

Project Data

Client: Ridge Breeze Dairy
Project: Waste Storage Calculations
County: PIERCE 5.33
Date: 6/6/2023
By: MJB
Checked By: DAM
Checked By Date: 6/6/2023

Waste Storage Facility Notes:

Start by selecting "Designed Values" or "Stage Storage" from drop down in cell L1. Enter the dimensions and depth for Design Values option. Enter Elevations and Areas into the Stage Storage cells (T10 through U44)

Feed Pad/Feed Lot Information:

Feed Pad Area: 92,400
Runoff Collected: 0.3
Solids Stacking Area 24,000
Runoff Collected: 6.5

Tons of Feed Stored: 31,500

Preliminary Animal Numbers & Waste Production	
Waste Production	6/6/2023
<i>Milking Cows (1,400 lbs average)</i>	
Head	1700 head
Manure (2.4 cu.ft./cow)	= 30,518 gal./day
Bedding (0.3 cu.ft./cow)	= 3,815 gal./day
Waste Water for Operations	= 11,900 gal./day
Total Daily Waste Production	46,233 gal./day
	16,875,118 gal./year
Volume of Waste to Storage	
Animal Waste + Bedding	34,333 gal./day
Waste Water	11,900 gal./day
Total Daily Production	46,233 gal./day
<u>Notes:</u>	
*Net Precipitation = surface area of lagoon(s) x net precipitation during storage duration	
*Runoff = drainage area x runoff during storage duration	
*Leachate collection is calculated to be 120% of that amount collected during the maximum 30 day production period	

Project Name: Ridge Breeze Dairy County: PIERCE
 Computed by: MJB Date: 6/6/2023
 Checked by: DAM Date: 6/6/2023

Existing Waste Storage Facility 1 Dimensions and Capacity

12 feet deep by 200 feet long by 200 feet wide

323,486 cf
Total Bottom to Top Capacity 2,419,676 gallons

Required Storage for Precipitation

		Surface Area (SF)	Runoff Area (SF)	
25yr,24hr Precip	5.33 in	40000	0	132895
12 mo Precip	32.71 in	40000	0	815569
Evaporation	12.37 in	40000		308425

Total Storage Precip 640,039 gallons

Required Volume for Freeboard & Solids

	ft ³	
12 inch Freeboard Volume	37931	283727
12 inch Solids	16384	122552

Volume of Unusable Freeboard and Solids Accumulation 406,279 gallons

Available Capacity of Storage Structure

Bottom to Top	2419676
Volume for Precip and Runoff	640039
Volume for Solids and Freeboard	406279

Available Volume for Dairy Waste 1,373,359 gallons

Project Name:	Ridge Breeze Dairy	County:	PIERCE
Computed by :	MJB	Date:	6/6/2023
Checked by:	DAM	Date:	6/6/2023

Existing Waste Storage Facility 2 Dimensions and Capacity

12 feet deep by 300 feet long by 300 feet wide

	837,086 cf
Total Bottom to Top Capacity	6,261,404 gallons

Required Storage for Precipitation

		Surface Area (SF)	Runoff Area (SF)	
25yr,24hr Precip	5.33 in	88888	0	295317
12 mo Precip	32.71 in	88888	0	1812349
Evaporation	12.37 in	88888		685379

Total Storage Precip	1,422,287 gallons
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Required Volume for Freeboard & Solids

	ft ³	
12 inch Freeboard Volume	86219	644917
12 inch Solids	51984	388840

Volume of Unusable Freeboard and Solids Accumulation	1,033,758 gallons
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Available Capacity of Storage Structure

Bottom to Top	6261404
Volume for Precip and Runoff	1422287
Volume for Solids and Freeboard	1033758

Available Volume for Dairy Waste	3,805,360 gallons
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Project Name: Ridge Breeze Dairy County: PIERCE
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Existing Waste Storage Facility 4 Dimensions and Capacity (ASBUILT)

20 feet deep by 330 feet long by 330 feet wide

1,482,248 cf

Total Bottom to Top Capacity 11,087,214 gallons

Required Storage for Precipitation

		Surface Area (SF)	Runoff Area (SF)	
25yr,24hr Precip	5.33 in	96482	0	320549
6 mo Precip	22.43 in	96482	0	1348950
Evaporation	11.49 in	96482		<u>691014</u>

Total Storage Precip 978,485 gallons

Required Volume for Freeboard & Solids

	ft ³	
12 inch Freeboard Volume	92849	694511
12 inch Solids	46420	347222

Volume of Unusable Freeboard and Solids Accumulation 1,041,732 gallons

Available Capacity of Storage Structure

Bottom to Top	11087214
Volume for Precip and Runoff	978485
Volume for Solids and Freeboard	1041732

Available Volume for Dairy Waste 9,066,997 gallons

Stage Storage Volume for WSF3 (ASBUILT)

Elev	Area (SF)	Incr (ft)	Average Area (SF)	Increment Volume (CF)	Cumulative Volume (CF)	Cumulative Volume (gal)
1089.5	44870				0	0
		0.5	45645	22822.5		
1090	46420	1	47723.5	47723.5	22822.5	170712
1091	49027	1	50398.5	50398.5	70546	527684
1092	51770	1	53143	53143	120944.5	904665
1093	54516	1	55936	55936	174087.5	1302175
1094	57356	1	58797.5	58797.5	230023.5	1720576
1095	60239	1	61725.5	61725.5	288821	2160381
1096	63212	1	64716.5	64716.5	350546.5	2622088
1097	66221	1	67772	67772	415263	3106167
1098	69323	1	70900.5	70900.5	483035	3613102
1099	72478	1	74094	74094	553935.5	4143438
1100	75710	1	77355	77355	628029.5	4697661
1101	79000	1	80682.5	80682.5	705384.5	5276276
1102	82365	1	84076	84076	786067	5879781
1103	85787	1	87538	87538	870143	6508670
1104	89289	1	91069	91069	957681	7163454
1105	92849	1	94665.5	94665.5	1048750	7844650
1106	96482	1	98319.5	98319.5	1143415.5	8552748
1107	100157	1	102027.5	102027.5	1241735	9288178
1108	103898	1	105830.5	105830.5	1343762.5	10051344
1109	107763	0.3	108849.5	32654.85	1449593	10842956
1109.3	109936				1482247.85	11087214

Liquid Waste Storage Volume Calculation Worksheet

Ridge Breeze Dairy

:Permittee Name

of A.U.'s:

2431

Dsn by:

MJB

Date:

6/6/2023

Total Annual Liquid Waste Volume (NRCS Table Values)	
Liquids Collected/Stored	Annual Gallons
Manure and Bedding	12,531,618
Parlor Wastewater	4,343,500
Feed Storage Leachate	117,810
Feed Storage Area 1 Runoff Collected *	735,717
Stacking Pad Runoff Collected*	476,838
Net Precipitation on Storage Surface(s) **	2,857,370
Other	
Other	
Other	
Other	
Other	
Other	
Other	
TOTAL:	21,062,853

Total Annual Liquid Waste from Hauling Logs **N/A**

1

Total Annual Volume Source (1=NRCS Table Values; 2=Hauling Log Values)

Total Liquid Waste Storage Capacity (gallons)						
Waste Storage	Total Vol. from Settled Top to Bottom	-Solids Storage	-25-yr, 24-hr Precip. on Storage	25-yr, 24-hr Collected Runoff ***	-Freeboard Vol.	Max. Operating Level (MOL) Vol.
#1	2,419,676	122,552	132,895	0	283,727	1,880,503
#2	6,261,404	388,840	295,317	79,737	644,917	4,852,593
#3	0	0	0	0	0	0
#4	11,087,214	347,222	320,549	0	694,511	9,724,933
#5	0	0	0	0	0	0
#6	0	0	0	0	0	0
Total MOL Vol:						16,458,029
Days of Storage:						285
Meets Days of Storage Criteria:						YES

Jan. 2018

NOTE 1: The volumes above can be calculated in the NRCS "Waste Storage Design" spreadsheet downloaded from the Wisconsin NRCS Engineering Resources website

NOTE 2: The NRCS "Waste Storage Design" spreadsheet can be used to calculate the days of storage as well, however it is designed to be used with only one waste storage

NOTE 3: Formula for days of storage: (Total Storage Capacity/Annual Liquid Waste Generation)*365 = Days of storage

* Collected Runoff Volumes can be calculated in the NRCS "Waste Storage Design" spreadsheet Monthly Runoff Section. Set the Days of Storage to 365.

** Net Precipitation on Storage Surface depth can be calculated in the NRCS "Waste Storage Design" spreadsheet and then multiplied by the storage top area to get the net

*** 25-yr Collected Runoff Volumes can be calculated in the NRCS "Waste Storage Design" spreadsheet 25-yr Runoff section.

http://www.nrcs.usda.gov/wps/portal/nrcs/detail/wi/technical/engineering/?cid=nrcs142p2_025422

Manure and Bedding	gal/day	Annual Gal.	Animal Breakdown:			
	34,333	12,531,618	1700 Milk Cows	2.4	cf/hd/day Manure	0.3 cf/hd/day bedding
			0 Dry Cows	2.4	cf/hd/day Manure	0.3 cf/hd/day bedding
			0 Heifers	2.1	cf/hd/day Manure	0 cf/hd/day bedding
			0 Heifers	1.4	cf/hd/day Manure	0.1 cf/hd/day bedding
			0 Heifers	1.0	cf/hd/day Manure	0.1 cf/hd/day bedding
			0 Heifers	0.7	cf/hd/day Manure	0.1 cf/hd/day bedding
			0 Steers	1.7	cf/hd/day Manure	0.2 cf/hd/day bedding
		0 Calves	0.3	cf/hd/day Manure	0.1 cf/hd/day bedding	
Parlor Wastewater	11,900	4,343,500	Parlor Wastewater:	7	Gal/MilkCow/Day	

Feed Storage Leachate	Area (SF)	Annual Gal.	Calculation:
	92,400	117,810	=31,500 tons x 0.50 ton leachate/ton feed x 7.48
Feed Storage Runoff Collected	92,400	735,717	Note: From Avg Annual Vol of Runoff Spreadsheet (FeedRunoff)

Solids Stacking Runoff Collected	Area (SF)	Annual Gal.	Calculation:
	24,000	476,838	Note: From Avg Annual Vol of Runoff Spreadsheet (FeedlotRunoff)

Net Precip on Storage Surfaces	Area (SF)	Misc Area (SF)	Misc Area Description	Precipitation (gal)	Evaporation (gal)	Net (gal)
Waste Storage #1	40,000	0	Descrip	815,569	308,425	507,144
Waste Storage #2	88,888	0	Descrip	1,812,349	685,379	1,126,970
Waste Storage #3	0	0	Descrip	0	0	0
Waste Storage #4	96,482	0	Descrip	1,967,194	743,937	1,223,257
Waste Storage #5	0	0	Descrip	0	0	0
Waste Storage #6	0	0	Descrip	0	0	0
					Total=	2,857,370

Stacking Pad Runoff Collected	Area (SF)	Annual Gal.	Calculation:
	0	0	=(000sf x (32.71/12)) x 7.48

25yr, 24hr Collected Runoff	Area (SF)	Area Description	25yr, 24hr Vol (Gal)	Calculation:
Waste Storage #1	0	Description	0	=(000sf x (25yr24hr/12)) x 7.48
Waste Storage #2	0	Description	0	=(000sf x (25yr24hr/12)) x 7.48
Waste Storage #3	0	Description	0	=(000sf x (25yr24hr/12)) x 7.48
Waste Storage #4	0	Description	0	=(000sf x (25yr24hr/12)) x 7.48
Waste Storage #5	0	Description	0	=(000sf x (25yr24hr/12)) x 7.48
Waste Storage #6	0	Description	0	=(000sf x (25yr24hr/12)) x 7.48

Average Annual Volume of Runoff Collected from Feed Storage Area 1

Mean Number of Days per Year that Precip. Exceeds 0.01 inches =	125	
Annual Precipitation=	32.71	inches
Feed Storage Area=	92,400	square feet
Runoff You Want to Collect=	0.25	inches
Runoff Curve Number (RCN)=	98	
Annual Volume of Runoff Collected=	12.77	inches
Annual Volume of Runoff Collected=	98,358	cubic feet
Annual Volume of Runoff Collected=	735,717	gallons

Rainfall Event, inches	Cumulative % Less Than	Cumulative # of Events	# of Events per Category	Cumulative Precipitation, inches	RCN = 98 Runoff, inches	Collected Runoff per Event, inches	(Collected Runoff per Event) x (# of Events) inches
0.00	0	0.00	0.0000	0.00	0.00	0.00	0.00
0.02	18.64	23.30	23.3000	6.10	0.00	0.00	0.00
0.04	26.92	33.65	10.3500	8.81	0.00	0.00	0.00
0.06	32.76	40.95	7.3000	10.72	0.00	0.00	0.01
0.08	38.20	47.75	6.8000	12.50	0.01	0.01	0.04
0.10	41.92	52.40	4.6500	13.71	0.01	0.01	0.06
0.12	45.24	56.55	4.1500	14.80	0.02	0.02	0.09
0.14	47.76	59.70	3.1500	15.62	0.03	0.03	0.10
0.16	50.44	63.05	3.3500	16.50	0.04	0.04	0.15
0.18	52.52	65.65	2.6000	17.18	0.06	0.06	0.15
0.20	53.96	67.45	1.8000	17.65	0.07	0.07	0.13
0.22	56.68	70.85	3.4000	18.54	0.08	0.08	0.28
0.24	58.32	72.90	2.0500	19.08	0.10	0.10	0.20
0.26	60.00	75.00	2.1000	19.63	0.11	0.11	0.24
0.28	61.68	77.10	2.1000	20.18	0.13	0.13	0.27
0.30	64.68	80.85	3.7500	21.16	0.15	0.15	0.54
0.32	66.52	83.15	2.3000	21.76	0.16	0.16	0.37
0.34	67.92	84.90	1.7500	22.22	0.18	0.18	0.31
0.36	69.32	86.65	1.7500	22.67	0.19	0.19	0.34
0.38	70.80	88.50	1.8500	23.16	0.21	0.21	0.39
0.40	71.96	89.95	1.4500	23.54	0.23	0.23	0.33
0.42	73.24	91.55	1.6000	23.96	0.25	0.25	0.39
0.44	74.24	92.80	1.2500	24.28	0.26	0.25	0.31
0.46	75.32	94.15	1.3500	24.64	0.28	0.25	0.34
0.48	76.20	95.25	1.1000	24.93	0.30	0.25	0.27
0.50	77.28	96.60	1.3500	25.28	0.32	0.25	0.34
0.52	78.12	97.65	1.0500	25.55	0.34	0.25	0.26
0.54	78.80	98.50	0.8500	25.78	0.35	0.25	0.21
0.56	79.24	99.05	0.5500	25.92	0.37	0.25	0.14
0.58	80.08	100.10	1.0500	26.19	0.39	0.25	0.26
0.60	80.92	101.15	1.0500	26.47	0.41	0.25	0.26
0.62	81.76	102.20	1.0500	26.74	0.43	0.25	0.26
0.64	82.48	103.10	0.9000	26.98	0.45	0.25	0.22
0.66	83.24	104.05	0.9500	27.23	0.47	0.25	0.24
0.68	83.64	104.55	0.5000	27.36	0.48	0.25	0.13
0.70	84.12	105.15	0.6000	27.52	0.50	0.25	0.15
0.72	84.64	105.80	0.6500	27.69	0.52	0.25	0.16
0.74	85.24	106.55	0.7500	27.88	0.54	0.25	0.19
0.76	85.80	107.25	0.7000	28.07	0.56	0.25	0.18

Average Annual Volume of Runoff Collected from Solids Stacking Slab

Mean Number of Days per Year that Precip. Exceeds 0.01 inches =	125	
Annual Precipitation=	32.71	inches
Feed Storage Area=	24,000	square feet
Runoff You Want to Collect=	6.50	inches
Runoff Curve Number (RCN)=	98	
Annual Volume of Runoff Collected=	31.87	inches
Annual Volume of Runoff Collected=	63,748	cubic feet
Annual Volume of Runoff Collected=	476,838	gallons

Rainfall Event, inches	Cumulative % Less Than	Cumulative # of Events	# of Events per Category	Cumulative Precipitation, inches	RCN = 98 Runoff, inches	Collected Runoff per Event, inches	(Collected Runoff per Event) x (# of Events) inches
0.00	0	0.00	0.0000	0.00	0.00	0.00	0.00
0.02	18.64	23.30	23.3000	6.10	0.00	0.00	0.00
0.04	26.92	33.65	10.3500	8.81	0.00	0.00	0.00
0.06	32.76	40.95	7.3000	10.72	0.00	0.00	0.01
0.08	38.20	47.75	6.8000	12.50	0.01	0.01	0.04
0.10	41.92	52.40	4.6500	13.71	0.01	0.01	0.06
0.12	45.24	56.55	4.1500	14.80	0.02	0.02	0.09
0.14	47.76	59.70	3.1500	15.62	0.03	0.03	0.10
0.16	50.44	63.05	3.3500	16.50	0.04	0.04	0.15
0.18	52.52	65.65	2.6000	17.18	0.06	0.06	0.15
0.20	53.96	67.45	1.8000	17.65	0.07	0.07	0.13
0.22	56.68	70.85	3.4000	18.54	0.08	0.08	0.28
0.24	58.32	72.90	2.0500	19.08	0.10	0.10	0.20
0.26	60.00	75.00	2.1000	19.63	0.11	0.11	0.24
0.28	61.68	77.10	2.1000	20.18	0.13	0.13	0.27
0.30	64.68	80.85	3.7500	21.16	0.15	0.15	0.54
0.32	66.52	83.15	2.3000	21.76	0.16	0.16	0.37
0.34	67.92	84.90	1.7500	22.22	0.18	0.18	0.31
0.36	69.32	86.65	1.7500	22.67	0.19	0.19	0.34
0.38	70.80	88.50	1.8500	23.16	0.21	0.21	0.39
0.40	71.96	89.95	1.4500	23.54	0.23	0.23	0.33
0.42	73.24	91.55	1.6000	23.96	0.25	0.25	0.39
0.44	74.24	92.80	1.2500	24.28	0.26	0.26	0.33
0.46	75.32	94.15	1.3500	24.64	0.28	0.28	0.38
0.48	76.20	95.25	1.1000	24.93	0.30	0.30	0.33
0.50	77.28	96.60	1.3500	25.28	0.32	0.32	0.43
0.52	78.12	97.65	1.0500	25.55	0.34	0.34	0.35
0.54	78.80	98.50	0.8500	25.78	0.35	0.35	0.30
0.56	79.24	99.05	0.5500	25.92	0.37	0.37	0.20
0.58	80.08	100.10	1.0500	26.19	0.39	0.39	0.41
0.60	80.92	101.15	1.0500	26.47	0.41	0.41	0.43
0.62	81.76	102.20	1.0500	26.74	0.43	0.43	0.45
0.64	82.48	103.10	0.9000	26.98	0.45	0.45	0.40
0.66	83.24	104.05	0.9500	27.23	0.47	0.47	0.44
0.68	83.64	104.55	0.5000	27.36	0.48	0.48	0.24
0.70	84.12	105.15	0.6000	27.52	0.50	0.50	0.30
0.72	84.64	105.80	0.6500	27.69	0.52	0.52	0.34
0.74	85.24	106.55	0.7500	27.88	0.54	0.54	0.41
0.76	85.80	107.25	0.7000	28.07	0.56	0.56	0.39