

Livestock Confinement Operations

Water Requirements and Consumptive Use Worksheet

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HZ 04/05/2017

COMPLETE BLUE HIGHLIGHTED SECTIONS ONLY

Prepared for: East Valley Cattle LLC

Revision: 1

Run Date: 1/23/2017

Remarks: Water rights indicate 28,125 animals

Current animals described below

Herd Information - User Input

Number of milking cows 13000
Number of dry cows 1500
Total Number of Animals 24500

Breed: Small

Calves at age:

1 month 0
2 months 0
3 months 0
4 months 0
5 months 0

Heifers / bulls at age:

6 - 9 months 0
9 - 12 months 0
12 - 15 months 0
15 - 18 months 0
18 - 24 months 10000
Weight 841.5

ANIMAL INFORMATION

Defaults or enter values if known

Large body weight 1000 lbs
Milk fat percentage 4.7 %
Average days dry 37.5
Annual milk yield per animal 18790.5 lbs/year
Percent dry matter in ration 62.25 %

Nearest weather station

Malta

Number of milkings/day

2

From Idaho USDA, see Jersey Data tab

Based off of ration see DMI Jersey Holter et al. 1996

Check: Total herd size based on days dry

14600

HERD SIZE OK

Lagoon Information - User Input*

Lagoon Number	Top width	Top length	SS (h:v)	Max depth	Average depth factor	% days with water	Top Area	Bottom Area	Average Area
1	500	500	2	16	0.5	100	250000	219024	234512
2	500	500	2	16	0.5	100	250000	219024	234512
3	600	600	2	16	0.5	100	360000	322624	341312
4	500	723	2	16	0.5	100	361560	323444.16	342502
5	500	1000	2	16	0.5	100	500000	453024	476512
6	500	1000	2	16	0.5	100	500000	453024	476512
7	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0
TOTAL ACRES							51.00	45.69	48.34

*Lagoon dimensions were reported as total area of 51 acres for 6 lagoons. Storage capacity of 784.7 afa

TRANSFER 81940
APPLICANT'S
EXHIBIT 5

Facility Information - User Input

	Holding Pen 1	Holding Pen 2	
Holding pen active	1	0	(0 = not used or nonexistent)
Number of sprinklers in pen	0		
Average line pressure	55		psi
Sprinkler nozzle size - primary	9/64	9/64	inches
Sprinkler nozzle size - secondary	0		(enter 0 for single-nozzle sprinklers)
Daily operation time of sprinklers	0		minutes
Percent of days per year cows are washed	0		%
Holding Pen Flush	30000		gal/day
Holding Pen Hand Washdown	1500		gal/day
Amount of manual flush which is second-use after coolers	0		gal

Number of free stalls	1	
Length of each free stall	feet	Assume entire section is stalled
Width of each free stall	feet	Assume entire section is stalled

Is the feeding area flushed to lagoon?	No
Is this housing area flushed to lagoon?	No

	Feeding	Housing
Flushing recycle rate	0	0

COOLING WATER VOLUMES Per Rotary Milking Parlor 1 milking

	Flow	Operation time	
Plate cooler	33 gpm	20.4 hours/day	See DeLaval Spreadsheet
Condensers	45 gpm	20.4 hours/day	See DeLaval Spreadsheet

CLEANING / FLUSHING VOLUMES

Large Double Rotary Barn/Each Data From Exhibit D

Cow Prep	2448 gal/day
Milk Tanks	3600 gal/day
Pipelines	1200 gal/day
Claw Back Flush	12240 gal/day
Deck Sprays	7800 gal/day
Deck Flush	2160 gal/day
Parlor Hand Wash Down	1500 gal/day
Milk Room Cleaning	1000 gal/day
Water Trough Cleaning	1332 gal/day

Barn 3-Data from DeLaval

Cow Prep	1160 gal/day
Bulk Tanks	1800 gal/day
Pipelines	1200 gal/day
Claw Back Flush	5800 gal/day
Deck Sprays	1000 gal/day
Deck Flush	7800 gal/day
Parlor Hand Wash Down	1620 gal/day
Milk Room Cleaning	600 gal/day
Water Trough Cleaning	1332 gal/day

Amount of above volumes which is second use after coolers	33280 gal
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Land Application Information - User Input

Type of system	Center Pivot
Predominant cropping	SGrain
Percent of waste water which goes to meet crop irrigation requirement	100 %

Stockwater Component

Drinking Water Calculation for Lactating Cows

4.7% fat-corrected milk yield	20711.82863 lbs/year
Daily average FCM yield	63.24 lbs/day
Daily average milk yield	57.38 lbs/day
DMI: Holter et al. 1996 Jersey Cattle	42.10 lbs/day

METHOD 1: Kertz	Kertz Method highly sensitive to DMI
Estimated total water intake (TWI)	257.2 lbs/day or 30.8 gal/day
As-fed feed daily intake	67.6 as-fed lb/day
Water content of feed	25.53 lb/day in feed 3.06 gal/day
Drinking water intake	231.7 lb/day or 27.8 gal/day
Drinking water requirement for lactating cows	361175 gal/day 404.6 ac-ft/year
Water Content of Feed	39794.6 gal/day
Maximum drinking water requirement	404.60 ac-ft/year
Water Content of Feed	44.58 ac-ft/year

METHOD 2: Holter and Urban
Regression equation with DMI, milk production, and dry matter %

Drinking water intake	73.8 liters/day 19.5 gal/day
	253286 gal/day 283.7 ac-ft/year

Drinking Water Calculation for Dry Cows

Estimated DMI	22 lbs/day
Average drinking water intake	13 gal/day

Average drinking water requirement	19500 gal/day 21.84 ac-ft/year
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Drinking Water Calculation for Replacement Herd (Calves and Heifers)

Age	GPD	Ac-Ft/year
1 mo	0	0.00
2 mo	0	0.00
3 mo	0	0.00
4 mo	0	0.00
5 mo	0	0.00
6-9 mo	0	0.00
9-12 mo	0	0.00
12-15 mo	0	0.00
15-18 mo	0	0.00
18-24 mo	84500	94.66
Drinking water requirement for replacement herd	84500 gpd	94.66 afa
WATER IN FEED	40300 gal/day	45.14 afa
TOTAL STOCKWATER COMPONENT		521.10 afa

Commercial Component

Number of Parlors 2 parlors

Milking Parlor Water Usage Calculation:

Volume needed 2 milkings in each Rotary Parlor: Conservative Use based on DeLaval Data

Rotary Barn			Barn 3-Smaller Rotary
Cleaning parlor	11460 gal		10420 gal
Cleaning milkroom, etc	1000 gal		600 gal
Cleaning Milk Tank	3600 gal		1800 gal
Cleaning pipeline	1200 gal		1200 gal
Cleaning equipment	13572 gal		7132 gal
Cleaning cows	2448 gal		1160 gal
Total milking parlor volume	33280 gal/day/parlor	33280	22312 gal/day
6 Rotary Barn Volume	66560 gal/day		
Second-use water (deduct)	33280 gal/day		0 gal/day
	37.28 ac-ft/year		24.99 ac-ft/year

Holding Pen Water Usage Calculation

Holding pen Flush	30000	24000
Additional Hand flush volume	1500	1000
6 Parlor Total holding pen volume	63000	25000
Second-use water (deduct)	0	0
Parlors	70.57 ac-ft/year	
With Barn 3	98.58 ac-ft/year	

Commercial Use

160.85 ac-ft/year

Other Flushing Water Calculation

Daily volume needed for:

	cooling water used for all other flushing	
Feeding area flushing	0 gal/day	Open, scraped
Housing area flushing	0 gal/day	Open pens, scraped

Total other flushing volume	0 gal/day
Recycled water	0

0.00 ac-ft/year

Cooling Water Calculation

Daily volume needed for: 2 milkings

	1X Rotary Parlor
Condenser water	110160 gal/day/parlor
Plate cooler	81660 gal/day/Parlor
Reuse Water	110160 gal/day/Parlor

Barn 3

44743 gal/day
44743 gal/day
44743 Condenser

Recirculate in Condenser

Fresh Water Parlor Volume	110160 gal/day/parlor
Total Volume DeLaval	220320 gal/day
	246.81 ac-ft/year

No ReCirc

191820 gal/day/parlor
383640.2343 gal/day
429.76 ac-ft/year

Cooling Water Available for Reuse	246.81 AC-FT/YEAR
Cooling Water Available for Reuse	429.76 AC-FT/YEAR

Recirculate Plate water in condenser
Plate cooler and condenser have new water

Consumptive Use Calculation

A. Lagoon Evaporation

Annual reference ET (Allen & Brockway, 1983)	4.44 feet	
Annual open water coeff (Kohler Nordenson Fox)	0.90	
Annual open water (lagoon) evaporation	3.99 feet	
Manual override: Input annual lagoon evap	3.22 feet	From Allen and Robison 2012 Etact MALI

Total lagoon water surface area at full	13401672 sq. ft.	
Total lagoon bottom area	1990164.16 sq. ft.	
Average surface area when water is present	2105862 sq. ft. =	48.34 ac

Total lagoon evaporation **155.67 ac-ft/year** Estimated--Used 51 acres in WB

B. Animal usage: milk, metabolism, and excretion loss

	Milking Cows	Dry Cows	Heifers
Waste excretion volume per cow	1.3	1.3 ft ³ /day/1000lb	1.3 ft ³ /day/1000lb
Water content	87.5	88.4 %	88.4 %
Total water volume in excrement	110611	12894 gal/day	72335 gal/day
Manure Volume	126412	14586 gal/day	81827 gal/day
Volume In Lagoons	37924	4376 gal/day	24548 gal/day
	66848		
Volume of Manure in lagoons	75	afa	
Percent of excrement flushed to lagoons	30 %	(based on areas which are flushed)	
Consumptive use (evap.) of water in excrement	70 %		
Consumptive use (evap.) volume	137088 gal/day		153.6 afa
Excrement c.u. attributable to drinking water	123483 gal/day		138.3 afa
Volume of Excrement Flushed to Lagoon	42299 gal/day		47.4 afa
	4198		4.7
Total milk production - assume 100% leaves site	745882 lbs/day or	89434 gal/day	100.2 afa
Water content of milk		77808 gal/day	87.2 afa
Water content attributable to drinking water		70086 gal/day	78.5 afa
Water use for Dairy animal metabolism	146821 gal/day	164.5 afa	
Metabolism water attributable to drinking water	132250 gal/day	148.1 afa	
Consumptive use - replacement herd (100%)	84500 gal/day	94.7 afa	
Total animal consumptive use	446217 gal/day or	499.86 ac-ft/year	
Percent of drinking water intake	95.9 %		
CU from Feed Portion of Water	15.2 afa		
Milk from Feed Portion of Water	8.7 afa		
Excrement from Feed Portion of Water	4.7 afa		
Total animal consumptive use from groundwater		471.27 afa	

C. Parlor Cleanup

Average sprinkler/washing system evap loss	0 %	
Milking and wet total area	1089000 sq. ft. =	25.00 acres
Length of time concrete is wet	16 hr/day	
Average evaporation from wet concrete	0.15 in./day	

Sprinkler system loss volume	0.00 ac-ft/year
Free stall evaporation volume	76.04 ac-ft/year

Total cleanup loss **76.04 ac-ft/year**

D. Land application site-Estimate

Crop evapotranspiration	2.30 ac-ft/ac/year
Irrigation diversion volume	2.87 ac-ft/ac/year
System efficiency	88 %
Waste water volume to lagoons	535.8 ac-ft/year
Waste water volume available for land application	380.1 ac-ft/year

Total pot. crop consumptive use of waste water **334.53 ac-ft/year**

Summary

Brockway Spreadsheet

Drinking Water

Milking herd	404.6 ac-ft/year	27.8 gal/hd/day
Non-milking herd (dry cows)	21.8 ac-ft/year	13.0 gal/hd/day
Replacement herd (calves and heifers)	94.7 ac-ft/year	8.5 gal/hd/day

Total drinking water volume	521.10 ac-ft/year
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Commercial

Milking parlor	62.28
Holding pen and cleanup	98.6
Cow Comfort-Sprinkler and Mister	
Total commercial volume	160.85 ac-ft/year

Reuse

Cooling water	429.76 ac-ft/year	15.7 gal/hd/day	
Dairy Process Total	1111.71 ac-ft/year	40.5 gal/hd/day	
Dilution	33.89 ac-ft/year	1.2 gal/hd/day	
Total Use	1145.60 ac-ft/year	41.7	24500

Consumptive Use

Lagoon evaporation	155.67 ac-ft/year
Animal milk, excretion, & metabolism	499.9 ac-ft/year
Parlor and holding pen cleanup	76.04 ac-ft/year
Crop consumptive use on land application	334.5 ac-ft/year
Total consumptive use	1066.10 ac-ft/year
Current Stock WR	1145.60 ac-ft/year
Irrigation Application Losses	79.50 ac-ft/year
Percent of diversion volume consumed	93.1 %
Annual crop consumptive use - IDWR allowable	3.0 afa

Water Use Estimates		
Drinking Water	521.10	ac-ft/year
Commercial Use	160.85	ac-ft/year
Total Use	1145.60	ac-ft/year
Total Daily Usage Per Cow	41.74	gal/au/day
Current Com/Stockwater	1145.60	ac-ft/year
Deficient Volume	0.00	ac-ft/year
Consumptive Use	3.00	ac-ft/acre
Equivalent Acres	0.00	acres