Soil (lbs/ft^3)
Sandy	120
Loamy	100
Clay	90



5. Buoyant Force (F_B)

Buoyant Force (F_B) = Outside Volume of Tank(2B) X Weight of Water Per Cubic Foot (62.4 lbs/ft^3) X 1.2 (Safety Factor)

439 X 62.4 lbs/cu.ft X 1.2 = 32,853.6 lbs

6. Evaluation of Net Forces

A. Downward Force = Force of Tank Weight (F_{TW})(3.) + Force of Soil Weight of Soil (F_{SW})(4D.)

11550 lbs + 18225 lbs = 29,775.0 lbs

B. Net Difference = Downward Force(6A) - Buoyant Force Including Safety Factor (5.)

29775 lbs - 32854 lbs = -3,078.6 lbs **Warning: Tank may float**

If the Net Difference is negative, counter measures will need to be taken to prevent the tank from floating out of the ground.

Comments/Solution:

I would recommend using 2 solid concrete Anchor blocks (2'x2'x6' = 3500 lb each) one on each side with 4 inch strapping over tank. Other means of anchoring may be used to offset tank buoyancy .

Onsite Sewage Treatment Program

Tank Buoyancy Worksheet

MINNESOTA POLLUTION CONTROL AGENCY

1. Tank Specifications

Project ID:

v 04.02.2024

A. Tank Manufacturer: BROWN WILBERT

Tank Model: 2500

B. Outside Tank Dimensions and Specifications:

Tank Use: Septic

Length:	144	in	Width:	81	in	Height:	77	in
Length:	12.0	ft	Width:	6.8	ft	Height:	6.4	ft

Diameter: in

Radius of Tank: in

2. Outside Volume of Tank

Rectangular Tank

A. Area of Tank = Length (ft) X Width (ft)

12.0 ft X 6.8 ft = 81.0 sq.ft

B. Volume of Tank = Area of Tank (2.A) X Height (ft)

81.0 sq.ft X 6.4 ft = 519.8 cu.ft

Circular Tank

A. Area of Tank = πr^2 = (3.14 X (Radius of Tank)^2)

3.14 X (ft)^2 = sq.ft

B. Volume of Tank = Area of Tank X Height (ft)

sq.ft X ft = cu.ft

3. Force of Tank Weight (F_{TW})

Weight of Tank (provided by manufacturer) 16860 lbs

4. Force of Soil Weight Over Tank (F_{SW})

A. Depth of Cover Over Tank: 28 in 2.3 ft

B. Weight of Soil Per Cubic Foot: 100 lbs/cu.ft

C. Volume of Soil Over Tank = Depth of Cover(4A) (ft) X Area of Tank(2A) (ft^2)

2.3 ft X 81.0 sq.ft = 189.0 cu.ft

D. Weight of Soil Over Tank = Volume of Soil Over Tank(4C) X Weight of Soil Per Cubic Foot

189.0 cu.ft X 100 lbs/cu.ft = 18,900.0 lbs

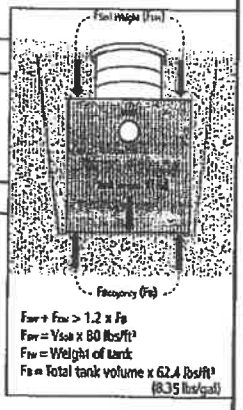
Note: Assumes saturation does not get over the lid of the tank

Soil Type	Weight of Soil (lbs/ft^3)
Sandy	120
Loamy	100
Clay	90

5.Buoyant Force (F_B)

Buoyant Force (F_B) = Outside Volume of Tank(2B) X Weight of Water Per Cubic Foot (62.4 lbs/ft^3) X 1.2 (Safety Factor)

520 X 62.4 lbs/cu.ft X 1.2 = 38,918.9 lbs



6. Evaluation of Net Forces

A. Downward Force = Force of Tank Weight (F_{TW})(3.) + Force of Soil Weight of Soil (F_{SW})(4D.)

16860 lbs + 18900 lbs = 35,760.0 lbs

B. Net Difference = Downward Force(6A) - Buoyant Force Including Safety Factor (5.)

35760 lbs - 38919 lbs = -3,158.9 lbs **Warning: Tank may float**

If the Net Difference is negative, counter measures will need to be taken to prevent the tank from floating out of the ground.

Comments/Solution:

I would recommend using 2 solid concrete Anchor blocks (2'x2'x6' = 3500 lb each) one on each side with 4 inch strapping over tank. Other means of anchoring may be used to offset pink buoyancy .