APPENDIX F-2

Emissions Calculations

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Herd Breakout

	Existing	Proposed
Milking Cow	1,420	4,000
Dry Cow	185	500
Heifer (15-24 mo)	337	1,000
Heifer (7-14 mo)	438	1,000
Calves (4-6 mo)	177	400
Calf (under 3 mo)	396	400
Totals	2,953	7,300
Increase		4,347

The estimated VOC emissions used in this analysis are from the SJVAPCD dairy emissions calculator dated January 2020 and estimates from CalEEMod v.2020.4.0

VOC Emissions from Harvested Acres in Merced County

	tons/day	lbs/year	lbs/acre/yr
Merced Farm	0.81	591,300	1.189
Harvested Acres	497,467		

		lbs/year	tons/year
Acres Existing	692	823	**0.411**
Acres Proposed	678	806	**0.403**
			-0.008

Farm Equipment emissions were calculated using an emissions factor of 1.19 lbs/acre/year of VOC based on an estimated 0.81 tons/day VOC emitted from farming equipment in the County, with 497,467 acres harvested. This emission factor is based on 2017 inventory data, the latest available, and would represent a conservative estimate of emissions.

This emission factor was applied to the existing 692 acres harvested (fields are harvested multiple times a year with double-cropping patterns) and to the proposed 678 acres harvested (fields would be harvested multiple times a year with double-cropping patterns).

California Air Resources Board. CEPAM2019V1.03 Emission Projection Data. 2017 Estimated Annual Average Emissions. Merced County. Accessed on October 13, 2023 at <https://ww2.arb.ca.gov/applications/emissions-county>

United States, Department of Agriculture (USDA). 2017. 2017 Census of Agriculture – County Data: Total Cropland - Harvested Cropland, Acres. Merced County. Accessed on October 13, 2023 at < https://www.nass.usda.gov/Publications/AgCensus/2017/Full_Report/Census_by_State/California/ >

VOC Emissions from Mobile Sources

Emissions	Emissions (lbs/day)	Emissions (tons/yr)
Traffic & Onsite Mobile Source (Tractors)	-	0.020
Truck Travel	*0.000299*	*0.0000546*
	0.000387	*0.0000706*
	0.000666	*0.0001215*
	0.0000356	*0.0000065*
	0.000212	*0.0000387*
Truck Idling	*0.00221*	*0.0004033*
	0.00221	*0.0004033*
	0.00331	*0.0006041*
	0.0011	*0.0002008*
Total Onsite Truck Travel and Idling		0.0019034
Tons/Year Total Mobile Source		**0.022**

Emissions from traffic, and onsite off-road equipment such as feed loaders were estimated using CalEEMod Version 2020.4.0, Appendix F-1.
See Appendix G for Onsite Truck Travel and Idling VOC emissions.

Total VOC Emissions

Emission Source	Existing VOC/ROG Emissions (tons/yr)	Proposed VOC/ROG Emissions (tons/yr)	Increment of Increase with Proposed Expansion
Traffic and Onsite Mobile Source			0.022
Farm Equipment	0.411	0.403	-0.008
Feed and Manure Management	23.63	57.23	33.61
	24.04	57.63	**33.62**

VOC emissions from traffic and onsite off-road equipment such as feed loaders were estimated using CalEEMod Version 2020.4.0. Onsite truck travel and idling VOC emissions are estimated in Appendix G of the EIR. VOC emissions from feed and manure management (including cow housing, liquid manure, and solid manure) were estimated using the SJVAPCD dairy emissions calculator. See Appendix F for calculator emissions and CalEEMod results.

Herd Breakout

	Existing	Proposed
Milking Cow	1,420	4,000
Dry Cow	185	500
Heifer (15-24 mo)	337	1,000
Heifer (7-14 mo)	438	1,000
Heifer (4-6 mo)	177	400
Calf (under 3 mo)	396	400
Totals	2,953	7,300

PM Emissions from Cow Housing

	Existing PM_{10} Emissions	Proposed PM_{10} Emissions	PM_{10} Increment of Increase	$PM_{2.5}$ Increment of Increase
Totals (lbs/yr)	9,530	4,591	-4,939	-563
Tons/Year	**4.77**	**2.30**	**-2.47**	**-0.28**

See SJVAPCD Calculator for PM_{10} Calculation Worksheets and Controls. To generate $PM_{2.5}$ emissions, the PM_{10} emission results were multiplied by the $PM_{2.5}$ fraction from the livestock fugitive dust profile in the California Emission Inventory Data and Reporting System (CEIDARS) developed by the California Air Resources Board.

Wind Erosion Cropped Fields

	PM Emission Factor (tons/ acre/yr)	PM10/PM2.5 Emission Factor (tons/acre/yr)	Emission Factor (lbs/ acre/yr)	Existing Acreage	Existing Emissions (tons/year)	Proposed Acreage	Proposed Emissions (tons/year)
PM10	0.013659	0.0061466	12.3	692	4.25	678	4.17
PM2.5*		0.0010594	2.12	692	0.733	678	0.718

	Note: PM2.5 Emissions Factor estimated from a comparison of Annual Average Emissions of both PM10 and PM2.5 as found in CARB Almanac Emission Projection Data (Published in 2013). 2012 Estimated Annual Average Emissions. 2012 Emissions Data for Merced County, Dust from Agricultural Lands (Non-Pasture). http://www.arb.ca.gov/ei/emissiondata.htm
	PM Emission Factor found in Methodology for California Air Resources Board, Section 7.12, Windblown Dust - Agricultural Lands, Revised July 1997. http://www.arb.ca.gov/ei/areasrc/index7.htm

PM 10 Emissions from Mobile Sources

Emissions	Emissions (lbs/day)	Emissions (tons/yr)	Increment of Increase (tons/year)
Traffic & Onsite Mobile Source (Tractors)			0.0264
Onsite Diesel PM			0.0000435
Truck Travel	*0.0000345*	*0.0000063*	
	0.0000444	*0.0000081*	
	0.0000764	*0.0000139*	
	0.00000409	*0.0000007*	
	0.0000243	*0.0000044*	
	0.0000452	*0.0000082*	
Truck Idling	*0.00000241*	*0.0000004*	
	0.00000241	*0.0000004*	
	0.00000362	*0.0000007*	
	0.00000121	*0.0000002*	
Tons/Year			**0.026**

Emission from area sources, traffic, and onsite off-road equipment such as feed loaders were estimated using CalEEMod Version 2020.4.0, Appendix F-1. See Appendix G for Onsite Diesel PM.

Land Preparation and Harvesting

	Crop Type	PM10 Emission Factor (lbs/acre/year)	PM2.5 Emission Factor (lbs/acre/year)	Existing Acreage	Existing PM10 Emissions (tons/year)	Existing PM2.5 Emissions (tons/year)	Proposed Acreage	Proposed PM10 Emissions (tons/year)	Proposed PM2.5 Emissions (tons/year)
Land Preparation	Oats	3.70	0.55	346	0.64	0.10	339	0.63	0.09
	Corn, silage	6.90	0.10	346	1.19	0.02	339	1.17	0.02
Total Land Preparation					**1.83**	**0.11**		**1.80**	**0.11**
Harvesting	Oats	5.80	0.87	346	1.00	0.15	339	0.98	0.15

	Crop Type	PM10 Emission Factor (lbs/acre/year)	PM2.5 Emission Factor (lbs/acre/year)	Existing Acreage	Existing PM10 Emissions (tons/year)	Existing PM2.5 Emissions (tons/year)	Proposed Acreage	Proposed PM10 Emissions (tons/year)	Proposed PM2.5 Emissions (tons/year)
	Corn, silage	0.17	0.00	346	0.03	0.00	339	0.03	0.00
Total Harvesting					1.03	0.15		1.01	0.15
Total Farming Operations					2.87	0.27		2.81	0.26
	Notes: CARB PM10 emission factors based on 2012 crop acreage. PM2.5 Emissions Factor estimated from CARB speciation profiles included in resource below.								
	California Air Resources Board, Section 7.4, Agricultural Land Preparation Operations, Revised and updated, April 2016. Section 7.5, Agricultural Harvest Operations, Updated April 2016, Revised March 2017. http://www.arb.ca.gov/ei/areasrc/index7.htm								
	Based on double-cropping, several fields would undergo land preparation twice in a year, and therefore the acreage was considered for each occurrence. Harvesting operations would occur multiple times for project fields. Cropping patterns obtained from existing and proposed NMPs.								

Dry Manure Application PM Emissions

	Emission Factor (lbs/acre/yr)	Existing Acreage	Existing Emissions (tons/year)	Proposed Acreage	Proposed Emissions (tons/year)
PM10	5.07	288	0.73	288	0.73
PM2.5	3.042	288	0.44	288	0.44
	To generate $PM_{2.5}$ emissions, the PM_{10} emission results were multiplied by the $PM_{2.5}$ fraction from the livestock waste profile in the California Emission Inventory Data and Reporting System (CEIDARS) developed by the California Air Resources Board.				

Aggregate PM10 and PM2.5

Emission Source	Existing PM_{10} Emissions (tons/year)	Proposed PM_{10} Emissions (tons/year)	Project Increase PM10 Emissions	Existing $PM_{2.5}$ Emissions (tons/year)	Proposed $PM_{2.5}$ Emissions (tons/year)	Project Increase PM2.5 Emissions
Wind Erosion	4.253	4.167	-0.086	0.733	0.718	-0.015
Farming Operations	2.867	2.809	-0.058	0.265	0.260	-0.005
Traffic & On-Site Mobile Source	-	-	0.026			0.012
Animal Movement	4.765	2.296	-2.470	0.543	0.262	-0.282
Dry Manure Application	0.730	0.730	0.000	0.438	0.438	0.000
Total	**12.615**	**10.002**	**-2.587**	**1.980**	**1.678**	**-0.290**

Existing Cropped Fields						Total Planted Acres	Total Harvested Acres	Crop Type
Field	Acres Planted	Acres Harvested	Crop	Solid Manure?				
Field on Right	36	36	Oats	WW		346	346	oats
	36	36	Corn	WW		346	346	corn
Big Field	34	34	Oats	WW			0	Alfalfa, hay
	34	34	Corn	WW			0	earlage
Palma/Hinds	37	37	Oats	SM/WW				Sudangrass, silage
	37	37	Corn	WW				Almond
Behind Heifers	13	13	Oats	WW				Wheat
	13	13	Corn	WW				Sorghum Sudan
JN-1	38	38	Oats	SM/WW				Pistachios
	38	38	Corn	WW				
JN-3	19	19	Oats	SM/WW		692	692	
	19	19	Corn	WW				
JN-5	21	21	Oats	SM		**Summary of overall cropping pattern**		
	21	21	Corn	SM				
HR-1/HR-2/HR-3	81	81	Oats	WW		346		Oats/Corn
	81	81	Corn	WW		18		Pasture
HR-4	29	29	Oats	SM		364		Total
	29	29	Corn	SM				
3rd St	38	38	Oats	SM				
	38	38	Corn	SM				
Total Acres	**692**	**692**						

	Proposed Cropped Fields					Total Planted Acres	Total Harvested Acres	Crop Type
Field	**Acres Planted**	**Acres Harvested**	**Crop**	**Solid Manure?**				
Filed on Right	36	36	Oats	WW		339	339	oats
	36	36	Corn	WW		339	339	corn
Big Field	34	34	Oats	WW			0	Alfalfa, hay
	34	34	Corn	WW			0	earlage
Palma/Hinds	37	37	Oats	SM/WW				Sudangrass, silage
	37	37	Corn	WW				Almond
Behind Heifers	6	6	Oats	WW				Wheat
	6	6	Corn	WW				Sorghum Sudan
JN-1	38	38	Oats	SM/WW				Pistachios
	38	38	Corn	WW				
JN-3	19	19	Oats	SM/WW		**678**	**678**	
	19	19	Corn	WW				
JN-5	21	21	Oats	SM		**Summary of overall cropping pattern**		
	21	21	Corn	SM				
HR-1/HR-2/HR-3	81	81	Oats	WW		339		Oats/Corn
	81	81	Corn	WW		18		Pasture
HR-4	29	29	Oats	SM		357		Total
	29	29	Corn	SM				
3rd St	38	38	Oats	SM				
	38	38	Corn	SM				
Total Acres	**678**	**678**						

Dry Manure Applied - Existing	
Field Name	**Acres**
Pasture	18
Palma/Hinds	37
JN-1	38
JN-3	19
JN-5	21
	21
HR-4	29
	29
3rd	38
	38
Total Acres	**288**

Dry Manure Applied - Proposed	
Field Name	**Acres**
Pasture	18
Palma/Hinds	37
JN-1	38
JN-3	19
JN-5	21
	21
HR-4	29
	29
3rd	38
	38
Total Acres	**288**

Farming Equipment: NOx Emissions from Harvested Acres in Merced County

	tons/day	lbs/year	lbs/acre/yr	tons/year	Increment of Increase
Merced Farm	4.59	3,350,700	6.736		
Total Harvested Acres	497,467				
Harvested Acres Existing	692	4,660.98		2.330	
Harvested Acres Proposed	678	4,566.68		2.283	-0.047

Farm Equipment emissions were calculated using an emissions factor of 6.74 lbs/acre/year of NO_X based on an estimated 4.59 tons/day NO_X emitted from farming equipment in Merced County, with 497,467 acres harvested. This emission factor is based on 2017 inventory data, the latest available, and would represent a conservative estimate of emissions.

This emission factor was applied to the existing 692 acres harvested (fields are harvested multiple times a year with double-cropping patterns) and to the proposed 678 acres harvested (fields would be harvested multiple times a year with double-cropping patterns).

California Air Resources Board. CEPAM2019V1.03 Emission Projection Data. 2017 Estimated Annual Average Emissions. Merced County. Accessed on October 18, 2023 at <https://ww2.arb.ca.gov/applications/emissions-county>

United States, Department of Agriculture (USDA). 2017. 2017 Census of Agriculture – County Data: Total Cropland - Harvested Cropland, Acres. Merced County. Accessed on October 18, 2023 at < https://www.nass.usda.gov/Publications/AgCensus/2017/Full_Report/Census_by_State/California/ >

Table 1. County Summary Highlights: 2017 (continued)

[For meaning of abbreviations and symbols, see introductory text.]

Item	Merced	Modoc	Mono	Monterey	Napa	Nevada	Orange
Farms .... number	2,337	423	65	1,104	1,866	673	193
Land in farms .... acres	946,385	571,191	73,031	1,340,142	255,778	52,061	32,401
Average size of farm .... acres	405	1,350	1,124	1,214	137	77	168
Median size of farm .... acres	40	239	36	80	11	10	4
Estimated market value of land and buildings:							
Average per farm .... dollars	5,299,308	2,640,981	2,158,060	8,944,364	6,052,361	574,346	3,205,502
Average per acre .... dollars	13,086	1,956	1,921	7,368	44,154	7,425	19,094
Estimated market value of all machinery and							
equipment $1,000	782,567	82,713	9,143	889,335	175,969	23,051	31,350
Average per farm .... dollars	334,860	195,540	140,666	805,557	94,303	34,251	162,436
Farms by size:							
1 to 9 acres	384	41	12	276	843	295	130
10 to 49 acres	867	65	24	227	555	253	31
50 to 179 acres	465	81	6	148	256	74	14
180 to 499 acres	284	66	6	138	103	34	11
500 to 999 acres	165	52	2	92	57	11	4
1,000 acres or more	172	118	15	223	52	6	3
Total cropland .... farms	1,851	319	36	789	1,788	377	147
acres	546,460	159,907	7,913	366,709	67,701	4,816	9,564
Harvested cropland .... farms	1,777	283	30	704	1,753	318	142
acres	497,467	115,640	7,591	299,378	60,978	3,313	5,803
Irrigated land .... farms	1,975	310	47	638	1,749	465	138
acres	493,726	142,138	41,736	294,590	60,945	4,952	4,214

CEPAM2019v1.03 Emission Projection Data by EIC

2017 Annual Average Emissions (Tons/Day)

MERCED COUNTY
MISCELLANEOUS PROCESSES
650-FUGITIVE WINDBLOWN DUST

Download these results (as a comma delimited file).
Start a new query.

EMISSIONS INVENTORY CATEGORY	TOG	ROG	CO	NOX	SOX	PM	PM10	PM2.5	NH3
650-650-5400-0000 ℹ️ Methodology 650-DUST FROM AGRICULTURAL LANDS (NON-PASTURE) 5400-DUST 0000-SUB-CATEGORY UNSPECIFIED	-	-	-	-	-	12.25	5.57	0.96	-
650-651-5400-0000 ℹ️ Methodology 651-DUST FROM PASTURE LANDS 5400-DUST 0000-SUB-CATEGORY UNSPECIFIED	-	-	-	-	-	2.73	1.24	0.21	-
650-652-5400-0000 ℹ️ Methodology 652-DUST FROM UNPAVED ROADS AND ASSOCIATED AREAS 5400-DUST 0000-SUB-CATEGORY UNSPECIFIED	-	-	-	-	-	0.78	0.46	0.06	-
TOTAL	-	-	-	-	-	15.75	7.26	1.24	-
FARM EQUIPMENT	0.94	0.81	4.91	4.59	0.00	0.29	0.29	0.26	0.00

CEPAM2019v1.03 Emission Projection Data by EIC

2017 Annual Average Emissions (Tons/Day)

MERCED COUNTY
MISCELLANEOUS PROCESSES
620-FARMING OPERATIONS

Download these results (as a comma delimited file).
Start a new query.

EMISSIONS INVENTORY CATEGORY	TOG	ROG	CO	NOX	SOX	PM	PM10	PM2.5	NH3
620-614-5400-0000 ⓘ Methodology 614-TILLING DUST 5400-DUST 0000-SUB-CATEGORY UNSPECIFIED	-	-	-	-	-	9.31	4.23	0.63	-
620-615-5400-0000 ⓘ Methodology 615-HARVEST OPERATIONS - DUST 5400-DUST 0000-SUB-CATEGORY UNSPECIFIED	-	-	-	-	-	11.17	5.08	0.76	-

NOx Emissions from Mobile Sources

Emissions	Emissions (lbs/day)	Emissions (tons/yr)	Increment of Increase (tons/year)
Traffic & Onsite Mobile Source (Tractors)			0.2381
Truck Travel	0.0152	0.0027740	
	0.0196	0.0035770	
	0.0337	0.0061503	
	0.00181	0.0003303	
	0.0107	0.0019528	
Truck Idling	0.00104	0.0001898	
	0.00104	0.0001898	
	0.00156	0.0002847	
	0.00052	0.0000949	
Onsite NOx from Truck Travel and Idling			0.0155435
Tons/Year			**0.2536**

Emission from traffic and onsite off-road equipment such as feed loaders were estimated using CalEEMod Version 2020.4.0, Appendix F-1.

See Appendix G for Onsite NOx emissions from onsite truck travel and idling.

NOx Emissions from Agricultural Activities

	Acres	N2O Annual Average (Metric Tons CO₂e/Acre/Year)	N2O Annual Average (tons NOx/acre/year)	Total NOx Emissions (tons/yr)	
Existing Cropping					
Corn/Oats	346	0.32	0.0012	0.410	
Proposed Cropping					
Corn/Oats	339	0.32	0.0012	0.401	
Increment of Increase				**-0.008**	

The Michigan State University's US Cropland Greenhouse Gas Calculator accounts for different cropping systems using USDA county-specific data considering crop type, tillage, fertilizer, and environmental variables to calculate greenhouse gas emissions. Michigan State University's US Cropland Greenhouse Gas Calculator. Accessed on March 30, 2023 at <http://carboncalculator.kbs.msu.edu/>

Total NOx Emissions

	Increment of Increase
	tons/yr
Traffic and Onsite Mobile Source	0.2536
Farming Equipment	-0.047
Soil Emissions	-0.008
Total	**0.198**

Pre-Project Facility Information

1. Does this facility house Holstein or Jersey cows? `Holstein`
   Most facilities house Holstein cows unless explicitly stated on the PTO or application.

2. Does the facility have an <u>anaerobic</u> treatment lagoon? `no`

3. Does the facility land apply liquid manure? `yes`
   Answering "yes" assumes worst case.

4. Does the facility land apply solid manure? `yes`
   Answering "yes" assumes worst case.

5. Is <u>any</u> scraped manure sent to a lagoon/storage pond? `no`
   Answering "yes" assumes worst case.

Pre-Project Herd Size					
Herd	Flushed Freestalls	Scraped Freestalls	Flushed Corrals	Scraped Corrals	Total # of Animals
Milk Cows	1,420				1,420
Dry Cows	185				185
Support Stock (Heifers, Calves, and Bulls)				952	952
Large Heifers					0
Medium Heifers					0
Small Heifers					0
Bulls					0

	Calf Hutches				Calf Corrals		
	Aboveground Flushed	Aboveground Scraped	On-Ground Flushed	On-Ground Scraped	Flushed	Scraped	Total # of Calves
Calves	396						396

Total Herd Summary	
Total Milk Cows	1,420
Total Mature Cows	1,605
Support Stock (Heifers, Calves, and Bulls)	952
Total Calves	396
Total Dairy Head	2,953

Pre-Project Silage Information			
Feed Type	Max # Open Piles	Max Height (ft)	Max Width (ft)
Corn			
Alfalfa			
Wheat			

Post-Project Facility Information

1. Does this facility house Holstein or Jersey cows? `Holstein`
   Most facilities house Holstein cows unless explicitly stated on the PTO or application.

2. Does the facility have an <u>anaerobic</u> treatment lagoon? `no`

3. Does the facility land apply liquid manure? `yes`
   Answering "yes" assumes worst case.

4. Does the facility land apply solid manure? `yes`
   Answering "yes" assumes worst case.

NOTE: An increase in total lagoon/storage pond surface area may result in an increase in H2S emissions. The District's Technical Services Division may need to conduct H2S modeling.

5. Is <u>any</u> scraped manure sent to a lagoon/storage pond? `no`
   Answering "yes" assumes worst case.

6. Does this project result in an increase or relocation of uncovered surface area for any lagoon/storage pond? `yes`

Post-Project Herd Size					
Herd	Flushed Freestalls	Scraped Freestalls	Flushed Corrals	Scraped Corrals	Total # of Animals
Milk Cows	4,000				4,000
Dry Cows	500				500
Support Stock (Heifers, Calves, and Bulls)	2,200			200	2,400
Large Heifers					0
Medium Heifers					0
Small Heifers					0
Bulls					0

	Calf Hutches				Calf Corrals		
	Aboveground Flushed	Aboveground Scraped	On-Ground Flushed	On-Ground Scraped	Flushed	Scraped	Total # of Calves
Calves	400						400

Total Herd Summary	
Total Milk Cows	4,000
Total Mature Cows	4,500
Support Stock (Heifers, Calves, and Bulls)	2,400
Total Calves	400
Total Dairy Head	7,300

Post-Project Silage Information			
Feed Type	Max # Open Piles	Max Height (ft)	Max Width (ft)
Corn			
Alfalfa			
Wheat			

This spreadsheet serves only as a resource to calculate potential emissions from dairies, and may not reflect the final emissions used by the District due to parameters not addressed in this spreadsheet and/or omissions from the spreadsheet. Any other permittable equipment (e.g. IC engines, gasoline tanks, etc.) at a facility will need to be calculated separately. All final calculations used in permitting projects will be conducted by District staff.

VOC Mitigation Measures and Control Efficiencies

Milking Parlor				
Measure Proposed?		Mitigation Measure(s) per Emissions Point	**VOC Control Efficiency (%)**	
Pre-Project	Post-Project		Pre-Project	Post-Project
		Enteric Emissions Mitigations		
☑	☑	**(D)** Feed according to NRC guidelines	10%	10%
		Total Control Efficiency	10%	10%
		Milking Parlor Floor Mitigations		
☑	☑	**(D)** Feed according to NRC guidelines	10%	10%
☑	☑	**(D)** Flush or hose milk parlor immediately prior to, immediately after, or during each milking. Note: If selected for dairies > 999 milk cows, control efficiency is already included in EF.	0%	0%
		Total Control Efficiency	10%	10%

Cow Housing				
Measure Proposed?		Mitigation Measure(s) per Emissions Point	**VOC Control Efficiency (%)**	
Pre-Project	Post-Project		Pre-Project	Post-Project
		Enteric Emissions Mitigations		
☑	☑	Feed according to NRC guidelines	10%	10%
		Total Control Efficiency	10%	10%
		Corrals/Pens Mitigations		
☑	☑	Feed according to NRC guidelines	10%	10%
☑	☑	Inspect water pipes and troughs and repair leaks at least once every seven days. Note: If selected for dairies > 999 milk cows, CE is already included in EF.	0%	0%
☐	☑	**Dairies**: Clean manure from corrals at least four times per year with at least 60 days between cleaning, or clean corrals at least once between April and July and at least once between September and December. Note: If selected for dairies > 999 milk cows, CE is already included in EF. Note: No additional control given for increased cleaning frequency (e.g. BACT requirement). **Heifer/Calf Ranches:** Scrape corrals twice a year with at least 90 days between cleanings, excluding in-corral mounds. Note: No additional control given for increased cleaning frequency (e.g. BACT requirement).	0%	0%
☐	☑	Scrape, vacuum, or flush concrete lanes in corrals at least once every day for mature cows and every seven days for support stock, or clean concrete lanes such that the depth of manure does not exceed 12 inches at any point or time. Note: No additional control given for increased cleaning frequency (e.g. BACT requirement).	0%	10%
☐	☐	Implement one of the following: 1) slope the surface of the corrals at least 3% where the available space for each animal is 400 sq ft or less and slope the surface of the corrals at least 1.5% where the available space for each animal is more than 400 sq ft; 2) maintain corrals to ensure proper drainage preventing water from standing more than 48 hrs; 3) harrow, rake, or scrape pens sufficiently to maintain a dry surface. Note: If selected for dairies > 999 milk cows, CE already included in EF.	0%	0%
☐	☐	Install shade structures such that they are constructed with a light permeable roofing material. Note: If selected for dairies > 999 milk cows, the control efficiency will be 5% since the EF used includes a partial control for this measure.	0%	5%
☐	☑	Install all shade structures uphill of any slope in the corral. Note: If selected for dairies > 999 milk cows, the control efficiency will be 5% since the EF used includes a partial control for this measure.		
☐	☐	Clean manure from under corral shades at least once every 14 days, when weather permits access into corral. Note: If selected for dairies > 999 milk cows, the control efficiency will be 5% since the EF used includes a partial control for this measure.		
☐	☐	Install shade structure so that the structure has a North/South orientation. Note: If selected for dairies > 999 milk cows, the control efficiency will be 5% since the EF used includes a partial control for this measure.		
☑	☑	Manage corrals such that the manure depth in the corral does not exceed 12 inches at any time or point, except for in-corral mounding. Manure depth may exceed 12 inches when corrals become inaccessible due to rain events. The manure facility must resume management of the manure depth of 12 inches or lower immediately upon the corral becoming accessible. Note: If selected for dairies > 999 milk cows, control efficiency is already included in EF.	0%	0%
☐	☑	Knockdown fence line manure build-up prior to it exceeding a height of 12 inches at any time or point. Manure depth may exceed 12 inches when corrals become inaccessible due to rain events. The facility must resume management of the manure depth of 12 inches or lower immediately upon the corral becoming accessible.	0%	10%
☐	☑	Use lime or a similar absorbent material in the corral according to the manufacturer's recommendation to minimize moisture in the corrals.	0%	10%
☐	☐	Apply thymol to the corral soil in accordance with the manufacturer's recommendation.	0%	0%
		Total Control Efficiency	10.00%	37.67%
		Bedding Mitigations		
☑	☑	Feed according to NRC guidelines	10%	10%
☐	☐	Use non-manure-based bedding and non-separated solids based bedding for at least 90% of the bedding material, by weight, for freestalls (e.g. rubber mats, almond shells, sand, or waterbeds).	0%	0%
☐	☑	For a large dairy (1,000 milk cows or larger) or a heifer/calf ranch - Remove manure that is not dry from individual cow freestall beds or rake, harrow, scrape, or grade freestall bedding at least once every 7 days.	0%	10%
☐	☐	**(D)** For a medium dairy only (500 to 999 milk cows) - Remove manure that is not dry from individual cow freestall beds or rake, harrow, scrape, or grade freestall bedding at least once every 14 days.	0%	0%
		Total Control Efficiency	10.00%	19.00%
		Lanes Mitigations		
☑	☑	Feed according to NRC guidelines	10%	10%

Liquid Manure Handling

Measure Proposed?		Mitigation Measure(s) per Emissions Point	VOC Control Efficiency (%)	
Pre-Project	Post-Project		Pre-Project	Post-Project
☑	☑	Pave feedlanes, where present, for a width of at least 8 feet along the corral side of the feedlane fence for milk and dry cows and at least 6 feet along the corral side of the feedlane for heifers. Note: No control efficiency at this time.	0%	0%
☐	☐	**Dairies:** Flush, scrape, or vacuum freestall flush lanes immediately prior to or after, or during each milking; or flush or scrape freestall flush lanes at least 3 times per day. **Heifer/Calf Ranches:** Vacuum, scrape, or flush freestalls at least once every seven days.	0%	10%
☐	☐	**(D)** Have no animals in exercise pens or corrals at any time.	10%	10%
		Total Control Efficiency	10.00%	19.00%

Liquid Manure Handling

Measure Proposed?		Mitigation Measure(s) per Emissions Point	VOC Control Efficiency (%)	
Pre-Project	Post-Project		Pre-Project	Post-Project
		Lagoons/Storage Ponds Mitigations		
☑	☑	Feed according to NRC guidelines	10%	10%
☐	☐	Use phototropic lagoon	0%	0%
☐	☐	Use an anaerobic treatment lagoon designed according to NRCS Guideline No. 359, or aerobic treatment lagoon, or mechanically aerated lagoon, or covered lagoon digester vented to a control device with minimum 95% control	0%	0%
☑	☑	Remove solids from the waste system with a solid separator system, prior to the waste entering the lagoon. Note: If selected for dairies > 999 milk cows, control efficiency is already included in EF.	0%	0%
☐	☐	Maintain lagoon pH between 6.5 and 7.5	0%	0%
		Liquid Manure Land Application Mitigations		
☑	☑	Feed according to NRC guidelines	10%	10%
☑	☑	Only apply liquid manure that has been treated with an anaerobic or aerobic treatment lagoon, aerobic lagoon, or digester system	0%	0%
☑	☑	Allow liquid manure to stand in the fields for no more than 24 hours after irrigation. Note: If selected for dairies > 999 milk cows, control efficiency is already included in EF.	0%	0%
☐	☐	Apply liquid/slurry manure via injection with drag hose or similar apparatus	0%	0%
		Total Control Efficiency	10.00%	10.00%

Solid Manure Handling

Measure Proposed?		Mitigation Measure(s) per Emissions Point	VOC Control Efficiency (%)	
Pre-Project	Post-Project		Pre-Project	Post-Project
		Solid Manure Storage Mitigations		
☑	☑	Feed according to NRC guidelines	10%	10%
☐	☐	**LARGE CAFO ONLY:** Within 72 hours of removal from housing, either a) remove dry manure from the facility, or b) cover dry manure outside the housing with a weatherproof covering from October through May, except for times when wind events remove the covering, not to exceed 24 hours per event.	0%	0%
		Total Control Efficiency	10.00%	10.00%
		Separated Solids Piles Mitigations		
☑	☑	Feed according to NRC guidelines	10%	10%
☑	☑	**LARGE CAFO ONLY:** Within 72 hours of removal from the drying process, either a) remove separated solids from the facility, or b) cover separated solids outside the housing with a weatherproof covering from October through May, except for times when wind events remove the covering, not to exceed 24 hours per event.	0%	0%
		Total Control Efficiency	10.00%	10.00%
		Solid Manure Land Application Mitigations		
☑	☑	Feed according to NRC guidelines	10%	10%
☑	☑	Incorporate all solid manure within 72 hours of land application. Note: If selected for dairies > 999 milk cows, control efficiency is already included in EF. Note: No additional control given for rapid manure incorporation (e.g. BACT requirement).	0%	0%
☐	☐	Only apply solid manure that has been treated with an anaerobic treatment lagoon, aerobic lagoon or digester system	0%	0%
☐	☐	Apply no solid manure with a moisture content of more than 50%	0%	0%
		Total Control Efficiency	10.00%	10.00%

Silage and TMR

Measure Proposed?		Mitigation Measure(s) per Emissions Point	VOC Control Efficiency (%)	
Pre-Project	Post-Project		Pre-Project	Post-Project
		Corn/Alfalfa/Wheat Silage Mitigations		
☑	☑	1. Utilize a sealed feed storage system (e.g. Ag-Bag) for bagged silage, or 2. Cover the surface of silage piles, except for the area where feed is being removed from the pile, with a plastic tarp that is at least 5 mils thick (0.005 inches), multiple plastic tarps with a cumulative thickness of at least 5 mils (0.005 inches), or an oxygen barrier film covered with a UV resistant material within 72 hours of last delivery of material to the pile, and implement one of the following:

a) build silage piles such that the average bulk density is at least 44 lb/cu-ft for corn silage and 40 lb/cu-ft for other silage types, as measured in accordance with Section 7.10 of Rule 4570.
b) when creating a silage pile, adjust filling parameters to assure a calculated average bulk density of at least 44 lb/cu-ft for corn silage and at least 40 lb/cu-ft for other silage types, using a spreadsheet approved by the District.
c) harvest silage crop at > or = 65% moisture for corn; and >= 60% moisture for alfalfa/grass and other silage crops; manage silage material delivery such that no more than 6 inches of materials are uncompacted on top of the pile, and incorporate the applicable Theoretical Length of Chop (TLC) and roller opening for the crop being harvested.

For dairies - implement two of the following:
For heifer/calf ranches - implement one of the following:
Manage Exposed Silage. a) manage silage piles such that only one silage pile has an uncovered face and the uncovered face has a total exposed surface area of less than 2,150 sq. ft., or b) manage multiple uncovered silage piles such that the total exposed surface area of all silage piles is less than 4,300 sq ft. | 39.0% | 39.0% |

Maintain Silage Working Face: a) use a shaver/facer to remove silage from the silage pile, or b) maintain a smooth vertical surface on the working face of the silage pile

Silage Additive: a) inoculate silage with homolactic acid bacteria in accordance with manufacturer recommendations to achieve a concentration of at least 100,000 colony forming units per gram of wet forage or apply propionic acid, benzoic acid, sorbic acid, sodium benzoate, or potassium sorbate at a rate specified by the manufacturer to reduce yeast counts when forming silage pile; or b) apply other additives at specified rates that have been demonstrated to reduce alcohol concentrations in silage and/or VOC emissions from silage and have been approved by the District and EPA.

Total Control Efficiency*	39.00%	39.00%

*Assumes 25% control for density mitigation measures and 10% each for the two optional measures, resulting in an overall control of 39%. The same conservative control efficiency will be applied to the sealed feed storage system (Ag-Bag).

TMR Mitigations				
☑	☑	(D) Push feed so that it is within 3 feet of feedlane fence within 2 hrs of putting out the feed or use a feed trough or other feeding structure designed to maintain feed within reach of the cows.	10%	10%
☑	☑	(D) Begin feeding total mixed rations within 2 hrs of grinding and mixing rations. Note: If selected for dairies > 999 milk cows, control efficiency already included in EF.	0%	0%
☑	☑	Feed steam-flaked, dry rolled, cracked or ground corn or other ground cereal grains.	10%	10%
☐	☑	Remove uneaten wet feed from feed bunks within 24 hrs after then end of a rain event.	0%	10%
☐	☐	(D) For total mixed rations that contain at least 30% by weight of silage, feed animals total mixed rations that contain at least 45% moisture.	0%	0%
☑	☑	Feed according to NRC guidelines. Note: If selected for dairies, control efficiency already included in EF.	0%	0%
		Total Control Efficiency	19.00%	27.10%

Ammonia Mitigation Measures and Control Efficiencies

Milking Parlor				
Measure Proposed?		**Mitigation Measure(s) per Emissions Point**	**NH3 Control Efficiency (%)**	
Pre-Project	Post-Project		Pre-Project	Post-Project
		Milking Parlor Floor Mitigations		
✓	✓	Feed according to NRC guidelines	28%	28%
		Total Control Efficiency	28%	28%

Cow Housing				
Measure Proposed?		**Mitigation Measure(s) per Emissions Point**	**NH3 Control Efficiency (%)**	
Pre-Project	Post-Project		Pre-Project	Post-Project
		Corrals/Pens Mitigations		
✓	✓	Feed according to NRC guidelines	28%	28%
☐	✓	Clean manure from corrals at least four times per year with at least 60 days between cleaning, or clean corrals at least once between April and July and at least once between September and December. **OR** Use lime or a similar absorbent material in the corral according to the manufacturer's recommendation to minimize moisture in the corrals. **OR** Apply thymol to the corral soil in accordance with the manufacturer's recommendation.	0%	50%
		Total Control Efficiency	28%	64%
		Bedding Mitigations		
✓	✓	Feed according to NRC guidelines	28%	28%
✓	✓	Use non-manure-based bedding and non-separated solids based bedding for at least 90% of the bedding material, by weight, for freestalls (e.g. rubber mats, almond shells, sand, or waterbeds). **OR** For a large dairy only (1,000 milk cows or larger) - Remove manure that is not dry from individual cow freestall beds or rake, harrow, scrape, or grade freestall bedding at least once every 7 days. **OR** For a medium dairy only (500 to 999 milk cows) - Remove manure that is not dry from individual cow freestall beds or rake, harrow, scrape, or grade freestall bedding at least once every 14 days.	47.7%	47.7%
		Total Control Efficiency	62.34%	62.34%
		Lanes Mitigations		
✓	✓	Feed according to NRC guidelines	28%	28%
		Total Control Efficiency	28%	28%

Liquid Manure Handling				
Measure Proposed?		**Mitigation Measure(s) per Emissions Point**	**NH3 Control Efficiency (%)**	
Pre-Project	Post-Project		Pre-Project	Post-Project
		Lagoons/Storage Ponds Mitigations		
✓	✓	Feed according to NRC guidelines	28%	28%
✓	✓	Use phototropic lagoon **OR** Remove solids from the waste system with a solid separator system, prior to the waste entering the lagoon.	80%	80%
		Total Control Efficiency	85.6%	85.6%
		Liquid Manure Land Application Mitigations		
✓	✓	Feed according to NRC guidelines	28%	28%
☐	☐	Only apply liquid manure that has been treated with an anaerobic treatment lagoon	0%	0%
		Total Control Efficiency	28.00%	28.00%

Solid Manure Handling				
Measure Proposed?		**Mitigation Measure(s) per Emissions Point**	**NH3 Control Efficiency (%)**	
Pre-Project	Post-Project		Pre-Project	Post-Project
		Solid Manure Land Application Mitigations		
✓	✓	Feed according to NRC guidelines	28%	28%
☐	☐	Incorporate all solid manure within 72 hours of land application. **AND** Only apply solid manure that has been treated with an anaerobic treatment lagoon, aerobic lagoon or digester system. **AND** Apply no solid manure with a moisture content of more than 50%	0%	0%
		Total Control Efficiency	28.00%	28.00%

lb/hd-yr Dairy Emissions Factors for Holstein Cows

Process			Milk Cows U <1000	Milk Cows U ≥1000	Milk Cows EF1	Milk Cows EF2	Dry Cows U <1000	Dry Cows U ≥1000	Dry Cows EF1	Dry Cows EF2	Large Heifers U <1000	Large Heifers U ≥1000	Large Heifers EF1	Large Heifers EF2	Medium Heifers U <1000	Medium Heifers U ≥1000	Medium Heifers EF1	Medium Heifers EF2	Small Heifers U <1000	Small Heifers U ≥1000	Small Heifers EF1	Small Heifers EF2	Calves U <1000	Calves U ≥1000	Calves EF1	Calves EF2	Bulls U <1000	Bulls U ≥1000	Bulls EF1	Bulls EF2
Milking Parlor	VOC	Enteric Emissions in Milking Parlors	0.43	0.41	0.37	0.37	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Milking Parlor Floor	0.04	0.03	0.03	0.03	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Total	0.47	0.44	0.40	0.40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	NH3	Total	0.19	0.19	0.14	0.14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cow Housing	VOC	Enteric Emissions in Cow Housing	3.89	3.69	3.32	3.32	2.33	2.23	2.01	2.01	1.81	1.71	1.54	1.54	1.23	1.17	1.05	1.05	0.69	0.65	0.58	0.58	0.32	0.31	0.28	0.28	1.10	1.04	0.94	0.94
		Corrals/Pens	10.00	6.60	5.94	4.11	5.40	3.59	3.23	2.24	4.20	2.76	2.48	1.72	2.85	1.88	1.69	1.17	1.60	1.04	0.94	0.65	0.75	0.50	0.45	0.31	2.55	1.67	1.50	1.04
		Bedding	1.05	1.00	0.90	0.81	0.57	0.54	0.49	0.44	0.44	0.42	0.38	0.34	0.30	0.28	0.26	0.23	0.17	0.16	0.14	0.13	0.08	0.08	0.07	0.06	0.27	0.25	0.23	0.20
		Lanes	0.84	0.80	0.72	0.65	0.45	0.44	0.39	0.35	0.35	0.33	0.30	0.27	0.24	0.23	0.21	0.18	0.13	0.13	0.11	0.10	0.06	0.06	0.05	0.05	0.21	0.20	0.18	0.16
		Total	15.78	12.09	10.88	8.89	8.75	6.80	6.12	5.04	6.81	5.22	4.70	3.87	4.62	3.56	3.20	2.64	2.59	1.98	1.78	1.47	1.22	0.95	0.85	0.70	4.13	3.16	2.84	2.34
	NH3	Enteric Emissions in Cow Housing	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Corrals/Pens	41.90	41.90	30.17	15.08	21.20	21.20	15.26	7.63	11.00	11.00	7.92	3.96	7.90	7.90	5.69	2.84	6.00	6.00	4.32	2.16	1.80	1.80	1.30	0.65	15.30	15.30	11.02	5.51
		Bedding	6.30	6.30	2.37	2.37	3.20	3.20	1.20	1.20	1.70	1.70	0.64	0.64	1.20	1.20	0.45	0.45	0.90	0.90	0.34	0.34	0.30	0.30	0.11	0.11	2.30	2.30	0.87	0.87
		Lanes	5.10	5.10	3.67	3.67	2.60	2.60	1.87	1.87	1.30	1.30	0.94	0.94	1.00	1.00	0.72	0.72	0.70	0.70	0.50	0.50	0.20	0.20	0.14	0.14	1.90	1.90	1.37	1.37
		Total	53.30	53.30	36.21	21.13	27.00	27.00	18.34	10.71	14.00	14.00	9.50	5.54	10.10	10.10	6.86	4.02	7.60	7.60	5.16	3.00	2.30	2.30	1.55	0.90	19.50	19.50	13.25	7.74
Liquid Manure Handling	VOC	Lagoons/Storage Ponds	1.52	1.30	1.17	1.17	0.82	0.71	0.64	0.64	0.64	0.54	0.49	0.49	0.43	0.37	0.33	0.33	0.24	0.21	0.19	0.19	0.11	0.10	0.09	0.09	0.40	0.33	0.30	0.30
		Liquid Manure Land Application	1.64	1.40	1.26	1.26	0.89	0.76	0.69	0.69	0.69	0.58	0.53	0.53	0.47	0.40	0.36	0.36	0.26	0.22	0.20	0.20	0.12	0.11	0.10	0.10	0.42	0.35	0.32	0.32
		Total	3.16	2.70	2.43	2.43	1.71	1.47	1.33	1.33	1.33	1.13	1.02	1.02	0.90	0.77	0.69	0.69	0.51	0.43	0.38	0.38	0.24	0.21	0.18	0.18	0.82	0.68	0.61	0.61
	NH3	Lagoons/Storage Ponds	8.20	8.20	1.18	1.18	4.20	4.20	0.60	0.60	2.20	2.20	0.32	0.32	1.50	1.50	0.22	0.22	1.20	1.20	0.17	0.17	0.35	0.35	0.05	0.05	3.00	3.00	0.43	0.43
		Liquid Manure Land Application	8.90	8.90	6.41	6.41	4.50	4.50	3.24	3.24	2.30	2.30	1.66	1.66	1.70	1.70	1.22	1.22	1.30	1.30	0.94	0.94	0.37	0.37	0.27	0.27	3.23	3.23	2.33	2.33
		Total	17.10	17.10	7.59	7.59	8.70	8.70	3.84	3.84	4.50	4.50	1.97	1.97	3.20	3.20	1.44	1.44	2.50	2.50	1.11	1.11	0.72	0.72	0.32	0.32	6.23	6.23	2.76	2.76
Solid Manure Handling	VOC	Solid Manure Storage	0.16	0.15	0.14	0.14	0.09	0.08	0.07	0.07	0.07	0.06	0.06	0.06	0.05	0.04	0.04	0.04	0.03	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.04	0.04	0.04	0.04
		Separated Solids Piles	0.06	0.06	0.05	0.05	0.03	0.03	0.03	0.03	0.03	0.03	0.02	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.02	0.02	0.02	0.02
		Solid Manure Land Application	0.39	0.33	0.30	0.30	0.21	0.18	0.16	0.16	0.16	0.14	0.12	0.12	0.11	0.09	0.08	0.08	0.06	0.05	0.05	0.05	0.03	0.03	0.02	0.02	0.10	0.08	0.07	0.07
		Total	0.61	0.54	0.49	0.49	0.33	0.29	0.26	0.26	0.26	0.23	0.20	0.20	0.17	0.15	0.14	0.14	0.10	0.09	0.08	0.08	0.05	0.04	0.04	0.04	0.16	0.14	0.13	0.12
	NH3	Solid Manure Storage	0.95	0.95	0.95	0.95	0.48	0.48	0.48	0.48	0.25	0.25	0.25	0.25	0.18	0.18	0.18	0.18	0.13	0.13	0.13	0.13	0.04	0.04	0.04	0.04	0.35	0.35	0.35	0.35
		Separated Solids Piles	0.38	0.38	0.38	0.38	0.19	0.19	0.19	0.19	0.10	0.10	0.10	0.10	0.07	0.07	0.07	0.07	0.05	0.05	0.05	0.05	0.02	0.02	0.02	0.02	0.14	0.14	0.14	0.14
		Solid Manure Land Application	2.09	2.09	1.50	1.50	1.06	1.06	0.76	0.76	0.55	0.55	0.40	0.40	0.39	0.39	0.28	0.28	0.30	0.30	0.22	0.22	0.09	0.09	0.06	0.06	0.76	0.76	0.55	0.55
		Total	3.42	3.42	2.83	2.83	1.73	1.73	1.43	1.43	0.90	0.90	0.75	0.75	0.64	0.64	0.53	0.53	0.48	0.48	0.40	0.40	0.15	0.15	0.12	0.12	1.25	1.25	1.04	1.04

Silage and TMR (Total Mixed Ration) Emissions (µg/m^2-min)

		Silage Type	Uncontrolled	EF1	EF2
Feed Storage and Handling	VOC	Corn Silage	34,681	21,155	21,155
		Alfalfa Silage	17,458	10,649	10,649
		Wheat Silage	43,844	26,745	26,745
		TMR	13,056	10,575	9,518

Assumptions: 1) Each silage pile is completely covered except for the front face and 2) Rations are fed within 48 hours.

PM10 Emission Factors (lb/hd-yr)

Type of Cow	Dairy EF	Source
Cows in Freestalls	1.37	Based on a Summer 2003 study by Texas A&M ASAE at a West Texas Dairy
Milk/Dry in Loafing Barns	2.73	SJVAPCD
Heifers/Bulls in Loafing Barns	5.28	SJVAPCD
Calves in Loafing Barns	0.69	SJVAPCD
Milk/Dry in Corrals	5.46	Based on a Summer 2003 study by Texas A&M ASAE at a West Texas Dairy
Support Stock (Heifers/Bulls) in Open Corrals	10.55	Based on a USDA/UC Davis report quantifying dairy and feedlot emissions in Tulare & Kern Counties (April '01)
Large Heifers in Open Corrals	8.01	SJVAPCD
Calf (under 3 mo.) open corrals	1.37	SJVAPCD
Calf on-ground hutches	0.343	SJVAPCD
Calf above-ground flushed	0.069	SJVAPCD
Calf above-ground scraped	0.206	SJVAPCD

The controlled PM10 EF will be calculated based on the specific PM10 mitigation measures, if any, for each freestall, corral, or calf hutch area. See the PM Mitigation Measures for calculations.

lb/hd-yr Dairy Emissions Factors for Jersey Cows

Note: Jersey cows will be assumed to generate 71% of the amount of VOC and NH3 emissions as a Holstein cow.

Category		Item	Milk Cows Unc. <1000	Milk Cows Unc. ≥1000	Milk Cows Ctrl EF1	Milk Cows Ctrl EF2	Dry Cows Unc. <1000	Dry Cows Unc. ≥1000	Dry Cows Ctrl EF1	Dry Cows Ctrl EF2	Lg Heifers Unc. <1000	Lg Heifers Unc. ≥1000	Lg Heifers Ctrl EF1	Lg Heifers Ctrl EF2	Med Heifers Unc. <1000	Med Heifers Unc. ≥1000	Med Heifers Ctrl EF1	Med Heifers Ctrl EF2	Sm Heifers Unc. <1000	Sm Heifers Unc. ≥1000	Sm Heifers Ctrl EF1	Sm Heifers Ctrl EF2	Calves Unc. <1000	Calves Unc. ≥1000	Calves Ctrl EF1	Calves Ctrl EF2	Bulls Unc. <1000	Bulls Unc. ≥1000	Bulls Ctrl EF1	Bulls Ctrl EF2
Milking Parlor	VOC	Enteric Emissions in Milking Parlors	0.31	0.29	0.26	0.26	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Milking Parlor Floor	0.03	0.02	0.02	0.02	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Total	0.34	0.31	0.28	0.28	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	NH3	Total	0.13	0.13	0.10	0.10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cow Housing	VOC	Enteric Emissions in Cow Housing	2.76	2.62	2.36	2.36	1.66	1.58	1.43	1.43	1.29	1.22	1.09	1.09	0.87	0.83	0.75	0.75	0.49	0.46	0.41	0.41	0.23	0.22	0.20	0.20	0.78	0.74	0.66	0.66
		Corrals/Pens	7.10	4.69	4.22	2.92	3.83	2.55	2.30	1.59	2.98	1.96	1.76	1.22	2.02	1.33	1.20	0.83	1.14	0.74	0.67	0.46	0.53	0.36	0.32	0.22	1.81	1.19	1.07	0.74
		Bedding	0.75	0.71	0.64	0.58	0.40	0.39	0.35	0.31	0.31	0.30	0.27	0.24	0.21	0.20	0.18	0.16	0.12	0.11	0.10	0.09	0.06	0.05	0.05	0.04	0.19	0.18	0.16	0.14
		Lanes	0.60	0.57	0.51	0.46	0.32	0.31	0.28	0.25	0.25	0.24	0.21	0.19	0.17	0.16	0.15	0.13	0.10	0.09	0.08	0.07	0.04	0.04	0.04	0.03	0.15	0.14	0.13	0.12
		Total	11.20	8.58	7.73	6.31	6.21	4.83	4.35	3.58	4.83	3.71	3.34	2.75	3.28	2.53	2.27	1.87	1.84	1.40	1.26	1.04	0.86	0.67	0.61	0.50	2.93	2.24	2.02	1.66
	NH3	Enteric Emissions in Cow Housing	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Corrals/Pens	29.75	29.75	21.42	10.71	15.05	15.05	10.84	5.42	7.81	7.81	5.62	2.81	5.61	5.61	4.04	2.02	4.26	4.26	3.07	1.53	1.28	1.28	0.92	0.46	10.86	10.86	7.82	3.91
		Bedding	4.47	4.47	1.68	1.68	2.27	2.27	0.86	0.86	1.21	1.21	0.45	0.45	0.85	0.85	0.32	0.32	0.64	0.64	0.24	0.24	0.21	0.21	0.08	0.08	1.63	1.63	0.61	0.61
		Lanes	3.62	3.62	2.61	2.61	1.85	1.85	1.33	1.33	0.92	0.92	0.66	0.66	0.71	0.71	0.51	0.51	0.50	0.50	0.36	0.36	0.14	0.14	0.10	0.10	1.35	1.35	0.97	0.97
		Total	37.84	37.84	25.71	15.00	19.17	19.17	13.02	7.60	9.94	9.94	6.74	3.93	7.17	7.17	4.87	2.85	5.40	5.40	3.67	2.13	1.63	1.63	1.10	0.64	13.85	13.85	9.41	5.50
Liquid Manure Handling	VOC	Lagoons/Storage Ponds	1.08	0.92	0.83	0.83	0.58	0.50	0.45	0.45	0.45	0.39	0.35	0.35	0.31	0.26	0.24	0.24	0.17	0.15	0.13	0.13	0.08	0.07	0.06	0.06	0.28	0.23	0.21	0.21
		Liquid Manure Land Application	1.16	0.99	0.89	0.89	0.63	0.54	0.49	0.49	0.49	0.42	0.37	0.37	0.33	0.28	0.25	0.25	0.19	0.16	0.14	0.14	0.09	0.08	0.07	0.07	0.30	0.25	0.22	0.22
		Total	2.24	1.92	1.72	1.72	1.21	1.04	0.94	0.94	0.94	0.80	0.72	0.72	0.64	0.55	0.49	0.49	0.36	0.30	0.27	0.27	0.17	0.15	0.13	0.13	0.58	0.48	0.43	0.43
	NH3	Lagoons/Storage Ponds	5.82	5.82	0.84	0.84	2.98	2.98	0.43	0.43	1.56	1.56	0.22	0.22	1.07	1.07	0.15	0.15	0.85	0.85	0.12	0.12	0.25	0.25	0.04	0.04	2.13	2.13	0.31	0.31
		Liquid Manure Land Application	6.32	6.32	4.55	4.55	3.20	3.20	2.30	2.30	1.63	1.63	1.18	1.18	1.21	1.21	0.87	0.87	0.92	0.92	0.66	0.66	0.26	0.26	0.19	0.19	2.29	2.29	1.65	1.65
		Total	12.14	12.14	5.39	5.39	6.18	6.18	2.73	2.73	3.20	3.20	1.40	1.40	2.27	2.27	1.02	1.02	1.78	1.78	0.79	0.79	0.51	0.51	0.22	0.22	4.42	4.42	1.96	1.96
Solid Manure Handling	VOC	Solid Manure Storage	0.11	0.11	0.10	0.10	0.06	0.06	0.05	0.05	0.05	0.04	0.04	0.04	0.03	0.03	0.03	0.03	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.03	0.03	0.03	0.03
		Separated Solids Piles	0.04	0.04	0.04	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01
		Solid Manure Land Application	0.28	0.23	0.21	0.21	0.15	0.13	0.11	0.11	0.12	0.10	0.09	0.09	0.08	0.07	0.06	0.06	0.04	0.04	0.03	0.03	0.02	0.02	0.02	0.02	0.07	0.06	0.05	0.05
		Total	0.43	0.38	0.35	0.34	0.23	0.21	0.19	0.19	0.18	0.16	0.14	0.14	0.12	0.11	0.10	0.10	0.07	0.06	0.05	0.05	0.03	0.03	0.03	0.03	0.11	0.10	0.09	0.09
	NH3	Solid Manure Storage	0.67	0.67	0.67	0.67	0.34	0.34	0.34	0.34	0.18	0.18	0.18	0.18	0.13	0.13	0.13	0.13	0.09	0.09	0.09	0.09	0.03	0.03	0.03	0.03	0.25	0.25	0.25	0.25
		Separated Solids Piles	0.27	0.27	0.27	0.27	0.13	0.13	0.13	0.13	0.07	0.07	0.07	0.07	0.05	0.05	0.05	0.05	0.04	0.04	0.04	0.04	0.01	0.01	0.01	0.01	0.10	0.10	0.10	0.10
		Solid Manure Land Application	1.48	1.48	1.07	1.07	0.75	0.75	0.54	0.54	0.39	0.39	0.28	0.28	0.28	0.28	0.20	0.20	0.21	0.21	0.15	0.15	0.06	0.06	0.05	0.05	0.54	0.54	0.39	0.39
		Total	2.43	2.43	2.01	2.01	1.23	1.23	1.02	1.02	0.64	0.64	0.53	0.53	0.45	0.45	0.38	0.38	0.34	0.34	0.28	0.28	0.11	0.11	0.09	0.09	0.89	0.89	0.74	0.74

Silage and TMR (Total Mixed Ration) Emissions (µg/m^2-min)

		Silage Type	Uncontrolled	EF1	EF2
Feed Storage and Handling	VOC	Corn Silage	34,681	21,155	21,155
		Alfalfa Silage	17,458	10,649	10,649
		Wheat Silage	43,844	26,745	26,745
		TMR	13,056	10,575	9,518

Assumptions: 1) Each silage pile is completely covered except for the front face and 2) Rations are fed within 48 hours.

PM₁₀ Emission Factors (lb/hd-yr)

Type of Cow	Dairy EF	Source
Cows in Freestalls	1.37	Based on a Summer 2003 study by Texas A&M ASAE at a West Texas Dairy
Milk/Dry in Loafing Barns	2.73	SJVAPCD
Heifers/Bulls in Loafing Barns	5.28	SJVAPCD
Calves in Loafing Barns	0.69	SJVAPCD
Milk/Dry in Corrals	5.46	Based on a Summer 2003 study by Texas A&M ASAE at a West Texas Dairy
Support Stock (Heifers/Bulls) in Open Corrals	10.55	Based on a USDA/UC Davis report quantifying dairy and feedlot emissions in Tulare & Kern Counties (April '01)
Large Heifers in Open Corrals	8.01	SJVAPCD
Calf (under 3 mo.) open corrals	1.37	SJVAPCD
Calf on-ground hutches	0.343	SJVAPCD
Calf above-ground flushed	0.069	SJVAPCD
Calf above-ground scraped	0.206	SJVAPCD

The controlled PM10 EF will be calculated based on the specific PM10 mitigation measures, if any, for each freestall, corral, or calf hutch area. See the PM Mitigation Measures for calculations.

PM10 Mitigation Measures and Control Efficiencies

Control Measure	PM10 Control Efficiency
Shaded corrals (milk and dry cows)	16.7%
Shaded corrals (heifers and bulls)	8.3%
Downwind shelterbelts	12.5%
Upwind shelterbelts	10%
Freestall with no exercise pens and non-manure based bedding	90%
Freestall with no exercise pens and manure based bedding	80%
Fibrous layer in dusty areas (i.e. hay, etc.)	10%
Bi-weekly corral/exercise pen scraping and/or manure removal using a pull type manure harvesting equipment in morning hours when moisture in air except during periods of rainy weather	15%
Sprinkling of open corrals/exercise pens	12.5%
Feeding young stock (heifers and calves) near dusk	10%

Pre-Project PM10 Mitigation Measures

Pre-Project PM10 Mitigation Measures

	Housing Name(s) or #(s)	Type of Housing	Type of cow	Total # of cows in Each Housing Structure(s)	Maximum Design Capacity of Each Structure	# of Combined Housing Structures in row	Shaded Corrals	Downwind Shelterbelts	Upwind Shelterbelts	No exercise pens, non-manure bedding	No exercise pens, manure bedding	Fibrous layer	Bi-weekly scraping Corrals/Pens	Sprinkling Corrals/Pens	Feed Young Stock Near Dusk
1	Freestall Barn 1	freestall	milk cows	473	806	1					✓		✓		
2	Freestall Barn 2	freestall	milk cows	473	807	1					✓		✓		
3	Freestall Barn 3	freestall	milk cows	474	807	1							✓		
4	Freestall Barn 4	freestall	support stock	1	320	1							✓		
5	Freestall Barn 5	freestall	dry cows	92	225	1							✓		
6	Freestall Barn 6	freestall	dry cows	93	200	1							✓		
7	Freestall Barn 6	freestall	support stock	1	600	1							✓		
8	Corral 1	open corral	support stock	190	200	1							✓		
9	Corral 2	open corral	support stock	212	220	1							✓		
10	Corral 3	open corral	support stock	212	220	1							✓		
11	Corral 4	open corral	support stock	112	133	1							✓		
12	Corral 5	open corral	support stock	112	133	1							✓		
13	Corral 6	open corral	support stock	112	134	1							✓		
14	Calf Hutches	aboveground flushed hutches	calves	396	400	1							✓		
15															
16															
	Pre-Project Total # of Cows			2,953											

Pre-Project PM10 Control Efficiencies and Emission Factors

	Housing Name(s) or #(s)	Type of Housing	Type of cow	Total # of cows in Each Housing Structure(s)	Maximum Design Capacity of Each Structure	Uncontrolled EF (lb/hd-yr)	Shaded Corrals	Downwind Shelterbelts	Upwind Shelterbelts	No exercise pens, non-manure bedding	No exercise pens, manure bedding	Fibrous layer	Bi-weekly scraping Corrals/Pens	Sprinkling Corrals/Pens	Feed Young Stock Near Dusk	Controlled EF (lb/hd-yr)
1	Freestall Barn 1	freestall	milk cows	473	806	1.370					80%		15%			0.23
2	Freestall Barn 2	freestall	milk cows	473	807	1.370					80%		15%			0.23
3	Freestall Barn 3	freestall	milk cows	474	807	1.370							15%			1.17
4	Freestall Barn 4	freestall	support stock	1	320	1.370							15%			1.17
5	Freestall Barn 5	freestall	dry cows	92	225	1.370							15%			1.17
6	Freestall Barn 6	freestall	dry cows	93	200	1.370							15%			1.17
7	Freestall Barn 6	freestall	support stock	1	600	1.370							15%			1.17
8	Corral 1	open corral	support stock	190	200	10.550							15%			8.97
9	Corral 2	open corral	support stock	212	220	10.550							15%			8.97
10	Corral 3	open corral	support stock	212	220	10.550							15%			8.97
11	Corral 4	open corral	support stock	112	133	10.550							15%			8.97
12	Corral 5	open corral	support stock	112	133	10.550							15%			8.97
13	Corral 6	open corral	support stock	112	134	10.550							15%			8.97
14	Calf Hutches	aboveground flushed hutches	calves	396	400	0.069							15%			0.06
15																
16																
	Pre-Project Total # of Cows			2,953												

Post-Project PM10 Mitigation Measures

Post-Project PM10 Mitigation Measures

#	Housing Name(s) or #(s)	Type of Housing	Type of cow	Total # of cows in Each Housing Structure(s)	Maximum Design Capacity of Each Structure	# of Combined Housing Structures in row	Shaded Corrals	Downwind Shelterbelts	Upwind Shelterbelts	No exercise pens, non-manure bedding	No exercise pens, manure bedding	Fibrous layer	Bi-weekly scraping Corrals/Pens	Sprinkling Corrals/Pens	Feed Young Stock Near Dusk
1	Freestall Barn 1	freestall	milk cows	800	800	1	☐	☐	☐	☐	✓	☐	✓	☐	☐
2	Freestall Barn 2	freestall	milk cows	800	800	1	☐	☐	☐	☐	✓	☐	✓	☐	☐
3	Freestall Barn 3	freestall	milk cows	800	800	1	☐	☐	☐	☐	✓	☐	✓	☐	☐
4	Freestall Barn 4	freestall	milk cows	320	320	1	☐	☐	☐	☐	✓	☐	✓	☐	☐
5	Freestall Barn 5	freestall	support stock	200	200	1	☐	☐	☐	☐	✓	☐	✓	☐	☐
6	Freestall Barn 6	freestall	dry cows	500	500	1	☐	☐	☐	☐	☐	☐	✓	☐	☐
7	Freestall Barn 6	freestall	support stock	300	300	1	☐	☐	☐	☐	☐	☐	✓	☐	☐
8	Corral 1	open corral	support stock	60	60	1	☐	☐	☐	☐	☐	☐	✓	☐	☐
9	Corral 2	open corral	support stock	40	40	1	☐	☐	☐	☐	☐	☐	✓	☐	☐
10	Corral 3	open corral	support stock	35	35	1	☐	☐	☐	☐	☐	☐	✓	☐	☐
11	Calf Hutches	aboveground flushed hutches	calves	400	400	1	☐	☐	☐	☐	☐	☐	☐	☐	☐
12							☐	☐	☐	☐	☐	☐	☐	☐	☐
13							☐	☐	☐	☐	☐	☐	☐	☐	☐
14							☐	☐	☐	☐	☐	☐	☐	☐	☐
15							☐	☐	☐	☐	☐	☐	☐	☐	☐
16							☐	☐	☐	☐	☐	☐	☐	☐	☐
17							☐	☐	☐	☐	☐	☐	☐	☐	☐
18							☐	☐	☐	☐	☐	☐	☐	☐	☐
19							☐	☐	☐	☐	☐	☐	☐	☐	☐
20							☐	☐	☐	☐	☐	☐	☐	☐	☐
21							☐	☐	☐	☐	☐	☐	☐	☐	☐
22							☐	☐	☐	☐	☐	☐	☐	☐	☐
23							☐	☐	☐	☐	☐	☐	☐	☐	☐
24							☐	☐	☐	☐	☐	☐	☐	☐	☐
25							☐	☐	☐	☐	☐	☐	☐	☐	☐
26							☐	☐	☐	☐	☐	☐	☐	☐	☐
27							☐	☐	☐	☐	☐	☐	☐	☐	☐
28							☐	☐	☐	☐	☐	☐	☐	☐	☐
29							☐	☐	☐	☐	☐	☐	☐	☐	☐
30							☐	☐	☐	☐	☐	☐	☐	☐	☐
31							☐	☐	☐	☐	☐	☐	☐	☐	☐
32							☐	☐	☐	☐	☐	☐	☐	☐	☐
33							☐	☐	☐	☐	☐	☐	☐	☐	☐
34							☐	☐	☐	☐	☐	☐	☐	☐	☐
35							☐	☐	☐	☐	☐	☐	☐	☐	☐
36							☐	☐	☐	☐	☐	☐	☐	☐	☐
37							☐	☐	☐	☐	☐	☐	☐	☐	☐
38							☐	☐	☐	☐	☐	☐	☐	☐	☐
39							☐	☐	☐	☐	☐	☐	☐	☐	☐
40							☐	☐	☐	☐	☐	☐	☐	☐	☐

Post-Project PM10 Mitigation Measures for New Housing Units at an Expanding Dairy

#	Housing Name(s) or #(s)	Type of Housing	Type of cow	Total # of cows in Each Housing Structure(s)	Maximum Design Capacity of Each Structure	# of Combined Housing Structures in row	Shaded Corrals	Downwind Shelterbelts	Upwind Shelterbelts	No exercise pens, non-manure bedding	No exercise pens, manure bedding	Fibrous layer	Bi-weekly scraping Corrals/Pens	Sprinkling Corrals/Pens	Feed Young Stock Near Dusk
1	Freestall Barn 7	freestall	milk cows	800	800	1	☐	☐	☐	☐	✓	☐	✓	☐	☐
2	Freestall Barn 8	freestall	milk cows	480	480	1	☐	☐	☐	☐	✓	☐	✓	☐	☐
3	Freestall Barn 9	freestall	support stock	200	200	1	☐	☐	☐	☐	✓	☐	✓	☐	☐
4	Freestall Barn 10	freestall	support stock	600	600	1	☐	☐	☐	☐	✓	☐	✓	☐	☐
5	Freestall Barn 11	freestall	support stock	200	200	1	☐	☐	☐	☐	✓	☐	✓	☐	☐
6	Corral 7	open corral	support stock	35	35	1	☐	☐	☐	☐	☐	☐	✓	☐	☐
7	Corral 8	open corral	support stock	30	30	1	☐	☐	☐	☐	☐	☐	✓	☐	☐
8	Loafing Barn 1	loafing barn	support stock	400	400	1	☐	☐	☐	☐	✓	☐	✓	☐	☐
9	Loafing Barn 2	loafing barn	support stock	300	300	1	☐	☐	☐	☐	✓	☐	✓	☐	☐
10							☐	☐	☐	☐	☐	☐	☐	☐	☐
11							☐	☐	☐	☐	☐	☐	☐	☐	☐
12							☐	☐	☐	☐	☐	☐	☐	☐	☐
13							☐	☐	☐	☐	☐	☐	☐	☐	☐
14							☐	☐	☐	☐	☐	☐	☐	☐	☐

Post-Project Total # of Cows	7,300	(The post-project total includes	dairy cows already on-site and	new cows from the expansion.)

Post-Project PM10 Control Efficiencies and Emission Factors

#	Housing Name(s) or #(s)	Type of Housing	Type of cow	Total # of cows in Each Housing Structure(s)	Maximum Design Capacity of Each Structure	Uncontrolled EF (lb/hd-yr)	Shaded Corrals	Downwind Shelterbelts	Upwind Shelterbelts	No exercise pens, non-manure bedding	No exercise pens, manure bedding	Fibrous layer	Bi-weekly scraping Corrals/Pens	Sprinkling Corrals/Pens	Feed Young Stock Near Dusk	Controlled EF (lb/hd-yr)
1	Freestall Barn 1	freestall	milk cows	800	800	1.370					80%		15%			0.23
2	Freestall Barn 2	freestall	milk cows	800	800	1.370					80%		15%			0.23
3	Freestall Barn 3	freestall	milk cows	800	800	1.370					80%		15%			0.23
4	Freestall Barn 4	freestall	milk cows	320	320	1.370					80%		15%			0.23
5	Freestall Barn 5	freestall	support stock	200	200	1.370					80%		15%			0.23
6	Freestall Barn 6	freestall	dry cows	500	500	1.370							15%			1.17

#	Housing Name(s) or #(s)	Type of Housing	Type of cow	Total # of cows in Each Housing Structure(s)	Maximum Design Capacity of Each Structure	Uncontrolled EF (lb/hd-yr)	Shaded Corrals	Downwind Shelterbelts	Upwind Shelterbelts	No exercise pens, non-manure bedding	No exercise pens, manure bedding	Fibrous layer	Bi-weekly scraping Corrals/Pens	Sprinkling Corrals/Pens	Feed Young Stock Near Dusk	Controlled EF (lb/hd-yr)
7	Freestall Barn 6	freestall	support stock	300	300	1.370							15%			1.17
8	Corral 1	open corral	support stock	60	60	10.550							15%			8.97
9	Corral 2	open corral	support stock	40	40	10.550							15%			8.97
10	Corral 3	open corral	support stock	35	35	10.550							15%			8.97
11	Calf Hutches	aboveground flushed hutches	calves	400	400	0.069							15%			0.06
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Post-Project PM10 Control Efficiencies and Emission Factors for New Housing Emissions Units

#	Housing Name(s) or #(s)	Type of Housing	Type of cow	Total # of cows in Each Housing Structure(s)	Maximum Design Capacity of Each Structure	Uncontrolled EF (lb/hd-yr)	Shaded Corrals	Downwind Shelterbelts	Upwind Shelterbelts	No exercise pens, non-manure bedding	No exercise pens, manure bedding	Fibrous layer	Bi-weekly scraping Corrals/Pens	Sprinkling Corrals/Pens	Feed Young Stock Near Dusk	Controlled EF (lb/hd-yr)
1	Freestall Barn 7	freestall	milk cows	800	800	1.370					80%		15%			0.23
2	Freestall Barn 8	freestall	milk cows	480	480	1.370					80%		15%			0.23
3	Freestall Barn 9	freestall	support stock	200	200	1.370					80%		15%			0.23
4	Freestall Barn 10	freestall	support stock	600	600	1.370					80%		15%			0.23
5	Freestall Barn 11	freestall	support stock	200	200	1.370					80%		15%			0.23
6	Corral 7	open corral	support stock	35	35	10.550							15%			8.97
7	Corral 8	open corral	support stock	30	30	10.550							15%			8.97
8	Loafing Barn 1	loafing barn	support stock	400	400	5.280					80%		15%			0.90
9	Loafing Barn 2	loafing barn	support stock	300	300	5.280					80%		15%			0.90
10																
11																
12																
13																
14																

Pre-Project Potential to Emit - Cow Housing

	Housing Name(s) or #(s)	Type of Cow	# of Cows	Controlled VOC EF (lb/hd-yr)	Controlled NH3 EF (lb/hd-yr)	Controlled PM10 EF (lb/hd-yr)	VOC (lb/day)	VOC (lb/yr)	NH3 (lb/day)	NH3 (lb/yr)	PM10 (lb/day)	PM10 (lb/yr)
1	Freestall Barn 1	milk cows	473	10.88	36.21	0.23	14.1	5,146	46.9	17,128	0.3	110
2	Freestall Barn 2	milk cows	473	10.88	36.21	0.23	14.1	5,146	46.9	17,128	0.3	110
3	Freestall Barn 3	milk cows	474	10.88	36.21	1.17	14.1	5,157	47.0	17,165	1.5	552
4	Freestall Barn 4	support stock	1	4.7	9.50	1.17	0.0	5	0.0	9	0.0	1
5	Freestall Barn 5	dry cows	92	6.12	18.34	1.17	1.5	563	4.6	1,687	0.3	107
6	Freestall Barn 6	dry cows	93	6.12	18.34	1.17	1.6	569	4.7	1,706	0.3	108
7	Freestall Barn 6	support stock	1	4.7	9.50	1.17	0.0	5	0.0	9	0.0	1
8	Corral 1	support stock	190	4.7	9.50	8.97	2.4	893	4.9	1,804	4.7	1,704
9	Corral 2	support stock	212	4.7	9.50	8.97	2.7	996	5.5	2,013	5.2	1,901
10	Corral 3	support stock	212	4.7	9.50	8.97	2.7	996	5.5	2,013	5.2	1,901
11	Corral 4	support stock	112	4.7	9.50	8.97	1.4	526	2.9	1,064	2.8	1,004
12	Corral 5	support stock	112	4.7	9.50	8.97	1.4	526	2.9	1,064	2.8	1,004
13	Corral 6	support stock	112	4.7	9.50	8.97	1.4	526	2.9	1,064	2.8	1,004
14	Calf Hutches	calves	396	0.85	1.55	0.06	0.9	337	1.7	615	0.1	23
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40												
	Pre-Project Total # of Cows		2,953				58.3	21,391	176.4	64,469	26.3	9,530

*Multiple emissions units (freestalls, corrals, calf hutch areas, etc.) are combined in these rows.

Pre-Project Totals

Total # of Cows	VOC (lb/day)	VOC (lb/yr)	NH3 (lb/day)	NH3 (lb/yr)	PM10 (lb/day)	PM10 (lb/yr)
2,953	58.3	21,391	176.4	64,469	26.3	9,530

Calculations:

Annual PE 1 for each pollutant (lb/yr) = Controlled EF (lb/hd-yr) x # of cows (hd)
Daily PE1 for each pollutant (lb/day) = [Controlled EF (lb/hd-yr) x # of cows (hd)] ÷ 365 (day/yr)

Post-Project Potential to Emit - Cow Housing

	Housing Name(s) or #(s)	Type of Cow	# of Cows	Controlled VOC EF (lb/hd-yr)	Controlled NH3 EF (lb/hd-yr)	Controlled PM10 EF (lb/hd-yr)	VOC (lb/day)	VOC (lb/yr)	NH3 (lb/day)	NH3 (lb/yr)	PM10 (lb/day)	PM10 (lb/yr)
1	Freestall Barn 1	milk cows	800	8.89	21.13	0.23	19.5	7,112	46.3	16,903	0.5	186
2	Freestall Barn 2	milk cows	800	8.89	21.13	0.23	19.5	7,112	46.3	16,903	0.5	186
3	Freestall Barn 3	milk cows	800	8.89	21.13	0.23	19.5	7,112	46.3	16,903	0.5	186
4	Freestall Barn 4	milk cows	320	8.89	21.13	0.23	7.8	2,845	18.5	6,761	0.2	75
5	Freestall Barn 5	support stock	200	3.87	5.54	0.23	2.1	774	3.0	1,107	0.1	47
6	Freestall Barn 6	dry cows	500	5.04	10.71	1.17	6.9	2,520	14.7	5,354	1.6	583
7	Freestall Barn 6	support stock	300	3.87	5.54	1.17	3.2	1,161	4.6	1,661	1.0	350
8	Corral 1	support stock	60	3.87	5.54	8.97	0.6	232	0.9	332	1.5	538
9	Corral 2	support stock	40	3.87	5.54	8.97	0.4	155	0.6	221	1.0	359
10	Corral 3	support stock	35	3.87	5.54	8.97	0.4	135	0.5	194	0.9	314
11	Calf Hutches	calves	400	0.7	0.90	0.06	0.8	280	1.0	362	0.1	24
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							VOC (lb/day)	VOC (lb/yr)	NH3 (lb/day)	NH3 (lb/yr)	PM10 (lb/day)	PM10 (lb/yr)
38												
39												
40												
	Post-Project # of Cows (non-expansion)		**4,255**				80.7	29,438	182.7	66,701	7.9	2,848

*Multiple emissions units (freestalls, corrals, calf hutch areas, etc.) are combined in these rows.

	Post-Project Potential to Emit - Cow Housing: New Housing Units at an Expanding Dairy											
	Housing Name(s) or #(s)	Type of Cow	# of Cows	Controlled VOC EF (lb/hd-yr)	Controlled NH3 EF (lb/hd-yr)	Controlled PM10 EF (lb/hd-yr)	VOC (lb/day)	VOC (lb/yr)	NH3 (lb/day)	NH3 (lb/yr)	PM10 (lb/day)	PM10 (lb/yr)
1	Freestall Barn 7	milk cows	800	8.89	21.13	0.23	19.5	7,112	46.3	16,903	0.5	186
2	Freestall Barn 8	milk cows	480	8.89	21.13	0.23	11.7	4,267	27.8	10,142	0.3	112
3	Freestall Barn 9	support stock	200	3.87	5.54	0.23	2.1	774	3.0	1,107	0.1	47
4	Freestall Barn 10	support stock	600	3.87	5.54	0.23	6.4	2,322	9.1	3,322	0.4	140
5	Freestall Barn 11	support stock	200	3.87	5.54	0.23	2.1	774	3.0	1,107	0.1	47
6	Corral 7	support stock	35	3.87	5.54	8.97	0.4	135	0.5	194	0.9	314
7	Corral 8	support stock	30	3.87	5.54	8.97	0.3	116	0.5	166	0.7	269
8	Loafing Barn 1	support stock	400	3.87	5.54	0.90	4.2	1,548	6.1	2,214	1.0	359
9	Loafing Barn 2	support stock	300	3.87	5.54	0.90	3.2	1,161	4.6	1,661	0.7	269
10												
11												
12												
13												
14												
	Total # of Cows From Expansion		**3,045**				49.9	18,209	100.9	36,816	4.7	1,743

*Multiple emissions units (freestalls, corrals, calf hutch areas, etc.) are combined in these rows.

Post-Project Totals						
Total # of Cows	VOC (lb/day)	VOC (lb/yr)	NH3 (lb/day)	NH3 (lb/yr)	PM10 (lb/day)	PM10 (lb/yr)
7,300	130.6	47,647	283.6	103,517	12.6	4,591

Calculations:

Annual PE 2 for each pollutant (lb/yr) = Controlled EF (lb/hd-yr) x # of cows (hd)

Daily PE2 for each pollutant (lb/day) = [Controlled EF (lb/hd-yr) x # of cows (hd)] ÷ 365 (day/yr)

Pre-Project Herd Size

Herd	Flushed Freestalls	Scraped Freestalls	Flushed Corrals	Scraped Corrals	Total # of Animals
Milk Cows	1,420	0	0	0	1,420
Dry Cows	185	0	0	0	185
Support Stock (Heifers, Calves and Bulls)	0	0	0	952	952
Large Heifers	0	0	0	0	0
Medium Heifers	0	0	0	0	0
Small Heifers	0	0	0	0	0
Bulls	0	0	0	0	0

	Calf Hutches				Calf Corrals		
	Aboveground Flushed	Aboveground Scraped	On-Ground Flushed	On-Ground Scraped	Flushed	Scraped	Total # of Calves
Calves	396	0	0	0	0	0	396

Silage Information

Feed Type	Maximum # Open Piles	Maximum Height (ft)	Maximum Width (ft)	Open Face Area (ft^2)
Corn	0	0	0	
Alfalfa	0	0	0	
Wheat	0	0	0	

Milking Parlor

Cow	VOC		NH3	
	lb/day	lb/yr	lb/day	lb/yr
Milk Cows	1.6	568	0.5	194

Cow Housing

Cow	VOC		NH3		PM10	
	lb/day	lb/yr	lb/day	lb/yr	lb/day	lb/yr
Total	58.3	21,391	176.4	64,469	26.3	9,530

Liquid Manure Handling

Cow	VOC		NH3		H2S*	
	lb/day	lb/yr	lb/day	lb/yr	lb/day	lb/yr
Milk Cows	9.5	3,451	29.5	10,778	N/A	N/A
Dry Cows	0.7	246	1.9	710	N/A	N/A
Support Stock (Heifers, Calves and Bulls)	0.0	0	0.0	0	N/A	N/A
Large Heifers	0.0	0	0.0	0	N/A	N/A
Medium Heifers	0.0	0	0.0	0	N/A	N/A
Small Heifers	0.0	0	0.0	0	N/A	N/A
Calves	0.2	71	0.3	127	N/A	N/A
Bulls	0.0	0	0.0	0	N/A	N/A
Total	10.4	3,768	31.7	11,615	N/A*	N/A*

Solid Manure Handling

Cow	VOC		NH3	
	lb/day	lb/yr	lb/day	lb/yr
Milk Cows	1.9	696	11.0	4,019
Dry Cows	0.1	48	0.7	265
Support Stock (Heifers, Calves and Bulls)	0.5	190	2.0	714
Large Heifers	0.0	0	0.0	0
Medium Heifers	0.0	0	0.0	0
Small Heifers	0.0	0	0.0	0
Calves	0.0	16	0.1	48
Bulls	0.0	0	0.0	0
Total	2.5	950	13.8	5,045

Feed Handling and Storage

	Daily PE (lb-VOC/day)	Annual PE (lb-VOC/yr)
Corn Emissions	0.0	0
Alfalfa Emissions	0.0	0
Wheat Emissions	0.0	0
TMR	56.4	20,575
Total	56.4	20,575

Calculations for milking parlor:

Annual PE = (# milk cows) x (EF1 lb-pollutant/hd-yr)

Daily PE = (Annual PE lb/yr) ÷ (365 day/yr)

Calculations for cow housing:

See detailed calculations under Cow Housing Calculations worksheet.

Calculations for liquid manure and solid manure handling:

Annual PE = [(# milk cows) x (EF1 lb-pollutant/hd-yr)] + [(# dry cows) x (EF1 lb-pollutant/hd-yr)] + [(# large heifers) x (EF1 lb-pollutant/hd-yr) + [(# medium heifers) x (EF1 lb-pollutant/hd-yr)] + [(# small heifers) x (EF1 lb-pollutant/hd-yr)] + [(# calves) x (EF1 lb-pollutant/hd-yr) + [(# bulls) x (EF1 lb-pollutant/hd-yr)]

Daily PE = (Annual PE lb/yr) ÷ (365 day/yr)

The H2S emission factor is assumed to be 10% of the NH3 lagoon/storage pond(s) emission factor, for each respective herd size.

Calculations for silage emissions:

Annual PE = (EF1) x (area ft²) x (0.0929 m²/ft²) x (8,760 hr/yr) x (60 min/hr) x 2.20E-9 lb/µg

Daily PE = (Annual PE lb/yr) ÷ (365 day/yr)

Calculation for TMR emissions:

Annual PE = (# cows) x (EF1) x (0.658 m²) x (525,600 min/yr) x (2.20E-9 lb/µg)

Daily PE = (Annual PE lb/yr) ÷ (365 day/yr)
Notes

Calves are not included in TMR calculation.

*Since there is a change in lagoon/storage pond surface area, H2S emissions will be calculated separately.

Total Daily Pre-Project Potential to Emit (lb/day)

Permit	NOx	SOx	PM10	CO	VOC	NH3	H2S
Milking Parlor	0.0	0.0	0.0	0.0	1.6	0.5	0.0
Cow Housing	0.0	0.0	26.3	0.0	58.3	176.4	0.0
Liquid Manure	0.0	0.0	0.0	0.0	10.4	31.7	N/A*
Solid Manure	0.0	0.0	0.0	0.0	2.5	13.8	0.0
Feed Handling	0.0	0.0	0.0	0.0	56.4	0.0	0.0
Total	0.0	0.0	26.3	0.0	129.2	222.4	0.0

Major Source Emissions (lb/yr)

Permit	NOx	SOx	PM10	CO	VOC
Milk Parlor	0	0	0	0	0
Cow Housing	0	0	0	0	0
Liquid Manure	0	0	0	0	1,815
Solid Manure	0	0	0	0	0
Feed Handling	0	0	0	0	0
Total	0	0	0	0	1,815

Total Annual Pre-Project Potential to Emit (lb/yr)

Permit	NOx	SOx	PM10	CO	VOC	NH3	H2S
Milking Parlor	0	0	0	0	568	194	0
Cow Housing	0	0	9,530	0	21,391	64,469	0
Liquid Manure	0	0	0	0	3,768	11,615	N/A*
Solid Manure	0	0	0	0	950	5,045	0
Feed Handling	0	0	0	0	20,575	0	0
Total	0	0	9,530	0	47,252	81,323	0

Post-Project Herd Size

Herd	Flushed Freestalls	Scraped Freestalls	Flushed Corrals	Scraped Corrals	Total # of Animals
Milk Cows	4,000	0	0	0	4,000
Dry Cows	500	0	0	0	500
Support Stock (Heifers, Calves, and Bulls)	2,200	0	0	200	2,400
Large Heifers	0	0	0	0	0
Medium Heifers	0	0	0	0	0
Small Heifers	0	0	0	0	0
Bulls	0	0	0	0	0

| | Calf Hutches | | | | Calf Corrals | | |
	Aboveground Flushed	Aboveground Scraped	On-Ground Flushed	On-Ground Scraped	Flushed	Scraped	Total # of Calves
Calves	400	0	0	0	0	0	400

Silage Information

Feed Type	Maximum # Open Piles	Maximum Height (ft)	Maximum Width (ft)	Open Face Area (ft^2)
Corn	0	0	0	
Alfalfa	0	0	0	
Wheat	0	0	0	

Milking Parlor

Cow	VOC		NH3	
Milk Cows	lb/day	lb/yr	lb/day	lb/yr
Total	**4.4**	**1,600**	**1.5**	**547**

Cow Housing

	VOC		NH3		PM10	
	lb/day	lb/yr	lb/day	lb/yr	lb/day	lb/yr
Total	**130.6**	**47,647**	**284**	**103,517**	**13**	**4,591**

Liquid Manure Handling

Cow	VOC		NH3		H2S	
	lb/day	lb/yr	lb/day	lb/yr	lb/day	lb/yr
Milk Cows	26.6	9,720	83.2	30,360	N/A	N/A
Dry Cows	1.8	665	5.3	1,920	N/A	N/A
Support Stock (Heifers, Calves, and Bulls)	6.1	2,244	11.9	4,334	N/A	N/A
Large Heifers	0.0	0	0.0	0	N/A	N/A
Medium Heifers	0.0	0	0.0	0	N/A	N/A
Small Heifers	0.0	0	0.0	0	N/A	N/A
Calves	0.2	72	0.4	128	N/A	N/A
Bulls	0.0	0	0.0	0	N/A	N/A
Total	**34.7**	**12,701**	**100.8**	**36,742**	**N/A***	**N/A***

Solid Manure Handling

Cow	VOC		NH3	
	lb/day	lb/yr	lb/day	lb/yr
Milk Cows	5.3	1,920	31.0	11,320
Dry Cows	0.4	130	2.0	715
Support Stock (Heifers, Calves, and Bulls)	1.3	480	4.9	1,800
Large Heifers	0.0	0	0.0	0
Medium Heifers	0.0	0	0.0	0
Small Heifers	0.0	0	0.0	0
Calves	0.0	16	0.1	48
Bulls	0.0	0	0.0	0
Total	**7.0**	**2,546**	**38.0**	**13,883**

Feed Handling and Storage

	Daily PE (lb-VOC/day)	Annual PE (lb-VOC/yr)
Corn Emissions	0.0	0
Alfalfa Emissions	0.0	0
Wheat Emissions	0.0	0
TMR	136.9	49,968
Total	**136.9**	**49,968**

Calculations for milking parlor:

Annual PE = (# milk cows) x (EF2 lb-pollutant/hd-yr)

Daily PE = (Annual PE lb/yr) ÷ (365 day/yr)

Calculations for cow housing:

See detailed calculations under Cow Housing Calculations worksheet.

Calculations for liquid manure and solid manure handling:

Annual PE = [(# milk cows) x (EF1 lb-pollutant/hd-yr)] + [(# dry cows) x (EF2 lb-pollutant/hd-yr)] + [(# large heifers) x (EF2 lb-pollutant/hd-yr)] + [(# medium heifers) x (EF2 lb-pollutant/hd-yr)] + [(# small heifers) x (EF2 lb-pollutant/hd-yr)] + [(# calves) x (EF2 lb-pollutant/hd-yr)] + [(# bulls) x (EF2 lb-pollutant/hd-yr)]

Daily PE = (Annual PE lb/yr) ÷ (365 day/yr)

The H2S emission factor is assumed to be 10% of the NH3 lagoon/storage pond(s) emission factor, for each respective herd size.

Calculations for silage emissions:

Annual PE = (EF2) x (area ft²) x (0.0929 m²/ft²) x (8,760 hr/yr) x (60 min/hr) x 2.20E-9 lb/μg

Daily PE = (Annual PE lb/yr) ÷ (365 day/yr)

Calculation for TMR emissions:

Annual PE = (# cows) x (EF2) x (0.658 m²) x (525,600 min/yr) x (2.20E-9 lb/μg)

Daily PE = (Annual PE lb/yr) ÷ (365 day/yr)

Note: Calves are not included in TMR calculation.

*Since there is a change in lagoon/storage pond surface area, H2S emissions will be calculated separately.

Total Daily Post-Project Potential to Emit (lb/day)

Permit	NOx	SOx	PM10	CO	VOC	NH3	H2S
Milking Parlor	0.0	0.0	0.0	0.0	4.40	1.50	0.0
Cow Housing	0.0	0.0	12.6	0.0	130.60	283.60	0.0
Liquid Manure	0.0	0.0	0.0	0.0	34.70	100.80	N/A*
Solid Manure	0.0	0.0	0.0	0.0	7.00	38.00	0.0
Feed Handling	0.0	0.0	0.0	0.0	136.90	0.00	0.0
Total	**0.0**	**0.0**	**12.6**	**0.0**	**313.60**	**423.90**	**0.0**

Major Source Emissions (lb/yr)

Permit	NOx	SOx	PM10	CO	VOC
Milk Parlor	0	0	0	0	0
Cow Housing	0	0	0	0	0
Liquid Manure	0	0	0	0	6,114
Solid Manure	0	0	0	0	0
Feed Handling	0	0	0	0	0
Total	**0**	**0**	**0**	**0**	**6,114**

Total Annual Post-Project Potential to Emit (lb/yr)

Permit	NOx	SOx	PM10	CO	VOC	NH3	H2S
Milking Parlor	0	0	0	0	1,600	547	0
Cow Housing	0	0	4,591	0	47,647	103,517	0
Liquid Manure	0	0	0	0	12,701	36,742	N/A*
Solid Manure	0	0	0	0	2,546	13,883	0
Feed Handling	0	0	0	0	49,968	0	0
Total	**0**	**0**	**4,591**	**0**	**114,462**	**154,689**	**0**