Becker County Planning & Zoning
915 Lake Ave
Detroit Lakes, MN 56501
(218) 846-7314
www.co.becker.mn.us

200492000-2025

Certificate of Compliance

Inspection Report - Permit #: SS2025-2461

Owner & Property Information

Owner Name:	DEAN SPAETH
Mailing Address:	DEAN SPAETH 1526 210TH ST MAHNOMEN MN 56557
Parcel #:	200492000
Secondary Parcel #:	

Site Address:	39021 DORA LEE RD
Township - Sec/Twp/Rng:	MAPLE GROVE - 09/142/040
Legal Description:	DORA LEE ESTATES|LOT 7
Designer:	JenCo Services, LLC, L4041 (James Piper)
Installer:	Muff's Trenching LLC, L576 (Ronald Muff)

Inspector Verified Specifications

Insp- Effluent Screen Installed:	No
Insp- Alarm Required:	Yes
Insp- Lift Pump in System:	Yes
Insp- Number of Bedrooms:	5

Insp- Tank Nbr/Size:	2/1500/2-1000
Insp- Drainfield Type:	Mound
Insp- Drainfield Size:	10X65 ROCK BED
Insp- Soil Verification:	#1:SEE ATTACHED #2:N/A #3:N/A

Inspector Verified Setbacks

Insp- Tank Dist to Road	10+
Insp- Tank Dist to Nearest Prop Line	10
Insp- Tank Dist to Nearest Structure	10
Insp- Tank Dist to Well	50+
Insp- Tank Dist to OHW	75+
Insp- Tank Dist to Pond/Wetland	NA
Insp- Tank Dist to Pressure Line	

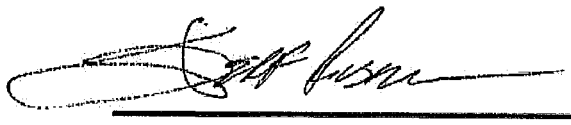
Insp- Drainfield Dist to Road	10+
Insp- Drainfield Dist to Nearest Prop Line	PLA/less than 10ft
Insp- Drainfield Dist to Nearest Structure	20
Insp- Drainfield Dist to Well	50+
Insp- Drainfield Dist to OHW	75+
Insp- Drainfield Dist to Pond/Wetland	NA
Insp- Drainfield Dist to Pressure Line	

Certificate of Compliance

(Yes) Certificate is hereby granted based upon the application, addendum from, plans, specifications and all other supporting data. With proper maintenance, this system can be expected to function satisfactory, however this is not a guarantee.

Certification Date: 08/21/2025

Zoning Office Signature:



Jeff Rusness - ISTS Inspector

*** Certificate of Compliance is not valid unless signed by a Registered Qualified Employee ***

Field Review Form

Permit # SS2025-2461

Property and Owner

Owner: **DEAN SPAETH**	Parcel Number: **200492000**
Site Address: **39021 DORA LEE RD**	Secondary Parcel:

Home Information

Does the structure contain any of the following elements?	Designer submitted	Inspector verified
	Garbage disposal: No Dishwasher: Grinder pump: Lift pump in bsmt:	Garbage disposal? Y (N) Dishwasher? (Y) N Grinder pump? Y (N) Lift pump in basement? Y (N)

Number of bedrooms: **5**	Review - Number of bedrooms: 5
Effluent screen	Effluent screen installed? Y (N) Mfr:
Alarm: **Yes** Type: **ELECTRIC**	Review - Alarm? (Y) N Type & Mfr: Aldexa Powell Post
Lift pump in system: **Yes**	Review - Lift pump in system? (Y) N Mfr: Zoeller N98

Component Information

Tank size: **1500, 1000**	Review - Tank nbr: 2 size: 1000 gal Mfr: Theben
Drainfield type: **Mound**	Review - Drainfield type: Mound
Drainfield size: Full size - **625** Reduced/warr. size -	Review - Drainfield status: none / (installed) / next spring Review - Drainfield size: 1x625 Rockbed
Absorption area size: **6"**	Review - Absorption area size:
Chamber type/num: Trench sqft/chamber -	Review - Chamber type: NA Num: Review - Trench sqft/chamber:
Drainfield rock depth: **6"**	Review - Rock depth: 6 in

Soil Verification

Vertical separation verified See attached	Boring #1: Boring #2: Boring #3:

Setback Verification

	Designer submitted		Inspector verified	
Distance to...	Tank	Drainfield	Tank	Drainfield
Road	+50'	+10'	10	10
Nearest prop line	+20'	5'	10	PLA
Nearest structure	+10'	+20'	10	20
Well	+50'	+50'	50+	50+
OHW	+75'	+100'	75	75
Pond/Wetland			NA	NA
Pressure line			NA	NA

Date System Installed: 8/20/2025 Installer: Muffs trench Inspector: [signature]

ONSITE SEWAGE TREATMENT PROGRAM

Preliminary Evaluation Worksheet

MINNESOTA POLLUTION CONTROL AGENCY

1. Contact Information

v 03.15.2023

Property Owner/Client:	DEAN P SPAETH & JOANN C SPAETH	Date Completed:	9/1/2024
Site Address:	39021 DORA LEE RD, WAUBUN, MN	Project ID:	
Email:	UNKNOWN	Phone:	UNKNOWN
Mailing Address:	1526 210TH ST, MAHNOMEN, MN 56557	Alt Phone:	
Legal Description:	DORA LEE ESTATES LOT 7		
Parcel ID:	200492000	SEC: 09 TWP: 142 RNG: 040	

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: # 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: NONE

Anticipated non-domestic waste: NONE

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		>50				OWNER
2							
3							
4							

Additional Well Information:

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)	No	Yes, source:	
Buried water supply pipes within 50 ft of proposed system (Y/N)	No		
B. Site located in a shoreland district/area?	Yes	Yes, name:	WHITE EARTH
Elevation of ordinary high water level:	1452 ft	Source:	GIS
Classification: Lake- Recreational	Tank Setback: 75 ft.	STA Setback: 75 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: 1138 Slope Range: 0 %

List landforms: BEACHES ON LAKESHORES

Landform position(s): Back/ Side Slope

Parent materials: Till

Depth to Bedrock/Restrictive Feature: >80 in Depth to Watertable: >80 in

Map Unit Ratings

Septic Tank Absorption Field- At-grade:	Moderately Limited
Septic Tank Absorption Field- Mound:	Not Limited
Septic Tank Absorption Field- Trench:	Extremely Limited

5. Local Government Unit Information

Name of LGU: BECKER COUNTY

LGU Contact: KYLE VAREBERG

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 03.15.2023

Property Owner/Client: DEAN P SPAETH & JOANN C SPAETH | Project ID:

Site Address: 39021 DORA LEE RD, WAUBUN, MN | Date Completed: 9/1/2024

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: Back/ Side Slope

Percent slope: 3 % | Slope shape: Linear, Linear | Slope direction: northeast

Describe the flooding or run-on potential of site: NONE

Describe the need for Type III or Type IV system: NONE

Note:

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

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: 3 | Soil observation logs attached (Y/N): Yes

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

5. Phase I. Reporting Information

	Depth		Elevation	
Limiting Condition*:	18	in	96.4	ft
Periodically saturated soil:	18	in	96.4	ft
Standing water:	>80	in		ft
Bedrock:	>80	in		ft
Benchmark Elevation:	100.0	ft		

*Most Restrictive Depth Identified from List Below

Soil Texture: Medium Sand

Percolation Rate: min/inch

Soil Hyd Loading Rate: 1.2 gpd/sq.ft

Elevations and Benchmark on map? (Y/N): Yes

Benchmark Elevation Location: TOP OF MOUND

Differences between soil survey and field evaluation:

Site evaluation issues / comments:

Anticipated construction issues:

University of Minnesota Onsite Sewage Treatment Program

Soil Observation Log

Project ID:

v 03.15.2023

Client:	DEAN P SPAETH & JOANN C SPAETH			Location / Address:	39021 DORA LEE RD, WAUBUN, MN
Soil parent material(s): (Check all that apply)	☐ Outwash ☐ Lacustrine ☐ Loess ☑ Till ☐ Alluvium ☐ Bedrock ☐ Organic Matter ☐ Disturbed/Fill				
Landscape Position:	Foot Slope	Slope %: 3.0	Slope shape:	Linear, Linear	Flooding/Run-On potential: No
Vegetation:	Grass	Soil survey map units:	1138		Surface Elevation-Relative to benchmark: 97.0
Date/Time of Day/Weather Conditions:	9/1/2024	PM	SUNNY		Limiting Layer Elevation: 95.5
Observation #/Location:	#1	NW CORNER		Observation Type:	Auger

Depth (in)	Texture	Rock Frag. %	Matrix Color(s)	Mottle Color(s)	Redox Kind(s)	Indicator(s)	Structure		
							Shape	Grade	Consistence
0-4	Medium Loamy Sand	2	10YR 3/2	None	None	None	Blocky	Weak	Friable
4-8	Medium Loamy Sand	2	10YR 4/4	None	None	None	Granular	Weak	Loose
8-18	Medium Loamy Sand	2	10YR 5/3	None	None	None	Granular	Weak	Loose
18+	Sandy Clay Loam	2	10YR 5/4	10YR 5/2	Depletions	S2	Blocky	Moderate	Friable

Comments:

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

JAMES PIPER		L4041	9/1/2024
(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 03.15.2023

Client:	DEAN P SPAETH & JOANN C SPAETH			Location / Address:	39021 DORA LEE RD, WAUBUN, MN
Soil parent material(s): (Check all that apply)	☐ Outwash ☐ Lacustrine ☐ Loess ☑ Till ☐ Alluvium ☐ Bedrock ☐ Organic Matter ☐ Disturbed/Fill				
Landscape Position:	Foot Slope	Slope %: 3.0	Slope shape:	Linear, Linear	Flooding/Run-On potential: No
Vegetation:	Grass	Soil survey map units:	1138		Surface Elevation-Relative to benchmark: 97.9
Date/Time of Day/Weather Conditions:	9/1/2024	PM	SUNNY		Limiting Layer Elevation: 95.4
Observation #/Location:	#2	MIDDLE		Observation Type:	Auger

Depth (in)	Texture	Rock Frag. %	Matrix Color(s)	Mottle Color(s)	Redox Kind(s)	Indicator(s)	Structure		
							Shape	Grade	Consistence
0-4	Medium Loamy Sand	2	10YR 3/2	None	None	None	Granular	Weak	Loose
4-9	Medium Loamy Sand	2	10YR 4/4	None	None	None	Granular	Weak	Loose
9-18	Medium Loamy Sand	2	10YR 5/3	None	None	None	Granular	Weak	Loose
18+	Sandy Clay Loam	2	10YR 5/4	10YR 5/2	Depletions	None	Blocky	Moderate	Friable

Comments:

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

JAMES PIPER		L4041	9/1/2024
(Designer/Inspector)	(Signature)	(License #)	(Date)

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

University of Minnesota Onsite Sewage Treatment Program

Soil Observation Log

Project ID:

v 03.15.2023

Client:	DEAN P SPAETH & JOANN C SPAETH	Location / Address:	39021 DORA LEE RD, WAUBUN, MN

Soil parent material(s): (Check all that apply) ☐ Outwash ☐ Lacustrine ☐ Loess ☑ Till ☐ Alluvium ☐ Bedrock ☐ Organic Matter ☐ Disturbed/Fill

Landscape Position:	Back/Side Slope	Slope %:	3.0	Slope shape:	Linear, Linear	Flooding/Run-On potential:	No
Vegetation:	Grass	Soil survey map units:	1138			Surface Elevation-Relative to benchmark:	96.9
Date/Time of Day/Weather Conditions:	9/1/2024	PM		SUNNY		Limiting Layer Elevation:	95.4
Observation #/Location:	#3	SE CORNER		Observation Type:	Auger		

Depth (in)	Texture	Rock Frag. %	Matrix Color(s)	Mottle Color(s)	Redox Kind(s)	Indicator(s)	Structure		
							Shape	Grade	Consistence
0-3	Medium Loamy Sand	2	10YR 3/2	None	None	None	Granular	Weak	Loose
3-9	Medium Loamy Sand	2	10YR 4/4	None	None	None	Granular	Weak	Loose
9-18	Medium Loamy Sand	2	10YR 5/3	None	None	None	Granular	Weak	Loose
18+	Sandy Clay Loam	2	10YR 5/4	None	None	None	Blocky	Weak	Friable

Comments:

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

JAMES PIPER		L4041	9/1/2024
(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 03.15.2023

Property Owner/Client: DEAN P SPAETH & JOANN C SPAETH | Project ID:

Site Address: 39021 DORA LEE RD, WAUBUN, MN | Date: 08/14/25

Email Address: UNKNOWN | Phone: UNKNOWN

2. DESIGN FLOW & WASTE STRENGTH

Attach waste strength data/estimated strength for Other Establishments

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

Minimum Capacity: Residential =1000 gal or 400 gal/bedroom, Other Establishment = Design Flow x 5.0, Minimum size 1000 gallons

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

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

Type of High Level Alarm: (Set @ 75% tank capacity)

Comments:

4. SEPTIC TANK SIZING

A. Residential dwellings:

Number of Bedrooms (Residential): 5

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

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

Effluent Screen & Alarm (Y/N): No | Model/Type:

B. Other Establishments:

Waste received by: GPD x Days Hyd. Retention Time

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

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

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

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

5. PUMP TANK SIZING

Soil Treatment Dosing Tank

Pump Tank Capacity (Minimum): 750 Gal

Pump Tank Capacity (Recommended): 1000 Gal

Pump Req: 56.0 GPM | Total Head 14.8 ft

Supply Pipe Dia. 2.00 in | Dose Vol: 150.0 gal

Other Component Dosing Tank:

Pump Tank Capacity (Minimum): Gal

Pump Tank Capacity (Recommended): Gal

Pump Req: GPM | Total Head ft

Supply Pipe Dia. in | Dose Vol: Gal

* Flow measurement device must be incorporated for any system with a pump: Elapsed Time Meter and/or Event Counter *

ONSITE SEWAGE TREATMENT PROGRAM

Design Summary Page

MINNESOTA POLLUTION CONTROL AGENCY

6. SYSTEM AND DISTRIBUTION TYPE

Project ID:

Soil Treatment Type:	Mound	Distribution Type:	Pressure Distribution-Level
Elevation Benchmark:	100.0 ft	Benchmark Location:	TOP OF MOUND
MPCA System Type:	Type I	Distribution Media:	Rock
Type III/IV/V Details:			

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 of Limiting Condition		
Limiting Condition:	18	inches	1.5	ft	96.40	ft	***Critical for system compliance***
Minimum Req'd Separation:	36	inches	3.0	ft			*Distribution Elevation >Code Max Depth*
					Elevation		
Code Max System Depth*:	Mound	inches	-1.5	ft	99.40	ft	**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 Elevation: 99.4 ft Minimum Sand Depth: 18.0 inches

A. Soil Texture:	Medium Sand	B. Organic Loading Rate (optional):		lbs/sq.ft/day	0
C. Soil Hyd. Loading Rate:	1.20 GPD/ft^2	D: Percolation Rate:		MPI	
E. Contour Loading Rate:	6	Note:			
F. Measured Land Slope:	3.0 %	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

Mound:

Dispersal Area	625.0 sq.ft	Bed Length	62.5 ft	Bed Width	10.0 ft
Absorption Width	10.0 ft	Clean Sand Lift	1.5 ft	Berm Width (0-1%)	ft
Upslope Berm Width	11.9 ft	Downslope Berm	16.5 ft	Endslope Berm Width	14.5 ft
Total System Length	91.5 ft	System Width	38.4 ft	Contour Loading Rate	12.0 gal/ft

Department of Minnesota
ONSITE SEWAGE TREATMENT PROGRAM

Design Summary Page

MINNESOTA POLLUTION CONTROL AGENCY

Project ID:

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	ft
Perforation Spacing	2.5	ft	Perforation Diameter	1/4	in	Drainback Volume	5	gal
Min Dose Volume	123	gal	Max Dose Volume	188	gal	Total Dosing Volume	155	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 At-Risk, HSW or Type IV Design

Organic Loading to Soil Treatment

A. Starting BOD Concentration = Design Flow X 0.7 X Starting BOD (mg/L) X 8.35 ÷ 1,000,000

____ gpd X ____ mg/L X 8.35 ÷ 1,000,000 = ____ lbs. BOD/day (Organic Loading Design)

B. Organic Loading to Soil Treatment Area: (enter loading value in 7B)

____ mg/L X ____ gpd X 0.7 X 8.35 ÷ 1,000,000 ÷ ____ sq.ft = ____ lbs./day/sqft

HSW Technology Strength Reduction

A. Starting BOD Concentration = Design Flow X Starting BOD (mg/L) X 8.35 ÷ 1,000,000

____ gpd X ____ mg/L X 8.35 ÷ 1,000,000 = ____ lbs. BOD/day (HSW Technology Design)

B. Target BOD Concentration = Design Flow X Target BOD (mg/L) X 8.35 ÷ 1,000,000

____ gpd X ____ mg/L X 8.35 ÷ 1,000,000 = ____ lbs. BOD/day (HSW Technology Design)

Lbs. BOD To Be Removed: ____ lbs. BOD/day (HSW Technology Design)

Pretreatment Technology: ____ *Must Meet or Exceed Target

Disinfection Technology: ____ *Required for Levels A & B

10. Comments/Special Design Considerations:

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

JAMES PIPER		L4041	8/14/2025
(Designer)	(Signature)	(License #)	(Date)

University of Minnesota Onsite Sewage Treatment Program

Mound Design Worksheet
≥1% Slope

MINNESOTA POLLUTION CONTROL AGENCY

1. SYSTEM SIZING: Project ID: v 03.15.2023

A. Design Flow:	750	GPD
B. Soil Loading Rate:	1.20	GPD/sqft
C. Depth to Limiting Condition	1.5	ft
D. Percent Land Slope:	3.0	%
E. Media (Sand) Loading Rate:	1.2	GPD/sqft
F. Mound Absorption Ratio:	1.00	

Table I
MOUND CONTOUR LOADING RATES:

Measured Perc Rate	← OR →	Texture - derived mound absorption ratio		Contour Loading Rate:
≤ 60mpi		1.0, 1.3, 2.0, 2.4, 2.6	›	≤12
61-120 mpi	← OR ›	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	0.5	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 ÷ 1.2 GPD/sqft = 625 sq.ft

Organic Sizing (OPTIONAL)

B. Organic Absorption Bed Area = Organic Loading (Summary 9A) ÷ Organic Soil Loading Rate (Summary 7B)

lbs BOD ÷ lbs BOD/sq.ft = sq.ft

C. Required Bed Area = Greater of Hydraulic (1D) or Organic Bed Area (1E) 625 sq.ft

D. Designed Dispersal Media Area: 625 sq.ft *Optional upsizing of area to be larger than 2C*

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

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

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

D. Calculate Minimum Dispersal Bed Length: Dispersal Bed Area(2A) ÷ Bed Width(2B)

625 sqft ÷ 10.0 ft = 62.5 ft

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

3. ABSORPTION AREA SIZING

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

10.0 ft X 1.0 = 10.0 ft

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

Calculate Downslope Absorption Width: Absorption Width(1F) - Bed Width(2B)

10.0 ft - 10.0 ft = 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)

3.0 ft - 1.5 ft = 1.5 ft Design Sand Lift (optional): ft

B. Upslope Height: Clean Sand Lift(6A) + Depth of Media(4AorB) +Depth to Cover Pipe+ Depth of Cover (1 ft)

1.5 ft + 0.50 ft + 0.33 ft + 1.0 ft = 3.3 ft

Land Slope %		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): 3.57

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

3.57 X 3.3 ft = 11.9 ft

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

10.0 ft X 3.0 % ÷ 100 = 0.30 ft

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

3.3 ft + 0.30 ft = 3.6 ft

Land Slope %		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): 4.54

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

4.54 x 3.6 ft = 16.5 ft

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

ft + 4 ft = 4.0 ft

J. Design Downslope Berm = greater of 5H and 5I: 16.5 ft

K. Select Endslope Berm Multiplier: 4.00 *(usually 3.0 or 4.0)*

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

4.00 X 3.6 ft = 14.5 ft

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

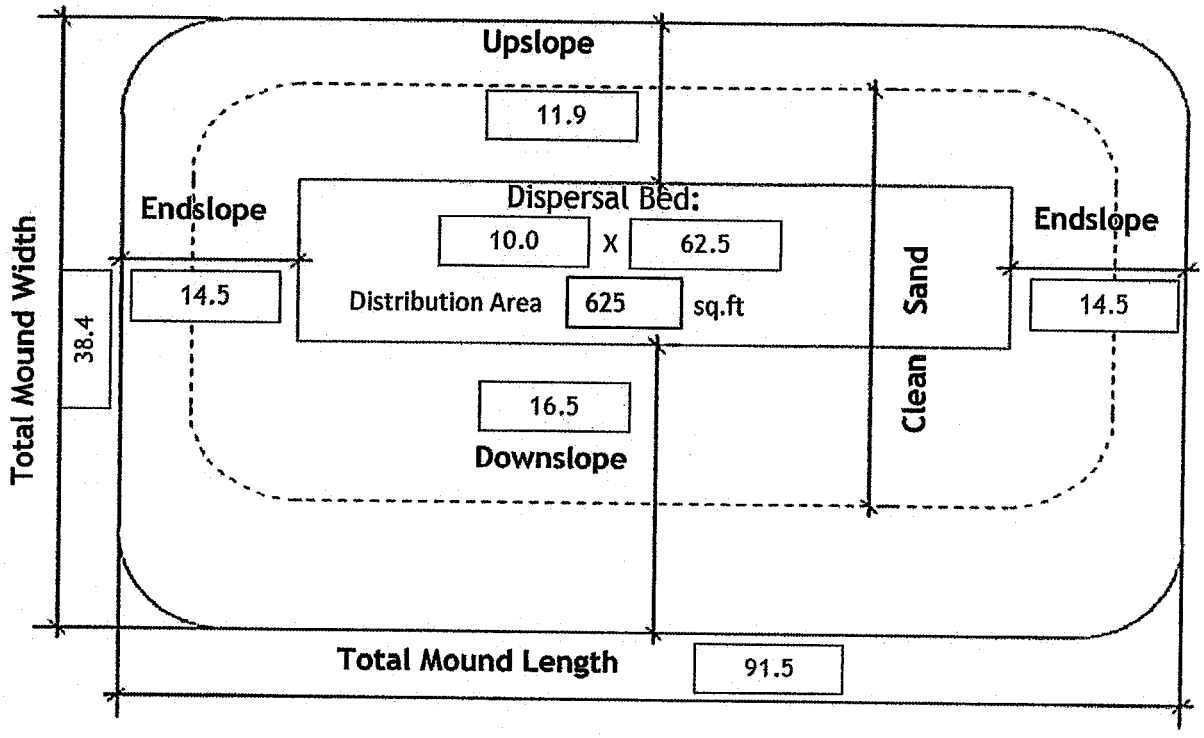
11.9 ft + 10.0 ft + 16.5 ft = 38.4 ft

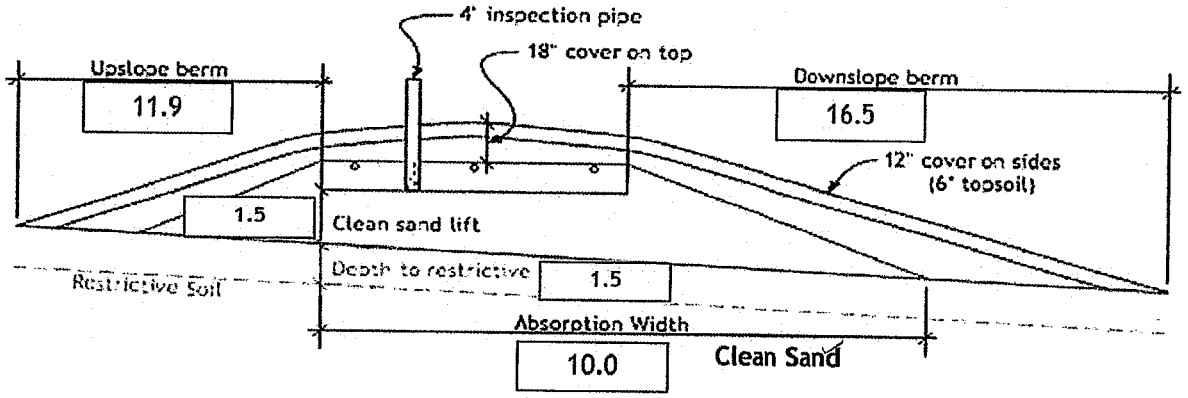
N. Calculate Mound Length: Endslope Berm Width (5L) + Bed Length(2D) + Endslope Berm Width(5L)

14.5 ft + 62.5 ft + 14.5 ft = 91.5 ft

6. MOUND DIMENSIONS (Feet)

Project ID:





Elevation to Benchmark

Required Separation: 36 (in)

Distribution Media: Rock

Media Depth: 6.0 (in)

Manifold Connection: End

Lateral Pipe Diameter: 2.00 (in)

Perforation Size: 1/4 (in)

Perforation Spacing: 30.0 (in)

Elevation Limiting Layer: 96.4 ft

Elevation required Separation: 99.4 ft

Elevation Distribution Media Bottom: 99.4 ft

Elevation Top of Media(min): 100.2 ft

Elevation Top of System(min): 101.2 ft

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

Comments:

University of Minnesota Onsite Sewage Treatment Program

Mound Materials Worksheet

MINNESOTA POLLUTION CONTROL AGENCY

Project ID:

v 03.15.2023

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

(6 in + 4.0 in) ÷ 12 X 62.5 ft X 10.0 ft = 520.8 cu.ft

Divide cu.ft by 27 cu.ft/cu.yd to calculate cubic yards: 520.8 cu.ft ÷ 27 = 19.3 cu.yd

Add 30% for constructability: 19.3 cu.yd X 1.3 = 25.1 cu.yd

B. Calculate *Clean Sand Volume:*

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

1.7 ft X 10.0 ft X 62.5 ft = 1031 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

((3.3 ft - 1) X 3.0 ft X 62.5) ÷ 2 = 218.4 cu.ft

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

((3.6 ft - 1) X ft X 62.5) ÷ 2 = cu.ft

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

(3.6 ft - 1) X 3.0 ft X 10.0 ft = 78.9 cu.ft

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

218.4 cu.ft + cu.ft + 78.9 cu.ft + 1031.3 cu.ft = 1328.6 cu.ft

Divide cu.ft by 27 cu.ft/cu.yd to calculate cubic yards: 1328.6 cu.ft ÷ 27 = 49.2 cu.yd

Add 30% for constructability: 49.2 cu.yd X 1.3 = 64.0 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

(3.5 - 0.5)ft X 38.4 ft X 91.5) ÷ 2 = 5233.2 cu.ft

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

5233.2 cu.ft - 1328.6 cu.ft - 520.8 cu.ft = 3383.8 cu.ft

Divide cu.ft by 27 cu.ft/cu.yd to calculate cubic yards: 3383.8 cu.ft ÷ 27 = 125.3 cu.yd

Add 30% for constructability: 125.3 yd^3 x 1.3 = 162.9 cu.yd

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

38.4 ft X 91.5 ft X 0.5 ft = 1756.1 cu.ft

Divide cu.ft by 27 cu.ft/cu.yd to calculate cubic yards: 1756.1 cu.ft ÷ 27 = 65.0 cu.yd

Add 30% for constructability: 65.0 cu.yd X 1.3 = 84.6 cu.yd

Onsite Sewage Treatment Program

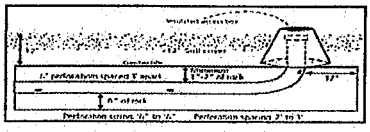
Pressure Distribution Design Worksheet

MINNESOTA POLLUTION CONTROL AGENCY

Project ID: v 03.15.2023

1. Media Bed Width: 10 ft
2. Minimum Number of Laterals in system/zone = Rounded up number of [(Media Bed Width - 4) ÷ 3] + 1.

   [(10 - 4) ÷ 3] + 1 = 3 laterals *Does not apply to at-grades*
3. Designer Selected *Number of Laterals*: 3 laterals
   Cannot be less than line 2 (Except in at-grades)
4. Select *Perforation Spacing*: 2.50 ft
5. Select *Perforation Diameter Size:* 1/4 in



6. *Length of Laterals* = Media Bed Length(1.) - 2 Feet.

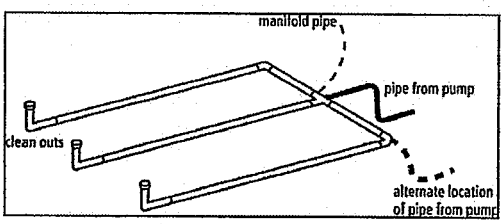
   62.5 - 2ft = 60.5 ft *Perforation can not be closer then 1 foot from edge.*
7. Determine the *Number of Perforation Spaces*. Divide the *Length of Laterals(6.)* by the *Perforation Spacing* (4.) and round down to the nearest whole number.

   Number of Perforation Spaces = 60.5 ft ÷ 2.5 ft = 24 Spaces
8. *Number of Perforations per Lateral* is equal to 1.0 plus the *Number of Perforation Spaces(7.)*. 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.

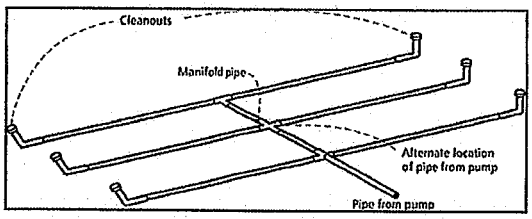
   Perforations Per Lateral = 24 Spaces + 1 = 25 Perfs. Per Lateral

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

1/4 Inch Perforations						7/32 Inch Perforations					
Perforation Spacing (Feet)	Pipe Diameter (Inches)					Perforation Spacing (Feet)	Pipe Diameter (Inches)				
	1	1¼	1½	2	3		1	1¼	1½	2	3
2	10	13	18	30	60	2	11	16	21	34	68
2½	8	12	16	28	54	2½	10	14	20	32	64
3	8	12	16	25	52	3	9	14	19	30	60
3/16 Inch Perforations						1/8 Inch Perforations					
Perforation Spacing (Feet)	Pipe Diameter (Inches)					Perforation Spacing (Feet)	Pipe Diameter (Inches)				
	1	1¼	1½	2	3		1	1¼	1½	2	3
2	12	18	26	46	87	2	21	33	44	74	149
2½	12	17	24	40	80	2½	20	30	41	69	135
3	12	16	22	37	75	3	20	29	38	64	128



END Connection



CENTER Connection

Perf Per Lateral: 25

Perf Per Lateral Equal Split: 13 | 12

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

* must not exceed maximum number perfs per lateral in table

9. *Total Number of Perforations* equals the *Number of Perforations per Lateral (8.)* multiplied by the *Number of Perforated Laterals.(3.)*

   25 Perf. Per Lat. X 3 Number of Perf. Lat. = 75 Total Number of Perf.
10. Spacing of laterals; Must be greater than 1 foot and no more than 3 feet: 3.0 ft
11. Select *Type of Manifold Connection* (End or Center): End
12. *Select Lateral Diameter (See Table)*: 2.00 in

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

ONSITE SEWAGE TREATMENT PROGRAM

Pressure Distribution Design Worksheet

MINNESOTA POLLUTION CONTROL AGENCY

13. 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) X Bed Length (ft)

10 ft X 63 ft = 625 sq.ft

b. *Square Foot per Perforation* = *Bed Area* ÷ by the *Total Number of Perfs*

625 sqft ÷ 75 perf = 8.3 sq.ft/perf

14. Select *Minimum Average Head*: 1.0 ft

15. Select *Perforation Discharge* based on Table: 0.74 GPM per Perf

16. *Flow Rate = Total Number of Perfs(9.) X Perforation Discharge(15.)*

75 Perfs X 0.74 GPM per Perforation = 56 GPM

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

18. *Volume of Distribution Piping = Number of Perforated Laterals(3.) X Length of Laterals(6.) X Volume of Liquid Per Foot of Distribution Piping (17.)*

3 X 61 ft X 0.170 gal/ft = 30.9 Gallons

19. Minimum Delivered Volume = Volume of Distribution Piping X 4

30.9 gals X 4 = 123.4 Gallons

20. Maximum Delivered Volume = Design flow x 25%

750.0 gpd X 25% = 187.5 Gallons

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

Comments/Special Design Considerations:

Perforation Discharge (GPM)				
Head (ft)	Perforation Diameter			
	1/8	3/16	7/32	1/4
1.0*	0.18	0.41	0.56	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

Onsite Sewage Treatment Program

Basic STA Pump Selection Design Worksheet

MINNESOTA POLLUTION CONTROL AGENCY

1. PUMP CAPACITY

Project ID:

v 03.15.2023

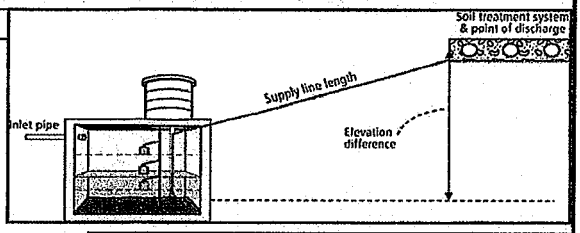
Pumping to Gravity or Pressure Distribution: Pressure

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: 56.0 GPM

C. Enter pump description: Demand Dosing

2. HEAD REQUIREMENTS



A. Elevation Difference between pump and point of discharge: 7 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

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

D. 1. Supply Pipe Diameter: 2.0 in

2. Supply Pipe Length: 30 ft

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

Friction Loss = 7.53 ft per 100ft of pipe

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*

30 ft X 1.25 = 37.5 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 =

7.53 ft per 100ft X 37.5 ft + 100 = 2.8 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)

7.0 ft + 5.0 ft + ____ ft + 2.8 ft = 14.8 ft

3. PUMP SELECTION

A pump must be selected to deliver at least **56.0** GPM with at least **14.8** feet of total head.

Comments:

Onsite Sewage Treatment Program

STA Dosing Pump Tank Design Worksheet (Demand Dose)

MINNESOTA POLLUTION CONTROL AGENCY

DETERMINE TANK CAPACITY AND DIMENSIONS | Project ID: | v 03.15.2023

1. A. *Design Flow (Design Sum.1A)*: 750 GPD C. Tank Use: Dosing
   B. Min. required pump tank capacity: 750 Gal D. Recommended pump tank capacity: 1000 Gal

2. A. Tank Manufacturer: BROWN PRECAST B. Tank Model: 1000 PT
   C. Capacity from manufacturer: 1001 Gallons
   D. Gallons per inch from manufacturer: 23.1 Gallons per inch
   E. Liquid depth of tank from manufacturer: 43.3 inches

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. Calculate *Volume to Cover Pump* (The inlet of the pump must be at least 4-inches from the bottom of the pump tank & 2 inches of water covering the pump is recommended)

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

   (6 in + 2 inches) X 23.1 Gallons Per Inch = 185 Gallons

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

   -Item 19 of the Pressure Distribution STA or Item 11 of Non-level STA 123 Gallons (Minimum dose) 5.3 inches/dose

5. Calculate *Maximum Pumpout Volume* (25% of Design Flow(1A))

   Design Flow: 750 GPD X 0.25 = 188 Gallons (Maximum dose) 8.1 inches/dose

6. *Select a pumpout volume that meets both Minimum and Maximum:* 150 Gallons

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

   750 gpd ÷ 150 gal = 5.00 *Doses**

   * Doses need to be equal to or greater than 4

8. Calculate Drainback:

   A. *Diameter of Supply Pipe* = 2 inches

   B. Length of Supply Pipe = 30 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)*

   30 ft X 0.170 gal/ft = 5.1 Gallons

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

   150 gal + 5.1 gal = 155 Gallons

10. Minimum Alarm Volume = Depth of alarm (2 or 3 inches) X gallons per inch of tank(2D)

    3 in X 23.1 gal/in = 69.3 Gallons

11. Reserve Capacity Volume = [Tank Liquid Depth(2E) - Alarm Float Depth(10.)] x gallons per inch of tank(2D)

    [43.3 in - 17.7 in] X 23.1 gal/in = 589.9 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

DEMAND DOSE FLOAT SETTINGS — Alarm and Pump are to be wired on separate circuits and inspected by the electrical inspector

12. Calculate *Float Separation Distance* using *Dosing Volume*.

    Total Dosing Volume(9.) ÷ Gallons Per Inch(2D)

    155 gal ÷ 23.1 gal/in = 6.7 inches

13. Measuring from bottom of tank:

    A. *Distance to set Pump Off Float* = Pump + block height + 2 inches

    6 in + 2 in = 8 inches

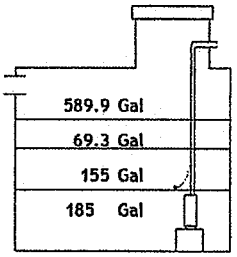
    B. *Distance to set Pump On Float=Distance to Set Pump-Off Float(13A) + Float Separation Distance(12.)*

    8 in + 6.7 in = 15 inches

    C. *Distance to set Alarm Float = Distance to set Pump-On Float(13B) + Alarm Depth* (2-3 inches)(10.)

    15 in + 3.0 in = 18 inches

Inches for Dose: 6.7 in
Alarm Depth 17.7 in
Pump On 14.7 in
Pump Off 8.0 in



Onsite Sewage Treatment Program

Tank Buoyancy Worksheet

MINNESOTA POLLUTION CONTROL AGENCY

1. Tank Specifications

Project ID:

v 03.15.2023

A. Tank Manufacturer: BROWN PRECAST

Tank Model: 1500 ST

B. Outside Tank Dimensions and Specifications:

Tank Use: Septic

Length: 144 in Width: 68 in Height: 61 in Diameter: in

Length: 12.0 ft Width: 5.7 ft Height: 5.1 ft Radius of Tank: in

2. Outside Volume of Tank

Rectangular Tank

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

12.0 ft X 5.7 ft = 68.0 sq.ft

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

68.0 sq.ft X 5.1 ft = 345.7 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) 13000 lbs

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

A. Depth of Cover Over Tank: 24 in 2.0 ft

B. Weight of Soil Per Cubic Foot: 120 lbs/cu.ft

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

2.0 ft X 68.0 sq.ft = 136.0 cu.ft

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

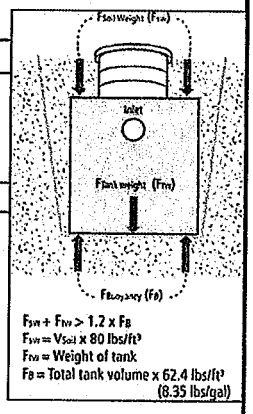
136.0 cu.ft X 120 lbs/cu.ft = 16,320.0 lbs *Note: Assumes saturation does not get over the lid of the tank*

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)

346 X 62.4 lbs/cu.ft X 1.2 = 25,883.5 lbs



6. Evaluation of Net Forces

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

13000 lbs + 16320 lbs = 29,320.0 lbs

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

29320 lbs - 25884 lbs = 3,436.5 lbs

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:

Onsite Sewage Treatment Program

Tank Buoyancy Worksheet

MINNESOTA POLLUTION CONTROL AGENCY

1. Tank Specifications

Project ID:

v 03.15.2023

A. Tank Manufacturer: BROWN PRECAST Tank Model: 1000 PT

B. Outside Tank Dimensions and Specifications: Tank Use: Dosing

Length:	86	in	Width:	68	in	Height:	61.25	in	Diameter:		in
Length:	7.2	ft	Width:	5.7	ft	Height:	5.1	ft	Radius of Tank:		in

2. Outside Volume of Tank

Rectangular Tank

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

7.2 ft X 5.7 ft = 40.6 sq.ft

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

40.6 sq.ft X 5.1 ft = 207.3 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) 8650 lbs

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

A. Depth of Cover Over Tank: 24 in 2.0 ft

B. Weight of Soil Per Cubic Foot: 120 lbs/cu.ft

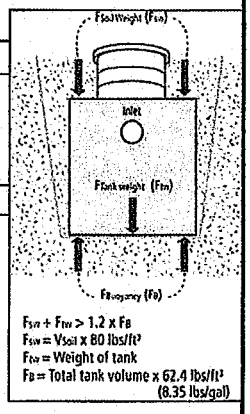
C. Volume of Soil Over Tank = Depth of Cover(4A) (ft) X Area of Tank(2A) (ft^2)

2.0 ft X 40.6 sq.ft = 81.2 cu.ft

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

81.2 cu.ft X 120 lbs/cu.ft = 9,746.7 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)

207 X 62.4 lbs/cu.ft X 1.2 = 15,521.6 lbs

6. Evaluation of Net Forces

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

8650 lbs + 9747 lbs = 18,396.7 lbs

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

18397 lbs - 15522 lbs = 2,875.1 lbs

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:


Tank = 98
SB #1 = 97
SB #2 = 97.9
SB #3 = 96.9
1" = 20'
well
±100'
30'
±100'
±100'
#1
#2
#3
10 x 65 - Rockbed
PL
-5'
3% Slope
ROW
±20'

Property Line Agreement

I, Julia Ann Miller, as Trustee of the Julia Ann Miller Revocable Living Trust, owner of the property described as:

Parcel No. 20.0491.000
Property Address: 39003 Dora Lee Road, Waubun MN 56589
Lot Six (6), Block One, Dora Lee Estates, according to the certified Plat thereof on file and of record in the office of the County Recorder in and for Becker County, Minnesota.

give Dean P. Spaeth and JoAnn C. Spaeth, husband and wife, as joint tenants, owners of the property described as:

Parcel No. 20.0492.000
Property Address: 39021 Dora Lee Road, Waubun MN 56589
Lot Seven (7), Block One, Dora Lee Estates, according to the certified Plat thereof on file and of record in the office of the County Recorder in and for Becker County, Minnesota.

permission to have their sewer system closer than the required 10 feet to the lot line.

Dated: July 24, 2025

Julia Ann Miller, Trustee

Subscribed and sworn to before me this 24th day of July, 2025.

Notary Public
My Comm. Expires: 1/31/29

TIFFANI RENEE LAVONNE ROSING
NOTARY PUBLIC - MINNESOTA
My Commission Expires Jan. 31, 2029

(Notary Stamp)