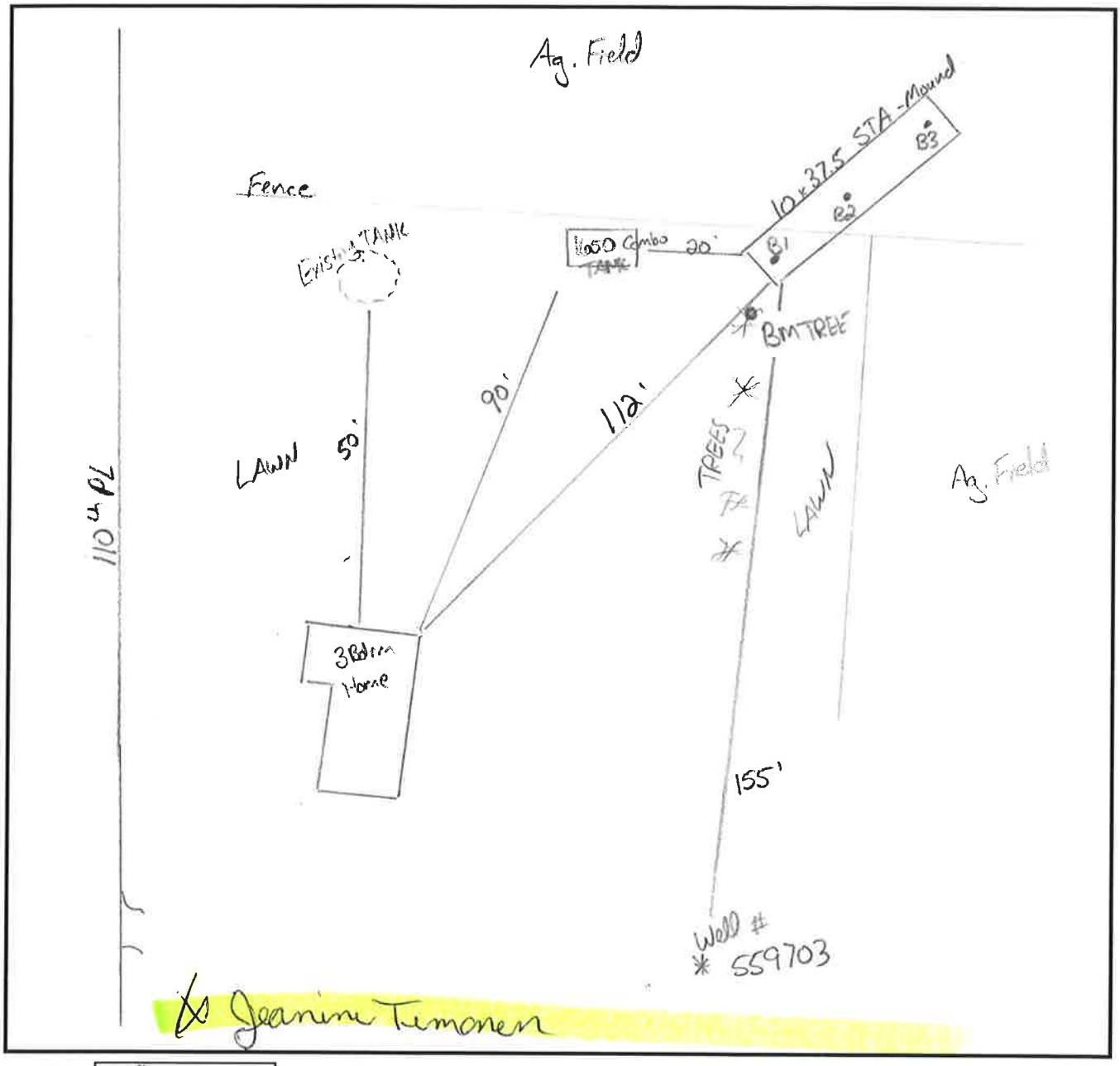
Onsite Sewage Treatment Program

Proposed Design Map

MINNESOTA POLLUTION CONTROL AGENCY

Project ID: v 03.01.2021

Property Owner/Client: MICHAEL & JEANINE TIMONEN



Map scale: 1" ≈ 25 ft ☐ Indicated north ☐ Show slope/contours

Elevations in feet Benchmark: 100 ft

System Corners:

NW:	97.7 ft	#1:	97.3 ft
NE:	97.4 ft	#2:	97.6 ft
SW:	97.7 ft	#3:	97.6 ft
SE:	97.2 ft		

Soil Borings:

Tank Outlet: ft

Other: ft

ft

Date Completed: 8/5/2022

ONSITE SEWAGE TREATMENT PROGRAM

Preliminary Evaluation Worksheet

MINNESOTA POLLUTION CONTROL AGENCY

1. Contact Information

v 04.01.2021

Property Owner/Client:	MICHAEL & JEANINE TIMONEN	Date Completed:	8/5/2022
Site Address:	29618 110TH PL, STURGEON LAKE MN 55783	Project ID:	
Email:		Phone:	218-460-6209
Mailing Address:	SAME	Alt Phone:	
Legal Description:			
Parcel ID:	04-0-039600	SEC:	TWP: RNG:

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: 3 Dwelling Sq.ft.: Unfinished Sq. Ft.:

Adults: 2 # Children: # Teenagers:

In-home business (Y/N): N 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: Jeanine Timonen

Client signature & date

B. Designer-determined flow Information

Attach additional information as necessary.

Design Flow: 450 GPD Anticipated Waste Type: Residential

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	DRILLED WELL	559763	100	100		50	MN WELL INDEX
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)	N	Yes, source:	
Site within a drinking water supply management area (Y/N)	N	Yes, source:	
Site in Well Head Protection inner wellhead management zone (Y/N)	N	Yes, source:	
Buried water supply pipes within 50 ft of proposed system (Y/N)	N		
B. Site located in a shoreland district/area?	N	Yes, name:	
Elevation of ordinary high water level:	ft	Source:	
Classification:	Tank Setback: ft.	STA Setbk: ft.	
C. Site located in a floodplain?	N	Yes, Type(s):	
Floodplain designation/elevation (10 Year):	ft	Source:	
Floodplain designation/elevation (100 Year):	ft	Source:	

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: C73C MILACA LOAM — Slope Range: 1-7 %

List landforms: MORAINES, DRUMLINS

Landform position(s): Back/ Side Slope

Parent materials: COARSE-LOAMY LODGMENT TILL

Depth to Bedrock/Restrictive Feature: 31-52 in — Depth to Watertable: 24-43 in

Map Unit Ratings

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

5. Local Government Unit Information

Name of LGU:	AITKIN COUNTY
LGU Contact:	218-927-7342
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 04.01.2021

Property Owner/Client: MICHAEL & JEANINE TIMONEN | Project ID:

Site Address: 29618 110TH PL, STURGEON LAKE MN 55783 | Date Completed: 8/5/2022

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): Lawn & Ag Field | Landscape position: Back/ Side Slope

Percent slope: 4 % | Slope shape: Linear, Linear | Slope direction: southeast

Describe the flooding or run-on potential of site: NA

Describe the need for Type III or Type IV system: LESS THAN 12" OF TYPE 1 SOILS

Note:

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

4. General Soils Information

Filled, Compacted, Disturbed areas (Y/N): N

If yes, describe:

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

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

Number of soil observations: 3 | Soil observation logs attached (Y/N): Y

Percolation tests performed & attached (Y/N): N

5. Phase I. Reporting Information

	Depth		Elevation	
Limiting Condition*:	8	in	**96.9**	ft
Periodically saturated soil:		in		ft
Standing water:		in		ft
Bedrock:		in		ft
Benchmark Elevation:	100.0	ft		

*Most Restrictive Depth Identified from List Below

Soil Texture: Fine Sandy Loam

Percolation Rate: min/inch

Soil Hyd Loading Rate: 0.68 gpd/ft^2

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

Benchmark Elevation Location: SCREW IN PINE TREE APPROX. 20FT. SOUTH OF STA/NEW TANK LOCATION

Differences between soil survey and field evaluation: SIMILAR

Site evaluation issues / comments:

Anticipated construction issues:

Aitkin County, Minnesota

At Grade: Moderately Limited
Mound: Slightly Limited
Trench: Extremely Limited

C73C—Milaca loam, 1 to 7 percent slopes, stony

Map Unit Setting

National map unit symbol: 2z19s
Elevation: 790 to 1,970 feet
Mean annual precipitation: 27 to 36 inches
Mean annual air temperature: 37 to 46 degrees F
Frost-free period: 80 to 150 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Milaca, stony, and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Milaca, Stony

Setting

Landform: Moraines, drumlins
Landform position (two-dimensional): Shoulder, backslope, summit
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Linear, convex
Parent material: Coarse-loamy lodgment till

Typical profile

A - 0 to 7 inches: loam
E - 7 to 9 inches: fine sandy loam
B/E - 9 to 16 inches: fine sandy loam
Bt - 16 to 40 inches: fine sandy loam
BCd - 40 to 79 inches: fine sandy loam

Properties and qualities

Slope: 1 to 7 percent
Surface area covered with cobbles, stones or boulders: 0.1 percent
Depth to restrictive feature: 31 to 52 inches to densic material
Drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.20 in/hr)
Depth to water table: About 24 to 43 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 6.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified

ONSITE SEWAGE TREATMENT PROGRAM

Soil Observation Log

Project ID:

v 04.01.2021

Client:	MICHAEL & JEANINE TIMONEN			Location / Address:	29618 110TH PL, STURGEON LAKE MN 55783
Soil parent material(s): (Check all that apply)	☐ Outwash ☐ Lacustrine ☐ Loess ☑ Till ☐ Alluvium ☐ Bedrock ☐ Organic Matter				
Landscape Position: (select one)	Back/Side Slope	Slope %: 5.0	Slope shape	Linear, Linear	Elevation-relative to benchmark: 97.3
Vegetation:	Lawn	Soil survey map units:	C73C MILACA LOAM		Limiting Layer Elevation: 96.8
Weather Conditions/Time of Day:	FULL SUN, 80 DEG.	4:00PM	Date	08/05/22	
Observation #/Location:		BORE SITE #1	Observation Type:	Auger	

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	<35%	5YR 3/2				Granular	Weak	Friable
4-6	Fine Sandy Loam	<35%	5YR 4/3				Granular	Moderate	Friable
6	Very Fine Sandy Loam	<35%	5YR 4/3	5YR 4/6	Concentrations	S1	Massive	Moderate	Firm

Comments

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

MICHAEL D. MIKROT		3846	8/5/2022
(Designer/Inspector)	(Signature)	(License #)	(Date)

University of Minnesota Onsite Sewage Treatment Program

Soil Observation Log

Project ID:

v 04.01.2021

Client:	MICHAEL & JEANINE TIMONEN	Location / Address:	29618 110TH PL, STURGEON LAKE MN 55783

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

Landscape Position: (select one)	Back/Side Slope	Slope %:	4.0	Slope shape	Linear, Linear
Elevation-relative to benchmark:	97.6				
Vegetation:	Ag. Land	Soil survey map units:	C73C- MILACA LOAM	Limiting Layer Elevation:	96.8
Weather Conditions/Time of Day:	FULL SUN, 80 DEG.	4:15PM		Date	08/05/22
Observation #/Location:		BORE SITE #2		Observation Type:	Auger

Depth (in)	Texture	Rock Frag. %	Matrix Color(s)	Mottle Color(s)	Redox Kind(s)	Indicator(s)	Structure: Shape	Structure: Grade	Structure: Consistence
0-10	Fine Sandy Loam	<35%	5YR 3/2				Granular	Weak	Friable
10	Very Fine Sandy Loam	<35%	5YR 4/4	5YR 4/6	Concentrations	S1	Massive	Moderate	Friable

Comments

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

MICHAEL D. MIKROT		3846	8/5/2022
(Designer/Inspector)	(Signature)	(License #)	(Date)

ONSITE SEWAGE TREATMENT PROGRAM

Soil Observation Log

Project ID:

v 04.01.2021

Client:	MICHAEL & JEANINE TIMONEN			Location / Address:	29618 110TH PL, STURGEON LAKE MN 55783
Soil parent material(s): (Check all that apply)	☐ Outwash ☐ Lacustrine ☐ Loess ☑ Till ☐ Alluvium ☐ Bedrock ☐ Organic Matter				
Landscape Position: (select one)	Back/Side Slope	Slope %: 3.0	Slope shape	Linear, Linear	Elevation-relative to benchmark: 97.3
Vegetation:	Ag. Land	Soil survey map units:	C73C-MILACA LOAM		Limiting Layer Elevation: 96.9
Weather Conditions/Time of Day:	FULL SUN, 80DEG		4:25PM	Date	08/05/22
Observation #/Location:		BORE SITE#3		Observation Type:	Auger

Depth (in)	Texture	Rock Frag. %	Matrix Color(s)	Mottle Color(s)	Redox Kind(s)	Indicator(s)	Structure: Shape	Structure: Grade	Structure: Consistence
0-8	Fine Sandy Loam	<35%	5YR 3/2				Granular	Weak	Friable
8	Very Fine Sandy Loam	<35%	5YR 4/4	5YR 4/6	Concentrations	S1	Massive	Moderate	Firm

Comments

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

MICHAEL D. MIKROT		3846	8/5/2022
(Designer/Inspector)	(Signature)	(License #)	(Date)

ONSITE SEWAGE TREATMENT PROGRAM

Design Summary Page

MINNESOTA POLLUTION CONTROL AGENCY

1. PROJECT INFORMATION

v 04.01.2021

Property Owner/Client:	MICHAEL & JEANINE TIMONEN	Project ID:	
Site Address:	29618 110TH PL, STURGEON LAKE MN 55783	Date:	08/05/22
Email Address:		Phone:	

2. DESIGN FLOW & WASTE STRENGTH

Attach data / estimate basis for Other Establishments

Design Flow: 450 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 =400 gal/bedroom, Other Establishment = Design Flow x 5.0, Minimum size 1000 gallons

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

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

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

Comments: ____

4. SEPTIC TANK SIZING

A. Residential dwellings:

Number of Bedrooms (Residential): 3

Code Minimum **Septic Tank** Capacity: 1000 Gallons in 1 Tanks or Compartments

Recommended **Septic Tank** Capacity: 1000 Gallons in 1 Tanks or Compartments

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

B. Other Establishments:

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

Code Minimum **Septic Tank** Capacity: ____ Gallons In ____ Tanks or Compartments

Recommended **Septic Tank** Capacity: ____ Gallons In ____ Tanks or Compartments

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

5. PUMP TANK SIZING

Pump Tank 1 Capacity (Minimum):	500 Gal	Pump Tank 2 Capacity (Minimum):	Gal
Pump Tank 1 Capacity (Recommended):	500 Gal	Pump Tank 2 Capacity (Recommended):	Gal
Pump 1: 27.0 GPM — Total Head	15.5 ft	Pump 2: GPM — Total Head	ft
Supply Pipe Dia.: 2.00 in — Dose Vol:	100.0 gal	Supply Pipe Dia.: — Dose Vol:	Gal

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 ft	Benchmark Location:	SCREW IN PINE TREE APPROX. 20F
MPCA System Type:	Type III	Distribution Media:	Rock
Type III/IV/V Details:	INSTALL ELAPSED TIME METER		

7. SITE EVALUATION SUMMARY:

Describe Limiting Condition: Redoximorphic Features/Saturated Soils

Layers with >35% Rock Fragments? (yes/no) N 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:	8	inches	0.7	ft	96.90	ft
Minimum Req'd Separation:	36	inches	3.0	ft		
					Elevation	
Code Max System Depth:	Mound	inches	-2.3	ft	99.90	ft

Critical for system compliance

This is the maximimum depth to the bottom of the distribution media for required separation. Negative Depth (ft) means it must be a mound.

Soil Texture:	Very Fine Sandy Loam		
Soil Hyd. Loading Rate:	0.68 GPD/ft^2	Percolation Rate:	MPI
Contour Loading Rate:	6	Note:	
Measured Land Slope:	3 %	Note:	
Comments:			

8. SOIL TREATMENT AREA DESIGN SUMMARY

Trench:

Dispersal Area	ft^2	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	ft^2	Sidewall Depth	in	Maximum Bed Depth	in
Bed Width	ft	Bed Length	ft	Designed Bed Depth	in

Mound:

Dispersal Area	375.0 ft^2	Bed Length	37.5 ft	Bed Width	10.0 ft
Absorption Width	18.0 ft	Clean Sand Lift	2.3 ft	Berm Width (0-1%)	ft
Upslope Berm Width	14.3 ft	Downslope Berm	21.1 ft	Endslope Berm Width	17.7 ft
Total System Length	73.0 ft	System Width	45.4 ft	Contour Loading Rate	12.0 gal/ft

ONSITE SEWAGE TREATMENT PROGRAM

Design Summary Page

MINNESOTA POLLUTION CONTROL AGENCY

At-Grade:

Bed Width	ft	Bed Length	ft	Finished Height	ft
Contour Loading Rate	gal/ft	Upslope Berm	ft	Downslope Berm	ft
Endslope Berm	ft	System Length	ft	System Width	ft

Level & Equal Pressure Distribution

No. of Laterals	3	Perforation Spacing	3 ft	Perforation Diameter	1/4 in
Lateral Diameter	2.00 in	Min Dose Volume	72 gal	Max Dose Volume	113 gal

Non-Level and Unequal Pressure Distribution

	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

9. Additional Info for At-Risk, HSW or Type IV Design

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

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

Lbs. BOD To Be Removed: _____

PreTreatment Technology: _____ *Must Meet or Exceed Target

Disinfection Technology: _____ *Required for Levels A & B

C. Organic Loading to Soil Treatment Area:

_____ mg/L X _____ gpd x 8.35 ÷ 1,000,000 ÷ _____ ft^2 = _____ lbs./day/ft^2

10. Comments/Special Design Considerations:

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

MICHAEL D. MIKROT		3846	8/5/2022
(Designer)	(Signature)	(License #)	(Date)

Mound Design Worksheet
≥1% Slope

MINNESOTA POLLUTION CONTROL AGENCY

1. SYSTEM SIZING: Project ID: v 04.01.2021

A. Design Flow:	450	GPD
B. Soil Loading Rate:	0.68	GPD/ft²
C. Depth to Limiting Condition	0.7	ft
D. Percent Land Slope:	3.0	%
E. Design Media Loading Rate:	1.2	GPD/ft²
F. Mound Absorption Ratio:	1.80	

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	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		Treatment Level A, A-2, B,	
	Absorption Area Loading Rate (gpd/ft²)	Mound Absorption Ratio	Absorption Area Loading Rate (gpd/ft²)	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. Calculate Dispersal Bed Area: Design Flow ÷ Design Media Loading Rate

450 GPD ÷ 1.2 GPD/ft² = 375 ft²

If a larger dispersal media area is desired, enter size: ft²

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

C. Calculate Contour Loading Rate: Bed Width X Design Media Loading Rate

10 ft² X 1.2 GPD/ft² = 12.0 gal/ft *Can not exceed Table 1*

D. Calculate Minimum Dispersal Bed Length: Dispersal Bed Area ÷ Bed Width

375 ft² ÷ 10.0 ft = 37.5 ft

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

3. ABSORPTION AREA SIZING

A. Calculate Absorption Width: Bed Width X Mound Absorption Ratio

10.0 ft X 1.8 = 18.0 ft

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

Calculate Downslope Absorption Width: Absorption Width - Bed Width

18.0 ft - 10.0 ft = 8.0 ft

4. DISTRIBUTION MEDIA: Project ID:

Select Dispersal Media: Rock Enter Either A. or B.

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:

6. MOUND SIZING

Project ID:

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

3.0 ft - 0.7 ft = 2.3 ft Design Sand Lift (optional): ____ ft

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

2.3 ft + 0.50 ft + 0.3 ft + 1.0 ft = 4.1 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): 3.45

D. Calculate Upslope Berm Width: Multiplier X Upslope Mound Height

3.45 ft X 4.1 ft = 14.3 ft

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

10.0 ft X 3.0 % ÷ 100 = 0.30 ft

F. Calculate Downslope Mound Height: Upslope Height + Drop in Elevation

4.1 ft + 0.30 ft = 4.4 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): 4.76

H. Calculate Downslope Berm Width: Downslope Multiplier X Downslope Height

4.76 x 4.4 ft = 21.1 ft

I. Calculate Minimum Berm to Cover Absorption Area: Downslope Absorption Width + 4 feet

8.0 ft + 4 ft = 12.0 ft

J. Design Downslope Berm = greater of 4H and 4I: 21.1 ft

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

L. Calculate Endslope Berm X Downslope Mound Height = Endslope Berm Width

4.00 ft X 4.4 ft = 17.7 ft

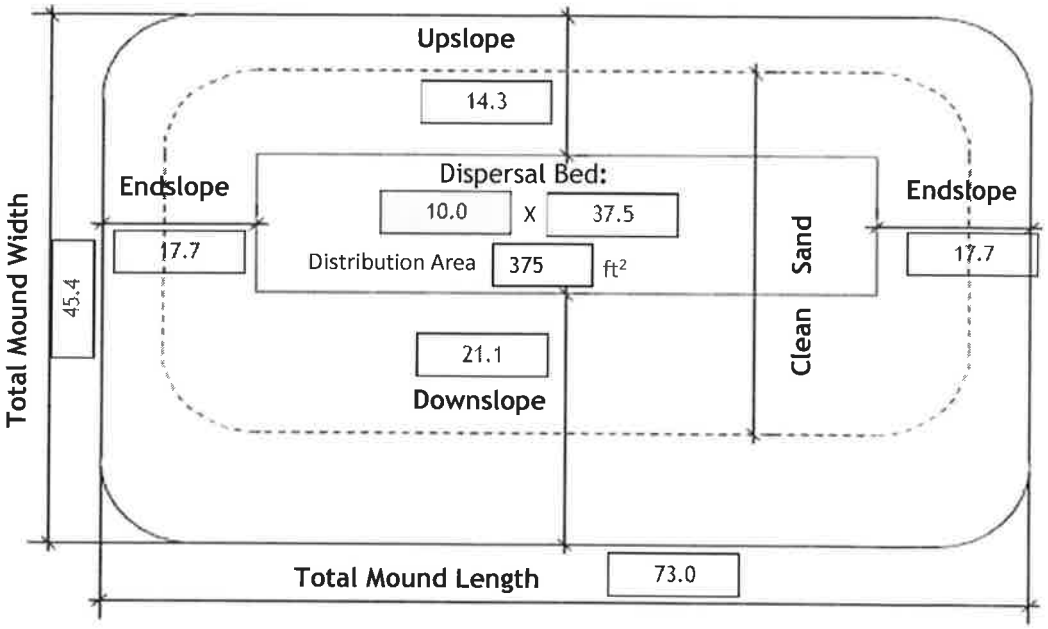
M. Calculate Mound Width: Upslope Berm Width + Bed Width + Downslope Berm Width

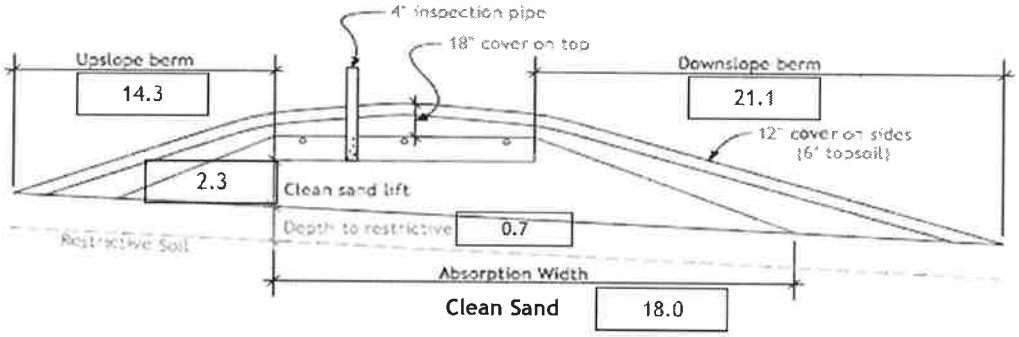
14.3 ft + 10.0 ft + 21.1 ft = 45.4 ft

N. Calculate Mound Length: Endslope Berm Width + Bed Length + Endslope Berm Width

17.7 ft + 37.5 ft + 17.7 ft = 73.0 ft

7. **MOUND DIMENSIONS (Feet)** Project ID:





Required Separation:	36 (in)	Distribution Media:	Rock
Manifold Connection:	End	Media Depth:	6.0 (in)
Perforation Size:	1/4 (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

Mound Materials Worksheet

MINNESOTA POLLUTION CONTROL AGENCY

Project ID:

v 04.01.2021

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 37.5 ft X 10.0 ft = 312.5 ft^3

Divide ft^3 by 27 ft^3/yd^3 to calculate cubic yards: 312.5 ft^3 ÷ 27 = 11.6 yd^3

Add 30% for constructability: 11.6 yd^3 X 1.3 = 15.0 yd^3

B. Calculate *Clean Sand Volume:*

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

2.3 ft X 10.0 ft X 37.5 ft = 856 ft^3

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*

ft^3 + ft^3 + ft^3 = ft^3

For a Mound on a slope greater than 1%

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

((4.1 ft - 1) X 3.0 ft X 37.5) ÷ 2 = 176.3 ft^3

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

((4.4 ft - 1) X 8.0 ft X 37.5) ÷ 2 = 515.0 ft^3

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

(4.4 ft - 1) X 3.0 ft X 10.0 ft = 103.0 ft^3

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

176.3 ft^3 + 515.0 ft^3 + 103.0 ft^3 + 856.3 ft^3 = 1650.5 ft^3

Divide ft^3 by 27 ft^3/yd^3 to calculate cubic yards: 1650.5 ft^3 ÷ 27 = 61.1 yd^3

Add 30% for constructability: 61.1 yd^3 X 1.3 = 79.5 yd^3

C. Calculate *Sandy Berm Volume:*

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

(4.3 - 0.5)ft X 45.4 ft X 73.0) ÷ 2 = 6261.3 ft^3

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

6261.3 ft^3 - 1650.5 ft^3 - 312.5 ft^3 = 4298.3 ft^3

Divide ft^3 by 27 ft^3/yd^3 to calculate cubic yards: 4298.3 ft^3 ÷ 27 = 159.2 yd^3

Add 30% for constructability: 159.2 yd^3 x 1.3 = 207.0 yd^3

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

45.4 ft X 73.0 ft X 0.5 ft = 1655.0 ft^3

Divide ft^3 by 27 ft^3/yd^3 to calculate cubic yards: 1655.0 ft^3 ÷ 27 = 61.3 yd^3

Add 30% for constructability: 61.3 yd^3 x 1.3 = 79.7 yd^3

Pressure Distribution Design Worksheet

ONSITE SEWAGE TREATMENT PROGRAM

MINNESOTA POLLUTION CONTROL AGENCY

Project ID: v 04.01.2021

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*: 3.00 ft
5. Select *Perforation Diameter Size:* 1/4 in

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

   37.5 - 2ft = 35.5 ft *Perforation can not be closer then 1 foot from edge.*
7. Determine the *Number of Perforation Spaces*. Divide the *Length of Laterals* by the *Perforation Spacing* and round down to the nearest whole number.

   Number of Perforation Spaces = 35.5 ft ÷ 3.0 ft = 11 Spaces
8. *Number of Perforations per Lateral* is equal to 1.0 plus the *Number of Perforation Spaces*. 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 = 11 Spaces + 1 = 12 Perfs. Per Lateral

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	60
2½	8	12	16	28	54
3	8	12	16	25	52

7/32 Inch Perforations

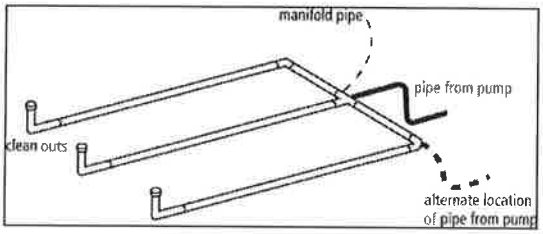
Perforation Spacing (Feet)	Pipe Diameter (Inches)				
	1	1¼	1½	2	3
2	11	16	21	34	68
2½	10	14	20	32	64
3	9	14	19	30	60

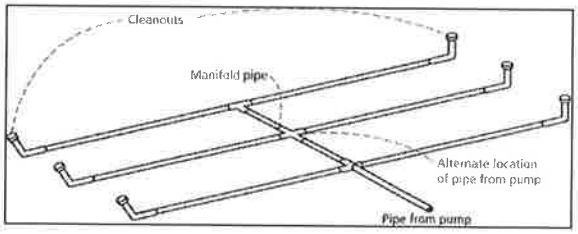
3/16 Inch Perforations

Perforation Spacing (Feet)	Pipe Diameter (Inches)				
	1	1¼	1½	2	3
2	12	18	26	46	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	128





9. *Total Number of Perforations* equals the *Number of Perforations per Lateral* multiplied by the *Number of Perforated Laterals.*

   12 Perf. Per Lat. X 3 Number of Perf. Lat. = 36 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

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 38 ft = 375 ft^2

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

375 ft^2 ÷ 36 perf = 10.4 ft^2/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 X Perforation Discharge.*

36 Perfs X 0.74 GPM per Perforation = 27 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* X *Length of Laterals* X (Volume of Liquid Per Foot of Distribution Piping]

3 X 36 ft X 0.170 gal/ft = 18.1 Gallons

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

18.1 gals X 4 = 72.4 Gallons

Perforation Discharge (GPM)

Head (ft)	Perforation Diameter			
	1/8	5/32	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

Comments/Special Design Considerations:

Basic Pump Selection Design Worksheet

MINNESOTA POLLUTION CONTROL AGENCY

1. PUMP CAPACITY Project ID: v 04.01.2021

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: 27.0 GPM

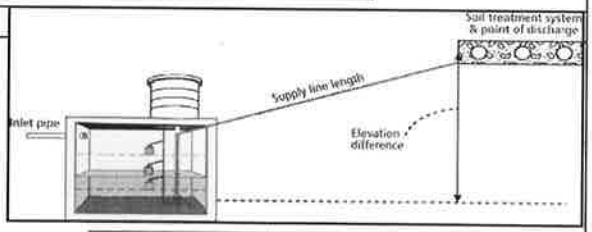
C. Enter pump description: Demand Dosing

2. HEAD REQUIREMENTS

A. Elevation Difference between pump and point of discharge: 10 ft

B. Distribution Head Loss: 5 ft

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



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: 20 ft

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

Friction Loss = 1.95 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*

20 ft X 1.25 = 25.0 ft

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

Supply Friction Loss =

1.95 ft per 100ft X 25.0 ft ÷ 100 = 0.5 ft

H. *Total Head* requirement is the sum of the *Elevation Difference* + Distribution Head Loss, + Additional Head Loss + Supply Friction Loss

10.0 ft + 5.0 ft + _____ ft + 0.5 ft = 15.5 ft

3. PUMP SELECTION

A pump must be selected to deliver at least **27.0** GPM with at least **15.5** feet of total head.

Comments:

Pump Tank Design Worksheet (Demand Dose)

MINNESOTA POLLUTION CONTROL AGENCY

DETERMINE TANK CAPACITY AND DIMENSIONS Project ID: v 04.01.2021

1. A. *Design Flow (Design Sum. 1A)*: 450 GPD C. Tank Use: Dosing
   B. Min. required pump tank capacity: 500 Gal D. Recommended pump tank capacity: 500 Gal

2. A. Tank Manufacturer: JACOBSON PRECAST CONCRETE B. Tank Model: 3SP 1650
   C. Capacity from manufacturer: 510 Gallons
   D. Gallons per inch from manufacturer: 12.7 Gallons per inch
   E. Liquid depth of tank from manufacturer: 45.5 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*

(16 in + 2 inches) X 12.7 Gallons Per Inch = 229 Gallons

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

-Item 18 of the Pressure Distribution or Item 11 of Non-level 72 **Gallons (Minimum dose)** 5.7 inches/dose

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

Design Flow: 450 GPD X 0.25 = 113 **Gallons (Maximum dose)** 8.9 inches/dose

6 *Select a pumpout volume that meets both Minimum and Maximum:* 100 Gallons

7 Calculate *Doses Per Day* = Design Flow ÷ *Delivered Volume*

450 gpd ÷ 100 gal = 4.50 *Doses*

8 Calculate Drainback:

A. *Diameter of Supply Pipe* = 2 inches

B. Length of Supply Pipe = 20 feet

C. *Volume of Liquid Per Lineal Foot of Pipe* = 0.170 Gallons/ft

D. *Drainback = Length of Supply Pipe X Volume of Liquid Per Lineal Foot of Pipe*

20 ft X 0.170 gal/ft = 3.4 Gallons

9. *Total Dosing Volume = Delivered Volume* plus *Drainback*

100 gal + 3.4 gal = 103 Gallons

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

3 in X 12.7 gal/in = 38.1 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

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

Total Dosing Volume / Gallons Per Inch

103 gal ÷ 12.7 gal/in = 8.1 Inches

12. Measuring from bottom of tank:

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

16 in + 2 in = 18 Inches

B. *Distance to set Pump On Float=Distance to Set Pump-Off Float + Float Separation Distance*

18 in + 8.1 in = 26 Inches

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

26 in + 3.0 in = 29 Inches

Inches for Dose: 8.1 in
Alarm Depth 29.1 in
Pump On 26.1 in
Pump Off 18.0 in