San Joaquin Valley
AIR POLLUTION CONTROL DISTRICT

HEALTHY AIR LIVING™

SEP 18 2019

Mike Kalmink
Innovative Ag Services, LLC
1201 Delta View Rd, Ste 5
Hanford, CA 93230

Re: Notice of Preliminary Decision - Authority to Construct
Facility Number: S-5836
Project Number: S-1191790

Dear Mr. Kalmink:

Enclosed for your review and comment is the District's analysis of Double "J" Dairy's application for an Authority to Construct to increase the dairy herd size to 7,140 milk cows not to exceed a combined total of 8,130 mature cows (milk and dry) and 5,490 support stock (heifers, calves, and bulls), and construct a new carousel milking parlor, four Saudi style barns, and three half freestall barns, at 6656 Avenue 328, Visalia, CA.

The notice of preliminary decision for this project has been posted on the District's website (www.valleyair.org). After addressing all comments made during the 30-day public notice period, the District intends to issue the Authority to Construct. Please submit your written comments on this project within the 30-day public comment period, as specified in the enclosed public notice.

Thank you for your cooperation in this matter. If you have any questions regarding this matter, please contact Mr. John Yoshimura of Permit Services at (559) 230-5887.

Sincerely,

Arnaud Marjollet
Director of Permit Services

AM:jy

Enclosures

cc: Courtney Graham, CARB (w/ enclosure) via email

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www.valleyair.org www.healthyairliving.com

San Joaquin Valley Air Pollution Control District

Authority to Construct Application Review

Dairy Expansion and Herd Increase

Facility Name:	Double "J" Dairy	Date:	September 10, 2019
Mailing Address:	1201 Delta View Rd, Ste 5 Hanford, CA 93230	Engineer:	John Yoshimura
		Lead Engineer:	Jerry Sandhu
Contact Person:	Mike Kalmink		
Telephone:	(559) 587-2800		
E-Mail:	mkalmink@innovativeag.net		
Application #s:	S-5836-1-4, '-2-3, '-3-5, '-4-3, and '-5-2		
Project #:	S-1191790		
Deemed Complete:	May 17, 2019		

I. Proposal

Double "J" Dairy has submitted Authority to Construct (ATC) applications to construct a new 114 stall carousel milking parlor, a new special needs Saudi style barn, three half freestall barns over existing open corrals (identified as Half Freestall Barns A, B, and C), and three Saudi style barns over existing corrals. The facility has also proposed to modify the current permitted herd size by increasing the milk cow herd size from 4,730 to 7,140, increase the mature cows (milk and dry combined) herd size from 5,610 to 8,130, and decrease the support stock (heifers, calves, and bulls) herd size from 5,490 to 4,540. The proposed cow housing permit will also identify that the support stock herd includes 800 calves housed in existing calf hutches. The proposed modifications are summarized as follows:

Milking Parlor (S-5836-1-4)

- Increase the milk cow herd size from 4,730 to 7,140.
- Construct a new 114 stall carousel milking parlor.

Cow Housing (S-5836-2-3)

- Increase the milk cow herd size from 4,730 to 7,140.
- Increase the mature cow (milk and dry combined) herd size from 5,610 to 8,130.
- Decrease the support stock (heifers, calves, and bulls) herd size from 5,490 to 4,540. The support stock herd includes 800 calves housed in existing calf hutches.
- Construct three half freestall barns over existing open corrals.
- Construct three Saudi style barns over existing open corrals.
- Construct a special needs Saudi style barn.

Liquid Manure Handling (S-5836-3-5)

- Increase in liquid manure as a result of the increase in herd size.

Double "J" Dairy has also proposed to permit a covered digester lagoon to collect biogas under a separate ATC application (ATC S-5836-3-4, project S-1174081). The facility has stated that construction of the digester will commence prior to the modifications proposed in this project.

With this project, the facility has proposed to operate the digester as a covered anaerobic digester lagoon to satisfy Best Available Control Technology (BACT) requirements. Therefore, the following condition will be added to the proposed liquid manure handling permit to ensure the modifications authorized by ATC S-5836-3-4 will be implemented concurrently, or prior to the modifications proposed in this project.

- Authority to Construct (ATC) S-5836-3-4 shall be implemented concurrently, or prior to the modifications authorized by this ATC. [District Rule 2201]

Solid Manure Handling (S-5836-4-3)
- Increase in solid manure as a result of the increase in herd size.

Feed Storage and Handling (S-5836-5-2)
- Increase in feed and total mixed rations as a result of the increase in herd size.

II. Applicable Rules

Rule 1070 Inspections (12/17/92)
Rule 2010 Permits Required (12/17/92)
Rule 2201 New and Modified Stationary Source Review Rule (2/18/16)
Rule 2410 Prevention of Significant Deterioration (6/16/11)
Rule 2520 Federally Mandated Operating Permits (6/21/01)
Rule 4101 Visible Emissions (2/17/05)
Rule 4102 Nuisance (12/17/92)
Rule 4550 Conservation Management Practices (CMP) (8/19/04)
Rule 4570 Confined Animal Facilities (CAF) (10/21/10)
CH&SC 41700 Health Risk Assessment
CH&SC 42301.6 School Notice
Public Resources Code 21000-21177: California Environmental Quality Act (CEQA)
California Code of Regulations, Title 14, Division 6, Chapter 3, Sections 15000-15387: CEQA Guidelines

III. Project Location

The facility is located at 6656 Avenue 328 in Visalia, CA. The equipment is not located within 1,000 feet of the outer boundary of a K-12 school. Therefore, the public notification requirement of California Health and Safety Code 42301.6 is not applicable to this project.

IV. Process Description

The primary function of this facility is the production of milk, which is used to make dairy products for human consumption. Production of milk requires a herd of mature dairy cows that are lactating. In order to produce milk, the cows must be bred and give birth. The gestation period for a cow is 9 months, and dairy cows are bred again 4 months after calving. Thus, a mature dairy cow produces a calf every 12 to 14 months. Therefore, a dairy operation may have several types of animal groups present, including calves, heifers, mature cows (lactating and dry cows), and bulls.

The milk cows at a dairy usually generate anywhere from 130 to 150 pounds of manure per day. Manure accumulates in confinement areas such as barns, open corrals, and the milking center.

Manure is primarily deposited in areas where the herd is fed and given water. How the manure is collected, stored, and treated depends directly on the manure management techniques used at a particular dairy.

Dairy manure is collected and managed as a liquid, a semi-solid or slurry, and a solid. Manure with a total solids or dry matter content of 20% or higher usually can be handled as a solid while manure with a total solids content of 10% or less can be handled as a liquid.

Milking Parlor (S-5836-1-4)
The milking parlor is a separate building, apart from the lactating cow confinement. The milking parlor is designed to facilitate changing the groups of cows milked and to allow workers access to the cows during milking. A holding area confines the cows that are ready for milking. The holding area is covered with open sides and is part of the milking parlor, which in turn, is located in the immediate vicinity of the cow housing.

Double "J" Dairy is currently permitted for one 128 stall parabone milking parlor and one 12 stall hospital milking parlor. The facility has proposed to construct a new 114 stall carousel milking parlor. The lactating cows will be milked up to three times per day in the milking parlors. The milking parlors will have concrete floors sloped to a drain. Manure that is deposited in the milking parlors will be sprayed or flushed into the drain using fresh water after each milking. The effluent from the milking parlors will be carried through pipes to the lagoon system.

Cow Housing (S-5836-2-3)
In a freestall barn, cows are grouped in large pens with free access to feed bunks, waterers, and stalls for resting. A standard freestall barn design has a feed alley in the center of the barn separating two feed bunks on each side. A variety of types of bedding materials are used for animal comfort and to prevent animal injury.

The design of a Saudi style barn was originally crafted for hot weather conditions in desert climates. These structures feature very high ceilings, with a ventilation gap running the length of the barn. The sides of the structure are open, and the high peak (typically 14-18 feet) enhances air flow. Saudi style barns are very similar to freestall barns with the exception of the freestalls.

An open corral is a large open area where cows are confined, also with unlimited access to feed bunks, water, and possibly an open structure to provide shade.

The dairy has separate housing for up to 800 calves. These calves are kept in existing individual onground hutches until they are ready to wean (to accustom to take nourishment other than by suckling).

Detailed pre-project and post-project housing arrangements are shown in Appendix F and site maps of the facility are shown in Appendix I.

Liquid Manure Handling (S-5836-3-5)
The liquid manure handling system consists of settling basin(s), mechanical separator(s), and two lagoons. The facility has separately proposed to construct a covered anaerobic digester lagoon over one of the existing uncovered lagoons.

Settling Basin(s)
The liquid manure from the flushed lanes will flow through settling basin(s) for solids separation prior to entering the lagoon.

Settling basins are structures designed to separate solids from liquid manure by sedimentation. The inflow of manure is restricted to allow some of the solids to settle out. A settling basin may achieve a solids removal rate of 40-70%. The liquids from the settling basins will gradually drain to the treatment lagoons. Solids remaining in settling basins are left to dry and then are removed. The separated solids will either be incorporated into cropland or stored for use as fertilizer.

Mechanical Separator(s)
Flush water from the milk barn and housing areas are pumped over the screens in the mechanical separator(s). The liquid passes through the screens and flows into the liquid manure lagoon. The solids fall off the bottom of the screen onto a stacking pad, from where they are later removed by a front end loader and spread out to dry on the drying pads.

Covered Anaerobic Digester Lagoon System
The proposed herd increase will cause the emissions from the liquid manure handling system to exceed the BACT threshold. To comply with the BACT requirements for the liquid manure handling system, the facility will be required to operate the covered lagoon as a covered anaerobic digester lagoon.

A covered anaerobic digester lagoon is a sealed basin or tank that is designed to accelerate and control the decomposition of organic matter by microorganisms in the absence of oxygen. Anaerobic decomposition results in the conversion of organic compounds in the substrate into methane (CH_4), carbon dioxide (CO_2), and water rather than intermediate Volatile Organic Compounds (VOCs). The gas generated by this process is known as biogas, waste gas, or digester gas. In addition to methane and carbon dioxide, biogas may also contain small amounts of Nitrogen (N_2), Oxygen (O_2), Hydrogen Sulfide (H_2S), and Ammonia (NH_3). Biogas may also include trace amounts of various VOCs that remain from incomplete digestion of the volatile solids in the incoming substrate. Because biogas is mostly composed of methane, the main component of natural gas, the gas produced in the covered anaerobic digester lagoon can be cleaned to remove H_2S and other impurities and used as fuel.

The covered anaerobic digester lagoon system will process the manure slurry (mixed manure solids and liquids) from the reception pits. The manure will be flushed from the milking parlor and the cow housing areas at the dairy and the manure will be routed via the existing underground piping system to reception pits where the waste stream will be adjusted to the proper solids content (9-15% solids) and then pumped into the new digester. The effluent from the digester will be pumped to a solid separation area where the fiber solids will be separated from the liquid digester effluent. After the fiber solids have been separated, the liquid digester effluent will be pumped back to the separated liquids pit to be used in the flush system. Excess liquid will flow to the settling basin(s) and lagoons to be used to fertilize adjacent cropland. No biogas will be emitted or combusted at the dairy because all biogas produced by the digester will be transported offsite through a pipeline to a central processing location.

Land Application
Liquid manure from the lagoons will be applied to cropland as fertilizer/irrigation water. The application is done through flood and furrow irrigation, at agronomic rates in conformance with a nutrient management plan that has been approved by the Regional Water Quality Control Board.

Solid Manure Handling (S-5836-4-3)

Manure Stock Piles (Storage) and Land Application
The solid manure stockpiled at this dairy will include the separated solids from the mechanical separator(s). The separated solids will be immediately incorporated into cropland, be dried and used as fertilizer or as bedding in the freestall barns, or hauled offsite. The applicant proposes to cover the dry separated solids piles and animal waste piles with weatherproof coverings from October through May, so that the solids will remain dry until they are ready to be used.

Feed Storage and Handling (S-5836-5-2)

Silage Piles and Commodity Barns
The feed consists primarily of silage, which is made from corn and wheat, or a variety of other feed crops. The silage is made by placing the harvested crops, chopped to desired pieces if necessary, into piles, which are then compacted with heavy equipment to remove air. The piles are then tightly covered to avoid reintroduction of air. This allows anaerobic microbes present in the crops to multiply, resulting in fermentation of the organic material in the feed. When the silage is ready, one end of the pile can be opened and the required amount of silage can be removed from that end on a daily basis.

In order to provide the right nutritional balance, silage is usually blended with other feed additives, such as oils, whey, seeds and grains, nut hulls, and various salts and minerals before it is fed to the cattle. These additives are usually stored in commodity barns to avoid exposure to weather.

Total Mixed Rations (TMR)
TMR refers to a blended mixture of silage and additives that is ready to be fed to the cattle. Most cattle facilities prepare their TMRs in small batches using a feed wagon equipped with a mixer. The silage and additives are placed in the feed wagon in the proportions prescribed by the dietary requirements of the group of cows to be fed. These ingredients are then thoroughly mixed in the wagon and delivered to the feed bunks.

V. Equipment Listing

Pre-Project Equipment Description

S-5836-1-3: 4,730 COW MILKING OPERATION WITH ONE 128 STALL PARABONE MILKING PARLOR AND ONE 12 STALL HOSPITAL MILKING PARLOR

S-5836-2-2: COW HOUSING - 4,730 MILK COWS NOT TO EXCEED A COMBINED TOTAL OF 5,610 MATURE COWS (MILK AND DRY COWS); 5,490 SUPPORT STOCK (HEIFERS, CALVES, AND BULLS); 2 FREESTALL BARNS AND 2 HALF FREESTALL BARNS WITH FLUSH/SCRAPE SYSTEM

Proposed ATC S-5836-3-4: LIQUID MANURE HANDLING SYSTEM CONSISTING OF SETTLING BASIN(S); MECHANICAL SEPARATOR(S); ONE LAGOON AND ONE COVERED DIGESTER LAGOON PERMITTED AS S-9125-2-0; MANURE IS LAND APPLIED THROUGH FLOOD AND FURROW IRRIGATION

S-5836-4-2: SOLID MANURE HANDLING CONSISTING OF MANURE STOCK PILES; SOLID MANURE APPLICATION TO LAND

S-5836-5-1: FEED STORAGE AND HANDLING CONSISTING OF COMMODITY BARN(S) AND SILAGE PILE(S)

ATC Equipment Description

S-5836-1-4: MODIFICATION OF 4,730 COW MILKING OPERATION WITH ONE 128 STALL PARABONE MILKING PARLOR AND ONE 12 STALL HOSPITAL MILKING PARLOR: INCREASE MILK COW HERD SIZE TO 7,140 AND CONSTRUCT A 114 STALL CAROUSEL MILKING PARLOR

S-5836-2-3: MODIFICATION OF COW HOUSING - 4,730 MILK COWS NOT TO EXCEED A COMBINED TOTAL OF 5,610 MATURE COWS (MILK AND DRY COWS); 5,490 SUPPORT STOCK (HEIFERS, CALVES, AND BULLS); 2 FREESTALL BARNS AND 2 HALF FREESTALL BARNS WITH FLUSH/SCRAPE SYSTEM: INCREASE MILK COW HERD SIZE TO 7,140; INCREASE MATURE COW HERD SIZE TO 8,130 (MILK AND DRY COWS); DECREASE SUPPORT STOCK TO 4,540 (HEIFERS, CALVES, AND BULLS) WHICH INCLUDES 800 CALVES HOUSED IN EXISTING ONGROUND CALF HUTCHES; CONSTRUCT 3 HALF FREESTALL BARNS OVER EXISTING OPEN CORRALS; CONSTRUCT 3 SAUDI STYLE BARNS OVER EXISTING OPEN CORRALS; CONSTRUCT A SPECIAL NEEDS SAUDI STYLE BARN

S-5836-3-5: MODIFICATION OF LIQUID MANURE HANDLING SYSTEM CONSISTING OF SETTLING BASIN(S); MECHANICAL SEPARATOR(S); ONE LAGOON AND ONE COVERED DIGESTER LAGOON PERMITTED AS S-9125-2-0; MANURE IS LAND APPLIED THROUGH FLOOD AND FURROW IRRIGATION: ALLOW FOR INCREASE IN LIQUID MANURE DUE TO HERD INCREASE AUTHORIZED BY AUTHORITY TO CONSTRUCT S-5836-2-3

S-5836-4-3: MODIFICATION OF SOLID MANURE HANDLING CONSISTING OF MANURE STOCK PILES; SOLID MANURE APPLICATION TO LAND: ALLOW INCREASE IN MANURE DUE TO INCREASE IN HERD SIZE AUTHORIZED BY AUTHORITY TO CONSTRUCT S-5836-2-3

Although it's not listed on the current PTO, the facility is currently using total mixed ration feeding. Therefore, the ATC and post-project equipment description will refer to "total mixed ration feeding".

S-5836-5-2: MODIFICATION OF FEED STORAGE AND HANDLING CONSISTING OF COMMODITY BARN(S), SILAGE PILE(S), AND TOTAL MIXED RATION FEEDING: INCREASE IN FEED AND TMR DUE TO INCREASE IN HERD SIZE AUTHORIZED BY AUTHORITY TO CONSTRUCT S-5836-2-3

Post Project Equipment Description

S-5836-1-4: 7,140 COW MILKING OPERATION WITH ONE 128 STALL PARABONE MILKING PARLOR, ONE 114 STALL CAROUSEL MILKING PARLOR, AND ONE 12 STALL HOSPITAL MILKING PARLOR

S-5836-2-3: COW HOUSING - 7,140 MILK COWS NOT TO EXCEED A COMBINED TOTAL OF 8,130 MATURE COWS (MILK AND DRY COWS); 3,740 SUPPORT STOCK (HEIFERS AND BULLS); AND 800 CALVES HOUSED IN ONGROUND HUTCHES; 2 FREESTALL BARNS, 5 HALF FREESTALL BARNS, 3 SAUDI STYLE BARNS, AND 1 SPECIAL NEEDS SAUDI STYLE BARN WITH FLUSH/SCRAPE SYSTEM

S-5836-3-5: LIQUID MANURE HANDLING SYSTEM CONSISTING OF SETTLING BASIN(S); MECHANICAL SEPARATOR(S); ONE LAGOON AND ONE COVERED ANAEROBIC DIGESTER LAGOON (611' X 480' X 23') PERMITTED AS S-9125-2-0; MANURE IS LAND APPLIED THROUGH FLOOD AND FURROW IRRIGATION

S-5836-4-3: SOLID MANURE HANDLING CONSISTING OF MANURE STOCK PILES; SOLID MANURE APPLICATION TO LAND

S-5836-5-2: FEED STORAGE AND HANDLING CONSISTING OF COMMODITY BARN(S), SILAGE PILE(S), AND TOTAL MIXED RATION FEEDING

VI. Emission Control Technology Evaluation

Particulate matter (PM_{10}), volatile organic compounds (VOC), ammonia (NH_3), and hydrogen sulfide (H_2S) are the major pollutants of concern from dairy operations. Gaseous pollutant emissions at a dairy result from the ruminant digestive processes (enteric emissions), from the decomposition and fermentation of feed, and also from decomposition of organic material in dairy manure. Volatile Organic Compounds (VOCs) are formed as intermediate metabolites when organic matter in manure degrades. Ammonia volatilization is the result of the microbial decomposition of nitrogenous compounds in manure. The quantity of enteric emissions depends directly on the number and types of cows. The quantity of emissions from manure decomposition depends on the amount of manure generated, which also depends on the number and types of cows. Therefore, the total herd size and composition is the critical factor in quantifying emissions from a dairy. Various management practices are used to control emissions at this dairy. Examples of some of these practices are discussed below:

Milking Parlor (S-5836-1-4)

This dairy uses a flush/spray system to wash out the manure from the milking parlor after each group of cows is milked. Since the milking parlor is constantly flushed, there will be no particulate matter emissions from the milking parlor. Manure, which is a source of VOC emissions, is removed from the milking parlor many times a day by flushing after each milking. Because of ammonia's high affinity for and solubility in water, volatilization of ammonia from the milking parlors will also be reduced by flushing after each milking.

Cow Housing (S-5836-2-3)

The cows at the facility will be housed in a combination of freestall and Saudi style barns, open corrals, and onground calf hutches. Some of the practices that will be utilized to reduce emissions at the dairy are described below:

Freestall and Saudi Style Barns
Particulate matter emissions from freestall and Saudi style barns are greatly reduced because the cows will be on a paved surface rather than on dry dirt. Additionally, flushing of the lanes creates a moist environment, which further decreases particulate matter emissions.

Shade Structures
Some of the support stock will be housed in an open corral with concrete lanes and a shade structure. Providing shade for the animals reduces movement and unnecessary activity during hot weather, which reduces PM_{10} emissions.

Frequent Flushing
Frequent flushing is also used for the removal of manure from the lanes and walkways in the housing barns. Frequent flushing creates a moist environment that greatly reduces or eliminates PM_{10} emissions. In addition, flush water dissolves NH_3 as well as various water-soluble VOC in the manure, thereby stopping or decelerating the emission of these pollutants directly into the atmosphere. Both manure and dissolved pollutants are subsequently carried by the flush water into the liquid manure handling system for further treatment.

Liquid Manure Handling (S-5836-3-5)

Solids Separation (Mechanical Separator(s) and Settling Basins(s))
The purpose of solids separation is to remove fibrous materials prior to the liquid manure entering the lagoon. By removing the most fibrous material from the liquid stream prior to entering the lagoon, it is anticipated that the amount of intermediate metabolites released during digestion in the lagoon may be reduced. Removal of the fibrous material allows for more complete digestion in the lagoon and lower emissions. Solids remaining are left to dry and then are removed. The separated solids can be immediately incorporated into cropland or spread in thin layers, harrowed, and dried.

Covered Anaerobic Digester Lagoon System
As previously discussed, an anaerobic digester is a sealed basin or tank that is designed to accelerate and control the decomposition of organic matter by microorganisms in the absence of oxygen. Anaerobic digestion results in greater conversion of organic compounds in the substrate into methane (CH_4), carbon dioxide (CO_2), and water rather than intermediate Volatile Organic Compounds (VOCs). VOC emissions from the liquid manure handling system have been reduced even more since the covered anaerobic digester lagoon was constructed over an existing lagoon at the dairy. The digester gas is piped offsite to a biogas upgrading plant.

Liquid Manure Land Application
Liquid manure will be applied to cropland at agronomic rates, in compliance with the dairy's comprehensive nutrient management plan and the requirements of the Regional Water Quality Control Board. These practices are expected to reduce odors and result in faster uptake of nutrients by crops. When applied nutrients are optimally matched with the nutrient needs of developing crops, the excess nutrients that are associated with increased emissions and/or groundwater pollution are minimized.

Solid Manure Handling (S-5836-4-3)
Based on the information currently available, emissions from solid manure applied to cropland are expected to be low. However, to ensure that any possible emissions are minimized, the manure will be promptly incorporated into the soil after application. This will reduce any

volatilization of gaseous pollutants, as the soil provides cover from wind and other weather elements that enhance volatilization. In addition, incorporation reduces emissions by biofilter effect, whereby the adsorption of NH_3, VOC, and other compounds onto soil particles provides an opportunity for oxidation by the action of various microorganisms the soil.[1]

Feed Storage and Handling (S-5836-5-2)

All cows will be fed in accordance with National Research Council (NRC) guidelines using routine nutritional analysis for rations. NRC guidelines are intended to optimize nutrient uptake by the cow, which not only increases feed efficiency but also minimizes the excretion of undigested protein and other nutrients in the manure. Since excess manure nutrients are the feedstock for the processes that result in NH_3, H_2S, and VOC emissions as manure decomposes, the reduction of nutrients in the manure is expected to reduce the emission of these pollutants.

In addition, any refused feed will be removed from the feed lanes on a regular basis to minimize gaseous emissions from decomposition. Silage piles will be covered with plastic tarps to minimize volatilization of pollutants from the pile surfaces.

Rule 4570 Mitigation Measures

The facility currently complies with all applicable Phase II mitigation measure requirements of District Rule 4570, as previously processed under project S-1111407. This project does not involve any change to the mitigation measures practiced at the facility.

All mitigation measures are expected to result in VOC emissions reductions for each permit unit at the dairy; reductions in ammonia emissions are also expected. A complete list of the mitigation measures practiced at the facility, and the expected control efficiency for each, is included with the emissions calculations shown in Appendix F.

VII. General Calculations

A. Assumptions

- Potential to Emit for the dairy will be based on the permitted capacity of the number and types of cows at the dairy;
- All PM_{10} emissions from the dairy will be allocated to the cow housing permit unit (S-5836-2-3) and internal combustion engine (S-5836-6-0);
- For this dairy, only emissions from the lagoons (S-5836-3-5) and internal combustion engine (S-5836-6-0) will be used in determining if this facility will be a major source since the lagoons and internal combustion engine are considered to be the only non-fugitive emissions at this dairy;
- The PM_{10} emission factors for the dairy animals are based on a District document entitled "Dairy and Feedlot PM_{10} Emissions Factors," which compiled data from studies performed by Texas A&M ASAE and a USDA/UC Davis report quantifying dairy and feedlot emissions;
- The NH_3 emission factors for milk cows are based on an internal document entitled "*Breakdown of Dairy VOC Emission Factor into Permit Units.*" The NH_3 emission factors for the other cows were developed by taking the ratio of manure generated by the different types of cows to the milk cow and multiplying it by the milk cow emission factor;

[1] Page 9-38 of U.S. EPA's draft document entitled "Emissions From Animal Feeding Operations" (http://www.epa.gov/ttn/chief/ap42/ch09/draft/draftanimalfeed.pdf)

- The VOC emission factors for the dairy animals are based on the District document entitled "Air Pollution Control Officer's Revision of the Dairy VOC Emissions Factor";
- The mitigation measures practiced at Double "J" Dairy as well as the number, type, and size of silage piles are taken from the Rule 4570 Phase II application, processed under District project S-1111407;
- The post-project Rule 4570 mitigation measures practiced at the dairy will be the same as the pre-project mitigation measures;
- There will be no new lagoons or any change to the surface area of the existing lagoons from this project;
- The District assumes 100% of the biogas (emissions) generated by the covered anaerobic digester lagoon is captured and transported offset. However, for potential to emit purposes, the District will conservatively apply the 40% VOC control efficiency from the anaerobic treatment lagoon mitigation measure.
- All H_2S emissions will be allocated to the liquid manure permit unit (S-5836-3-5).

B. Emission Factors

PM_{10}, VOC, NH_3, and H_2S

The emissions calculations shown in Appendix F lists the PM_{10}, VOC, NH_3, and H_2S emission factors from the animals and feed at this dairy. These emission factors will be used to calculate the pre-project and post-project PM_{10}, VOC, NH_3, and H_2S emissions from the entire dairy.

C. Calculations

1. Pre-Project Potential to Emit (PE1)

A summary of the pre-project potential to emit from each modified permit unit is shown in the following table and are included in Appendix F:

Daily PE1 (lb/day)							
Permit #	NOx	SOx	PM_{10}	CO	VOC	NH_3	H_2S
S-5836-1-3 (milking parlor)	0.0	0.0	0.0	0.0	5.2	1.8	0.0
S-5836-2-2 (cow housing)	0.0	0.0	168.8	0.0	197.6	372.7	0.0
S-5836-3-4 (liquid manure handling)	0.0	0.0	0.0	0.0	48.2	133.7	2.8
S-5836-4-2 (solid manure handling)	0.0	0.0	0.0	0.0	9.4	50.0	0.0
S-5836-5-1 (feed storage and handling)	0.0	0.0	0.0	0.0	437.4	0.0	0.0

Annual PE1 (lb/year)							
Permit #	NOx	SOx	PM_{10}	CO	VOC	NH_3	H_2S
S-5836-1-3 (milking parlor)	0	0	0	0	1,892	647	0
S-5836-2-2 (cow housing)	0	0	61,530	0	72,188	136,043	0
S-5836-3-4 (liquid manure handling)	0	0	0	0	17,592	48,775	1,025
S-5836-4-2 (solid manure handling)	0	0	0	0	3,422	18,258	0
S-5836-5-1 (feed storage and handling)	0	0	0	0	159,628	0	0

2. Post-Project Potential to Emit (PE2)

A summary of the post-project potential to emit from each modified permit unit is shown in the following table and are included in Appendix F:

Daily PE2 (lb/day)							
Permit #	NOx	SOx	PM_{10}	CO	VOC	NH_3	H_2S
S-5836-1-4 (milking parlor)	0.0	0.0	0.0	0.0	7.8	2.7	0.0
S-5836-2-3 (cow housing)	0.0	0.0	112.4	0.0	253.0	500.8	0.0
S-5836-3-5 (liquid manure handling)	0.0	0.0	0.0	0.0	37.2	116.1	2.8
S-5836-4-3 (solid manure handling)	0.0	0.0	0.0	0.0	12.0	67.3	0.0
S-5836-5-2 (feed storage and handling)	0.0	0.0	0.0	0.0	472.0	0.0	0.0

Annual PE2 (lb/year)							
Permit #	NOx	SOx	PM_{10}	CO	VOC	NH_3	H_2S
S-5836-1-4 (milking parlor)	0	0	0	0	2,856	977	0
S-5836-2-3 (cow housing)	0	0	41,114	0	92,512	182,882	0
S-5836-3-5 (liquid manure handling)	0	0	0	0	13,576	42,388	1,025
S-5836-4-3 (solid manure handling)	0	0	0	0	4,393	24,523	0
S-5836-5-2 (feed storage and handling)	0	0	0	0	172,261	0	0

3. Pre-Project Stationary Source Potential to Emit (SSPE1)

Pursuant to District Rule 2201, the SSPE1 is the Potential to Emit (PE) from all units with valid Authorities to Construct (ATC) or Permits to Operate (PTO) at the Stationary Source and the quantity of Emission Reduction Credits (ERC) which have been banked since September 19, 1991 for Actual Emissions Reductions (AER) that have occurred at the source, and which have not been used on-site. The emissions for permit units S-5836-1 through '-6 are calculated in Appendix F.

Pre-Project Stationary Source Potential to Emit [SSPE1] (lb/year)							
	NOx	SOx	PM_{10}	CO	VOC	NH_3	H_2S
S-5836-1-3	0	0	0	0	1,892	647	0
S-5836-2-2	0	0	61,530	0	72,188	136,043	0
S-5836-3-4	0	0	0	0	17,592	48,775	1,025
S-5836-4-2	0	0	0	0	3,422	18,258	0
S-5836-5-1	0	0	0	0	159,628	0	0
S-5836-6-0	1,825	1	129	393	148	0	0
SSPE1	**1,825**	**1**	**61,659**	**393**	**254,870**	**203,723**	**1,025**

4. Post-Project Stationary Source Potential to Emit (SSPE2)

Pursuant to District Rule 2201, the SSPE2 is the PE from all units with valid ATCs or PTOs at the Stationary Source and the quantity of ERCs which have been banked since September 19, 1991 for AER that have occurred at the source, and which have not been used on-site. The emissions for permit units S-5836-1 through '-6 are calculated in Appendix F.

Post-Project Stationary Source Potential to Emit [SSPE2] (lb/year)							
	NO_X	SO_X	PM_{10}	CO	VOC	NH_3	H_2S
S-5836-1-4	0	0	0	0	2,856	977	0
S-5836-2-3	0	0	41,114	0	92,512	182,882	0
S-5836-3-5	0	0	0	0	13,576	42,388	1,025
S-5836-4-3	0	0	0	0	4,393	24,523	0
S-5836-5-2	0	0	0	0	172,261	0	0
S-5836-6-0	1,825	1	129	393	148	0	0
SSPE2	**1,825**	**1**	**41,243**	**393**	**285,746**	**250,770**	**1,025**

5. Major Source Determination

Agricultural operations do not belong to any of the source categories specified in 40 CFR 51.165. Since this facility is an agricultural operation, fugitive emissions shall not be included in determining whether it is a major stationary source.

40 CFR 71.2 defines fugitive emissions as "those emissions which could not reasonably pass through a stack, chimney, vent, or other functionally-equivalent opening." In 2005, the California Air Pollution Control Officers Association (CAPCOA) issued guidance for estimating VOC emissions from dairy farms. This guidance determined that VOC emissions from the milking centers, cow housing areas, corrals, common manure storage areas, and land application of manure are considered fugitive since they are not physically contained and could not reasonably pass through a stack, chimney, vent, or other functionally-equivalentopening. The guidance also determined that VOC emissions from liquid manure lagoons and storage ponds are not considered fugitive because emission collection technologies for liquid manure systems exist. The District has researched this issue and concurs with the CAPCOA determinations, as discussed in more detail below:

Milking Parlor

The mechanical ventilation system could arguably be utilized to capture emissions from the milking parlor. In order achieve and maintain the negative pressure required for this purpose, the adjoining holding area would also need to be completely enclosed. However, enclosing the holding area is not practical due to the continuous movement of cows in and out of the barn throughout the day. In addition, the capital outlay required to enclose this large area would be prohibitive. The District therefore determines that emissions from the milking parlor cannot reasonably be captured, and are to be considered fugitive.

Cow Housing

Although there are smaller dairy farms that have enclosed housing barns, such barns are usually not fully enclosed and do not include any systems for the collection of emissions. In addition, the airflow requirements for dairy cows are extremely high, primarily for herd health reasons. Airflow requirements are expected to be even higher in places such as the San Joaquin Valley, where daytime temperatures can exceed 110 degrees for prolonged periods during the summer months. Given the high air flow rates that will be involved, collection and control of the exhaust from housing barns is not only impractical but also cost prohibitive. The District therefore determines that emissions from housing barns cannot reasonably be captured, and are to be

considered fugitive.

Manure Storage Areas

Solid manure is typically stored in the housing areas, as mounds or piles in individual corrals or pens. Some manure may also be stored in piles outside the housing areas while awaiting land application, shipment offsite, or other uses. Thus, manure storage areas are widely distributed over the dairy site, making it impractical to capture emissions from any significant proportion of the solid manure. The District therefore determines that emissions from manure storage areas cannot reasonably be captured, and are to be considered fugitive.

Land Application

Since manure has to be applied over large expanses of cropland (hundreds or even thousands of acres), there is no practical method that can be used to capture the associated emissions. The District therefore determines that emissions from land application of manure cannot reasonably be captured, and are to be considered fugitive.

Feed Handling and Storage

Silage and total mixed rations (TMR) are the primary sources of emissions from feed storage and handling. Silage is stored in several tarped/covered piles and/or plastic bags. One end/face of the pile/bag that is actively being used to prepare feed rations must remain open to allow extraction of the silage. A front-end loader is used to extract silage from the open face of the pile throughout the day as the feed rations for the various groups or categories of cows are prepared. A significant proportion of silage pile emissions are associated with this open face, which is exposed to the atmosphere and frequently disturbed during silage extraction. Due to the need to access the pile's open face throughout the day, it is not practical to enclose it or equip it with any kind of device or system that could be used to capture of emissions.

TMR is prepared by mixing silage with various additives such as seeds, grains, and molasses. Because the quality of silage degrades fairly rapidly upon exposure to air, TMR is prepared only when needed and promptly distributed to the feed lanes for consumption. Most of the TMR emissions are thus emitted from the feed lanes, which are located inside the housing barns, where the TMR will remain exposed to the air for at least several hours as the cows feed. As previously discussed, collection and control of emissions from housing barns is not only impractical but also cost prohibitive.

The District therefore determines that emissions from feed handling and storage cannot reasonably be captured, and are to be considered fugitive.

As previously stated, emissions from liquid manure lagoons and IC engines have already been determined to be non-fugitive. The facility's non-fugitive stationary source potential emissions are summarized in the following tables (see Appendix F for non-fugitive totals):

Non-Fugitive SSPE1 (lb/year)						
Category	**NOx**	**SOx**	**PM10**	**PM2.5**	**CO**	**VOC**
S-5836-3-4 - Lagoons	0	0	0	0	0	8,466
S-5836-6-0 - Engine	1,825	1	129	129	393	148
Non-Fugitive SSPE1	**1,825**	**1**	**129**	**129**	**393**	**8,614**

Non-Fugitive SSPE2 (lb/year)						
Category	**NOx**	**SOx**	**PM10**	**PM2.5**	**CO**	**VOC**
S-5070-3-5 - Lagoons	0	0	0	0	0	6,501
S-5070-6-0 - Engine	1,825	1	129	129	393	148
Non-Fugitive SSPE2	**1,825**	**1**	**129**	**129**	**393**	**6,649**

The Rule 2201 major source determination is summarized in the following table:

Rule 2201 Major Source Determination (lb/year)						
	NOx	**SOx**	**PM10**	**PM2.5**	**CO**	**VOC**
SSPE1	1,825	1	129	129	393	8,466
SSPE2	1,825	1	129	129	393	6,649
Major Source Threshold	20,000	140,000	140,000	140,000	200,000	20,000
Major Source?	No	No	No	No	No	No

Note: PM2.5 assumed to be equal to PM10

As seen in the table above, the facility is not an existing Major Source and is not becoming a Major Source as a result of this project.

Rule 2410 Major Source Determination

The facility or the equipment evaluated under this project is not listed as one of the categories specified in 40 CFR 52.21 (b)(1)(iii). Therefore the PSD Major Source threshold is 250 tpy for any regulated NSR pollutant.

PSD Major Source Determination (tons/year)						
	NO_2	**VOC**	**SO_2**	**CO**	**PM**	**PM_{10}**
Estimated Facility PE before Project Increase	0.9	4.3	0.0	0.2	0.0	0.0
PSD Major Source Thresholds	250	250	250	250	250	250
PSD Major Source ? (Y/N)	N	N	N	N	N	N

As shown above, the facility is not an existing PSD major source for any regulated NSR pollutant expected to be emitted at this facility.

6. Baseline Emissions (BE)

The BE calculation (in lb/year) is performed pollutant-by-pollutant for each unit within the project to calculate the QNEC, and if applicable, to determine the amount of offsets required.

Pursuant to District Rule 2201, BE = PE1 for:

- Any unit located at a non-Major Source,

- Any Highly-Utilized Emissions Unit, located at a Major Source,
- Any Fully-Offset Emissions Unit, located at a Major Source, or
- Any Clean Emissions Unit, located at a Major Source.

otherwise,

BE = Historic Actual Emissions (HAE), calculated pursuant to District Rule 2201.

As shown in Section VII.C.5 above, the facility is not a Major Source for any pollutant. Therefore BE = PE1.

As calculated in Section VII.C.1 above, PE1 is summarized in the following table:

BE (lb/year)						
	NO_X	SO_X	PM_{10}	$PM_{2.5}$	CO	VOC
S-5836-1-4	0	0	0	0	0	1,892
S-5836-2-3	0	0	61,530	61,530	0	72,188
S-5836-3-5	0	0	0	0	0	14,178
S-5836-4-3	0	0	0	0	0	3,422
S-5836-5-2	0	0	0	0	0	159,628

7. SB 288 Major Modification

SB 288 Major Modification is defined in 40 CFR Part 51.165 as "any physical change in or change in the method of operation of a major stationary source that would result in a significant net emissions increase of any pollutant subject to regulation under the Act."

Since this facility is not a major source for any of the pollutants addressed in this project, this project does not constitute an SB 288 major modification.

8. Federal Major Modification

District Rule 2201 states that a Federal Major Modification is the same as a "Major Modification" as defined in 40 CFR 51.165 and part D of Title I of the CAA.

Since this facility is not a Major Source for any pollutants, this project does not constitute a Federal Major Modification.

9. Rule 2410 – Prevention of Significant Deterioration (PSD) Applicability Determination

Rule 2410 applies to any pollutant regulated under the Clean Air Act, except those for which the District has been classified nonattainment. The pollutants which must be addressed in the PSD applicability determination for sources located in the SJV and which are emitted in this project are: (See 52.21 (b) (23) definition of significant)

- PM
- PM_{10}
- Hydrogen sulfide (H_2S)

- Total reduced sulfur (inlcuding H_2S)
- VOC

I. Project Emissions Increase - New Major Source Determination

The post-project potentials to emit from all new and modified units are compared to the PSD major source thresholds to determine if the project constitutes a new major source subject to PSD requirements.

The facility or the equipment evaluated under this project is not listed as one of the categories specified in 40 CFR 52.21 (b)(1)(i). The PSD Major Source threshold is 250 tpy for any regulated NSR pollutant.

PSD Major Source Determination: Potential to Emit (tons/year)						
	NO_2	VOC	SO_2	CO	PM	PM_{10}
Total PE from New and Modified Units	0.0	3.3	0.0	0.0	0.0	0.0
PSD Major Source threshold	250	250	250	250	250	250
New PSD Major Source?	N	N	N	N	N	N

As shown in the table above, the potential to emit for the project, by itself, does not exceed any PSD major source threshold. Therefore Rule 2410 is not applicable and no further analysis is required.

10. Quarterly Net Emissions Change (QNEC)

The QNEC is calculated solely to establish emissions that are used to complete the District's PAS emissions profile screen. Detailed QNEC calculations are included in Appendix H.

VIII. Compliance Determination

Rule 1070 Inspections

This rule allows the District to perform inspections for the purpose of obtaining information necessary to determine whether air pollution sources are in compliance with applicable rules and regulations. The rule also allows the District to require record keeping, to make inspections and to conduct tests of air pollution sources. The following conditions will be listed on the ATC as a mechanism to ensure compliance:

- {3215} Upon presentation of appropriate credentials, a permittee shall allow an authorized representative of the District to enter the permittee's premises where a permitted source is located or emissions related activity is conducted, or where records must be kept under condition of the permit. [District Rule 1070]
- {3216} Upon presentation of appropriate credentials, a permittee shall allow an authorized representative of the District to have access to and copy, at reasonable times, any records that must be kept under the conditions of the permit. [District Rule 1070]

Rule 2010 Permits Required

The provisions of this rule apply to any person who plans to or does operate, construct, alter, or replace any source operation, which may emit air contaminants or may reduce the emission of air contaminants.

Pursuant to Section 4.0, a written permit shall be obtained from the APCO. No Permit to Operate shall be granted either by the APCO or the Hearing Board for any source operation described in Section 3.0 constructed or installed without authorization as required by Section 3.0 until the information required is presented to the APCO and such source operation is altered, if necessary, and made to conform to the standards set forth in Rule 2070 (Standards for Granting Applications) and elsewhere in these rules and regulations.

The facility has obtained all required Air District permits and complies with the requirements of this rule.

Rule 2201 New and Modified Stationary Source Review Rule

A. Best Available Control Technology (BACT)

1. BACT Applicability

Pursuant to District Rule 2201, Section 4.1, BACT requirements are triggered on a pollutant-by-pollutant basis and on an emissions unit-by-emissions unit basis. Unless specifically exempted by Rule 2201, BACT shall be required for the following actions*:

a. Any new emissions unit with a potential to emit exceeding two pounds per day,
b. The relocation from one Stationary Source to another of an existing emissions unit with a potential to emit exceeding two pounds per day,
c. Modifications to an existing emissions unit with a valid Permit to Operate resulting in an Adjusted Increase in Permitted Emissions (AIPE) exceeding two pounds per day, and/or
d. Any new or modified emissions unit, in a stationary source project, which results in an SB 288 Major Modification or a Federal Major Modification, as defined by the rule.

*Except for CO emissions from a new or modified emissions unit at a Stationary Source with an SSPE2 of less than 200,000 pounds per year of CO.

a. New emissions units – PE > 2 lb/day

The facility has proposed to construct a new 114 stall carousel milking parlor and a new Saudi style barn. As shown in Appendix F, BACT is required for VOC emissions for the milking parlor and VOC, PM_{10}, and NH_3 emissions for the special needs Saudi style barn.

b. Relocation of emissions units – PE > 2 lb/day

As discussed in Section I above, there are no emissions units being relocated from one stationary source to another; therefore BACT is not triggered.

c. Modification of emissions units – AIPE > 2 lb/day

AIPE = PE2 – HAPE

Where,

AIPE = Adjusted Increase in Permitted Emissions, (lb/day)
PE2 = Post-Project Potential to Emit, (lb/day)
HAPE = Historically Adjusted Potential to Emit, (lb/day)

HAPE = PE1 x (EF2/EF1)

Where,

PE1 = The emissions unit's PE prior to modification or relocation, (lb/day)
EF2 = The emissions unit's permitted emission factor for the pollutant after modification or relocation. If EF2 is greater than EF1 then EF2/EF1 shall be set to 1
EF1 = The emissions unit's permitted emission factor for the pollutant before the modification or relocation

AIPE = PE2 – (PE1 * (EF2 / EF1))

The milk parlor permit (S-5836-1), cow housing permit (S-5836-2), liquid manure handling permit (S-5836-3), solid manure handling permit (S-5836-4), and feed storage and handling permit (S-5836-5) are being modified. Therefore, the Adjusted Increase in Permitted Emissions (AIPE) must be calculated.

Based on the AIPE values in Appendix F, BACT is triggered for the following emissions units and pollutants, as shown in the table below.

Permit Unit	Emissions Unit Requiring BACT	BACT Pollutants
Milking Parlor (S-5836-1)	128 Stall Parabone Milking Parlor and the Hospital Milking Parlor	VOC
Cow Housing (S-5836-2)	Corral 38	NH_3
Cow Housing (S-5836-2)	Half Freestall Barns A, B, and C	VOC, PM_{10}, and NH_3
Liquid Manure Handling (S-5836-3)	Lagoons	VOC and NH_3
Liquid Manure Handling (S-5836-3)	Land Application	VOC and NH_3
Solid Manure Handling (S-5836-4)	Solid Manure Storage/Separated Solids Piles	NH_3
Solid Manure Handling (S-5836-4)	Land Application	NH_3
Feed Storage and Handling (S-5836-5)	TMR	VOC

d. SB 288/Federal Major Modification

As discussed in Sections VII.C.7 and VII.C.8 above, this project does not constitute an SB 288 and/or Federal Major Modification for any pollutant. Therefore BACT is not triggered for any pollutant.

2. BACT Guideline

BACT Guideline 5.8.1, applies to the milking parlor. [Milking Parlor] (See Appendix C)

BACT Guideline 5.8.2, applies to the freestall and Saudi style barns in the cow housing operation. [Cow Housing – Freestall and Saudi Style Barns] (See Appendix C)

BACT Guideline 5.8.3, applies to the open corral in the cow housing operation. [Cow Housing – Open Corrals] (See Appendix C)

BACT Guideline 5.8.6, applies to the lagoons in the liquid manure handling system. [Liquid Manure Handling – Lagoon/Storage Pond] (See Appendix C)

BACT Guideline 5.8.7, applies to the liquid/slurry land application in the liquid manure handling system. [Liquid Manure Handling – Liquid/Slurry Land Application] (See Appendix C)

BACT Guideline 5.8.8, applies to storage/separated solids piles in the solid manure handling system. [Solid Manure Handling – Storage/Separated Solids Piles] (See Appendix C)

BACT Guideline 5.8.9, applies to the land application in the solid manure handling system. [Solid Manure Handling – Land Application] (See Appendix C)

BACT Guideline 5.8.11, applies to the feed/TMR in the feed storage and handling operation. [Feed Storage and Handling – Feed/TMR] (See Appendix C)

3. Top-Down BACT Analysis

Per Top-Down BACT Analysis (see Appendix D), BACT is satisfied with the following requirements:

Milking Parlor (S-5836-1-4)

128 stall parabone milking parlor, hospital milking parlors, and the 114 stall carousel milking parlor (VOC)
VOC: 1) Flush/Spray before, after, or during milking each group of cows

The following conditions will be included on the proposed milking parlor ATC to assure compliance with the BACT requirements of this rule:

1) Flush/Spray immediately prior to, immediately after, or during each batch of milking (VOC)

- Permittee shall flush or hose milk parlor immediately prior to, immediately after, or during each milking. [District Rules 2201 and 4570]
- Permittee shall provide verification that milk parlors are flushed or hosed prior to, immediately after, or during each milking. [District Rules 2201 and 4570]

Cow Housing (S-5836-2-3)

Half Freestall Barns A, B, and C and Special Needs Barn (VOC, NH_3, and PM_{10})

VOC:
1) Concrete feed lanes and walkways;
2) Flushing the lanes and walkways for the mature cows (milk and dry cows) four times per day and flushing lanes and walkways for the remaining animals once per day (or for dairies that cannot use a flush system, scraping lanes and walkways for mature cows with an automatic scraper (or equivalent) four times per day and cleaning lanes and walkways for support stock (heifers) at least once per day);
3) Feeding all animals in accordance with National Research Council (NRC) or other District-approved guidelines;
4) Properly sloping exercise pens (minimum of 3% slope where the available space for each animal is 400 square feet or less and minimum of 1.5% where the available space for each animal is more than 400 square feet per animal) or managing corrals to maintain a dry surface;
5) Scraping exercise pens every two weeks using pull-type scraper in the morning hours except when prevented by wet conditions; and
6) Rule 4570 Measures

NH_3:
1) Concrete feed lanes and walkways;
2) Flushing the lanes and walkways for the mature cows (milk and dry cows) four times per day and flushing lanes and walkways for the remaining animals once per day (or for dairies that cannot use a flush system, scraping lanes and walkways for mature cows with an automatic scraper (or equivalent) four times per day and cleaning lanes and walkways for support stock (heifers) at least once per day);
3) Feeding all animals in accordance with National Research Council (NRC) or other District-approved guidelines;
4) Properly sloping exercise pens (minimum of 3% slope where the available space for each animal is 400 square feet or less and minimum of 1.5% where the available space for each animal is more than 400 square feet per animal) or managing corrals to maintain a dry surface; and
5) Scraping exercise pens every two weeks using pull-type scraper in the morning hours except when prevented by wet conditions;

PM_{10}:
1) Concrete feed lanes and walkways; and
2) Scraping exercise pens every two weeks using pull-type scraper in the morning hours except when prevented by wet conditions.

The following conditions will be included on the proposed cow housing ATC to assure compliance with the BACT requirements of this rule:

1) Concrete Feedlanes and Walkways (VOC and NH_3 and PM_{10})

- Permittee shall pave feedlanes, where present, for a width of at least 8 feet along the feedlane fence for mature cows and at least 6 feet along the feedlane fence for support stock. [District Rules 2201 and 4570]

2) Frequent Flushing of Feed Lanes and Walkways (VOC and NH_3)

- For Half Freestall Barns A, B, and C, Special Needs Barn, and Open Corral 38, the permittee shall flush or scrape the feed lanes and walkways at least four times per day for mature cows and at least once per day for support stock. [District Rules 2201 and 4570]
- For Half Freestall Barns A, B, and C, Special Needs Barn, and Open Corral 38, the permittee shall keep records or maintain an operating plan that requires the feed lanes and walkways for mature cows to be flushed or scraped at least four times per day and the feed lanes and walkways for support stock to be flushed or scraped at least once per day. [District Rules 2201 and 4570]

3) Cows Fed in Accordance with NRC Guidelines (VOC and NH_3)

- The permittee shall feed all animals according to National Research Council (NRC) guidelines. [District Rules 2201 and 4570]
- The permittee shall maintain records of feed content, formulation, and quantity of feed additive utilized, to demonstrate compliance with National Research Council (NRC) guidelines. Records such as feed company guaranteed analyses (feed tags), ration sheets, or feed purchase records may be used to meet this requirement. [District Rules 2201 and 4570]

4) Properly sloping exercise pens (minimum of 3% slope where the available space for each animal is 400 square feet or less and minimum of 1.5% where the available space for each animal is more than 400 square feet per animal) or managing corrals to maintain a dry surface (VOC and NH_3)

- Permittee shall implement at least one of the following exercise pen/corral mitigation measures: 1) slope the surface of the exercise pens and corrals at least 3% where the available space for each animal is 400 square feet or less and shall slope the surface of the corrals at least 1.5% where the available space for each animal is more than 400 square feet per animal; 2) maintain exercise pens and corrals to ensure proper drainage preventing water from standing more than forty-eight hours; or 3) harrow, rake, or scrape exercise pens and corrals sufficiently to maintain a dry surface except during periods of rainy weather. [District Rules 2201 and 4570]
- Permittee shall either 1) maintain sufficient records to demonstrate that exercise pens and corrals are maintained to ensure proper drainage preventing water from standing for more than forty-eight hours or 2) maintain records of dates exercise pens and corrals are groomed (i.e. harrowed, raked, or scraped, etc.). [District Rules 2201 and 4570]

5) Scraping exercise pens every two weeks using pull-type scraper in the morning hours except when prevented by wet conditions (VOC and NH_3 and PM_{10})

- For Half Freestall Barns A, B, and C, Special Needs Barn, and Open Corral 38, the permittee shall scrape the exercise pens and the open corral at least once every two weeks using a pull-type scraper in the morning hours except when prevented by wet conditions. [District Rule 2201]
- For Half Freestall Barns A, B, and C, Special Needs Barn, and Open Corral 38, the permittee shall maintain sufficient records to demonstrate that the exercise pens and open corral are scraped at least once every two weeks, except when prevented by wet conditions. [District Rule 2201]

6) District Rule 4570 Mitigation Measures (VOC)

- Permittee shall flush or scrape freestall lanes immediately prior to, immediately after or during each milking. [District Rules 2201 and 4570]
- Permittee shall maintain records sufficient to demonstrate that freestall lanes are flushed or scraped immediately prior to, immediately after or during each milking. [District Rules 2201 and 4570]
- Permittee shall remove manure that is not dry from individual cow freestall beds or shall rake, harrow, scrape, or grade freestall bedding at least once every seven (7) days. [District Rules 2201 and 4570]
- Permittee shall record either of the following: 1) the dates when manure that is not dry is removed from individual cow freestall beds or 2) the dates when the freestall bedding is raked, harrowed, scraped, or graded. [District Rules 2201 and 4570]

Open Corral 38 (NH_3)

NH_3:
1) Concrete feed lanes and walkways;
2) Flushing the lanes and walkways for the mature cows (milk and dry cows) four times per day and flushing lanes and walkways for the remaining animals once per day (or for dairies that cannot use a flush system, Scraping lanes and walkways for mature cows with an automatic scraper (or equivalent) four times per day and cleaning lanes and walkways for support stock (heifers) at least once per day);
3) Feeding all animals in accordance with National Research Council (NRC) or other District-approved guidelines;
4) Properly sloping corrals (minimum of 3% slope where the available space for each animal is 400 square feet or less and minimum of 1.5% where the available space for each animal is more than 400 square feet per animal) or managing corrals to maintain a dry surface; and
5) Scraping corrals every two weeks using pull-type scraper in the morning hours except when prevented by wet conditions;

The following conditions will be included on the proposed cow housing ATC to assure compliance with the BACT requirements of this rule:

1) Concrete Feedlanes and Walkways (NH_3)

- Permittee shall pave feedlanes, where present, for a width of at least 8 feet along the feedlane fence for mature cows and at least 6 feet along the feedlane fence for support

stock. [District Rules 2201 and 4570]

2) Frequent Flushing of Feed Lanes and Walkways (NH_3)

- For Half Freestall Barns A, B, and C, Special Needs Barn, and Open Corral 38, the permittee shall flush or scrape the feed lanes and walkways at least four times per day for mature cows and at least once per day for support stock. [District Rules 2201 and 4570]
- For Half Freestall Barns A, B, and C, Special Needs Barn, and Open Corral 38, the permittee shall keep records or maintain an operating plan that requires the feed lanes and walkways for mature cows to be flushed or scraped at least four times per day and the feed lanes and walkways for support stock to be flushed or scraped at least once per day. [District Rules 2201 and 4570]

3) Cows Fed in Accordance with NRC Guidelines (NH_3)

- The permittee shall feed all animals according to National Research Council (NRC) guidelines. [District Rules 2201 and 4570]
- The permittee shall maintain records of feed content, formulation, and quantity of feed additive utilized, to demonstrate compliance with National Research Council (NRC) guidelines. Records such as feed company guaranteed analyses (feed tags), ration sheets, or feed purchase records may be used to meet this requirement. [District Rules 2201 and 4570]

4) Properly sloping corrals (minimum of 3% slope where the available space for each animal is 400 square feet or less and minimum of 1.5% where the available space for each animal is more than 400 square feet per animal) or managing corrals to maintain a dry surface (NH_3)

- Permittee shall implement at least one of the following exercise pen/corral mitigation measures: 1) slope the surface of the exercise pens and corrals at least 3% where the available space for each animal is 400 square feet or less and shall slope the surface of the corrals at least 1.5% where the available space for each animal is more than 400 square feet per animal; 2) maintain exercise pens and corrals to ensure proper drainage preventing water from standing more than forty-eight hours; or 3) harrow, rake, or scrape exercise pens and corrals sufficiently to maintain a dry surface except during periods of rainy weather. [District Rules 2201 and 4570]
- Permittee shall either 1) maintain sufficient records to demonstrate that exercise pens and corrals are maintained to ensure proper drainage preventing water from standing for more than forty-eight hours or 2) maintain records of dates exercise pens and corrals are groomed (i.e. harrowed, raked, or scraped, etc.). [District Rules 2201 and 4570]

5) Scraping corrals and exercise pens every two weeks using pull-type scraper in the morning hours except when prevented by wet conditions (NH_3)

- For Half Freestall Barns A, B, and C, Special Needs Barn, and Open Corral 38, the permittee shall scrape the exercise pens and the open corral at least once every two weeks using a pull-type scraper in the morning hours except when prevented by wet conditions. [District Rule 2201]

- For Half Freestall Barns A, B, and C, Special Needs Barn, and Open Corral 38, the permittee shall maintain sufficient records to demonstrate that the exercise pens and open corral are scraped at least once every two weeks, except when prevented by wet conditions. [District Rule 2201]

Liquid Manure Handling System (S-5836-3-5)

Lagoon (VOC)
VOC: 1) Covered lagoon digester vented to a control device with minimum 95% control.

The following condition will be included on the proposed liquid manure handling ATC to assure compliance with the BACT requirements of this rule:

1) Covered lagoon digester (VOC)

- The covered anaerobic digester lagoon shall be configured and operated in accordance with National Resource Conservation Service (NRCS) California Field Office Technical Guide Code 366: Anaerobic Digester or other standards approved by the District. [District Rules 2201 and 4570]
- All liquid manure shall be treated in the covered anaerobic digester lagoon. [District Rules 2201 and 4570]

Lagoon (NH_3)
NH_3: 1) All animals fed in accordance with National Research Council (NRC) or other District-approved guidelines.

The following condition will be included on the proposed liquid manure handling ATC to assure compliance with the BACT requirements of this rule:

1) Cows Fed in Accordance with NRC Guidelines (NH_3)

- Permittee shall feed all animals according to National Research Council (NRC) guidelines. [District Rules 2201 and 4570]
- Permittee shall maintain records of feed content, formulation, and quantity of feed additive utilized, to demonstrate compliance with National Research Council (NRC) guidelines. Records such as feed company guaranteed analyses (feed tags), ration sheets, or feed purchase records may be used to meet this requirement. [District Rules 2201 and 4570]

Land Application (VOC)
VOC:1) Irrigation of crops using liquid manure from a holding/storage pond after being treated in a covered lagoon/digester (VOC)

The following condition will be included on the proposed liquid manure handling ATC to assure compliance with the BACT requirements of this rule:

1) Irrigation of crops using treated liquid manure from a covered lagoon/digester (VOC)

- Permittee shall only apply liquid manure that has been treated in the covered anaerobic digester lagoon. [District Rules 2201 and 4570]
- Permittee shall maintain records that only liquid manure treated in the covered anaerobic digester lagoon is applied to fields. [District Rules 2201 and 4570]

Land Application (NH_3)

NH_3: 1) All animals fed in accordance with National Research Council (NRC) or other District-approved guidelines.

The following condition will be included on the proposed liquid manure handling ATC to assure compliance with the BACT requirements of this rule:

1) Cows Fed in Accordance with NRC Guidelines (NH_3)

- Permittee shall feed all animals according to National Research Council (NRC) guidelines. [District Rules 2201 and 4570]
- Permittee shall maintain records of feed content, formulation, and quantity of feed additive utilized, to demonstrate compliance with National Research Council (NRC) guidelines. Records such as feed company guaranteed analyses (feed tags), ration sheets, or feed purchase records may be used to meet this requirement. [District Rules 2201 and 4570]

Solid Manure Handling System (S-5836-4-3)

Solid Manure – Solid Manure Storage/Separated Solids Piles (NH_3)

NH_3: 1) All animals fed in accordance with National Research Council (NRC) or other District-approved guidelines.

The following condition will be included on the proposed solid manure handling ATC to assure compliance with the BACT requirements of this rule:

1) Cows Fed in Accordance with NRC Guidelines (NH_3)

- Permittee shall feed all animals according to National Research Council (NRC) guidelines. [District Rules 2201 and 4570]
- Permittee shall maintain records of feed content, formulation, and quantity of feed additive utilized, to demonstrate compliance with National Research Council (NRC) guidelines. Records such as feed company guaranteed analyses (feed tags), ration sheets, or feed purchase records may be used to meet this requirement. [District Rules 2201 and 4570]

Land Application (NH_3)

NH_3: 1) Rapid incorporation of solid manure into the soil after land application, and all animals fed in accordance with NRCS or other District-approved guidelines.

The following conditions will be included on the proposed solid manure handling ATC to assure compliance with the BACT requirements of this rule:

1) Rapid incorporation of solid manure into the soil after land application, and all animals feed in accordance with NRCS or other District approved guidelines (NH_3)

- Solid manure applied to fields shall be incorporated into the soil within two hours after application. [District Rules 2201 and 4570]
- Permittee shall maintain records to demonstrate that all solid manure has been incorporated within two hours of land application. [District Rules 2201 and 4570]
- Permittee shall feed all animals according to National Research Council (NRC) guidelines. [District Rules 2201 and 4570]
- Permittee shall maintain records of feed content, formulation, and quantity of feed additive utilized, to demonstrate compliance with National Research Council (NRC) guidelines. Records such as feed company guaranteed analyses (feed tags), ration sheets, or feed purchase records may be used to meet this requirement. [District Rules 2201 and 4570]

Feed Storage and Handling (S-5836-5-2)

TMR (VOC)
VOC: 1) Implement District Rule 4570 management practices for feed.

The following conditions will be included on the proposed feed storage and handling ATC to assure compliance with the BACT requirements of this rule:

1) District Rule 4570 measures (VOC)

- Permittee shall feed all animals according to National Research Council (NRC) guidelines. [District Rules 2201 and 4570]
- Permittee shall maintain records of feed content, formulation, and quantity of feed additive utilized, to demonstrate compliance with National Research Council (NRC) guidelines. Records such as feed company guaranteed analyses (feed tags), ration sheets, or feed purchase records may be used to meet this requirement. [District Rules 2201 and 4570]
- Permittee shall push feed so that it is within three feet of feedlane fence within two hours of putting out the feed or use a feed trough or other feeding structure designed to maintain feed within reach of the animals. [District Rules 2201 and 4570]
- Permittee shall maintain an operating plan or record that requires feed to be pushed within three feet of feedlane fence within two hours of putting out the feed, or use of a feed trough or other structure designed to maintain feed within reach of the animals. [District Rules 2201 and 4570]
- Permittee shall begin feeding total mixed rations within two hours of grinding and mixing rations. [District Rules 2201 and 4570]
- Permittee shall maintain an operating plan or record of when feeding of total mixed rations began within two hours of grinding and mixing rations. [District Rules 2201 and 4570]
- Permittee shall store grain in a weatherproof storage structure or under a weatherproof covering from October through May. [District Rules 2201 and 4570]
- Permittee shall maintain records demonstrating grain is/was stored in a weatherproof storage structure or under a weatherproof covering from October through May. [District Rules 2201 and 4570]
- Permittee shall remove uneaten wet feed from feed bunks within twenty-four (24) hours after the end of a rain event. [District Rules 2201 and 4570]

- Permittee shall maintain records demonstrating that uneaten wet feed was removed from feed bunks within twenty-four (24) hours after the end of a rain event. [District Rules 2201 and 4570]

B. Offsets

Offset requirements shall be triggered on a pollutant by pollutant basis and shall be required if the SSPE2 equals to or exceeds the offset threshold levels in Table 4-1 of Rule 2201. As shown in the table below, the SSPE2 is compared to the offset thresholds. VOC and PM_{10} emissions exceed the offset threshold; however, per Section 4.6.9, offsets are not required for agricultural sources unless they are a major source. As determined in Section VII.C.5 above, this facility is not a major source for any pollutant. Therefore, offsets are not required.

Offset Determination (lb/year)					
	NO_X	**SO_X**	**PM_{10}**	**CO**	**VOC**
SSPE2	1,825	1	41,243	393	285,746
Offset Thresholds	20,000	54,750	29,200	200,000	20,000
Above Offset Threshold	No	No	Yes	No	Yes
Offsets Triggered	No	No	No	No	No

C. Public Notification

1. Applicability

Pursuant to District Rule 2201, Section 5.4, public noticing is required for:

a. New Major Sources, Federal Major Modifications, and SB 288 Major Modifications,
b. Any new emissions unit with a Potential to Emit greater than 100 pounds during any one day for any one pollutant,
c. Any project which results in the offset thresholds being surpassed,
d. Any project with an SSIPE of greater than 20,000 lb/year for any pollutant, and/or
e. Any project which results in a Title V significant permit modification

a. New Major Sources, Federal Major Modifications, and SB 288 Major Modifications

New Major Sources are new facilities, which are also Major Sources. As shown in Section VII.C.5 above, the SSPE2 is not greater than the Major Source threshold for any pollutant. Therefore, public noticing is not required for this project for new Major Source purposes.

As demonstrated in Sections VII.C.7 and VII.C.8, this project does not constitute an SB 288 or Federal Major Modification; therefore, public noticing for SB 288 or Federal Major Modification purposes is not required.

b. PE > 100 lb/day

Applications which include a new emissions unit with a PE greater than 100 pounds during any one day for any pollutant will trigger public noticing requirements. As shown in Appendix F, this project does not include a new emissions unit (such as the

proposed milking parlor and Saudi style barn) which has daily emissions greater than 100 lb/day for any pollutant, therefore public noticing for PE > 100 lb/day purposes is not required.

c. Offset Threshold

Public notification is required if the pre-project Stationary Source Potential to Emit (SSPE1) is increased to a level exceeding the offset threshold levels. The following table compares the SSPE1 with the SSPE2 in order to determine if any offset thresholds have been surpassed with this project.

Offset Thresholds				
Pollutant	**SSPE1 (lb/year)**	**SSPE2 (lb/year)**	**Offset Threshold**	**Public Notice Required?**
NO_X	1,825	1,825	20,000 lb/year	No
SO_X	1	1	54,750 lb/year	No
PM_{10}	61,659	41,243	29,200 lb/year	No
CO	393	393	200,000 lb/year	No
VOC	254,870	285,746	20,000 lb/year	No

As detailed above, there were no thresholds surpassed with this project; therefore public noticing is not required for offset purposes.

d. SSIPE > 20,000 lb/year

Public notification is required for any permitting action that results in a SSIPE of more than 20,000 lb/year of any affected pollutant. According to District policy, the SSIPE = SSPE2 – SSPE1. The SSIPE is compared to the SSIPE Public Notice thresholds in the following table.

SSIPE Public Notice Thresholds					
Pollutant	**SSPE2 (lb/year)**	**SSPE1 (lb/year)**	**SSIPE (lb/year)**	**SSIPE Public Notice Threshold**	**Public Notice Required?**
NO_x	1,825	1,825	0	20,000 lb/year	No
SO_x	1	1	0	20,000 lb/year	No
PM_{10}	41,243	61,659	-20,416	20,000 lb/year	No
CO	393	393	0	20,000 lb/year	No
VOC	285,746	254,870	30,876	20,000 lb/year	Yes
NH_3	250,770	203,723	47,047	20,000 lb/year	Yes
H_2S	1,025	1,025	0	20,000 lb/year	No

As demonstrated above, the SSIPEs for VOC and NH_3 are greater than 20,000 lb/year; therefore public noticing for SSIPE purposes is required.

e. Title V Significant Permit Modification

Since this facility does not have a Title V operating permit, this change is not a Title V significant Modification, and therefore public noticing is not required.

2. Public Notice Action

As discussed above, public noticing is required for this project for VOC and NH_3 emissions increasing in excess of 20,000 lb/year. Therefore, public notice documents will be submitted to the California Air Resources Board (CARB) and a public notice will be electronically published on the District's website prior to the issuance of the ATC for this equipment.

D. Daily Emission Limits (DELs)

DELs and other enforceable conditions are required by Rule 2201 to restrict a unit's maximum daily emissions, to a level at or below the emissions associated with the maximum design capacity. The DEL must be contained in the latest ATC and contained in or enforced by the latest PTO and enforceable, in a practicable manner, on a daily basis. DELs are also required to enforce the applicability of BACT.

DELs and other enforceable conditions are required by Rule 2201 to restrict a unit's maximum daily emissions, to a level at or below the emissions associated with the maximum design capacity. The DEL must be contained in the latest ATC and contained in or enforced by the latest PTO and enforceable, in a practicable manner, on a daily basis. DELs are also required to enforce the applicability of BACT.

For dairies, the DEL is satisfied based on the number and types of cows at the dairy. The number and types of cows are listed in the permit equipment description for the milking parlor and cow housing permits.

S-5836-1-4 (Milking Parlor)

- Permittee shall flush or hose milk parlor immediately prior to, immediately after, or during each milking. [District Rules 2201 and 4570]

S-5836-2-3 (Cow Housing)

- Permittee shall 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. [District Rules 2201 and 4570]
- Permittee shall flush or scrape freestall lanes immediately prior to, immediately after or during each milking. [District Rules 2201 and 4570]
- For Half Freestall Barns A, B, and C, Special Needs Barn, and Open Corral 38, the permittee shall flush or scrape the freestall/Saudi style barn and open corral feed lanes and walkways at least four times per day for mature cows and at least once per day for support stock. [District Rules 2201 and 4570]
- The permittee shall feed all animals according to National Research Council (NRC) guidelines. [District Rules 2201 and 4570]
- Permittee shall remove manure that is not dry from individual cow freestall beds or shall rake, harrow, scrape, or grade freestall bedding at least once every seven (7) days. [District Rules 2201 and 4570]
- Permittee shall inspect water pipes and troughs and repair leaks at least once every seven (7) days. [District Rules 2201 and 4570]
- For Half Freestall Barns A, B, and C, Special Needs Barn, and Open Corral 38, the permittee shall scrape the exercise pens and the open corral at least once every two

weeks using a pull-type scraper in the morning hours except when prevented by wet conditions. [District Rule 2201]

- Permittee shall clean manure from corrals at least four (4) times per year with at least sixty (60) days between each cleaning, or permittee shall clean corrals at least once between April and July and at least once between September and December. [District Rules 2201 and 4570]
- Permittee shall implement at least one of the following exercise pen/corral mitigation measures: 1) slope the surface of the exercise pens and corrals at least 3% where the available space for each animal is 400 square feet or less and shall slope the surface of the corrals at least 1.5% where the available space for each animal is more than 400 square feet per animal; 2) maintain exercise pens and corrals to ensure proper drainage preventing water from standing more than forty-eight hours; or 3) harrow, rake, or scrape exercise pens and corrals sufficiently to maintain a dry surface except during periods of rainy weather. [District Rules 2201 and 4570]
- Permittee shall scrape or flush concrete lanes in corrals at least once every day for mature cows and every seven (7) days for support stock. [District Rules 2201 and 4570]
- Shade structures shall be installed in any of the following ways: 1) constructed with a light permeable roofing material; 2) uphill of any slope in the corral; 3) installed so that the structure has a North/South orientation. OR Permittee shall clean manure from under corral shades at least once every fourteen (14) days, when weather permits access into the corral. [District Rules 2201 and 4570]
- Permittee shall manage corrals such that the manure depth in the corral does not exceed twelve (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. However, permittee must resume management of the manure depth of 12 inches or lower immediately upon the corral becoming accessible. [District Rules 2201 and 4570]
- The number of calves housed at this facility may exceed the limit for calves in this permit provided that the total combined value for support stock and calves is not exceeded and there is no increase in the number of corrals or the total area of corrals. [District Rule 2201]

S-5836-3-5 (Liquid Manure Handling)

- Permittee shall remove solids with a solid separator system, prior to the manure entering the lagoon. [District Rules 2201 and 4570]
- Permittee shall not allow liquid manure to stand in the fields for more than twenty-four (24) hours after irrigation. [District Rules 2201 and 4570]
- Permittee shall feed all animals according to National Research Council (NRC) guidelines. [District Rules 2201 and 4570]
- The covered anaerobic digester lagoon shall be configured and operated in accordance with National Resource Conservation Service (NRCS) California Field Office Technical Guide Code 366: Anaerobic Digester or other standards approved by the District. [District Rules 2201 and 4570]
- All liquid manure shall be treated in the covered anaerobic digester lagoon. [District Rules 2201 and 4570]
- Permittee shall only apply liquid manure that has been treated in the covered anaerobic digester lagoon. [District Rules 2201 and 4570]

S-5836-4-3 (Solid Manure Handling)

- Permittee shall feed all animals according to National Research Council (NRC) guidelines. [District Rules 2201 and 4570]
- Within seventy two (72) hours of removal of solid manure from housing, permittee shall either 1) remove dry manure from the facility, or 2) 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 twenty-four (24) hours per event. [District Rules 2201 and 4570]
- Solid manure applied to fields shall be incorporated into the soil within two hours after application. [District Rules 2201 and 4570]

S-5836-5-2 (Feed Storage and Handling)

- Permittee shall feed all animals according to National Research Council (NRC) guidelines. [District Rules 2201 and 4570]
- Permittee shall push feed so that it is within three feet of feedlane fence within two hours of putting out the feed or use a feed trough or other feeding structure designed to maintain feed within reach of the animals. [District Rules 2201 and 4570]
- Permittee shall begin feeding total mixed rations within two hours of grinding and mixing rations. [District Rules 2201 and 4570]
- Permittee shall store grain in a weatherproof storage structure or under a weatherproof covering from October through May. [District Rules 2201 and 4570]
- Permittee shall remove uneaten wet feed from feed bunks within twenty-four (24) hours after the end of a rain event. [District Rules 2201 and 4570]
- For bagged silage/feedstuff, permittee shall utilize a sealed feed storage system (e.g., ag bag). [District Rules 2201 and 4570]
- Permittee shall cover all silage piles, except for the area where feed is being removed from the pile, with a plastic tarp that is at least five (5) mils (0.005 inches) thick, 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. Silage piles shall be covered within seventy-two (72) hours of last delivery of material to the pile. Sheets of material used to cover silage shall overlap so that silage is not exposed where the sheets meet. [District Rules 2201 and 4570]
- Permittee shall select and implement one of the following mitigation measures for building each silage pile at the facility: Option 1) build the silage pile 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 7.11 of District Rule 4570; Option 2) Adjust filling parameters when creating the silage pile to achieve an average bulk density of at least 44 lb/cu ft for corn silage and at least 40 lb/cu ft for other silage types as determined using a District-approved spreadsheet; or Option 3) build silage piles using crops harvested with the applicable minimum moisture content, maximum Theoretical Length of Chop (TLC), and roller opening identified in District Rule 4570, Table 4.1, 1.d and manage silage material delivery such that the thickness of the layer of un-compacted material delivered on top of the pile is no more than six (6) inches. Records of the option chosen as a mitigation measure for building each silage pile shall be maintained. [District Rules 2201 and 4570]
- For each silage pile that Option 3 (Moisture, TLC, Roller Opening, & Material Delivery) is chosen as a mitigation measure for building the pile, the permittee shall harvest corn used

for the pile at an average moisture content of at least 65% and harvest other silage crops for the pile at an average moisture content of at least 60%. [District Rules 2201 and 4570]

- For each silage pile that Option 3 (Moisture, TLC, Roller Opening, & Material Delivery) is chosen as a mitigation measure for building the pile, the permittee shall adjust setting of equipment used to harvest crops for the pile to incorporate the following parameters for Theoretical Length of Chop (TLC) and roller opening, as applicable: 1) Corn with no processing: TLC not exceeding 1/2 inch, 2) Processed Corn: TLC not exceeding 3/4 inch and roller opening of 1-4 mm, 3) Alfalfa/Grass: TLC not exceeding 1.0 inch, 4) Other silage crops: TLC not exceeding 1/2 inch. [District Rules 2201 and 4570]
- For each silage pile that Option 3 (Moisture, TLC, Roller Opening, & Material Delivery) is chosen as a mitigation measure for building the pile, the permittee shall manage silage material delivery such that the thickness of the layer of un-compacted material delivered on top of the pile is no more than six (6) inches. [District Rules 2201 and 4570]
- Permittee shall select and implement at least two of the following mitigation measures for management of silage piles at the facility: Option 1) manage silage piles such that only one silage pile has an uncovered face and the total exposed surface area is less than 2,150 square feet, or manage multiple uncovered silage piles such that the total exposed surface area of all uncovered silage piles is less than 4,300 square feet; Option 2) use a shaver/facer to remove silage from the silage pile, or shall use another method to maintain a smooth vertical surface on the working face of the silage pile; or Option 3) inoculate silage with homolactic lactic acid bacteria in accordance with manufacturer recommendations to achieve a concentration of at least 100,000 colony forming units per gram of wet forage, apply propionic acid, benzoic acid, sorbic acid, sodium benzoate, or potassium sorbate at the rate specified by the manufacturer to reduce yeast counts when forming silage piles, or apply other additives at 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. Records of the options chosen for managing each silage pile shall be maintained. [District Rules 2201 and 4570]

E. Compliance Assurance

1. Source Testing

Pursuant to District Policy APR 1705, source testing is not required to demonstrate compliance with Rule 2201.

2. Monitoring

No monitoring is required to demonstrate compliance with Rule 2201.

3. Recordkeeping

S-5836-1-4 (Cow Milking)

- Permittee shall provide verification that milk parlors are flushed or hosed prior to, immediately after, or during each milking. [District Rules 2201 and 4570]
- Permittee shall keep and maintain all records for a minimum of five (5) years and shall make records available to the APCO and EPA upon request. [District Rules 2201 and 4570]

S-5836-2-3 (Cow Housing)

- Permittee shall maintain records sufficient to demonstrate that freestall lanes are flushed or scraped immediately prior to, immediately after or during each milking. [District Rules 2201 and 4570]
- For Half Freestall Barns A, B, and C, Special Needs Barn, and Open Corral 38, the permittee shall keep records or maintain an operating plan that requires the feed lanes and walkways for mature cows to be flushed or scraped at least four times per day and the feed lanes and walkways for support stock to be flushed or scraped at least once per day. [District Rules 2201 and 4570]
- The permittee shall maintain records of feed content, formulation, and quantity of feed additive utilized, to demonstrate compliance with National Research Council (NRC) guidelines. Records such as feed company guaranteed analyses (feed tags), ration sheets, or feed purchase records may be used to meet this requirement. [District Rules 2201 and 4570]
- Permittee shall record either of the following: 1) the dates when manure that is not dry is removed from individual cow freestall beds or 2) the dates when the freestall bedding is raked, harrowed, scraped, or graded. [District Rules 2201 and 4570]
- Permittee shall maintain records demonstrating that water pipes and troughs are inspected and leaks are repaired at least once every seven (7) days. [District Rules 2201 and 4570]
- For Half Freestall Barns A, B, and C, Special Needs Barn, and Open Corral 38, the permittee shall maintain sufficient records to demonstrate that the exercise pens and open corral are scraped at least once every two weeks, except when prevented by wet conditions. [District Rule 2201]
- Permittee shall demonstrate that manure from corrals are cleaned at least four (4) times per year with at least sixty (60) days between each cleaning or demonstrate that corrals are cleaned at least once between April and July and at least once between September and December. [District Rules 2201 and 4570]
- Permittee shall either 1) maintain sufficient records to demonstrate that exercise pens and corrals are maintained to ensure proper drainage preventing water from standing for more than forty-eight hours or 2) maintain records of dates exercise pens and corrals are groomed (i.e. harrowed, raked, or scraped, etc.). [District Rules 2201 and 4570]
- Permittee shall maintain records demonstrating that concrete lanes in corrals are scraped or flushed at least once every day for mature cows and at least once every seven (7) days for support stock. [District Rules 2201 and 4570]
- If permittee has selected to comply using shades constructed with a light permeable roofing material, then permittee shall maintain records, such as design specifications, demonstrating that the shade structures are equipped with such roofing material or if permittee has selected to comply by cleaning the manure from under the corral shades, then permittee shall maintain records demonstrating that manure is cleaned from under the shades at least once every fourteen (14) days, as long as weather permits access to corrals. [District Rules 2201 and 4570]
- Permittee shall measure and document the depth of manure in the corrals at least once every ninety (90) days. [District Rules 2201 and 4570]
- Permittee shall maintain a record of the number of animals of each species and production group at the facility and shall maintain quarterly records of any changes to this information. [District Rules 2201 and 4570]

- Permittee shall keep and maintain all records for a minimum of five (5) years and shall make records available to the APCO and EPA upon request. [District Rules 2201 and 4570]

S-5836-3-5 (Liquid Manure Handling)

- Permittee shall maintain records to demonstrate liquid manure did not stand in the fields for more than twenty-four (24) hours after irrigation. [District Rules 2201 and 4570]
- Permittee shall maintain records of feed content, formulation, and quantity of feed additive utilized, to demonstrate compliance with National Research Council (NRC) guidelines. Records such as feed company guaranteed analyses (feed tags), ration sheets, or feed purchase records may be used to meet this requirement. [District Rules 2201 and 4570]
- Permittee shall maintain records that only liquid manure treated in the covered anaerobic digester lagoon is applied to fields. [District Rules 2201 and 4570]
- Permittee shall keep and maintain all records for a minimum of five (5) years and shall make records available to the APCO and EPA upon request. [District Rules 2201 and 4570]

S-5836-4-3 (Solid Manure Handling)

- Permittee shall keep records of dates when manure is removed from the facility or permittee shall maintain records to demonstrate that dry manure piles outside the pens are covered with a weatherproof covering from October through May. [District Rules 2201 and 4570]
- If weatherproof coverings are used, permittee shall maintain records, such as manufacturer warranties or other documentation, demonstrating that the weatherproof covering over dry manure are installed, used, and maintained in accordance with manufacturer recommendations and applicable standards listed in NRCS Field Office Technical Guide Code 313 or 367, or any other applicable standard approved by the APCO, ARB, and EPA. [District Rules 2201 and 4570]
- Permittee shall maintain records to demonstrate that all solid manure has been incorporated within two hours of land application. [District Rules 2201 and 4570]
- Permittee shall keep and maintain all records for a minimum of five (5) years and shall make records available to the APCO and EPA upon request. [District Rules 2201 and 4570]

S-5836-5-2 (Feed Storage and Handling)

- Permittee shall maintain records of feed content, formulation, and quantity of feed additive utilized, to demonstrate compliance with National Research Council (NRC) guidelines. Records such as feed company guaranteed analyses (feed tags), ration sheets, or feed purchase records may be used to meet this requirement. [District Rules 2201 and 4570]
- Permittee shall maintain an operating plan or record that requires feed to be pushed within three feet of feedlane fence within two hours of putting out the feed, or use of a feed trough or other structure designed to maintain feed within reach of the animals. [District Rules 2201 and 4570]

- Permittee shall maintain an operating plan or record of when feeding of total mixed rations began within two hours of grinding and mixing rations. [District Rules 2201 and 4570]
- Permittee shall maintain records demonstrating grain is/was stored in a weatherproof storage structure or under a weatherproof covering from October through May. [District Rules 2201 and 4570]
- Permittee shall maintain records demonstrating that uneaten wet feed was removed from feed bunks within twenty-four (24) hours after the end of a rain event. [District Rules 2201 and 4570]
- Permittee shall maintain records of the thickness and type of cover used to cover each silage pile. Permittee shall also maintain records of the date of the last delivery of material to each silage pile and the date each pile is covered. [District Rules 2201 and 4570]
- For each silage pile that Option 1 (Measured Bulk Density) is chosen as a mitigation measure for building the pile, records of the measured bulk density shall be maintained. [District Rules 2201 and 4570]
- For each silage pile that Option 2 (Bulk Density Determined by Spreadsheet) is chosen as a mitigation measure for building the pile, records of the filling parameters entered into the District-approved spreadsheet to determine the bulk density shall be maintained. [District Rules 2201 and 4570]
- For each silage pile that Option 3 (Moisture, TLC, Roller Opening, & Material Delivery) is chosen as a mitigation measure for building the pile, records of the average percent moisture of crops harvested for silage shall be maintained. [District Rules 2201 and 4570]
- For each silage pile that Option 3 (Moisture, TLC, Roller Opening, & Material Delivery) is chosen as a mitigation measure for building the pile, records that equipment used to harvest crops for the pile was set to the required TLC and roller opening for the type of crop harvested shall be maintained. [District Rules 2201 and 4570]
- For each silage pile that Option 3 (Moisture, TLC, Roller Opening, & Material Delivery) is chosen as a mitigation measure for building the pile, the permittee shall maintain a plan that requires that the thickness of the layer of un-compacted material delivered on top of the pile is no more than six (6) inches. [District Rules 2201 and 4570]
- If Option 1 (Limiting Exposed Area of Silage) is chosen as a mitigation measure for managing silage piles, the permittee shall calculate and record the maximum (largest part of pile) total exposed area of each silage pile. Records of the maximum calculated area shall be maintained. [District Rules 2201 and 4570]
- For each silage pile that Option 2 (Shaver/Facer or Smooth Face) is chosen as a mitigation measure for managing the pile, the permittee shall maintain records that a shaver/facer was used to remove silage from the pile or shall visually inspect the pile at least daily to verify that the working face was smooth and maintain records of the visual inspections. [District Rules 2201 and 4570]
- For each silage pile that Option 3 (Silage Additives) is chosen as a mitigation measure for managing the pile, records shall be maintained of the type additive (e.g. inoculants, preservative, other District & EPA-approved additive), the quantity of the additive applied to the pile, and a copy of the manufacturer's instructions for application of the additive. [District Rules 2201 and 4570]

- Permittee shall keep and maintain all records for a minimum of five (5) years and shall make records available to the APCO and EPA upon request. [District Rules 2201 and 4570]

4. Reporting

No reporting is required to demonstrate compliance with Rule 2201.

F. Ambient Air Quality Analysis (AAQA)

Section 4.14 of District Rule 2201 requires that an AAQA be conducted for the purpose of determining whether a new or modified Stationary Source will cause or make worse a violation of an air quality standard. The District's Technical Services Division conducted the required analysis. Refer to Appendix E of this document for the AAQA summary sheet.

The proposed location is in an attainment area for NO_X, CO, and SO_X. As shown by the AAQA summary sheet the proposed equipment will not cause a violation of an air quality standard for NO_X, CO, or SO_X.

The proposed location is in a non-attainment area for the state's PM_{10} as well as federal and state $PM_{2.5}$ thresholds. As shown by the AAQA summary sheet the proposed equipment will not cause a violation of an air quality standard for PM_{10} and $PM_{2.5}$.

Rule 2410 Prevention of Significant Deterioration

As shown in Section VII.C.9 above, this project does not result in a new PSD major source or PSD major modification. No further discussion is required.

Rule 2520 Federally Mandated Operating Permits

Since this facility's potential emissions do not exceed any major source thresholds of Rule 2201, this facility is not a major source, and Rule 2520 does not apply.

Rule 4001 New Source Performance Standards (NSPS)

This rule incorporates NSPS from Part 60, Chapter 1, Title 40, Code of Federal Regulations (CFR); and applies to all new sources of air pollution and modifications of existing sources of air pollution listed in 40 CFR Part 60. However, no subparts of 40 CFR Part 60 apply to confined animal facilities.

Rule 4002 National Emission Standards for Hazardous Air Pollutants (NESHAPs)

This rule incorporates NESHAPs from Part 61, Chapter I, Subchapter C, Title 40, CFR and the NESHAPs from Part 63, Chapter I, Subchapter C, Title 40, CFR; and applies to all sources of hazardous air pollution listed in 40 CFR Part 61 or 40 CFR Part 63. However, no subparts of 40 CFR Part 61 or 40 CFR Part 63 apply to confined animal facilities.

Rule 4101 Visible Emissions

Rule 4101 states that no air contaminant shall be discharged into the atmosphere for a period or periods aggregating more than three minutes in any one hour which is as dark as, or darker than, Ringelmann 1 or 20% opacity.

Pursuant to section 4.12, emissions subject to or specifically exempt from Regulation VIII (Fugitive PM_{10} Prohibitions) are exempt from Rule 4101.
Pursuant to District Rule 8011, section 4.12, on-field agricultural sources are exempt from the requirements of Regulation VIII.

On-field agricultural sources are defined in Rule 8011, section 3.35 as the following:

- Activities conducted solely for the purpose of preparing land for the growing of crops or ***the raising of fowl or animals***, such as brush or timber clearing, grubbing, scraping, ground excavation, land leveling, grading, turning under stalks, disking, or tilling;

Therefore, activities conducted solely for the purpose of raising fowl or animals are exempt from the requirements of Regulation VIII and Rule 4101.

Rule 4102 Nuisance

Rule 4102 prohibits discharge of air contaminants which could cause injury, detriment, nuisance or annoyance to the public. Public nuisance conditions are not expected as a result of these operations, provided the equipment is well maintained. Therefore, compliance with this rule is expected.

California Health & Safety Code 41700 (Health Risk Assessment)

District Policy APR 1905 – *Risk Management Policy for Permitting New and Modified Sources* specifies that for an increase in emissions associated with a proposed new source or modification, the District perform an analysis to determine the possible impact to the nearest resident or worksite.

An HRA is not required for a project with a total facility prioritization score of less than one. According to the Technical Services Memo for this project (Appendix E), the total facility prioritization score including this project was greater than one. Therefore, an HRA was required to determine the short-term acute and long-term chronic exposure from this project. The cancer risk for this project is shown below:

HRA Summary		
Unit	**Cancer Risk**	**T-BACT Required**
S-5836-1-4	0.0254 per million	No
S-5836-2-3	1.12 per million	No
S-5836-3-5	0.0 per million	No
S-5836-4-3	0.0 per million	No
S-5836-5-2	N/A*	No

*There is no risk associated with this unit as the District does not have an approved toxic speciation profile for dairy feed and storage handling operations.

Discussion of T-BACT

BACT for toxic emission control (T-BACT) is required if the cancer risk exceeds one in one million. As demonstrated above, T-BACT is not required for this project because the HRA indicates that the risk is not above the District's thresholds for triggering T-BACT requirements; therefore, compliance with the District's Risk Management Policy is expected.

District policy APR 1905 also specifies that the increase in emissions associated with a proposed new source or modification not have acute or chronic indices, or a cancer risk greater than the District's significance levels (i.e. acute and/or chronic indices greater than 1 and a cancer risk greater than 20 in a million). As outlined by the HRA Summary in Appendix E of this report, the emissions increases for this project was determined to be less than significant.

Rule 4570 Confined Animal Facilities (CAF)

This rule applies to Confined Animal Facilities (CAF) located within the San Joaquin Valley Air Basin. The purpose of this rule is to limit emissions of Volatile Organic Compounds (VOC) from Confined Animal Facilities (CAF).

PTOs incorporating Phase II mitigation measures of District Rule 4570, as evaluated under District project S-1111407, have already been issued to this facility. Under this project, the applicant has not proposed any changes to the mitigation measures currently practiced at both dairies; no further discussion is required.

California Health & Safety Code 42301.6 (School Notice)

The District has verified that this site is not located within 1,000 feet of a school. Therefore, pursuant to California Health and Safety Code 42301.6, a school notice is not required.

California Environmental Quality Act (CEQA)

CEQA requires each public agency to adopt objectives, criteria, and specific procedures consistent with CEQA Statutes and the CEQA Guidelines for administering its responsibilities under CEQA, including the orderly evaluation of projects and preparation of environmental documents. The District adopted its *Environmental Review Guidelines* (ERG) in 2001. The basic purposes of CEQA are to:

- Inform governmental decision-makers and the public about the potential, significant environmental effects of proposed activities;
- Identify the ways that environmental damage can be avoided or significantly reduced;
- Prevent significant, avoidable damage to the environment by requiring changes in projects through the use of alternatives or mitigation measures when the governmental agency finds the changes to be feasible; and
- Disclose to the public the reasons why a governmental agency approved the project in the manner the agency chose if significant environmental effects are involved.

Greenhouse Gas (GHG) Significance Determination

District is a Responsible Agency
It is determined that another agency has prepared an environmental review document for the project. The District is a Responsible Agency for the project because of its discretionary approval power over the project via its Permits Rule (Rule 2010) and New Source Review Rule (Rule 2201), (CEQA Guidelines §15381). As a Responsible Agency, the District is limited to mitigating or avoiding impacts for which it has statutory authority. The District does not have statutory authority for regulating greenhouse gas emissions. The District has determined that the applicant is responsible for implementing greenhouse gas mitigation measures, if any, imposed by the Lead Agency.

District CEQA Findings

Tulare County is the Agency which has the principal responsibility for approving this project. Consistent with procedures established within the Final Environmental Impact Report (FEIR) for the Animal Confinement Facility Plan (AFCP) and Dairy Climate Action Plan, the Tulare County Planning Agency has approved the project through its Minor Modification process.

The District is a Responsible Agency for the project because of its discretionary approval power over the project via its Permits Rule (Rule 2010) and New Source Review Rule (Rule 2201), (CCR §15381). Rule 2010 requires operators of emission sources to obtain an Authority to Construct (ATC) and Permit to Operate (PTO) from the District. Rule 2201 requires that new and modified stationary sources reduce their emissions using Best Available Control Technology (BACT) and offsetting emissions when above certain thresholds.

The project is located in Tulare County and is thus, subject to the Tulare County Planning Agency Minor Modification Process. In 2017, Tulare County amended their General Plan to include the AFCP and Dairy Comate Action Plan (General Plan Amendment No. GPA 10-002) and implemented Zoning Ordinance Amendment No. PAC 17-040. The AFCP was developed by the Tulare County Planning Agency as a comprehensive set of goals, objectives, policies, and standards to guide development, expansion, and operation of milk cow (bovine) dairies and dairy replacement stock facilities within Tulare County. The AFCP establishes a written process by which subsequent dairy projects involving site-specific operations can be evaluated to determine whether the environmental effects of the operation were covered in the FEIR.

The County determined that the AFCP would have a significant adverse environmental impact. In certifying the Final EIR, the County determined that after implementing all feasible mitigation measures certain impacts on air quality would be significant and unavoidable. The County approved the FEIR and adopted a Statement of Overriding Considerations (SOC), in accordance with CEQA Guidelines §15093(a), stating that economic, legal, social, technological, and other benefits resulting from the project will outweigh the unavoidable adverse environmental effects. The FEIR for the AFCP and Dairy Climate Action Plan (State Clearinghouse Number 2011111078) was certified by the Tulare County Board of Supervisors on December 12, 2017.

The County determined this project to be exempt from CEQA according to CEQA Guidelines §15301. Consistent with CEQA Guidelines §15062 a Notice of Exemption was prepared and adopted by the County.

The District has prepared an Authority to Construct Application Review, this document, and has determined that compliance with District rules and required mitigation measures will reduce project specific stationary source emissions to the extent feasible. Before reaching a final decision to approve the project and issue ATCs the District will prepare findings and file a Notice of Determination consistent with CEQA Guidelines §15096 requirements.

Indemnification Agreement/Letter of Credit Determination

According to District Policy APR 2010 (CEQA Implementation Policy), when the District is the Lead or Responsible Agency for CEQA purposes, an indemnification agreement and/or a letter of credit may be required. The decision to require an indemnity agreement and/or a letter of credit is based on a case-by-case analysis of a particular project's potential for litigation risk, which in turn may be based on a project's potential to generate public concern, its potential for significant impacts, and the project proponent's ability to pay for the costs of litigation without a letter of credit, among other factors.

The criteria pollutant emissions and toxic air contaminant emissions associated with the proposed project are not significant, and there is minimal potential for public concern for this particular operation. Therefore, an Indemnification Agreement and/or a Letter of Credit will not be required for this project in the absence of expressed public concern.

IX. Recommendation

Compliance with all applicable rules and regulations is expected. Pending a successful NSR Public Noticing period, issue ATCs S-5836-1-4, '-2-3, '-3-5, '-4-3, and '-5-2 subject to the permit conditions on the attached draft ATCs in Appendix A.

X. Billing Information

Annual Permit Fees			
Permit Number	**Fee Schedule**	**Fee Description**	**Annual Fee**
S-5836-1-4	3020-06	Cow Milking Operation	$128
S-5836-2-3	3020-06	Cow Housing	$128
S-5836-3-5	3020-06	Liquid Manure Handling	$128
S-5836-4-3	3020-06	Solid Manure Handling	$128
S-5836-5-2	3020-06	Feed Storage and Handling	$128

Appendixes

A: Draft ATCs
B: Current PTOs
C: BACT Guideline
D: BACT Analysis
E: RMR/AAQA Summary
F: SSPE Calculations
G: Quarterly Net Emissions Change (QNEC)
H: Covered Anaerobic Digester Lagoon Design Check
I: Pre- and Post-Project Site Maps

APPENDIX A
Draft ATCs

San Joaquin Valley
Air Pollution Control District

AUTHORITY TO CONSTRUCT

DRAFT

PERMIT NO: S-5836-1-4

ISSUANCE DATE: DRAFT

LEGAL OWNER OR OPERATOR: DOUBLE "J" DAIRY
MAILING ADDRESS: 6656 AVENUE 328
VISALIA, CA 93291

LOCATION: 6656 AVENUE 328
VISALIA, CA 93291

EQUIPMENT DESCRIPTION:
MODIFICATION OF 4,730 COW MILKING OPERATION WITH ONE 128 STALL PARABONE MILKING PARLOR AND ONE 12 STALL HOSPITAL MILKING PARLOR: INCREASE MILK COW HERD SIZE TO 7,140 AND CONSTRUCT A 114 STALL CAROUSEL MILKING PARLOR

CONDITIONS

1. {3215} Upon presentation of appropriate credentials, a permittee shall allow an authorized representative of the District to enter the permittee's premises where a permitted source is located or emissions related activity is conducted, or where records must be kept under condition of the permit. [District Rule 1070]
2. {3216} Upon presentation of appropriate credentials, a permittee shall allow an authorized representative of the District to have access to and copy, at reasonable times, any records that must be kept under the conditions of the permit. [District Rule 1070]
3. {3658} This permit does not authorize the violation of any conditions established for this facility in the Conditional Use Permit (CUP), Special Use Permit (SUP), Site Approval, Site Plan Review (SPR), or other approval documents issued by a local, state, or federal agency. [Public Resources Code 21000-21177: California Environmental Quality Act]
4. {4452} If a licensed veterinarian or a certified nutritionist determines that any VOC mitigation measure will be required to be suspended as a detriment to animal health or necessary for the animal to molt, the owners/operators must notify the District in writing within forty-eight (48) hours of the determination including the duration and the specific health condition requiring the mitigation measure to be suspended. If the situation is expected to exist longer than a thirty-day (30) period, the owner/operator shall submit a new emission mitigation plan designating a mitigation measure to be implemented in lieu of the suspended mitigation measure. [District Rule 4570]

CONDITIONS CONTINUE ON NEXT PAGE

YOU MUST NOTIFY THE DISTRICT COMPLIANCE DIVISION AT (661) 392-5500 WHEN CONSTRUCTION IS COMPLETED AND PRIOR TO OPERATING THE EQUIPMENT OR MODIFICATIONS AUTHORIZED BY THIS AUTHORITY TO CONSTRUCT. This is NOT a PERMIT TO OPERATE. Approval or denial of a PERMIT TO OPERATE will be made after an inspection to verify that the equipment has been constructed in accordance with the approved plans, specifications and conditions of this Authority to Construct, and to determine if the equipment can be operated in compliance with all Rules and Regulations of the San Joaquin Valley Unified Air Pollution Control District. Unless construction has commenced pursuant to Rule 2050, this Authority to Construct shall expire and application shall be cancelled two years from the date of issuance. The applicant is responsible for complying with all laws, ordinances and regulations of all other governmental agencies which may pertain to the above equipment.

Samir Sheikh, Executive Director / APCO

DRAFT

Arnaud Marjollet, Director of Permit Services

S-5836-1-4 : Sep 11 2019 10:18AM – YOSHIMUJ : Joint Inspection NOT Required

5. Permittee shall flush or hose milk parlor immediately prior to, immediately after, or during each milking. [District Rules 2201 and 4570]
6. Permittee shall provide verification that milk parlors are flushed or hosed prior to, immediately after, or during each milking. [District Rules 2201 and 4570]
7. Permittee shall keep and maintain all records for a minimum of five (5) years and shall make records available to the APCO and EPA upon request. [Districts 2201 and Rule 4570]

San Joaquin Valley
Air Pollution Control District

AUTHORITY TO CONSTRUCT

PERMIT NO: S-5836-2-3

ISSUANCE DATE: DRAFT

LEGAL OWNER OR OPERATOR: DOUBLE "J" DAIRY
MAILING ADDRESS: 6656 AVENUE 328
VISALIA, CA 93291

LOCATION: 6656 AVENUE 328
VISALIA, CA 93291

EQUIPMENT DESCRIPTION:
MODIFICATION OF COW HOUSING - 4,730 MILK COWS NOT TO EXCEED A COMBINED TOTAL OF 5,610 MATURE COWS (MILK AND DRY COWS); 5,490 SUPPORT STOCK (HEIFERS, CALVES, AND BULLS); 2 FREESTALL BARNS AND 2 HALF FREESTALL BARNS WITH FLUSH/SCRAPE SYSTEM: INCREASE MILK COW HERD SIZE TO 7,140; INCREASE MATURE COW HERD SIZE TO 8,130 (MILK AND DRY COWS); DECREASE SUPPORT STOCK TO 4,540 (HEIFERS, CALVES, AND BULLS) WHICH INCLUDES 800 CALVES HOUSED IN EXISTING ONGROUND CALF HUTCHES; CONSTRUCT 3 HALF FREESTALL BARNS OVER EXISTING OPEN CORRALS; CONSTRUCT 3 SAUDI STYLE BARNS OVER EXISTING OPEN CORRALS; CONSTRUCT A SPECIAL NEEDS SAUDI STYLE BARN

CONDITIONS

1. {3215} Upon presentation of appropriate credentials, a permittee shall allow an authorized representative of the District to enter the permittee's premises where a permitted source is located or emissions related activity is conducted, or where records must be kept under condition of the permit. [District Rule 1070]
2. {3216} Upon presentation of appropriate credentials, a permittee shall allow an authorized representative of the District to have access to and copy, at reasonable times, any records that must be kept under the conditions of the permit. [District Rule 1070]
3. {3658} This permit does not authorize the violation of any conditions established for this facility in the Conditional Use Permit (CUP), Special Use Permit (SUP), Site Approval, Site Plan Review (SPR), or other approval documents issued by a local, state, or federal agency. [Public Resources Code 21000-21177: California Environmental Quality Act]

CONDITIONS CONTINUE ON NEXT PAGE

YOU MUST NOTIFY THE DISTRICT COMPLIANCE DIVISION AT (661) 392-5500 WHEN CONSTRUCTION IS COMPLETED AND PRIOR TO OPERATING THE EQUIPMENT OR MODIFICATIONS AUTHORIZED BY THIS AUTHORITY TO CONSTRUCT. This is NOT a PERMIT TO OPERATE. Approval or denial of a PERMIT TO OPERATE will be made after an inspection to verify that the equipment has been constructed in accordance with the approved plans, specifications and conditions of this Authority to Construct, and to determine if the equipment can be operated in compliance with all Rules and Regulations of the San Joaquin Valley Unified Air Pollution Control District. Unless construction has commenced pursuant to Rule 2050, this Authority to Construct shall expire and application shall be cancelled two years from the date of issuance. The applicant is responsible for complying with all laws, ordinances and regulations of all other governmental agencies which may pertain to the above equipment.

Samir Sheikh, Executive Director / APCO

Arnaud Marjollet, Director of Permit Services
S-5836-2-3 : Sep 12 2019 3:21PM – YOSHIMUJ : Joint Inspection NOT Required

4. {4452} If a licensed veterinarian or a certified nutritionist determines that any VOC mitigation measure will be required to be suspended as a detriment to animal health or necessary for the animal to molt, the owners/operators must notify the District in writing within forty-eight (48) hours of the determination including the duration and the specific health condition requiring the mitigation measure to be suspended. If the situation is expected to exist longer than a thirty-day (30) period, the owner/operator shall submit a new emission mitigation plan designating a mitigation measure to be implemented in lieu of the suspended mitigation measure. [District Rule 4570]
5. Permittee shall 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. [District Rules 2201 and 4570]
6. Permittee shall flush or scrape freestall lanes immediately prior to, immediately after or during each milking. [District Rules 2201 and 4570]
7. Permittee shall maintain records sufficient to demonstrate that freestall lanes are flushed or scraped immediately prior to, immediately after or during each milking. [District Rules 2201 and 4570]
8. For Half Freestall Barns A, B, and C, Special Needs Barn, and Open Corral 38, the permittee shall flush or scrape the feed lanes and walkways at least four times per day for mature cows and at least once per day for support stock. [District Rules 2201 and 4570]
9. For Half Freestall Barns A, B, and C, Special Needs Barn, and Open Corral 38, the permittee shall keep records or maintain an operating plan that requires the feed lanes and walkways for mature cows to be flushed or scraped at least four times per day and the feed lanes and walkways for support stock to be flushed or scraped at least once per day. [District Rules 2201 and 4570]
10. The permittee shall feed all animals according to National Research Council (NRC) guidelines. [District Rules 2201 and 4570]
11. The permittee shall maintain records of feed content, formulation, and quantity of feed additive utilized, to demonstrate compliance with National Research Council (NRC) guidelines. Records such as feed company guaranteed analyses (feed tags), ration sheets, or feed purchase records may be used to meet this requirement. [District Rules 2201 and 4570]
12. Permittee shall remove manure that is not dry from individual cow freestall beds or shall rake, harrow, scrape, or grade freestall bedding at least once every seven (7) days. [District Rules 2201 and 4570]
13. Permittee shall record either of the following: 1) the dates when manure that is not dry is removed from individual cow freestall beds or 2) the dates when the freestall bedding is raked, harrowed, scraped, or graded. [District Rules 2201 and 4570]
14. Permittee shall inspect water pipes and troughs and repair leaks at least once every seven (7) days. [District Rules 2201 and 4570]
15. Permittee shall maintain records demonstrating that water pipes and troughs are inspected and leaks are repaired at least once every seven (7) days. [District Rules 2201 and 4570]
16. For Half Freestall Barns A, B, and C, Special Needs Barn, and Open Corral 38, the permittee shall scrape the exercise pens and the open corral at least once every two weeks using a pull-type scraper in the morning hours except when prevented by wet conditions. [District Rule 2201]
17. For Half Freestall Barns A, B, and C, Special Needs Barn, and Open Corral 38, the permittee shall maintain sufficient records to demonstrate that the exercise pens and open corral are scraped at least once every two weeks, except when prevented by wet conditions. [District Rule 2201]
18. Permittee shall clean manure from corrals at least four (4) times per year with at least sixty (60) days between each cleaning, or permittee shall clean corrals at least once between April and July and at least once between September and December. [District Rules 2201 and 4570]
19. Permittee shall demonstrate that manure from corrals are cleaned at least four (4) times per year with at least sixty (60) days between each cleaning or demonstrate that corrals are cleaned at least once between April and July and at least once between September and December. [District Rules 2201 and 4570]

CONDITIONS CONTINUE ON NEXT PAGE

20. Permittee shall implement at least one of the following exercise pen/corral mitigation measures: 1) slope the surface of the exercise pens and corrals at least 3% where the available space for each animal is 400 square feet or less and shall slope the surface of the corrals at least 1.5% where the available space for each animal is more than 400 square feet per animal; 2) maintain exercise pens and corrals to ensure proper drainage preventing water from standing more than forty-eight hours; or 3) harrow, rake, or scrape exercise pens and corrals sufficiently to maintain a dry surface except during periods of rainy weather. [District Rules 2201 and 4570]
21. Permittee shall either 1) maintain sufficient records to demonstrate that exercise pens and corrals are maintained to ensure proper drainage preventing water from standing for more than forty-eight hours or 2) maintain records of dates exercise pens and corrals are groomed (i.e. harrowed, raked, or scraped, etc.). [District Rules 2201 and 4570]
22. Permittee shall scrape or flush concrete lanes in corrals at least once every day for mature cows and every seven (7) days for support stock. [District Rules 2201 and 4570]
23. Permittee shall maintain records demonstrating that concrete lanes in corrals are scraped or flushed at least once every day for mature cows and at least once every seven (7) days for support stock. [District Rules 2201 and 4570]
24. Shade structures shall be installed in any of the following ways: 1) constructed with a light permeable roofing material; 2) uphill of any slope in the corral; 3) installed so that the structure has a North/South orientation. OR Permittee shall clean manure from under corral shades at least once every fourteen (14) days, when weather permits access into the corral. [District Rules 2201 and 4570]
25. If permittee has selected to comply using shades constructed with a light permeable roofing material, then permittee shall maintain records, such as design specifications, demonstrating that the shade structures are equipped with such roofing material or if permittee has selected to comply by cleaning the manure from under the corral shades, then permittee shall maintain records demonstrating that manure is cleaned from under the shades at least once every fourteen (14) days, as long as weather permits access to corrals. [District Rules 2201 and 4570]
26. Permittee shall manage corrals such that the manure depth in the corral does not exceed twelve (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. However, permittee must resume management of the manure depth of 12 inches or lower immediately upon the corral becoming accessible. [District Rules 2201 and 4570]
27. Permittee shall measure and document the depth of manure in the corrals at least once every ninety (90) days. [District Rules 2201 and 4570]
28. Permittee shall maintain a record of the number of animals of each species and production group at the facility and shall maintain quarterly records of any changes to this information. [District Rules 2201 and 4570]
29. The number of calves housed at this facility may exceed the limit for calves in this permit provided that the total combined value for support stock and calves is not exceeded and there is no increase in the number of corrals or the total area of corrals. [District Rule 2201]
30. Permittee shall keep and maintain all records for a minimum of five (5) years and shall make records available to the APCO and EPA upon request. [District Rules 2201 and 4570]

San Joaquin Valley
Air Pollution Control District

AUTHORITY TO CONSTRUCT

DRAFT

PERMIT NO: S-5836-3-5

ISSUANCE DATE: DRAFT

LEGAL OWNER OR OPERATOR: DOUBLE "J" DAIRY
MAILING ADDRESS: 6656 AVENUE 328
VISALIA, CA 93291

LOCATION: 6656 AVENUE 328
VISALIA, CA 93291

EQUIPMENT DESCRIPTION:
MODIFICATION OF LIQUID MANURE HANDLING SYSTEM CONSISTING OF SETTLING BASIN(S); MECHANICAL SEPARATOR(S); ONE LAGOON AND ONE COVERED DIGESTER LAGOON PERMITTED AS S-9125-2-0; MANURE IS LAND APPLIED THROUGH FLOOD AND FURROW IRRIGATION: ALLOW FOR INCREASE IN LIQUID MANURE DUE TO HERD INCREASE AUTHORIZED BY AUTHORITY TO CONSTRUCT S-5836-2-3

CONDITIONS

1. Authority to Construct (ATC) S-5836-3-4 shall be implemented concurrently, or prior to the modifications authorized by this ATC. [District Rule 2201]
2. {3215} Upon presentation of appropriate credentials, a permittee shall allow an authorized representative of the District to enter the permittee's premises where a permitted source is located or emissions related activity is conducted, or where records must be kept under condition of the permit. [District Rule 1070]
3. {3216} Upon presentation of appropriate credentials, a permittee shall allow an authorized representative of the District to have access to and copy, at reasonable times, any records that must be kept under the conditions of the permit. [District Rule 1070]
4. {4452} If a licensed veterinarian or a certified nutritionist determines that any VOC mitigation measure will be required to be suspended as a detriment to animal health or necessary for the animal to molt, the owners/operators must notify the District in writing within forty-eight (48) hours of the determination including the duration and the specific health condition requiring the mitigation measure to be suspended. If the situation is expected to exist longer than a thirty-day (30) period, the owner/operator shall submit a new emission mitigation plan designating a mitigation measure to be implemented in lieu of the suspended mitigation measure. [District Rule 4570]
5. Permittee shall remove solids with a solid separator system, prior to the manure entering the lagoon. [District Rules 2201 and 4570]

CONDITIONS CONTINUE ON NEXT PAGE

YOU MUST NOTIFY THE DISTRICT COMPLIANCE DIVISION AT (661) 392-5500 WHEN CONSTRUCTION IS COMPLETED AND PRIOR TO OPERATING THE EQUIPMENT OR MODIFICATIONS AUTHORIZED BY THIS AUTHORITY TO CONSTRUCT. This is NOT a PERMIT TO OPERATE. Approval or denial of a PERMIT TO OPERATE will be made after an inspection to verify that the equipment has been constructed in accordance with the approved plans, specifications and conditions of this Authority to Construct, and to determine if the equipment can be operated in compliance with all Rules and Regulations of the San Joaquin Valley Unified Air Pollution Control District. Unless construction has commenced pursuant to Rule 2050, this Authority to Construct shall expire and application shall be cancelled two years from the date of issuance. The applicant is responsible for complying with all laws, ordinances and regulations of all other governmental agencies which may pertain to the above equipment.

Samir Sheikh, Executive Director / APCO

DRAFT

Arnaud Marjollet, Director of Permit Services

S-5836-3-5 : Sep 12 2019 11:12AM – YOSHIMUJ : Joint Inspection NOT Required

6. Permittee shall not allow liquid manure to stand in the fields for more than twenty-four (24) hours after irrigation. [District Rules 2201 and 4570]
7. Permittee shall maintain records to demonstrate liquid manure did not stand in the fields for more than twenty-four (24) hours after irrigation. [District Rules 2201 and 4570]
8. Permittee shall feed all animals according to National Research Council (NRC) guidelines. [District Rules 2201 and 4570]
9. Permittee shall maintain records of feed content, formulation, and quantity of feed additive utilized, to demonstrate compliance with National Research Council (NRC) guidelines. Records such as feed company guaranteed analyses (feed tags), ration sheets, or feed purchase records may be used to meet this requirement. [District Rules 2201 and 4570]
10. The covered anaerobic digester lagoon shall be configured and operated in accordance with National Resource Conservation Service (NRCS) California Field Office Technical Guide Code 366: Anaerobic Digester or other standards approved by the District. [District Rules 2201 and 4570]
11. All liquid manure shall be treated in the covered anaerobic digester lagoon. [District Rules 2201 and 4570]
12. Permittee shall only apply liquid manure that has been treated in the covered anaerobic digester lagoon. [District Rules 2201 and 4570]
13. Permittee shall maintain records that only liquid manure treated in the covered anaerobic digester lagoon is applied to fields. [District Rules 2201 and 4570]
14. {3658} This permit does not authorize the violation of any conditions established for this facility in the Conditional Use Permit (CUP), Special Use Permit (SUP), Site Approval, Site Plan Review (SPR), or other approval documents issued by a local, state, or federal agency. [Public Resources Code 21000-21177: California Environmental Quality Act]
15. Permittee shall keep and maintain all records for a minimum of five (5) years and shall make records available to the APCO and EPA upon request. [District Rules 2201 and 4570]

San Joaquin Valley
Air Pollution Control District

AUTHORITY TO CONSTRUCT

PERMIT NO: S-5836-4-3

ISSUANCE DATE: DRAFT

LEGAL OWNER OR OPERATOR: DOUBLE "J" DAIRY
MAILING ADDRESS: 6656 AVENUE 328
VISALIA, CA 93291

LOCATION: 6656 AVENUE 328
VISALIA, CA 93291

EQUIPMENT DESCRIPTION:
MODIFICATION OF SOLID MANURE HANDLING CONSISTING OF MANURE STOCK PILES; SOLID MANURE APPLICATION TO LAND: ALLOW INCREASE IN MANURE DUE TO INCREASE IN HERD SIZE AUTHORIZED BY AUTHORITY TO CONSTRUCT S-5836-2-3

CONDITIONS

1. {3215} Upon presentation of appropriate credentials, a permittee shall allow an authorized representative of the District to enter the permittee's premises where a permitted source is located or emissions related activity is conducted, or where records must be kept under condition of the permit. [District Rule 1070]
2. {3216} Upon presentation of appropriate credentials, a permittee shall allow an authorized representative of the District to have access to and copy, at reasonable times, any records that must be kept under the conditions of the permit. [District Rule 1070]
3. {3658} This permit does not authorize the violation of any conditions established for this facility in the Conditional Use Permit (CUP), Special Use Permit (SUP), Site Approval, Site Plan Review (SPR), or other approval documents issued by a local, state, or federal agency. [Public Resources Code 21000-21177: California Environmental Quality Act]
4. {4452} If a licensed veterinarian or a certified nutritionist determines that any VOC mitigation measure will be required to be suspended as a detriment to animal health or necessary for the animal to molt, the owners/operators must notify the District in writing within forty-eight (48) hours of the determination including the duration and the specific health condition requiring the mitigation measure to be suspended. If the situation is expected to exist longer than a thirty-day (30) period, the owner/operator shall submit a new emission mitigation plan designating a mitigation measure to be implemented in lieu of the suspended mitigation measure. [District Rule 4570]

CONDITIONS CONTINUE ON NEXT PAGE

YOU MUST NOTIFY THE DISTRICT COMPLIANCE DIVISION AT (661) 392-5500 WHEN CONSTRUCTION IS COMPLETED AND PRIOR TO OPERATING THE EQUIPMENT OR MODIFICATIONS AUTHORIZED BY THIS AUTHORITY TO CONSTRUCT. This is NOT a PERMIT TO OPERATE. Approval or denial of a PERMIT TO OPERATE will be made after an inspection to verify that the equipment has been constructed in accordance with the approved plans, specifications and conditions of this Authority to Construct, and to determine if the equipment can be operated in compliance with all Rules and Regulations of the San Joaquin Valley Unified Air Pollution Control District. Unless construction has commenced pursuant to Rule 2050, this Authority to Construct shall expire and application shall be cancelled two years from the date of issuance. The applicant is responsible for complying with all laws, ordinances and regulations of all other governmental agencies which may pertain to the above equipment.

Samir Sheikh, Executive Director / APCO

Arnaud Marjollet, Director of Permit Services

S-5836-4-3 : Sep 12 2019 3:13PM – YOSHIMUJ : Joint Inspection NOT Required

5. Permittee shall feed all animals according to National Research Council (NRC) guidelines. [District Rules 2201and 4570]
6. Permittee shall maintain records of feed content, formulation, and quantity of feed additive utilized, to demonstrate compliance with National Research Council (NRC) guidelines. Records such as feed company guaranteed analyses (feed tags), ration sheets, or feed purchase records may be used to meet this requirement. [District Rules 2201 and 4570]
7. Within seventy two (72) hours of removal of solid manure from housing, permittee shall either 1) remove dry manure from the facility, or 2) 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 twenty-four (24) hours per event. [District Rules 2201 and 4570]
8. Permittee shall keep records of dates when manure is removed from the facility or permittee shall maintain records to demonstrate that dry manure piles outside the pens are covered with a weatherproof covering from October through May. [District Rules 2201and 4570]
9. If weatherproof coverings are used, permittee shall maintain records, such as manufacturer warranties or other documentation, demonstrating that the weatherproof covering over dry manure are installed, used, and maintained in accordance with manufacturer recommendations and applicable standards listed in NRCS Field Office Technical Guide Code 313 or 367, or any other applicable standard approved by the APCO, ARB, and EPA. [District Rules 2201 and 4570]
10. Solid manure applied to fields shall be incorporated into the soil within two hours after application. [District Rules 2201 and 4570]
11. Permittee shall maintain records to demonstrate that all solid manure has been incorporated within two hours of land application. [District Rules 2201 and 4570]
12. Permittee shall keep and maintain all records for a minimum of five (5) years and shall make records available to the APCO and EPA upon request. [District Rules 2201 and 4570]

San Joaquin Valley
Air Pollution Control District

AUTHORITY TO CONSTRUCT

DRAFT

PERMIT NO: S-5836-5-2

ISSUANCE DATE: DRAFT

LEGAL OWNER OR OPERATOR: DOUBLE "J" DAIRY
MAILING ADDRESS: 6656 AVENUE 328
VISALIA, CA 93291

LOCATION: 6656 AVENUE 328
VISALIA, CA 93291

EQUIPMENT DESCRIPTION:
MODIFICATION OF FEED STORAGE AND HANDLING CONSISTING OF COMMODITY BARN(S), SILAGE PILE(S), AND TOTAL MIXED RATION FEEDING: INCREASE IN FEED AND TMR DUE TO INCREASE IN HERD SIZE AUTHORIZED BY AUTHORITY TO CONSTRUCT S-5836-2-3

CONDITIONS

1. {3215} Upon presentation of appropriate credentials, a permittee shall allow an authorized representative of the District to enter the permittee's premises where a permitted source is located or emissions related activity is conducted, or where records must be kept under condition of the permit. [District Rule 1070]
2. {3216} Upon presentation of appropriate credentials, a permittee shall allow an authorized representative of the District to have access to and copy, at reasonable times, any records that must be kept under the conditions of the permit. [District Rule 1070]
3. {3658} This permit does not authorize the violation of any conditions established for this facility in the Conditional Use Permit (CUP), Special Use Permit (SUP), Site Approval, Site Plan Review (SPR), or other approval documents issued by a local, state, or federal agency. [Public Resources Code 21000-21177: California Environmental Quality Act]
4. {4452} If a licensed veterinarian or a certified nutritionist determines that any VOC mitigation measure will be required to be suspended as a detriment to animal health or necessary for the animal to molt, the owners/operators must notify the District in writing within forty-eight (48) hours of the determination including the duration and the specific health condition requiring the mitigation measure to be suspended. If the situation is expected to exist longer than a thirty-day (30) period, the owner/operator shall submit a new emission mitigation plan designating a mitigation measure to be implemented in lieu of the suspended mitigation measure. [District Rule 4570]

CONDITIONS CONTINUE ON NEXT PAGE

YOU MUST NOTIFY THE DISTRICT COMPLIANCE DIVISION AT (661) 392-5500 WHEN CONSTRUCTION IS COMPLETED AND PRIOR TO OPERATING THE EQUIPMENT OR MODIFICATIONS AUTHORIZED BY THIS AUTHORITY TO CONSTRUCT. This is NOT a PERMIT TO OPERATE. Approval or denial of a PERMIT TO OPERATE will be made after an inspection to verify that the equipment has been constructed in accordance with the approved plans, specifications and conditions of this Authority to Construct, and to determine if the equipment can be operated in compliance with all Rules and Regulations of the San Joaquin Valley Unified Air Pollution Control District. Unless construction has commenced pursuant to Rule 2050, this Authority to Construct shall expire and application shall be cancelled two years from the date of issuance. The applicant is responsible for complying with all laws, ordinances and regulations of all other governmental agencies which may pertain to the above equipment.

Samir Sheikh, Executive Director / APCO

DRAFT

Arnaud Marjollet, Director of Permit Services

S-5836-5-2 : Sep 11 2019 10:19AM – YOSHIMUJ : Joint Inspection NOT Required

5. Permittee shall feed all animals according to National Research Council (NRC) guidelines. [District Rules 2201 and 4570]
6. Permittee shall maintain records of feed content, formulation, and quantity of feed additive utilized, to demonstrate compliance with National Research Council (NRC) guidelines. Records such as feed company guaranteed analyses (feed tags), ration sheets, or feed purchase records may be used to meet this requirement. [District Rules 2201 and 4570]
7. Permittee shall push feed so that it is within three feet of feedlane fence within two hours of putting out the feed or use a feed trough or other feeding structure designed to maintain feed within reach of the animals. [District Rules 2201 and 4570]
8. Permittee shall maintain an operating plan or record that requires feed to be pushed within three feet of feedlane fence within two hours of putting out the feed, or use of a feed trough or other structure designed to maintain feed within reach of the animals. [District Rules 2201 and 4570]
9. Permittee shall begin feeding total mixed rations within two hours of grinding and mixing rations. [District Rules 2201 and 4570]
10. Permittee shall maintain an operating plan or record of when feeding of total mixed rations began within two hours of grinding and mixing rations. [District Rules 2201 and 4570]
11. Permittee shall store grain in a weatherproof storage structure or under a weatherproof covering from October through May. [District Rules 2201 and 4570]
12. Permittee shall maintain records demonstrating grain is/was stored in a weatherproof storage structure or under a weatherproof covering from October through May. [District Rules 2201 and 4570]
13. Permittee shall remove uneaten wet feed from feed bunks within twenty-four (24) hours after the end of a rain event. [District Rules 2201 and 4570]
14. Permittee shall maintain records demonstrating that uneaten wet feed was removed from feed bunks within twenty-four (24) hours after the end of a rain event. [District Rules 2201 and 4570]
15. For bagged silage/feedstuff, permittee shall utilize a sealed feed storage system (e.g., ag bag). [District Rules 2201 and 4570]
16. Permittee shall cover all silage piles, except for the area where feed is being removed from the pile, with a plastic tarp that is at least five (5) mils (0.005 inches) thick, 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. Silage piles shall be covered within seventy-two (72) hours of last delivery of material to the pile. Sheets of material used to cover silage shall overlap so that silage is not exposed where the sheets meet. [District Rules 2201 and 4570]
17. Permittee shall maintain records of the thickness and type of cover used to cover each silage pile. Permittee shall also maintain records of the date of the last delivery of material to each silage pile and the date each pile is covered. [District Rules 2201 and 4570]
18. Permittee shall select and implement one of the following mitigation measures for building each silage pile at the facility: Option 1) build the silage pile 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 7.11 of District Rule 4570; Option 2) Adjust filling parameters when creating the silage pile to achieve an average bulk density of at least 44 lb/cu ft for corn silage and at least 40 lb/cu ft for other silage types as determined using a District-approved spreadsheet; or Option 3) build silage piles using crops harvested with the applicable minimum moisture content, maximum Theoretical Length of Chop (TLC), and roller opening identified in District Rule 4570, Table 4.1, 1.d and manage silage material delivery such that the thickness of the layer of un-compacted material delivered on top of the pile is no more than six (6) inches. Records of the option chosen as a mitigation measure for building each silage pile shall be maintained. [District Rules 2201 and 4570]
19. For each silage pile that Option 1 (Measured Bulk Density) is chosen as a mitigation measure for building the pile, records of the measured bulk density shall be maintained. [District Rules 2201 and 4570]

CONDITIONS CONTINUE ON NEXT PAGE

20. For each silage pile that Option 2 (Bulk Density Determined by Spreadsheet) is chosen as a mitigation measure for building the pile, records of the filling parameters entered into the District-approved spreadsheet to determine the bulk density shall be maintained. [District Rules 2201 and 4570]

21. For each silage pile that Option 3 (Moisture, TLC, Roller Opening, & Material Delivery) is chosen as a mitigation measure for building the pile, the permittee shall harvest corn used for the pile at an average moisture content of at least 65% and harvest other silage crops for the pile at an average moisture content of at least 60%. [District Rules 2201 and 4570]

22. For each silage pile that Option 3 (Moisture, TLC, Roller Opening, & Material Delivery) is chosen as a mitigation measure for building the pile, records of the average percent moisture of crops harvested for silage shall be maintained. [District Rules 2201 and 4570]

23. For each silage pile that Option 3 (Moisture, TLC, Roller Opening, & Material Delivery) is chosen as a mitigation measure for building the pile, the permittee shall adjust setting of equipment used to harvest crops for the pile to incorporate the following parameters for Theoretical Length of Chop (TLC) and roller opening, as applicable: 1) Corn with no processing: TLC not exceeding 1/2 inch, 2) Processed Corn: TLC not exceeding 3/4 inch and roller opening of 1-4 mm, 3) Alfalfa/Grass: TLC not exceeding 1.0 inch, 4) Other silage crops: TLC not exceeding 1/2 inch. [District Rules 2201 and 4570]

24. For each silage pile that Option 3 (Moisture, TLC, Roller Opening, & Material Delivery) is chosen as a mitigation measure for building the pile, records that equipment used to harvest crops for the pile was set to the required TLC and roller opening for the type of crop harvested shall be maintained. [District Rules 2201 and 4570]

25. For each silage pile that Option 3 (Moisture, TLC, Roller Opening, & Material Delivery) is chosen as a mitigation measure for building the pile, the permittee shall manage silage material delivery such that the thickness of the layer of un-compacted material delivered on top of the pile is no more than six (6) inches. [District Rules 2201 and 4570]

26. For each silage pile that Option 3 (Moisture, TLC, Roller Opening, & Material Delivery) is chosen as a mitigation measure for building the pile, the permittee shall maintain a plan that requires that the thickness of the layer of un-compacted material delivered on top of the pile is no more than six (6) inches. [District Rules 2201 and 4570]

27. Permittee shall select and implement at least two of the following mitigation measures for management of silage piles at the facility: Option 1) manage silage piles such that only one silage pile has an uncovered face and the total exposed surface area is less than 2,150 square feet, or manage multiple uncovered silage piles such that the total exposed surface area of all uncovered silage piles is less than 4,300 square feet; Option 2) use a shaver/facer to remove silage from the silage pile, or shall use another method to maintain a smooth vertical surface on the working face of the silage pile; or Option 3) inoculate silage with homolactic lactic acid bacteria in accordance with manufacturer recommendations to achieve a concentration of at least 100,000 colony forming units per gram of wet forage, apply propionic acid, benzoic acid, sorbic acid, sodium benzoate, or potassium sorbate at the rate specified by the manufacturer to reduce yeast counts when forming silage piles, or apply other additives at 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. Records of the options chosen for managing each silage pile shall be maintained. [District Rules 2201 and 4570]

28. If Option 1 (Limiting Exposed Area of Silage) is chosen as a mitigation measure for managing silage piles, the permittee shall calculate and record the maximum (largest part of pile) total exposed area of each silage pile. Records of the maximum calculated area shall be maintained. [District Rules 2201 and 4570]

29. For each silage pile that Option 2 (Shaver/Facer or Smooth Face) is chosen as a mitigation measure for managing the pile, the permittee shall maintain records that a shaver/facer was used to remove silage from the pile or shall visually inspect the pile at least daily to verify that the working face was smooth and maintain records of the visual inspections. [District Rules 2201 and 4570]

30. For each silage pile that Option 3 (Silage Additives) is chosen as a mitigation measure for managing the pile, records shall be maintained of the type additive (e.g. inoculants, preservative, other District & EPA-approved additive), the quantity of the additive applied to the pile, and a copy of the manufacturer's instructions for application of the additive. [District Rules 2201 and 4570]

31. Permittee shall keep and maintain all records for a minimum of five (5) years and shall make records available to the APCO and EPA upon request. [District Rules 2201 and 4570]

APPENDIX B
Current PTOs

San Joaquin Valley
Air Pollution Control District

PERMIT UNIT: S-5836-1-3 **EXPIRATION DATE:** 12/31/2021

EQUIPMENT DESCRIPTION:
4,730 COW MILKING OPERATION WITH ONE 128 STALL PARABONE MILKING PARLOR AND ONE 12 STALL HOSPITAL MILKING PARLOR

PERMIT UNIT REQUIREMENTS

1. Upon presentation of appropriate credentials, a permittee shall allow an authorized representative of the District to enter the permittee's premises where a permitted source is located or emissions related activity is conducted, or where records must be kept under condition of the permit. [District Rule 1070]
2. Upon presentation of appropriate credentials, a permittee shall allow an authorized representative of the District to have access to and copy, at reasonable times, any records that must be kept under the conditions of the permit. [District Rule 1070]
3. This permit does not authorize the violation of any conditions established for this facility in the Conditional Use Permit (CUP), Special Use Permit (SUP), Site Approval, Site Plan Review (SPR), or other approval documents issued by a local, state, or federal agency. [Public Resources Code 21000-21177: California Environmental Quality Act]
4. If a licensed veterinarian or a certified nutritionist determines that any VOC mitigation measure will be required to be suspended as a detriment to animal health or necessary for the animal to molt, the owners/operators must notify the District in writing within forty-eight (48) hours of the determination including the duration and the specific health condition requiring the mitigation measure to be suspended. If the situation is expected to exist longer than a thirty-day (30) period, the owner/operator shall submit a new emission mitigation plan designating a mitigation measure to be implemented in lieu of the suspended mitigation measure. [District Rule 4570]
5. Permittee shall flush or hose milk parlor immediately prior to, immediately after, or during each milking. [District Rule 4570]
6. Permittee shall provide verification that milk parlors are flushed or hosed prior to, immediately after, or during each milking. [District Rule 4570]
7. Permittee shall keep and maintain all records for a minimum of five (5) years and shall make records available to the APCO and EPA upon request. [District Rule 4570]

San Joaquin Valley
Air Pollution Control District

PERMIT UNIT: S-5836-2-2 **EXPIRATION DATE:** 12/31/2021

EQUIPMENT DESCRIPTION:
COW HOUSING - 4,730 MILK COWS NOT TO EXCEED A COMBINED TOTAL OF 5,610 MATURE COWS (MILK AND DRY COWS); 5,490 SUPPORT STOCK (HEIFERS, CALVES, AND BULLS); 2 FREESTALL BARNS AND 2 HALF FREESTALL BARNS WITH FLUSH/SCRAPE SYSTEM

PERMIT UNIT REQUIREMENTS

1. Upon presentation of appropriate credentials, a permittee shall allow an authorized representative of the District to enter the permittee's premises where a permitted source is located or emissions related activity is conducted, or where records must be kept under condition of the permit. [District Rule 1070]
2. Upon presentation of appropriate credentials, a permittee shall allow an authorized representative of the District to have access to and copy, at reasonable times, any records that must be kept under the conditions of the permit. [District Rule 1070]
3. This permit does not authorize the violation of any conditions established for this facility in the Conditional Use Permit (CUP), Special Use Permit (SUP), Site Approval, Site Plan Review (SPR), or other approval documents issued by a local, state, or federal agency. [Public Resources Code 21000-21177: California Environmental Quality Act]
4. If a licensed veterinarian or a certified nutritionist determines that any VOC mitigation measure will be required to be suspended as a detriment to animal health or necessary for the animal to molt, the owners/operators must notify the District in writing within forty-eight (48) hours of the determination including the duration and the specific health condition requiring the mitigation measure to be suspended. If the situation is expected to exist longer than a thirty-day (30) period, the owner/operator shall submit a new emission mitigation plan designating a mitigation measure to be implemented in lieu of the suspended mitigation measure. [District Rule 4570]
5. Permittee shall 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. [District Rule 4570]
6. Permittee shall flush, scrape or vacuum freestall lanes immediately prior to, immediately after or during each milking. [District Rule 4570]
7. Permittee shall maintain records sufficient to demonstrate that freestall lanes are flushed, scraped or vacuumed immediately prior to, immediately after or during each milking. [District Rule 4570]
8. Permittee shall remove manure that is not dry from individual cow freestall beds or shall rake, harrow, scrape, or grade freestall bedding at least once every seven (7) days. [District Rule 4570]
9. Permittee shall record either of the following: 1) the dates when manure that is not dry is removed from individual cow freestall beds or 2) the dates when the freestall bedding is raked, harrowed, scraped, or graded. [District Rule 4570]
10. Permittee shall inspect water pipes and troughs and repair leaks at least once every seven (7) days. [District Rule 4570]
11. Permittee shall maintain records demonstrating that water pipes and troughs are inspected and leaks are repaired at least once every seven (7) days. [District Rule 4570]
12. Permittee shall clean manure from corrals at least four (4) times per year with at least sixty (60) days between each cleaning, or permittee shall clean corrals at least once between April and July and at least once between September and December. [District Rule 4570]

PERMIT UNIT REQUIREMENTS CONTINUE ON NEXT PAGE

13. Permittee shall demonstrate that manure from corrals are cleaned at least four (4) times per year with at least sixty (60) days between each cleaning or demonstrate that corrals are cleaned at least once between April and July and at least once between September and December. [District Rule 4570]
14. Permittee shall implement at least one of the following corral mitigation measures: 1) slope the surface of the corrals at least 3% where the available space for each animal is 400 square feet or less and shall slope the surface of the corrals at least 1.5% where the available space for each animal is more than 400 square feet per animal; 2) maintain corrals to ensure proper drainage preventing water from standing more than forty-eight hours; or 3) harrow, rake, or scrape pens sufficiently to maintain a dry surface except during periods of rainy weather. [District Rule 4570]
15. Permittee shall either 1) maintain sufficient records to demonstrate that corrals are maintained to ensure proper drainage preventing water from standing for more than forty-eight hours or 2) maintain records of dates pens are groomed (i.e., harrowed, raked, or scraped, etc.). [District Rule 4570]
16. Permittee shall scrape, vacuum or flush concrete lanes in corrals at least once every day for mature cows and every seven (7) days for support stock. [District Rule 4570]
17. Permittee shall maintain records demonstrating that concrete lanes in corrals are scraped, vacuumed, or flushed at least once every day for mature cows and at least once every seven (7) days for support stock. [District Rule 4570]
18. Shade structures shall be installed in any of the following ways: 1) constructed with a light permeable roofing material; 2) uphill of any slope in the corral; 3) installed so that the structure has a North/South orientation. OR Permittee shall clean manure from under corral shades at least once every fourteen (14) days, when weather permits access into the corral. [District Rule 4570]
19. If permittee has selected to comply using shades constructed with a light permeable roofing material, then permittee shall maintain records, such as design specifications, demonstrating that the shade structures are equipped with such roofing material or if permittee has selected to comply by cleaning the manure from under the corral shades, then permittee shall maintain records demonstrating that manure is cleaned from under the shades at least once every fourteen (14) days, as long as weather permits access to corrals. [District Rule 4570]
20. Permittee shall manage corrals such that the manure depth in the corral does not exceed twelve (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. However, permittee must resume management of the manure depth of 12 inches or lower immediately upon the corral becoming accessible. [District Rule 4570]
21. Permittee shall measure and document the depth of manure in the corrals at least once every ninety (90) days. [District Rule 4570]
22. Permittee shall maintain a record of the number of animals of each species and production group at the facility and shall maintain quarterly records of any changes to this information. [District Rule 4570]
23. Permittee shall keep and maintain all records for a minimum of five (5) years and shall make records available to the APCO and EPA upon request. [District Rule 4570]

San Joaquin Valley
Air Pollution Control District

PERMIT UNIT: S-5836-3-3 **EXPIRATION DATE:** 12/31/2021

EQUIPMENT DESCRIPTION:
LIQUID MANURE HANDLING SYSTEM CONSISTING OF FOUR SETTLING BASINS; MECHANICAL SEPARATOR(S); ONE LAGOON AND ONE STORAGE POND; MANURE IS LAND APPLIED THROUGH FLOOD AND FURROW IRRIGATION

PERMIT UNIT REQUIREMENTS

1. Upon presentation of appropriate credentials, a permittee shall allow an authorized representative of the District to enter the permittee's premises where a permitted source is located or emissions related activity is conducted, or where records must be kept under condition of the permit. [District Rule 1070]
2. Upon presentation of appropriate credentials, a permittee shall allow an authorized representative of the District to have access to and copy, at reasonable times, any records that must be kept under the conditions of the permit. [District Rule 1070]
3. If a licensed veterinarian or a certified nutritionist determines that any VOC mitigation measure will be required to be suspended as a detriment to animal health or necessary for the animal to molt, the owners/operators must notify the District in writing within forty-eight (48) hours of the determination including the duration and the specific health condition requiring the mitigation measure to be suspended. If the situation is expected to exist longer than a thirty-day (30) period, the owner/operator shall submit a new emission mitigation plan designating a mitigation measure to be implemented in lieu of the suspended mitigation measure. [District Rule 4570]
4. Permittee shall remove solids with a solid separator system, prior to the manure entering the lagoon. [District Rule 4570]
5. Permittee shall not allow liquid manure to stand in the fields for more than twenty-four (24) hours after irrigation. [District Rule 4570]
6. Permittee shall maintain records to demonstrate liquid manure did not stand in the fields for more than twenty-four (24) hours after irrigation. [District Rule 4570]
7. Permittee shall keep and maintain all records for a minimum of five (5) years and shall make records available to the APCO and EPA upon request. [District Rule 4570]
8. This permit does not authorize the violation of any conditions established for this facility in the Conditional Use Permit (CUP), Special Use Permit (SUP), Site Approval, Site Plan Review (SPR), or other approval documents issued by a local, state, or federal agency. [Public Resources Code 21000-21177: California Environmental Quality Act]
9. The liquid manure handling system shall handle flush manure from no more than 4,730 milk cows; not to exceed a combined total of 5,610 mature cows (milk and dry cows); and 5,490 total support stock (heifers, calves, and bulls). [District Rule 2201]

San Joaquin Valley
Air Pollution Control District

PERMIT UNIT: S-5836-4-2 **EXPIRATION DATE:** 12/31/2021

EQUIPMENT DESCRIPTION:
SOLID MANURE HANDLING CONSISTING OF MANURE STOCK PILES; SOLID MANURE APPLICATION TO LAND

PERMIT UNIT REQUIREMENTS

1. Upon presentation of appropriate credentials, a permittee shall allow an authorized representative of the District to enter the permittee's premises where a permitted source is located or emissions related activity is conducted, or where records must be kept under condition of the permit. [District Rule 1070]
2. Upon presentation of appropriate credentials, a permittee shall allow an authorized representative of the District to have access to and copy, at reasonable times, any records that must be kept under the conditions of the permit. [District Rule 1070]
3. This permit does not authorize the violation of any conditions established for this facility in the Conditional Use Permit (CUP), Special Use Permit (SUP), Site Approval, Site Plan Review (SPR), or other approval documents issued by a local, state, or federal agency. [Public Resources Code 21000-21177: California Environmental Quality Act]
4. If a licensed veterinarian or a certified nutritionist determines that any VOC mitigation measure will be required to be suspended as a detriment to animal health or necessary for the animal to molt, the owners/operators must notify the District in writing within forty-eight (48) hours of the determination including the duration and the specific health condition requiring the mitigation measure to be suspended. If the situation is expected to exist longer than a thirty-day (30) period, the owner/operator shall submit a new emission mitigation plan designating a mitigation measure to be implemented in lieu of the suspended mitigation measure. [District Rule 4570]
5. Within seventy two (72) hours of removal of solid manure from housing, permittee shall either 1) remove dry manure from the facility, or 2) 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 twenty-four (24) hours per event. [District Rule 4570]
6. Permittee shall keep records of dates when manure is removed from the facility or permittee shall maintain records to demonstrate that dry manure piles outside the pens are covered with a weatherproof covering from October through May. [District Rule 4570]
7. If weatherproof coverings are used, permittee shall maintain records, such as manufacturer warranties or other documentation, demonstrating that the weatherproof covering over dry manure are installed, used, and maintained in accordance with manufacturer recommendations and applicable standards listed in NRCS Field Office Technical Guide Code 313 or 367, or any other applicable standard approved by the APCO, ARB, and EPA. [District Rule 4570]
8. Permittee shall incorporate all solid manure within seventy-two (72) hours of land application. [District Rule 4570]
9. Permittee shall maintain records to demonstrate that all solid manure has been incorporated within seventy-two (72) hours of land application. [District Rule 4570]
10. Permittee shall keep and maintain all records for a minimum of five (5) years and shall make records available to the APCO and EPA upon request. [District Rule 4570]

San Joaquin Valley
Air Pollution Control District

PERMIT UNIT: S-5836-5-1 **EXPIRATION DATE:** 12/31/2021

EQUIPMENT DESCRIPTION:
FEED STORAGE AND HANDLING CONSISTING OF COMMODITY BARN(S) AND SILAGE PILE(S)

PERMIT UNIT REQUIREMENTS

1. Upon presentation of appropriate credentials, a permittee shall allow an authorized representative of the District to enter the permittee's premises where a permitted source is located or emissions related activity is conducted, or where records must be kept under condition of the permit. [District Rule 1070]
2. Upon presentation of appropriate credentials, a permittee shall allow an authorized representative of the District to have access to and copy, at reasonable times, any records that must be kept under the conditions of the permit. [District Rule 1070]
3. This permit does not authorize the violation of any conditions established for this facility in the Conditional Use Permit (CUP), Special Use Permit (SUP), Site Approval, Site Plan Review (SPR), or other approval documents issued by a local, state, or federal agency. [Public Resources Code 21000-21177: California Environmental Quality Act]
4. If a licensed veterinarian or a certified nutritionist determines that any VOC mitigation measure will be required to be suspended as a detriment to animal health or necessary for the animal to molt, the owners/operators must notify the District in writing within forty-eight (48) hours of the determination including the duration and the specific health condition requiring the mitigation measure to be suspended. If the situation is expected to exist longer than a thirty-day (30) period, the owner/operator shall submit a new emission mitigation plan designating a mitigation measure to be implemented in lieu of the suspended mitigation measure. [District Rule 4570]
5. Permittee shall feed all animals according to National Research Council (NRC) guidelines. [District Rule 4570]
6. Permittee shall maintain records of feed content, formulation, and quantity of feed additive utilized, to demonstrate compliance with National Research Council (NRC) guidelines. Records such as feed company guaranteed analyses (feed tags), ration sheets, or feed purchase records may be used to meet this requirement. [District Rule 4570]
7. Permittee shall push feed so that it is within three feet of feedlane fence within two hours of putting out the feed or use a feed trough or other feeding structure designed to maintain feed within reach of the animals. [District Rule 4570]
8. Permittee shall maintain an operating plan or record that requires feed to be pushed within three feet of feedlane fence within two hours of putting out the feed, or use of a feed trough or other structure designed to maintain feed within reach of the animals. [District Rule 4570]
9. Permittee shall begin feeding total mixed rations within two hours of grinding and mixing rations. [District Rule 4570]
10. Permittee shall maintain an operating plan or record of when feeding of total mixed rations began within two hours of grinding and mixing rations. [District Rule 4570]
11. Permittee shall store grain in a weatherproof storage structure or under a weatherproof covering from October through May. [District Rule 4570]
12. Permittee shall maintain records demonstrating grain is/was stored in a weatherproof storage structure or under a weatherproof covering from October through May. [District Rule 4570]

PERMIT UNIT REQUIREMENTS CONTINUE ON NEXT PAGE

13. Permittee shall remove uneaten wet feed from feed bunks within twenty-four (24) hours after the end of a rain event. [District Rule 4570]
14. Permittee shall maintain records demonstrating that uneaten wet feed was removed from feed bunks within twenty-four (24) hours after the end of a rain event. [District Rule 4570]
15. For bagged silage/feedstuff, permittee shall utilize a sealed feed storage system (e.g., ag bag). [District Rule 4570]
16. Permittee shall cover all silage piles, except for the area where feed is being removed from the pile, with a plastic tarp that is at least five (5) mils (0.005 inches) thick, 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. Silage piles shall be covered within seventy-two (72) hours of last delivery of material to the pile. Sheets of material used to cover silage shall overlap so that silage is not exposed where the sheets meet. [District Rule 4570]
17. Permittee shall maintain records of the thickness and type of cover used to cover each silage pile. Permittee shall also maintain records of the date of the last delivery of material to each silage pile and the date each pile is covered. [District Rule 4570]
18. Permittee shall select and implement one of the following mitigation measures for building each silage pile at the facility: Option 1) build the silage pile 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 7.11 of District Rule 4570; Option 2) Adjust filling parameters when creating the silage pile to achieve an average bulk density of at least 44 lb/cu ft for corn silage and at least 40 lb/cu ft for other silage types as determined using a District-approved spreadsheet; or Option 3) build silage piles using crops harvested with the applicable minimum moisture content, maximum Theoretical Length of Chop (TLC), and roller opening identified in District Rule 4570, Table 4.1, 1.d and manage silage material delivery such that the thickness of the layer of un-compacted material delivered on top of the pile is no more than six (6) inches. Records of the option chosen as a mitigation measure for building each silage pile shall be maintained. [District Rule 4570]
19. For each silage pile that Option 1 (Measured Bulk Density) is chosen as a mitigation measure for building the pile, records of the measured bulk density shall be maintained. [District Rule 4570]
20. For each silage pile that Option 2 (Bulk Density Determined by Spreadsheet) is chosen as a mitigation measure for building the pile, records of the filling parameters entered into the District-approved spreadsheet to determine the bulk density shall be maintained. [District Rule 4570]
21. For each silage pile that Option 3 (Moisture, TLC, Roller Opening, & Material Delivery) is chosen as a mitigation measure for building the pile, the permittee shall harvest corn used for the pile at an average moisture content of at least 65% and harvest other silage crops for the pile at an average moisture content of at least 60%. [District Rule 4570]
22. For each silage pile that Option 3 (Moisture, TLC, Roller Opening, & Material Delivery) is chosen as a mitigation measure for building the pile, records of the average percent moisture of crops harvested for silage shall be maintained. [District Rule 4570]
23. For each silage pile that Option 3 (Moisture, TLC, Roller Opening, & Material Delivery) is chosen as a mitigation measure for building the pile, the permittee shall adjust setting of equipment used to harvest crops for the pile to incorporate the following parameters for Theoretical Length of Chop (TLC) and roller opening, as applicable: 1) Corn with no processing: TLC not exceeding 1/2 inch, 2) Processed Corn: TLC not exceeding 3/4 inch and roller opening of 1-4 mm, 3) Alfalfa/Grass: TLC not exceeding 1.0 inch, 4) Other silage crops: TLC not exceeding 1/2 inch. [District Rule 4570]
24. For each silage pile that Option 3 (Moisture, TLC, Roller Opening, & Material Delivery) is chosen as a mitigation measure for building the pile, records that equipment used to harvest crops for the pile was set to the required TLC and roller opening for the type of crop harvested shall be maintained. [District Rule 4570]
25. For each silage pile that Option 3 (Moisture, TLC, Roller Opening, & Material Delivery) is chosen as a mitigation measure for building the pile, the permittee shall manage silage material delivery such that the thickness of the layer of un-compacted material delivered on top of the pile is no more than six (6) inches. [District Rule 4570]

PERMIT UNIT REQUIREMENTS CONTINUE ON NEXT PAGE

26. For each silage pile that Option 3 (Moisture, TLC, Roller Opening, & Material Delivery) is chosen as a mitigation measure for building the pile, the permittee shall maintain a plan that requires that the thickness of the layer of un-compacted material delivered on top of the pile is no more than six (6) inches. [District Rule 4570]
27. Permittee shall select and implement at least two of the following mitigation measures for management of silage piles at the facility: Option 1) manage silage piles such that only one silage pile has an uncovered face and the total exposed surface area is less than 2,150 square feet, or manage multiple uncovered silage piles such that the total exposed surface area of all uncovered silage piles is less than 4,300 square feet; Option 2) use a shaver/facer to remove silage from the silage pile, or shall use another method to maintain a smooth vertical surface on the working face of the silage pile; or Option 3) inoculate silage with homolactic lactic acid bacteria in accordance with manufacturer recommendations to achieve a concentration of at least 100,000 colony forming units per gram of wet forage, apply propionic acid, benzoic acid, sorbic acid, sodium benzoate, or potassium sorbate at the rate specified by the manufacturer to reduce yeast counts when forming silage piles, or apply other additives at 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. Records of the options chosen for managing each silage pile shall be maintained. [District Rule 4570]
28. If Option 1 (Limiting Exposed Area of Silage) is chosen as a mitigation measure for managing silage piles, the permittee shall calculate and record the maximum (largest part of pile) total exposed area of each silage pile. Records of the maximum calculated area shall be maintained. [District Rule 4570]
29. For each silage pile that Option 2 (Shaver/Facer or Smooth Face) is chosen as a mitigation measure for managing the pile, the permittee shall maintain records that a shaver/facer was used to remove silage from the pile or shall visually inspect the pile at least daily to verify that the working face was smooth and maintain records of the visual inspections. [District Rule 4570]
30. For each silage pile that Option 3 (Silage Additives) is chosen as a mitigation measure for managing the pile, records shall be maintained of the type additive (e.g. inoculants, preservative, other District & EPA-approved additive), the quantity of the additive applied to the pile, and a copy of the manufacturers instructions for application of the additive. [District Rule 4570]
31. Permittee shall keep and maintain all records for a minimum of five (5) years and shall make records available to the APCO and EPA upon request. [District Rule 4570]

APPENDIX C
BACT Guideline

Best Available Control Technology (BACT) Guideline 5.8.1
Last Update: 12/18/2013

Milking Parlor

Pollutant	Achieved in Practice or in the SIP	Technologically Feasible	Alternate Basic Equipment
VOC	Flush/Spray before, after, or during milking each group of cows	1) Enclosure of milk parlor with biogas vented to incinerator with 95% control 2) Enclosure of milk parlor with biogas vented to biofilter with minimum 80% control	

BACT is the most stringent control technique for the emissions unit and class of source. Control techniques that are not achieved in practice or contained in a state implementation plan must be cost effective as well as feasible. Economic analysis to demonstrate cost effectiveness is required for all determinations that are not achieved in practice or contained in an EPA approved State Implementation Plan.

This is a Summary Page for this Class of Source. For background information, see Permit Specific BACT Determinations on Details Page.

Best Available Control Technology (BACT) Guideline 5.8.2
Last Update: 12/18/2013

Cow Housing - Freestall and Saudi-Style Barns

Pollutant	Achieved in Practice or in the SIP	Technologically Feasible	Alternate Basic Equipment
PM10	1) Concrete feed lanes and walkways; 2) Scraping exercise pens every two weeks using pull-type scraper in the morning hours except when prevented by wet conditions		
VOC	1) Concrete feed lanes and walkways; 2) Flushing the lanes and walkways for the mature cows (milk and dry cows) four times per day and flushing lanes and walkways for the remaining animals once per day (or for dairies that cannot use a flush system, Scraping lanes and walkways for mature cows with an automatic scraper (or equivalent) four times per day and cleaning lanes and walkways for support stock (heifers) at least once per day); 3) Feeding all animals in accordance with National Research Council (NRC) or other District-approved guidelines; 4) Properly sloping exercise pens (minimum of 3% slope where the available space for each animal is 400 square feet or less and minimum of 1.5% where the available space for each animal is more than 400 square feet per animal) or managing corrals to maintain a dry surface; 5) Scraping exercise pens every two weeks using pull-type scraper in the morning hours except when prevented by wet conditions; and 6) Rule 4570 Measures		

Pollutant	Achieved in Practice or in the SIP	Technologically Feasible	Alternate Basic Equipment
NH3	1) Concrete feed lanes and walkways; 2) Flushing the lanes and walkways for the mature cows (milk and dry cows) four times per day and flushing lanes and walkways for the remaining animals once per day (or for dairies that cannot use a flush system, Scraping lanes and walkways for mature cows with an automatic scraper (or equivalent) four times per day and cleaning lanes and walkways for support stock (heifers) at least once per day); 3) Feeding all animals in accordance with National Research Council (NRC) or other District-approved guidelines; 4) Properly sloping exercise pens (minimum of 3% slope where the available space for each animal is 400 square feet or less and minimum of 1.5% where the available space for each animal is more than 400 square feet per animal) or managing corrals to maintain a dry surface; and 5) Scraping exercise pens every two weeks using pull-type scraper in the morning hours except when prevented by wet conditions;		

BACT is the most stringent control technique for the emissions unit and class of source. Control techniques that are not achieved in practice or contained in a state implementation plan must be cost effective as well as feasible. Economic analysis to demonstrate cost effectiveness is required for all determinations that are not achieved in practice or contained in an EPA approved State Implementation Plan.

This is a Summary Page for this Class of Source. For background information, see Permit Specific BACT Determinations on Details Page.

Best Available Control Technology (BACT) Guideline 5.8.3
Last Update: 3/17/2015

Cow Housing - Open Corrals

Pollutant	Achieved in Practice or in the SIP	Technologically Feasible	Alternate Basic Equipment
NH3	1) Concrete feed lanes and walkways; 2) Flushing the lanes and walkways for the mature cows (milk and dry cows) four times per day and flushing lanes and walkways for the remaining animals once per day (or for dairies that cannot use a flush system, Scraping lanes and walkways for mature cows with an automatic scraper (or equivalent) four times per day and cleaning lanes and walkways for support stock (heifers) at least once per day); 3) Feeding all animals in accordance with National Research Council (NRC) or other District-approved guidelines; 4) Properly sloping corrals (minimum of 3% slope where the available space for each animal is 400 square feet or less and minimum of 1.5% where the available space for each animal is more than 400 square feet per animal) or managing corrals to maintain a dry surface; and 5) Scraping corrals and exercise pens every two weeks using pull-type scraper in the morning hours except when prevented by wet conditions;		

BACT is the most stringent control technique for the emissions unit and class of source. Control techniques that are not achieved in practice or contained in a state implementation plan must be cost effective as well as feasible. Economic analysis to demonstrate cost effectiveness is required for all determinations that are not achieved in practice or contained in an EPA approved State Implementation Plan.

This is a Summary Page for this Class of Source. For background information, see Permit Specific BACT Determinations on Details Page.

Best Available Control Technology (BACT) Guideline 5.8.6
Last Update: 12/18/2013

Liquid Manure Handling - Lagoon/Storage Pond

Pollutant	Achieved in Practice or in the SIP	Technologically Feasible	Alternate Basic Equipment
VOC	Anaerobic treatment lagoon designed according to NRCS Guideline, and solids removal/separation system (mechanical separator(s) or settling basin(s)/weeping wall(s))	1) Aerobic treatment lagoon or mechanically aerated lagoon; 2) Covered lagoon digester vented to a control device with minimum 95% control	
NH3	All animals fed in accordance with NRCS or other District-approved guidelines		

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This is a Summary Page for this Class of Source. For background information, see Permit Specific BACT Determinations on Details Page.

Best Available Control Technology (BACT) Guideline 5.8.7
Last Update: 12/18/2013

Liquid Manure Handling - Liquid/Slurry Land Application

Pollutant	Achieved in Practice or in the SIP	Technologically Feasible	Alternate Basic Equipment
VOC	Irrigation of crops using liquid/slurry manure from the secondary lagoon/holding/storage pond preceded by an uncovered anaerobic treatment lagoon designed to meet Natural Resources Conservation Service (NRCS) standards	1) Irrigation of crops using liquid manure from an aerobic treatment lagoon or mechanically aerated lagoon (95% VOC control efficiency) 2) Irrigation of crops using liquid manure from a holding/storage pond after being treated in a covered lagoon/digester (80% VOC control efficiency)	
NH3	All animals fed in accordance with NRCS or other District-approved guidelines		

BACT is the most stringent control technique for the emissions unit and class of source. Control techniques that are not achieved in practice or contained in a state implementation plan must be cost effective as well as feasible. Economic analysis to demonstrate cost effectiveness is required for all determinations that are not achieved in practice or contained in an EPA approved State Implementation Plan.

This is a Summary Page for this Class of Source. For background information, see Permit Specific BACT Determinations on Details Page.

Best Available Control Technology (BACT) Guideline 5.8.8
Last Update: 12/18/2013

Solid Manure Handling - Storage/Separated Solids Piles

Pollutant	Achieved in Practice or in the SIP	Technologically Feasible	Alternate Basic Equipment
NH3	All animals fed in accordance with NRCS or other District-approved guidelines		

BACT is the most stringent control technique for the emissions unit and class of source. Control techniques that are not achieved in practice or contained in a state implementation plan must be cost effective as well as feasible. Economic analysis to demonstrate cost effectiveness is required for all determinations that are not achieved in practice or contained in an EPA approved State Implementation Plan.

This is a Summary Page for this Class of Source. For background information, see Permit Specific BACT Determinations on Details Page.

Best Available Control Technology (BACT) Guideline 5.8.9
Last Update: 12/18/2013

Solid Manure Handling - Land Application

Pollutant	Achieved in Practice or in the SIP	Technologically Feasible	Alternate Basic Equipment
NH3	Rapid incorporation of solid manure into the soil after land application, and all animals fed in accordance with NRCS or other District-approved guidelines		

BACT is the most stringent control technique for the emissions unit and class of source. Control techniques that are not achieved in practice or contained in a state implementation plan must be cost effective as well as feasible. Economic analysis to demonstrate cost effectiveness is required for all determinations that are not achieved in practice or contained in an EPA approved State Implementation Plan.

This is a Summary Page for this Class of Source. For background information, see Permit Specific BACT Determinations on Details Page.

Best Available Control Technology (BACT) Guideline 5.8.11
Last Update: 12/18/2013

Feed Storage and Handling - Feed/TMR

Pollutant	Achieved in Practice or in the SIP	Technologically Feasible	Alternate Basic Equipment
VOC	District Rule 4570 Measures for Feed/TMR		

BACT is the most stringent control technique for the emissions unit and class of source. Control techniques that are not achieved in practice or contained in a state implementation plan must be cost effective as well as feasible. Economic analysis to demonstrate cost effectiveness is required for all determinations that are not achieved in practice or contained in an EPA approved State Implementation Plan.

This is a Summary Page for this Class of Source. For background information, see Permit Specific BACT Determinations on Details Page.

APPENDIX D
BACT Analysis

Top-Down BACT Analysis for Confined Animal Facility – Dairy Milking Parlor

1. Top-Down BACT Analysis for VOC Emissions:

This BACT discussion applies to the existing 128 stall parabone and 12 stall milking parlors and the proposed 114 stall carousel milking parlor.

a. Step 1 - Identify All Possible Control Technologies

The following options were identified as possible controls for VOC emissions from the milking parlors:

1) Milking Parlors Vented to an Incinerator
2) Milking Parlor Vented to a Biofilter
3) Flush/Spray Milking Parlor Before, After, or During Milking Each Group of Cows

Description of Control Technologies

1) Milking Parlors Vented to an Incinerator

Milking parlors can be either naturally or mechanically ventilated. According to some dairy designers, mechanical ventilation is more reliable than natural ventilation. Mechanical ventilation can be easily applied to all areas of the milking parlors, except the holding area. The mechanical system for the milking parlors can be utilized to capture the gases emitted from the milking parlors, however in order to capture all of the gases, and to keep an appropriate negative pressure throughout the system, the holding area would also need to be entirely enclosed. No facility currently encloses the holding area since cows are continuously going in and out of the barn throughout the day. The capital required to enclose this large area would also be significant. Although the feasibility of such a technology is in question, it will be considered in this analysis.

The captured VOC emissions could then be sent to an incinerator. Thermal incineration is a well-established VOC control technique. During combustion, gaseous hydrocarbons are oxidized to form CO_2 and water. It is assumed that 95% of the gasses emitted from the milking parlor will be captured by the mechanical ventilation system and that 98% of the captured VOCs will be eliminated by thermal incineration[2]; therefore the total control for VOCs from the milking parlor = 0.95 x 0.98 = 93.1%.

2) Milking Parlor Vented to a Biofilter

A biofilter is a device for removing contaminants from a gas in which the gas is passed through a media that supports microbial activity by which pollutants are degraded by biological oxidation. During biofiltration, exhaust air containing pollutants passes through a media that contains an established, diverse population of aerobic microorganisms. These microorganisms oxidize the gaseous organic contaminants, ammonia, and sulfur compounds in the exhaust air resulting in carbon dioxide, nitrogen, water, salt, and biomass.

[2] OAQPS Control Cost Manual, 4th Edition, EPA 450/3-90-006, January 1990, page 3-8.

The bacterial cultures (microorganisms that typically consist of several species coexisting in a colony) that use oxygen to biodegrade organics are called aerobic cultures. These aerobic cultures are usually supported by organic material contained in the biofilter, such as compost, wood chips, soil, peat, etc. Biofilters must maintain sufficient porosity to allow the contaminated air stream to pass through for treatment and to prevent anaerobic conditions. The moisture content of biofilter beds must also be regulated to ensure that there is sufficient moisture to maintain the microorganisms needed for treatment while avoiding excess moisture that can cause anaerobic conditions. A filtration system may be required upstream of the biofilter to remove particular matter which will clog the biofilter over time. Biofilters must be maintained free of rodents and weeds to avoid channeling of gases through the filter media and a loss of performance. The filter media of natural biofilters needs to be replaced periodically because of deterioration and loss of porosity.

Since biofilters rely on living organisms to function, a biofilter's performance will be affected by several factors, including: ambient temperature; temperature of the air stream being treated; the pollutant concentrations in the air stream; moisture content of the filter and air stream, and pH of the filter media. These parameters should be monitored to ensure optimum operating conditions for the biofilter.

It is assumed that 95% of the gasses emitted from the enclosed animal housing will be captured by the mechanical ventilation system and that a properly functioning biofilter will eliminate 80% of the captured VOC emissions[3]; therefore, the total control for VOCs from the enclosed animal housing = 0.95 x 0.80 = 76%.

3) Flush/Spray Milking Parlor Before, After, or During Milking Each Group of Cows

Almost all dairy operations utilize some type of flush or spray system to wash out the manure that dairy cows deposit in the milking parlors. The primary purpose of the flush or spray system is to maintain the minimum level of sanitation required in the milking parlors. However, this system also serves as an emission control for reducing VOC and ammonia emissions. The manure deposited in the milking parlor, which is a source of VOC emissions, is removed from the milking parlors many times a day by flushing after each milking. Many of the VOCs emitted from fresh cow manure, such as alcohols (ethanol and methanol) and many Volatile Fatty Acids (VFAs), are highly soluble in water. Therefore, a large percentage of these compounds will dissolve in the flush water and will not be emitted from the milking parlors. The flush water can then carry the manure and the dissolved volatile compounds to an anaerobic treatment lagoon or other manure stabilization process for treatment.

It must be noted that flushing or spraying out the milking parlors before, after, or during each group of cows is milked will only control the VOCs emitted from the manure, it will have little or no effect on enteric emissions produced from the cows' digestive processes. It will be assumed that the control efficiency for VOCs emitted from manure is 75%. Enteric emissions compose approximately 78% of the VOC emissions from the milking parlor and VOC emissions from the manure make up the remaining 22%; therefore the total control for VOCs from the milking parlor = 0.75 x 0.22 = 16.5%.

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[3] The SCAQMD Rule 1133.2 staff report (page 18) indicates control efficiencies of 80-90% for VOC for existing biofilter composting applications and that a well-designed, well-operated, and well-maintained biofilter is capable of achieving 80 percent control efficiency for VOC, http://www.aqmd.gov/docs/default-source/rule-book/support-documents/rule-1133/st_ff-report.pdf?sfvrsn=2

b. Step 2 - Eliminate Technologically Infeasible Options

There are no technologically infeasible options.

c. Step 3 - Rank Remaining Control Technologies by Control Effectiveness

1) Milking Parlor Vented to an Incinerator (93% VOC control efficiency)
2) Milking Parlor Vented to a Biofilter (76% VOC control efficiency)
3) Flush/Spray Milking Parlor Before, After, or During Milking Each Group of Cows (16.5% VOC control efficiency)

d. Step 4 - Cost Effectiveness Analysis

1) Milking Parlor Vented to an Incinerator

The following cost analysis will be performed to determine whether the cost of natural gas alone, not including any capital costs, causes catalytic incineration to exceed the District VOC cost effectiveness threshold. The temperature required for catalytic incineration is 600 °F. The temperature required for thermal incineration is 1,400 °F. Since the fuel requirements and fuel cost for thermal incineration are greater than catalytic incineration, if catalytic incineration is determined not to be cost effective, then it can logically be reasoned that thermal incineration will not be cost effective as well.

Air Flow Rate of Milking Parlor

In order to effectively calculate the costs of this control option, the airflow rate of the milking parlors must be determined. According to Cornell University's publication "Environmental Controls for Today's Milking Center", the minimum ventilation rate required for milking parlors is 15 room exchanges per hour in the winter and 60 to 90 room exchanges per hour in the summer. For calculation purposes, an average airflow rate of 35 room exchanges will assumed for the milking parlor.

The following analysis is based on the cost of emission reductions for 7,140 milk cows. It will assume a conservatively sized milking parlor of 200 ft long by 40 ft wide and a height of 20 feet. The total exhaust airflow rate can be calculated as follows:

Total exhaust airflow rate = 200 ft x 40 ft x 20 ft x 35/hr
= 5,600,000 ft^3/hr

Fuel Requirement for Thermal Incineration:

The gas leaving the milking parlor is principally air, with a volumetric specific heat of 0.0194 Btu/scf -°F under standard conditions.

Natural Gas Requirement = $(flow)(Cp_{Air})(\Delta T)(1\text{-}HEF)$

Where:

Flow (Q) = exhaust flow rate of VOC
CpAir = specific heat of air: 0.0194 Btu/scf
ΔT = increase in the temperature of the contaminated air stream required for catalytic oxidation to occur (It will be assumed that the air stream would increase in temperature from 100 °F to 600 °F.)
HEF = heat exchanger factor: 0.7

Natural Gas Requirement = (2,800,000 scf/hr)(0.0194 Btu/scf)(600 °F - 100 °F)(1-0.7)
= 16,296,000 Btu/hr

Fuel Cost for Thermal Incineration:

The cost for natural gas shall be based upon the average industrial price in California reported by the Energy Information Administration (EIA), taken from the EIA website at: http://www.eia.gov/dnav/ng/ng_pri_sum_dcu_SCA_a.htm. Price data for the years 2018 and 2019 are not available, therefore, the average industrial price of natural gas for the year 2017 will be used for calculation purposes.

Average industrial price for natural gas in California for the year 2017
= $7.05/1,000 scf

$7.05/1,000 scf x 1 scf/1,000 Btu x 1,000,000 Btu/MMBtu
= $7.05/MMBtu

The oxidizer is assumed to operate 16 hours per day (2 shifts) and 365 days per year.

The fuel costs to operate the incinerator are calculated as follows:

16,296,000 Btu/hr x 1 MMBtu/10^6 Btu x 16 hr/day x 365 day/year x $7.05/MMBtu
= $670,938/year

VOC Emission Reductions for Thermal Incineration

The annual VOC Emission Reductions for the milking parlor is calculated as follows:

[Number of milk cows] x [Uncontrolled Milking Parlor VOC EF (lb/milk cow-year)] x [Capture Efficiency] x [Thermal Incinerator Control Efficiency]

= (7,140 milk cows) x (0.44 lb-VOC/milk cow-year) x (0.95) x (0.98)
= 2,925 lb-VOC/year

Cost of VOC Emission Reductions

Cost of reductions = ($670,938/year)/[(2,925 lb-VOC/year)(1 ton/2000 lb)]
= $458,788/ton of VOC reduced

As shown above, the natural gas cost alone for thermal or catalytic incineration would cause the cost of the VOC reductions to be greater than the $17,500/ton cost effectiveness

threshold of the District BACT policy. The equipment is therefore not cost effective and is being removed from consideration at this time.

2) Milking Parlor Vented to a Biofilter

The following analysis is based on the cost of emission reductions for confining 7,140 milk cows in a conservatively sized milking parlor of 200 ft long by 40 ft wide and a height of 20 feet, and venting the milking parlor to a biofilter. Costs for larger dairies would be linearly proportional.

Biofiltration can control both VOC and ammonia emissions. Although, this technology can control both pollutants, a cost effectiveness threshold has not been established for ammonia. Therefore, only achieved-in-practice options will be considered for ammonia at this time and a multi-pollutant cost effectiveness analysis for VOC and ammonia will not be performed.

Air Flow Rate of Milking Parlor

In order to effectively calculate the costs of this control option, the airflow rate of the milking parlors must be determined. According to Cornell University's publication "Environmental Controls for Today's Milking Center", the minimum ventilation rate required for milking parlors is 15 room exchanges per hour in the winter and 60 to 90 room exchanges per hour in the summer. For calculation purposes, an average airflow rate of 35 room exchanges will assumed for the milking parlor.

The total exhaust airflow rate can be calculated as follows:

Total exhaust airflow rate = 200 ft x 40 ft x 20 ft x 35/hr x 1/60 min
= 93,333 cfm

Cost of Biofiltration

The table below summarizes the cost information for biofilters found in literature. The references follow the table.

Biofilter Costs from Literature					
Article Number	Year published	Capital Cost Range ($/cfm)	Adj 2019 Capital Cost ($/cfm)	Operating Cost Range ($/cfm/yr)	Adj 2019 Operating Cost ($/yr)
1	2003	$2.35 - $7.74 biofilter	$3.26 - $10.75	$3.31 biofilter	$4.60
2	2003	$20.20 - 30.30 biotrickling filter	$28.20 - $33.34	$6.35 biotrickling filter	$8.82
3	1991	$12.79 - $20.93 open biofilter	$24.00 - $39.27		
4	1991	$20.93 - $116.28 enclosed biofilter	$39.27 - $218.17		
5	1998	-	-	$2 - $14	$3.14 - $21.95
6	2008	$15	$17.80	$2	$2.37
7	2005	$16.99 - $118.93	$22.23 - $155.62	$5.10 - $16.99	$6.67 - $22.23
8	1996	$2.50 - $5.00	$4.07 - $8.14	$'2 - $14	$3.26 - $22.80
9	1999	$13.30 - $18.00	$20.40 - $27.61	$3.33 - $6.67	$5.11 - $10.23
10	2002	$2.79	$3.96	10% of capital cost	
11	2004	$0.15 - $0.25	$0.20 - $0.34	$0.005 -$ 0.015	$.01 - $0.03

The articles referenced in the previous table are cited below:

1 & 2. U.S. Environmental Protection Agency, The Clean Air Technology Center (CATC), "Using Bioreactors to Control Air Pollution" EPA-456/R-03-003, (E143-03), September 2003, http://www.epa.gov/ttn/catc/dir1/fbiorect.pdf

3. U.S. Environmental Protection Agency, "Emissions from Animal Feeding Operations" (Draft), EPA Contract No. 68-D6-0011, August 15, 2001, Section 9.2.3 - Biofiltration of Confinement Housing Exhaust, http://www.epa.gov/ttn/chief/ap42/ch09/draft/draftanimalfeed.pdf

4. Leson, G. and A.M. Winer. 1991. "Biofiltration: An Innovative Air Pollution Control Technology for VOC Emissions". Journal of the Air and Waste Management Association. 41(8):1045-54.)

5. Operating Cost Estimate for a Biofilter (1998): $2-14/cfm (from Boyette, R. A. 1998. "Getting Down to (Biofilter) Basics". Biocycle 39(5):58-62)

6. Bohn, Hinrich, "Biofilter Technology Offers Emissions Abatement Option", Distillers Grain Quarterly, 3rd Qtr 2008, http://www.ethanolproducer.com/dgq/article-print.jsp?article_id=1257

7. Delhoménie, Marie-Caroline; Heitz, Michèle, "Biofiltration of Air: A Review", Critical Reviews in Biotechnology, 1549-7801, Volume 25, Issue 1, 2005, Pages 53 – 72

8. Boyette, R. Allen – E&A Environmental Consultants Inc., "Biofilter Economics and Performance", 1996, http://www.p2pays.org/ref/12/11505.pdf

9. Govind, Rakesh – PRD Tech Inc., White Paper - "Biofilteration: An Innovative Technology for the Future", 1999, http://www.prdtechinc.com/PDF/PRDBIOFILTERR&DMAGAZINEPAPER.pdf

10. South Coast Air Quality Management District, "Technology Assessment for: Proposed Rule 1133: Emission Reductions from Composting and Related Operations", March 22, 2002, http://www.aqmd.gov/rules/doc/r1133/r1133_techassessment.pdf

11. Schmidt, David. Janni, Kevin. Nicolai, Richard. "Biofilter Design Information". Biosystems and Agricultural Engineering Update: BAEU-18, Revised March 2004. University of Minnesota Department of Biosystems and Agricultural Engineering, College of Agricultural, Food and Environmental Sciences, http://www.manure.umn.edu/assets/baeu18.pdf

Note: The capital cost estimate obtained from article number 11 was ten times lower than the low-end of the cost estimates given in other sources listed above and the estimates from biofilter suppliers presented below and the operating cost estimate from this source was more than 100 times lower than the lowest the cost estimates given in the other sources listed above. Because of this significant difference in costs, the design of this biofilter was evaluated to determine if it would meet District and EPA standards for an add-on VOC control device. This preliminary evaluation is discussed below.

Reference #11 describes a biofilter designed to reduce odors not total VOCs. The document recommends that an open-bed biofilter used to control exhaust from animal housing have a depth of 10-18 inches and an empty bed contact time of 3-5 seconds. For an open-bed biofilter used for VOC control, the recommended depth and contact time are generally 3-5 feet and 30-60 seconds, respectively. The lower recommended depth is the result of limitations with typical exhaust fans used for ventilation in animal housing, which are not designed for the larger pressure drops that would be caused by a deeper biofilter bed. It is likely that the much smaller recommended contact time is related to the fact that the biofilter is only designed to reduce odors. Many odorous compounds are branched-chain volatile fatty acids (VFAs) that consist of large molecules with a strong tendency to adhere to any surfaces that they contact; thus shortening the contact time required to treat these compounds. Although VFAs are largely responsible for objectionable odors from agricultural facilities, recent studies have shown that alcohols comprise the majority of VOC emissions. The biofilter design recommended in the document would not be as effective for reducing alcohols or other VOCs which are more volatile and do not have a strong tendency to adhere to surfaces. The biofilter does not appear to be designed to handle the total flow rates from the animal housing but is probably intended to handle smaller flow rates from high-odor areas such as manure pits. Another limitation with the design is that there is no dedicated outlet to allow measurement and determination of control efficiency; thus there isn't any way to accurately assess if the biofilter is functioning properly. Because of the substantial deviation from established criteria for the design of biofilters for control of VOCs and the lack of information to support and quantify total VOC reductions from this particular design, the cost estimates associated with this design will be removed from further consideration. This

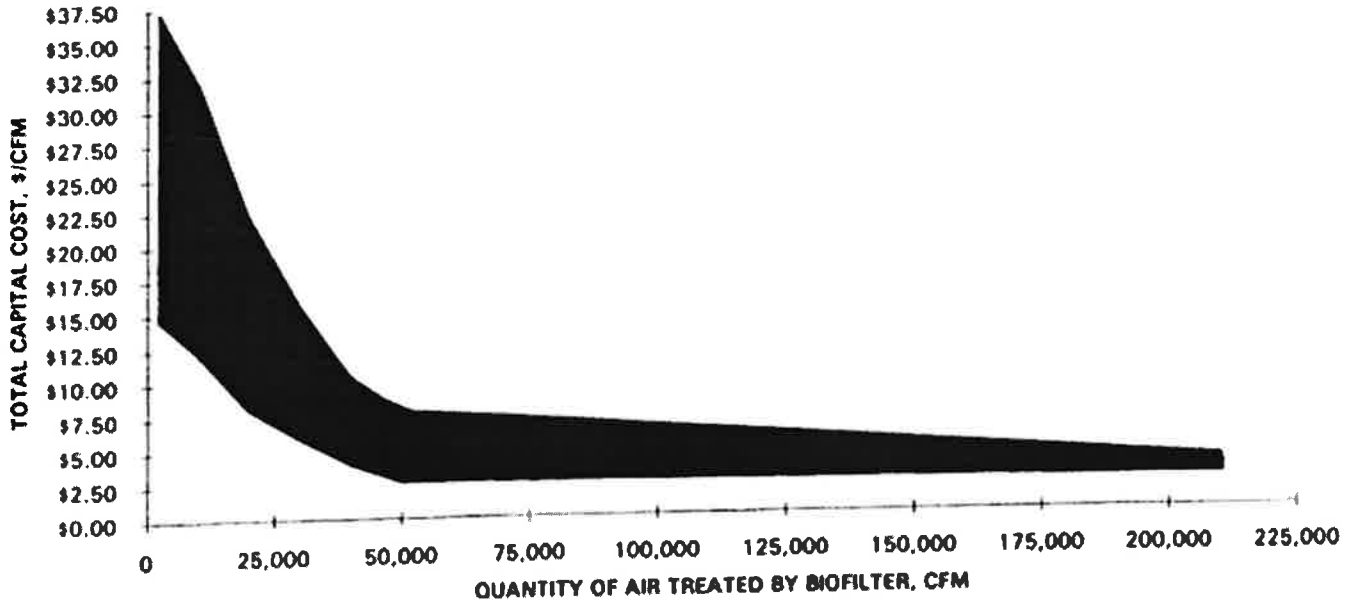
design may be re-evaluated at a later time if the necessary information is provided or becomes available.

Reduced Capital Cost from Economy of Scale

The potential for reduced dollar-per-cfm capital costs was considered based on the large airflow rates that would be handled by biofilters for confined animal facilities. Based on the information reviewed, it was determined that there is not any additional cost reduction benefit related to economy of scale for biofilters handling such large flow rates.

The information available indicates significant reductions in biofilter costs per cfm as the flow rate treated increases to a few thousand cfm but diminishing reductions in cost after this until there is no further benefit. This is illustrated in the graph below. The graph shows no additional cost reductions benefits after approximately 50,000 cfm. Also, in a phone conversation with Jim Cash of MEGTEC Systems, Inc. he stated that economy of scale cost reductions for biofilter systems were insignificant after approximately 20,000 cfm. This was because multiple individual units are generally required to treat flows greater than this and each unit would still cost about the same. Additionally, single units, and sometimes even multiple units, handling such large flow rates would not be pre-fabricated but would have to be specially constructed on site, which can increase costs. This was also supported by the information provided by other biofilter suppliers. Therefore, any potential cost reduction benefits related to economy of scale have already been captured in the lower biofilter cost estimates given above and no additional cost benefits will be realized at higher flow rates. As a result, the cost estimates for biofilters will be directly proportional to the airflow rate treated and the number of animals housed.

FIGURE 1 BIOFILTER CAPITAL COST PER CFM OF AIR TREATED



Boyette, R. Allen – E&A Environmental Consultants Inc., "Biofilter Economics and Performance", 1996

Cost Estimate for Biofilters for this Analysis

For purposes of this analysis, the following biofilter cost estimate will be used. The cost estimate is conservative and significantly lower than many of the capitol cost estimates given in the references listed above.

Capital Cost (2019): $3.00/cfm

Capital Cost

The cost estimate for the biofilter includes the costs of the fans, media, plenum, engineering, and labor but does not include installation of the required ductwork. As stated above, a conservative capital cost of $3.00 per cfm will be assumed in this cost analysis.

Based on the required airflow previously determined, the capital cost of the biofilter is calculated as follows:

$3.00 cfm x 93,333 cfm = $280,000

Pursuant to District Policy APR 1305, section X (11/09/99), the cost for the purchase of the biofilter will be spread over the expected life of the system using the capital recovery equation. The biofilter media (e.g., soil, compost, wood chips) must be replaced after 3-5 years in order to remain effective. This is an additional cost that is not being considered in this cost analysis. Therefore, the expected life of the entire system (fans, media, plenum, etc) will be estimated at 10 years. A 10% interest rate is assumed in the equation and the assumption will be made that the equipment has no salvage value at the end of the ten-year cycle.

$$A = [P \times i(I+1)^n]/[(I+1)^n-1]$$

Where: A = Annual Cost
P = Present Value
I = Interest Rate (10%)
N = Equipment Life (10 years)

$$A = [\$280,000 \times 0.1(1.1)^{10}]/[(1.1)^{10}-1]$$
= $45,569/year

VOC Emission Reductions for Biofiltration

The annual VOC Emission Reductions for the milking parlor is calculated as follows:

[Number of milk cows] x [Uncontrolled Milking Parlor VOC EF (lb/milk cow-year)] x [Capture Efficiency] x [Biofilter Control Efficiency]

= (7,140 milk cows) x (0.44 lb-VOC/milk cow-year) x (0.95) x (0.80)
= 2,388 lb-VOC/year

Cost of VOC Emission Reductions

Cost of reductions = ($45,569/year)/[(2,388 lb-VOC/year)(1 ton/2000 lb)]
= $38,165/ton of VOC reduced

As shown above, the capital cost alone for a biofilter would cause the cost of the VOC reductions to be greater than the $17,500/ton cost effectiveness threshold of the District BACT policy. Therefore, this option is not cost effective and is being removed from consideration at this time.

3) Flush/Spray Milking Parlor Before, After, or During Milking Each Group of Cows

The technology/practice is currently used at all dairies and is therefore cost effective.

e. Step 5 - Select BACT

Since the higher-ranked options are not cost effective, the remaining Achieved in Practice option is determined to be BACT. Therefore, BACT for this operation is flush/spray milking parlor before, after, or during milking each group of cows. The facility has proposed to implement this option to satisfy BACT.

Top-Down BACT Analysis for Confined Animal Facility – Cow Housing – Freestall and Saudi Style Barns

1. Top-Down BACT Analysis for PM_{10} Emissions:

This BACT discussion applies to the Half Freestall Barns A, B, and C, and the Special Needs (Saudi Style) Barn.

a. Step 1 - Identify All Possible Control Technologies

The following options were identified as possible controls for PM_{10} emissions from the cow housing (freestall barns and Saudi style barns):

1) Concrete Feedlanes and Walkways
2) Scraping of Exercise Pens with a Pull-Type Scraper

Description of Control Technologies

1) Concrete Feedlanes and Walkways

Constructing the feed lanes and walkways of concrete causes the dairy animals to spend an increased amount of time on a paved surface rather than dry dirt, thus reducing PM_{10} emissions. Additionally, the manure that is deposited in the lanes and walkways will be flushed, which will prevent PM_{10} emissions from drying manure.

2) Scraping of Exercise Pens with a Pull-Type Scraper

The surface of the freestall or Saudi Style exercise pens is composed of earth and deposited manure, both of which have the potential for particulate matter emissions either as a result of wind or animal movement. Frequent scraping of exercise pen surfaces will reduce the amount of dry manure on the corral surfaces that may be pulverized by the cows' hooves and emitted as PM_{10}.

Increasing the frequency that exercise pen are scraped is expected to reduce emissions of gaseous pollutants from the exercise pen surface and PM that results from the cattle hooves acting on the surface of the exercise pen; however, requiring an excessively high frequency may negate these emission reductions because of the NO_X and PM emitted from combustion of fuel for the tractor and PM emissions resulting from use of the tractor on the exercise pen surface.

b. Step 2 - Eliminate Technologically Infeasible Options

There are no technologically infeasible options.

c. Step 3 - Rank Remaining Control Technologies by Control Effectiveness

1) Concrete feed lanes and walkways;
2) Scraping of exercise pens every two weeks using a pull-type scraper in the morning hours except when prevented by wet conditions.

d. Step 4 - Cost Effectiveness Analysis

The options above are all achieved in practice; therefore a cost analysis is not required.

e. Step 5 - Select BACT

The applicant has proposed to implement the following options:

1) Concrete feed lanes and walkways;
2) Scraping exercise pens every two weeks using pull-type scraper in the morning hours except when prevented by wet conditions.

The proposal satisfies BACT for half freestall barns A, B, C, and Special Needs barn.

2. Top-Down BACT Analysis for VOC Emissions:

This BACT discussion applies to the Half Freestall Barns A, B, and C, and the Special Needs (Saudi Style) Barn.

a. Step 1 - Identify all control technologies

The following options were identified as possible controls for VOC emissions from the cow housing (freestall barns and Saudi Style barns):

Feed and Manure Management Practices

1) Concrete feed lanes and walkways;
2) Flushing the lanes and walkways for the mature cows (milk and dry cows) four times per day and flushing lanes and walkways for the remaining animals once per day (or for dairies that cannot use a flush system, scraping lanes and walkways for mature cows with an automatic scraper (or equivalent) four times per day and cleaning lanes and walkways for support stock (heifers) at least once per day.
3) Feeding all animals in accordance with National Research Council (NRC) or other District-approved guidelines;
4) Properly sloping exercise pens (minimum of 3% slope where the available space for each animal is 400 square feet or less and minimum of 1.5% where the available space for each animal is more than 400 square feet per animal) or managing exercise pens to maintain a dry surface;
5) Scraping exercise pens every two weeks using a pull-type scraper in the morning hours except when prevented by wet conditions; and
6) Rule 4570 Measures.

Description of Control Technologies

1) Concrete Feed Lanes and Walkways

Dairy animals spend a large amount of time on the feed lanes and walkways. Constructing these areas of concrete will reduce particulate matter emissions by having the animals spend more time on a paved surface rather than dry dirt. The concrete lanes and walkways create an avenue for the flush or scrape manure removal systems. The flush system will further reduce particulate matter emissions and will also reduce VOC and ammonia emissions (see below).

2) Frequent Cleaning of Lanes and Walkways

Many dairy operations use flush or scrape systems to remove manure from the freestall or Saudi-style barn lanes and walkways. When dairies use a flush system, a large volume of water is introduced at the head of the paved area of the freestall or Saudi-style barn, and the cascading water removes the manure. The required volume of flush water varies with the size and slope of the area to be flushed. When dairies use a scrape system for manure management, manure is typically scraped from the cow housing lanes using a tractor or skid steer with a scraping attachment, or using an automatic mechanical scraper. The automatic scraper usually consists of a hinged v-shaped scraper driven by a cable or chain. The mechanical scraper is periodically dragged forward to draw manure to the end of a lane. After completing a pass, the chain or cable reverses direction and pulls the scraper back in the opposite direction.

The scraped manure is either temporarily stored in a pile where liquids are allowed to drain off, or loaded onto a truck or tractor for transport or land application. The freestall or Saudi style barn lanes for milk and dry cows are typically flushed or scraped twice per day, but the cleaning frequency can vary between one to four times per day. The lanes for support stock are usually flushed or scraped once per day or less frequently.

In addition to cleaning the lanes and walkways, the flush and scrape systems also serve as an emission control for reducing VOC emissions. The manure deposited in the lanes, which is a source of VOC emissions, is removed from the cow housing area by the flush or scrape system. Flush systems also reduce PM_{10} and ammonia emissions. Additionally, many of the VOCs emitted from fresh cow manure, such as alcohols (ethanol and methanol) and many Volatile Fatty Acids (VFAs), are highly soluble in water. Therefore, when a flush system is used, a large percentage of these compounds will dissolve in the flush water and will not be emitted from the cow housing permit unit. The flush water can then carry the manure and the dissolved volatile compounds to an anaerobic treatment lagoon or other manure stabilization process for treatment.

It must be noted that the system for cleaning the lanes and walkways will only control the VOCs emitted from the manure it will have little or no effect on enteric emissions produced from the cows' digestive processes. As stated above, the lanes and walkways in the cow housing areas are typically cleaned twice per day. Cleaning the lanes four times per day will increase the frequency that manure is removed from the cow housing permit unit. Although the control efficiency for VOCs may actually be much higher, increasing the cleaning frequency of the lanes will be conservatively assumed to have a control efficiency of 10% for VOCs emitted from manure until better data becomes available.

3) Animals Fed in Accordance with (NRC) or other District-Approved Guidelines

Nutritional management of dairy feed is routinely practiced to improve milk production and herd health. The potential for VOC emissions can be reduced by reducing the quantity of undigested nutrients in the manure. Many of the VOCs emitted from Confined Animal Facilities, including dairies, originate from the decomposition of undigested protein in animal waste.[1] This undigested protein also produces ammonia and hydrogen sulfide emissions. The level of microbial action in the manure corresponds to the level of organic nitrogen content in the manure; the lower the level of nitrogen the lower the level of microbial action and the lower the production of VOCs, ammonia, and hydrogen sulfide.

A diet that is formulated to feed proper amounts of ruminantly degradable protein will result in improved nitrogen utilization by the animal and corresponding reduction in urea and organic nitrogen content of the manure, which will reduce the production of VOCs and ammonia. The latest National Research Council (NRC) guidelines for the selection of an optimal bovine diet should be followed to the maximum extent possible. The diet recommendations made in this publication seek to achieve the maximum uptake of protein by the animal and the minimum carryover of nitrogen into the manure.

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[1] "Emissions of Volatile Organic Compounds Originating from UK Livestock Agriculture", Hobbs, P.J. 2004 – Journal of the Science of Food and Agriculture

Based on very limited data (Klaunser, 1998, *J Prod Agric),* diet manipulation decreased nitrogen excretion by 34% while improving milk production. Up to 70% of excess nitrogen is lost off of the farm through volatilization, denitrification and leaching. Because of limited research, feeding dairy animals in accordance with National Research Council (NRC) or other District-approved guidelines will be assumed to have a conservative control efficiency of only 5-10% for both enteric VOC emissions from dairy animals and VOC emissions from manure.

4) Properly sloping exercise pens

Accumulation of water on exercise pen surfaces, due to rain or on-farm activities, could result in anaerobic conditions and thereby increase emissions. Keeping exercise pen surfaces dry and properly aerated, on the other hand, promotes the aerobic conditions that reduce emissions. Proper slope design is therefore required to ensure that drainage of any water deposited on the exercise pen surfaces will be as rapid as possible.

5) Scraping of Exercise Pens with a Pull-Type Scraper

Frequent scraping the freestall or Saudi style barn exercise pens will reduce the amount of manure on the surfaces, which will reduce VOC and ammonia emissions resulting from decomposition of this manure. This practice will also provide a uniform surface, reducing anaerobic conditions on the surface, which will reduce gaseous pollutants from this area. The frequency that exercise pens are scraped at dairies can vary from as little as once a year to every week.

Increasing the frequency that exercise pens are scraped is expected to reduce emissions of gaseous pollutants from the surface and PM that results from the cattle hooves acting on the surface of the exercise pens; however, requiring an excessively high frequency may negate these emission reductions because of the NOx and PM emitted from combustion of fuel for the tractor and PM emissions resulting from use of the tractor on the exercise pen surface.

b. Step 2 - Eliminate Technologically Infeasible Options

There are no technologically infeasible options.

c. Step 3 - Rank remaining options by control effectiveness

All the options identified in step 1 are assumed to each have the same control effectiveness:

Feed and Manure Management Practices

1) Concrete feed lanes and walkways;
2) Flushing the lanes and walkways for the mature cows (milk and dry cows) four times per day and flushing lanes and walkways for the remaining animals once per day (or for dairies that cannot use a flush system, scraping lanes and walkways for mature cows with an automatic scraper (or equivalent) four times per day and cleaning lanes and walkways for support stock (heifers) at least once per day.
3) Feeding all animals in accordance with National Research Council (NRC) or other District-approved guidelines;

4) Properly sloping exercise pens (minimum of 3% slope where the available space for each animal is 400 square feet or less and minimum of 1.5% where the available space for each animal is more than 400 square feet per animal) or managing exercise pens to maintain a dry surface;
5) Scraping exercise pens every two weeks using a pull-type scraper in the morning hours except when prevented by wet conditions; and
6) Rule 4570 Measures.

d. Step 4 - Cost Effectiveness Analysis

The options above are all achieved in practice; therefore a cost analysis is not required.

e. Step 5 - Select BACT

The applicant has proposed to implement the following options:

1) Concrete feed lanes and walkways;
2) Flushing the lanes and walkways for the mature cows (milk and dry cows) four times per day and flushing lanes and walkways for the remaining animals once per day (or for dairies that cannot use a flush system, scraping lanes and walkways for mature cows with an automatic scraper (or equivalent) four times per day and cleaning lanes and walkways for support stock (heifers) at least once per day.
3) Feeding all animals in accordance with NRC or other District-approved guidelines;
4) Properly sloping exercise pens (minimum of 3% slope where the available space for each animal is 400 square feet or less and minimum of 1.5% where the available space for each animal is more than 400 square feet per animal) or managing exercise pens to maintain a dry surface ;
5) Scraping exercise pens every two weeks using a pull-type scraper in the morning hours except when prevented by wet conditions; and
6) Rule 4570 Measures.

The proposal satisfies BACT for half freestall barns A, B, C, and Special Needs barn.

3. Top-Down BACT Analysis for NH_3 Emissions

This BACT discussion applies to the Half Freestall Barns A, B, and C, and the proposed Special Needs (Saudi Style) Barn.

a. Step 1 - Identify all control technologies

The following management practices have been identified as possible control options for the NH_3 emissions from the cow housing (freestall barns and Saudi style barns):

Feed and Manure Management Practices

1) Concrete feed lanes and walkways;
2) Flushing the lanes and walkways for the mature cows (milk and dry cows) four times per day and flushing lanes and walkways for the remaining animals once per day (or for dairies that cannot use a flush system, scraping lanes and walkways for mature cows with an automatic scraper (or equivalent) four times per day and cleaning lanes and walkways for support stock (heifers) at least once per day.
3) Feeding all animals in accordance with National Research Council (NRC) or other District-approved guidelines;
4) Properly sloping exercise pens (minimum of 3% slope where the available space for each animal is 400 square feet or less and minimum of 1.5% where the available space for each animal is more than 400 square feet per animal) or managing exercise pens to maintain a dry surface; and
5) Scraping exercise pens every two weeks using a pull-type scraper in the morning hours except when prevented by wet conditions; and

Description of Control Technologies

1) Concrete Feed Lanes and Walkways

Dairy animals spend a large amount of time on the feed lanes and walkways. Constructing these areas of concrete will reduce particulate matter emissions by having the animals spend more time on a paved surface rather than dry dirt. The concrete lanes and walkways create an avenue for the flush or scrape manure removal systems. The flush system will further reduce particulate matter emissions and will also reduce VOC and ammonia emissions (see below).

2) Frequent Cleaning of Lanes and Walkways

Many dairy operations use flush or scrape systems to remove manure from the freestall and Saudi-style lanes and walkways. When dairies use a flush system, a large volume of water is introduced at the head of the paved area of the freestall and Saudi style barn, and the cascading water removes the manure. The required volume of flush water varies with the size and slope of the area to be flushed. When dairies use a scrape system for manure management, manure is typically scraped from the cow housing lanes using a tractor or skid steer with a scraping attachment, or using an automatic mechanical scraper. The automatic scraper usually consists of a hinged v-shaped scraper driven by a cable or chain. The mechanical scraper is periodically dragged forward to draw manure to the end of a lane. After completing a pass, the chain or cable reverses direction and pulls the scraper back in the opposite direction. The scraped manure is either temporarily stored in a pile where liquids are allowed to drain off, or loaded onto a truck or tractor for transport or land application. The freestall

and Saudi style lanes for milk and dry cows are typically flushed or scraped twice per day, but the cleaning frequency can vary between one to four times per day. The lanes for support stock are usually flushed or scraped once per day or less frequently.

In addition to cleaning the freestall and Saudi style lanes and walkways, the flush or scrape systems also serve as an emission control for reducing emissions. The manure deposited in the lanes, which is a source of NH_3 emissions, is removed from the cow housing area by the flush or scrape system. Additionally, ammonia is highly soluble in water. Therefore, when a flush system is used, a large portion of ammonia will be flushed away with the flush water and will not be emitted from the cow housing permit unit.

3) Animals fed in accordance with (NRC) or other District-approved Guidelines

Nutritional management of dairy feed is routinely practiced to improve milk production and herd health. The potential for ammonia emissions can be reduced by reducing the amount of undigested nitrogen compounds in the manure. The level of microbial action in the manure corresponds to the level of organic nitrogen content in the manure; the lower the level of nitrogen the lower the level of microbial action and the lower the production of ammonia and VOCs.

A diet that is formulated to feed proper amounts of ruminantly degradable protein will result in improved nitrogen utilization by the animal and corresponding reduction in urea and organic nitrogen content of the manure, which will reduce the production of VOCs and ammonia. The latest National Research Council (NRC) guidelines for the selection of an optimal bovine diet should be followed to the maximum extent possible. The diet recommendations made in this publication seek to achieve the maximum uptake of protein by the animal and the minimum carryover of nitrogen into the manure.

4) Properly sloping exercise pens

Accumulation of water on exercise pen surfaces, due to rain or on-farm activities, could result in anaerobic conditions and thereby increase emissions. Keeping exercise pen surfaces dry and properly aerated, on the other hand, promotes the aerobic conditions that reduce emissions. Proper slope design is therefore required to ensure that drainage of any water deposited on the exercise pen surfaces will be as rapid as possible.

5) Scraping of Exercise Pens with a Pull-Type Scraper

Frequent scraping the freestall or Saudi style barn exercise pens will reduce the amount of manure on the surfaces, which will reduce VOC and ammonia emissions resulting from decomposition of this manure. This practice will also provide a uniform surface, reducing anaerobic conditions on the surface, which will reduce gaseous pollutants from this area.

Increasing the frequency that exercise pens are scraped is expected to reduce emissions of gaseous pollutants from the surface and PM that results from the cattle hooves acting on the surface of the exercise pens; however, requiring an excessively high frequency may negate these emission reductions because of the NO_x and PM emitted from combustion of fuel for the tractor and PM emissions resulting from use of the tractor on the exercise pen surface.

b. Step 2 - Eliminate technologically infeasible options

There are no technologically infeasible options.

c. Step 3 - Rank remaining options by control effectiveness

All the options identified in step 1 are assumed to each have the same control effectiveness:

Feed and Manure Management Practices

1) Concrete feed lanes and walkways;
2) Flushing the lanes and walkways for the mature cows (milk and dry cows) four times per day and flushing lanes and walkways for the remaining animals once per day (or for dairies that cannot use a flush system, scraping lanes and walkways for mature cows with an automatic scraper (or equivalent) four times per day and cleaning lanes and walkways for support stock (heifers) at least once per day.
3) Feeding all animals in accordance with National Research Council (NRC) or other District-approved guidelines;
4) Properly sloping exercise pens (minimum of 3% slope where the available space for each animal is 400 square feet or less and minimum of 1.5% where the available space for each animal is more than 400 square feet per animal) or managing exercise pens to maintain a dry surface; and
5) Scraping exercise pens every two weeks using a pull-type scraper in the morning hours except when prevented by wet conditions; and

d. Step 4 - Cost Effectiveness Analysis

The options above are all achieved in practice; therefore a cost analysis is not required.

e. Step 5 - Select BACT

The applicant has proposed to implement the following options:

1) Concrete feed lanes and walkways;
2) Flushing the lanes and walkways for the mature cows (milk and dry cows) four times per day and flushing lanes and walkways for the remaining animals once per day (or for dairies that cannot use a flush system, scraping lanes and walkways for mature cows with an automatic scraper (or equivalent) four times per day and cleaning lanes and walkways for support stock (heifers) at least once per day.
3) Feeding all animals in accordance with National Research Council (NRC) or other District-approved guidelines;
4) Properly sloping exercise pens (minimum of 3% slope where the available space for each animal is 400 square feet or less and minimum of 1.5% where the available space for each animal is more than 400 square feet per animal) or managing exercise pens to maintain a dry surface; and
5) Scraping exercise pens every two weeks using a pull-type scraper in the morning hours except when prevented by wet conditions; and

The proposal satisfies BACT for half freestall barns A, B, C, and Special Needs barn.

Top Down BACT Analysis for Confined Animal Facility – Cow Housing – Open Corrals

1. Top-Down BACT Analysis for NH_3 Emissions:

This BACT discussion applies to Open Corral 38.

a. Step 1 - Identify all control technologies

The following options were identified as possible controls for NH_3 emissions from the cow housing (open corrals):

Feed and Manure Management Practices

1) Concrete feed lanes and walkways;
2) Flushing the lanes and walkways for the mature cows (milk and dry cows) four times per day and flushing lanes and walkways for the remaining animals once per day (or for dairies that cannot use a flush system, scraping lanes and walkways for mature cows with an automatic scraper (or equivalent) four times per day and cleaning lanes and walkways for support stock (heifers) at least once per day);
3) Feeding all animals in accordance with National Research Council (NRC) or other District-approved guidelines;
4) Properly sloping corrals (minimum of 3% slope where the available space for each animal is 400 square feet or less and minimum of 1.5% where the available space for each animal is more than 400 square feet per animal) or managing corrals to maintain a dry surface; and
5) Scraping corrals and exercise pens every two weeks using pull-type scraper in the morning hours except when prevented by wet conditions.

Description of Control Technologies

1) Concrete Feed Lanes and Walkways

Dairy animals spend a large amount of time on the feed lanes and walkways. Constructing these areas of concrete will reduce particulate matter emissions by having the animals spend more time on a paved surface rather than dry dirt. The concrete lanes and walkways create an avenue for the flush or scrape manure removal systems. The flush system will further reduce particulate matter emissions and will also reduce VOC and ammonia emissions (see below).

2) Frequent Cleaning of Lanes and Walkways

Many dairy operations use flush or scrape systems to remove manure from the corral and freestall lanes and walkways. When dairies use a flush system, a large volume of water is introduced at the head of the paved area of the corrals or freestalls, and the cascading water removes the manure. The required volume of flush water varies with the size and slope of the area to be flushed. When dairies use a scrape system for manure management, manure is typically scraped from the cow housing lanes using a tractor or skid steer with a scraping attachment, or using an automatic mechanical scraper. The automatic scraper usually consists of a hinged v-shaped scraper driven by a cable or chain. The mechanical scraper is periodically dragged forward to draw

manure to the end of a lane. After completing a pass, the chain or cable reverses direction and pulls the scraper back in the opposite direction. The scraped manure is either temporarily stored in a pile where liquids are allowed to drain off, or loaded onto a truck or tractor for transport or land application. The freestall and corral lanes for milk and dry cows are typically flushed or scraped twice per day, but the cleaning frequency can vary between one to four times per day. The lanes for support stock are usually flushed or scraped once per day or less frequently.

In addition to cleaning the corral and freestall lanes and walkways, the flush, scrape, and vacuum systems also serve as an emission control for reducing emissions. The manure deposited in the lanes, which is a source of NH_3 emissions, is removed from the cow housing area by the flush, scrape, or vacuum system. Additionally, ammonia is highly soluble in water. Therefore, when a flush system is used, a large portion of ammonia will be flushed away with the flush water and will not be emitted from the cow housing permit unit.

3) Animals fed in accordance with (NRC) or other District-approved Guidelines

Nutritional management of dairy feed is routinely practiced to improve milk production and herd health. The potential for ammonia emissions can be reduced by reducing the amount of undigested nitrogen compounds in the manure. The level of microbial action in the manure corresponds to the level of organic nitrogen content in the manure; the lower the level of nitrogen the lower the level of microbial action and the lower the production of ammonia and VOCs.

A diet that is formulated to feed proper amounts of ruminantly degradable protein will result in improved nitrogen utilization by the animal and corresponding reduction in urea and organic nitrogen content of the manure, which will reduce the production of VOCs and ammonia. The latest National Research Council (NRC) guidelines for the selection of an optimal bovine diet should be followed to the maximum extent possible. The diet recommendations made in this publication seek to achieve the maximum uptake of protein by the animal and the minimum carryover of nitrogen into the manure.

4) Properly sloping corrals

Accumulation of water on corrals surfaces, due to rain or on-farm activities, could result in anaerobic conditions and thereby increase emissions. Keeping corral surfaces dry and properly aerated, on the other hand, promotes the aerobic conditions that reduce emissions. Proper slope design is therefore required to ensure that drainage of any water deposited on the corral surfaces will be as rapid as possible.

5) Scraping of Corrals and Exercise Pens with a Pull-Type Scraper

Frequent scraping the corrals and exercise pens will reduce the amount of manure on the corral surfaces, which will reduce VOC and ammonia emissions resulting from decomposition of this manure. This practice will also provide a uniform surface, reducing anaerobic conditions on the corral surface, which will reduce gaseous pollutants from this area.

Increasing the frequency that corrals are scraped is expected to reduce emissions of gaseous pollutants from the corral surface and PM that results from the cattle hooves acting on the surface of the corrals; however, requiring an excessively high frequency may negate these emission reductions because of the NOx and PM emitted from combustion of fuel for the tractor and PM emissions resulting from use of the tractor on the corral surface.

b. Step 2 - Eliminate technologically infeasible options

There are no technologically infeasible options.

c. Step 3 - Rank remaining options by control effectiveness

All the options identified in step 1 are assumed to each have the same control effectiveness:

Feed and Manure Management Practices

1) Concrete feed lanes and walkways;
2) Flushing the lanes and walkways for the mature cows (milk and dry cows) four times per day and flushing lanes and walkways for the remaining animals once per day (or for dairies that cannot use a flush system, scraping lanes and walkways for mature cows with an automatic scraper (or equivalent) four times per day and cleaning lanes and walkways for support stock (heifers) at least once per day.
3) Feeding all animals in accordance with National Research Council (NRC) or other District-approved guidelines;
4) Properly sloping corrals (minimum of 3% slope where the available space for each animal is 400 square feet or less and minimum of 1.5% where the available space for each animal is more than 400 square feet per animal) or managing corrals to maintain a dry surface; and
5) Scraping corrals and exercise pens every two weeks using pull-type scraper in the morning hours except when prevented by wet conditions.

d. Step 4 - Cost Effectiveness Analysis

The options above are all achieved in practice; therefore a cost analysis is not required.

e. Step 5 - Select BACT

The applicant has proposed to implement the following options:

1) Concrete feed lanes and walkways;
2) Flushing the Lanes and walkways for the mature cows (milk and dry cows) four times per day and flushing lanes and walkways for the remaining animals at least once per day (or for dairies that cannot use a flush system, scraping lanes and walkways for mature cows with an automatic scraper (or equivalent) four times per day and cleaning lanes and walkways for support stock (heifers) at least once per day);
3) Feeding all animals in accordance with National Research Council (NRC) or other District-approved guidelines;

4) Properly sloping corrals (minimum of 3% slope where the available space for each animal is 400 square feet or less and minimum of 1.5% where the available space for each animal is more than 400 square feet per animal) or managing corrals to maintain a dry surface; and
5) Scraping of open corrals and exercise pens every two weeks using pull-type scraper in the morning hours except when prevented by wet conditions.

The proposal satisfies BACT for Open Corral 38.

Top Down BACT Analysis for Confined Animal Facility – Liquid Manure Handling – Lagoon/Storage Ponds

1. Top-Down BACT Analysis for VOC Emissions:

This BACT discussion applies to the liquid manure handling system consisting of one lagoon and one covered anaerobic digester lagoon.

a. Step 1 - Identify all control technologies

The following options were identified as possible controls for VOC emissions from the lagoons in the liquid manure handling system:

1) Aerobic treatment lagoon or mechanically aerated lagoon;
2) Covered lagoon digester vented to a control device with minimum 95% control
3) Anaerobic treatment lagoon designed according to NRCS Guideline, and solids removal/separation system (mechanical separator(s) or settling basin(s)/weeping wall(s))

Description of Control Technologies

1) Aerobic Treatment Lagoon or Mechanically Aerated Lagoon

An aerobic lagoon is a waste treatment lagoon that is designed to facilitate the decomposition of wastewater by microbes in the presence of oxygen (O_2). The process of aerobic decomposition results in the conversion of organic compounds in the wastewater into carbon dioxide (CO_2), and (H_2O), nitrates, sulfates, and inert biomass (sludge). The process of aerobic digestion is sometimes referred to as nitrification (especially when discussing NH_3 transformation). Complete aerobic digestion (100% aeration) removes nearly all malodors and also virtually eliminates VOCs, H_2S, and NH_3 emissions from liquid waste.

In completely aerated lagoons sufficient oxygen must be provided to sustain the aerobic microorganisms. NRCS Practice Standard Code 359 specifies that naturally aerobic lagoons have a minimum surface area determined by regional climate and daily Biological Oxygen Demand (BOD_5) and requires the depth of naturally aerobic lagoons have a maximum depth no greater than five feet. For mechanically aerated lagoons NRCS Practice Standard Code 359 specifies that the aeration equipment shall provide a minimum of 1 pound of oxygen for each pound of daily BOD_5 loading. The mechanical aerators that provide the required oxygen may float on the lagoon surface or be submerged in the lagoon. Aeration can also be performed by injection of tiny air bubbles into the lagoon water, mixing of the lagoon water, or spraying of the water into the air. According to Dr. Ruihong Zhang, a researcher at the University of California, Davis, at least 95% VOC control can be achieved if the dissolved oxygen (DO) concentration of the liquid manure is 2.0 mg/L or more. However, the DO concentrations achieved in mechanically aerated lagoons treating manure are typically much less than this and will therefore have lower control efficiencies.

2) Covered Lagoon Digester Vented to a Control Device

Covered treatment lagoons are one type of anaerobic digester. An anaerobic digester is an enclosed basin or tank that is designed to facilitate the decomposition of wastewater by microbes in the absence of oxygen. The process of anaerobic decomposition results in the preferential conversion of organic compounds in the wastewater into methane (CH_4), carbon dioxide (CO_2), and water rather than intermediate metabolites (VOCs). The gas generated by this process is known as biogas, waste gas or digester gas. In addition to methane and carbon dioxide, biogas also contains small amounts of Nitrogen (N_2), Oxygen (O_2), Hydrogen Sulfide (H_2S), and Ammonia (NH_3). Biogas will also include trace amounts of various Volatile Organic Compounds (VOCs) that remain from incomplete digestion of the volatile solids in the incoming wastewater. The small amounts of undigested solids that remain after digestion are removed from the digester as sludge. Because biogas is mostly composed of methane, the main component of natural gas, the gas produced in the digester can be cleaned to remove H_2S and other impurities and used as fuel. The captured biogas can be combusted in a flare or may be sent to a boiler or internal combustion engine, where the gas can be used to generate useful heat or electrical energy.

As stated above, the gas generated in the covered lagoon anaerobic digester can be captured and then sent to a suitable combustion device. During combustion, gaseous hydrocarbons are oxidized to form CO_2 and water. The VOCs emitted from the liquid manure in the covered lagoon can be reduced by 95% with the use of an appropriate combustion device. Therefore, installation of the digester will lower the total VOCs emitted from the liquid manure from the liquid manure handling system. Although the control efficiency of the gas captured from the primary lagoon is expected to be 95% or more, the overall control efficiency is expected to be less since VOCs will also be emitted from the storage pond and as fugitive emissions. For this analysis, the overall control efficiency is assumed to be 80% of the emissions that would have been emitted from the lagoon system.

3) Anaerobic Treatment Lagoon Designed to Meet Natural Resources Conservation Service (NRCS) Standards and solids removal/separation system

Anaerobic Treatment Lagoon

An anaerobic treatment lagoon is a waste treatment lagoon that is designed to facilitate the decomposition of manure by microbes in the absence of oxygen. The process of anaerobic decomposition results in the preferential conversion of organic compounds in the wastewater into methane (CH_4), carbon dioxide (CO_2), and water rather than intermediate metabolites (VOCs). The National Resource Conservation Service (NRCS) California Field Office Technical Guide Code 359 - Waste Treatment Lagoon specifies the following criteria for the design of anaerobic treatment lagoons:

- Required volume: The minimum design volume should account for all potential sludge, treatment, precipitation, and runoff volumes.
- Treatment period: retention time of the material in the lagoon shall be the time required to provide environmentally safe utilization of waste. The minimum hydraulic retention time for a covered lagoon in the San Joaquin Valley is about 38 days.

- Waste loading: shall be based on the maximum daily loading considering all waste sources that will be treated by the lagoon. The loading rate is typically based on volatile solids (VS) loading per unit of volume. The suggested loading rate for the San Joaquin Valley is 6.5-11 lb-VS/1000 ft^3/day depending on separation and type of system.
- The operating depth of the lagoon shall be 12 feet or greater. Maximizing the depth of the lagoon minimizes the surface area, which in turn minimizes the cover size and cost. Increasing the lagoon depth has the following advantages:
  - Minimizes surface area in contact with the atmosphere, thus reducing surface available to convection, evaporation
  - Smaller surface areas provide a more favorable and stable environment for methane bacteria
  - Better mixing of lagoon due to rising gas bubbles
  - Requires less land
  - More efficient for mechanical mixing

The lagoon design shall also consider location, soils and foundation, erosion, and depth to groundwater as required by the regional water control board.

The NRCS guideline suggests that this system consist of two cells, a treatment lagoon (primary lagoon) and a storage pond (secondary lagoon). The first stage of the lagoon system is the biological treatment stage and is designed with a constant liquid level to stabilize the anaerobic digestion. The effluent from the first stage overflows into a second lagoon designed for liquid storage capacity. Effluent from the second lagoon is used in the flush lanes and for the irrigation of cropland. The secondary (overflow) lagoon acts as the storage pond, which can be emptied when necessary. However, a single lagoon can also be considered an anaerobic lagoon as long as all the criteria are met and that the liquid manure is not drawn less than 6 feet at any time.

A properly designed anaerobic treatment lagoon will reduce the Volatile Solids (VS) by at least 50% and will reduce the biological oxygen demand (BOD), which will result in greater efficiency in degrading compounds that contain carbon into methane and carbon dioxide rather than VOCs. Although, the VS reduction is expected to be at least 50%, a conservative control efficiency of 40% will be assumed for anaerobic treatment lagoons, until better data becomes available.

Solids Removal/Separation

Mechanical Separation

Mechanical separators separate solids out from the liquid/slurry stream. There are many different versions of separators on the market. The percentage of separation varies depending on screen size and type of separation system. However, a 50% solid removal efficiency is used as a general rule of thumb. Although the separation efficiency can be improved by better separation or addition of separators or screens, it does not necessarily result in an increase in VOC emission reduction. The type of solids removed are generally non-digestible (lignins, cellulose, etc.) materials that do not easily digest in the lagoons; the amount of volatiles solids that end up in the lagoon will most likely not change even though there is an increase in solid removal efficiency. In addition, there is no data that links higher removal efficiency with an increase in VOC emission reduction.

Settling Basin Separation

The purpose of settling basin separation is to remove the fibrous materials prior to the liquid manure entering the lagoon. By removing the most fibrous material from the liquid stream prior to entering the pond, it is anticipated that the amount of intermediate metabolites released during digestion in the pond may be reduced. Removal of the fibrous material allows for more complete digestion in the pond and lower emissions.

Solids remaining in the settling basin are left to dry and then are removed. The separated solids can be immediately incorporated into cropland or spread in thin layers, harrowed, and dried.

The control efficiency of settling basins is not known at this time. Separation systems in general have the potential of reducing emissions from the lagoon system by allowing for more complete digestion to take place in the lagoon through the prior removal of indigestible solids. Settling basins dewater predominantly through draining. Some evaporation can occur (depending on weather), but the settling basin is drained, thereby creating a biofilter (crust) over the top of the basin.

Weeping Wall Separation

The purpose of weeping wall separation is to remove the fibrous materials prior to the liquid manure entering the lagoon and enhance the dewatering surface when compared to any other separation pit, basin, or pond. By removing the most fibrous material from the liquid stream prior to entering the pond, it is anticipated that the amount of intermediate metabolites released during digestion in the pond will be reduced. Removal of the fibrous material allows for more complete digestion in the pond and lower emissions. With weeping walls the effluent is allowed to weep through the slots between boards or screens while the solids are retained. Liquid manure enters the structure and slowly drains through the solids in the structure to dewater at a face. Solids from the structure can be hauled directly out of the structure if farming practices permit or they can be further dried for future use. Weeping wall systems can remove 60% of the solids in manure.

The emissions control efficiency of weeping walls is not known at this time. Separation systems in general have the potential of reducing emissions from the lagoon system by allowing for more complete digestion to take place through the removal of indigestible solids.

b. Step 2 - Eliminate technologically infeasible options

No technologically feasible options were removed.

c. Step 3 - Rank remaining options by control effectiveness

1) Aerobic Treatment Lagoon or Mechanically Aerated Lagoon (95% VOC control efficiency)
2) Covered Lagoon Digester Vented to a Control Device (80% VOC control efficiency)
3) Anaerobic Treatment Lagoon Designed to Meet Natural Resources Conservation Service (NRCS) Standards (40% VOC control efficiency) and solids removal/separation

d. Step 4 - Cost Effectiveness Analysis

1) Aerobic Treatment Lagoon or Mechanically Aerated Lagoon

The following analysis is based on the treatment of manure from 7,140 milk cows in naturally aerobic lagoons and mechanically aerated lagoons.

Space Requirement for a Naturally Aerobic Lagoon Treating Manure from 7,140 Dairy Cows

NRCS Practice Standard Code 359 requires that naturally aerobic lagoons be designed to have a minimum treatment surface area as determined on the basis of daily BOD_5 loading per unit of lagoon surface. The standard specifies that the maximum loading rate of naturally aerobic lagoons shall not exceed the loading rate indicated by the NRCS Agricultural Waste Management Field Handbook (AWMFH) or the maximum loading rate according to state regulatory requirements, whichever is more stringent. According to Figure 10-30 (August 2009) of the latest version of the AWMFH, the maximum aerobic lagoon loading rate for the San Joaquin Valley is 45 - 55 lb-BOD_5/acre-day. According to Table 4-5 (March 2008) of the NRCS AWMFH, the total daily manure produced by a milk cow will have 2.9 lb-BOD_5/day. Assuming that 80% of the manure will be flushed to the lagoon system, the minimum lagoon surface area required for a naturally aerobic lagoon treating manure from 7,140 milk cows in the San Joaquin Valley can be calculated as follows:

BOD_5 loading (lb/day) = 7,140 milk cows x 2.9 lb-BOD_5/cow-day x 0.80
= 16,565 lb-BOD/day

Minimum Surface Area (acres) in areas of the San Joaquin Valley with a maximum loading rate of 55 lb-BOD_5/acre-day =
16,565 lb-BOD_5/day ÷ 55 lb-BOD_5/acre-day = 301 acres

Minimum Surface Area (acres) in areas of the San Joaquin Valley with a maximum loading rate of 45 lb-BOD_5/acre-day =
16,565 lb-BOD_5/day ÷ 45 lb-BOD_5/acre-day = 368 acres

As shown above the minimum surface area required for a naturally aerobic lagoon treating manure from 7,140 milk cows in the San Joaquin Valley would range from approximately 301 to 368 acres. This does not include the additional surface area that would be required to treat manure from support stock onsite. Based on the space requirements alone it is clear that this option cannot reasonably be required and no further analysis is needed.

Analysis for a Mechanically Aerated Lagoon Treating Manure from 7,140 Dairy Cows

As discussed above, the very large space requirements for naturally aerobic lagoons cause this option to be infeasible for most confined animal facilities. Mechanically aerating a lagoon can achieve some of the benefits of a naturally aerobic lagoon without the large space requirements. However, the costs of energy for complete aeration have also caused this option to be infeasible. The amount of energy required for aeration is based on the amount of volatile solids excreted by animals that must be treated; thus, this cost will be directly proportional to the number of animals at a site. The following analysis will determine the cost

of emission reductions that can be achieved from a mechanically aerated lagoon treating manure from 7,140 milk cows.

Biological Oxygen Demand (BOD_5)

In order to effectively calculate the costs of this control option, the energy requirement for complete aeration must be determined. It should be noted that approximately 1.5 to 2.5 pounds of oxygen is required to digest 1 pound of Biological Oxygen Demand (BOD_5) with additional oxygen required for conversion of ammonia to nitrate (nitrification). It is generally accepted that at least twice the BOD should be provided for complete aeration. According to Dr. Ruihong Zhang of the University of California, Davis, 2.4 lbs (1.1 kg) of oxygen (O2) per cow must be provided each day for removal of BOD and an additional 3 lbs (1.4 kg) per cow for oxidation of 70% of the nitrogen. [22]

The proposed rule specifies that an aerobic lagoon be designed and operated in accordance with NRCS Practice Standard Code 359. NRCS Practice Standard Code 359 requires that mechanically aerated lagoons use aeration equipment that provides a minimum of one pound of oxygen for each pound of daily BOD loading. As discussed above, the total daily manure produced by a milk cow will have a BOD_5 of 2.9 lb/day and a lagoon handling flushed manure from 7,140 milk cows will have a loading rate of approximately 16,565 lb-BOD_5/day (7,529 kg-BOD_5/day).

Energy Requirement a Mechanically Aerated Lagoon Treating Manure from 7,140 Milk Cows:

Based on the data gathered in a UC Davis study on aerator performance for wastewater lagoons, aeration efficiencies for mechanical aerators ranged from 0.10 to 0.68 kg of oxygen provided per kW-hr of energy utilized. The most efficient aerator tested that had been installed in dairy lagoons had an aeration efficiency of 0.49 kg-O2/kW-hr. These efficiency tests were performed in clean water and lower aeration efficiencies are expected in liquid manure because of the significant amount of solids that it contains. The yearly energy requirement mechanically aerated lagoon treating flushed manure from 7,140 milk cows is calculated as follows:

High Efficiency Aerator
7,529 kg-BOD_5/day ÷ (0.68 kg-O2/kW-hr) x (365 day/year) = 4,041,301 kW-hr/year

Low Efficiency Aerator
7,529 kg-BOD_5/day ÷ (0.10 kg-O2/kW-hr) x (365 day/year) = 27,480,850 kW-hr/year

Cost of Electricity for a Mechanically Aerated Lagoon Treating Manure from 7,140 Milk Cows:

The cost for electricity will be based upon the average price for industrial electricity in California as of September 2019, as taken from the Energy Information Administration (EIA) Website:
http://www.eia.gov/electricity/monthly/epm_table_grapher.cfm?t=epmt_5_06_b

Average Cost for electricity = $0.1225/kW-hr

The electricity costs for complete aeration are calculated as follows:

Low Cost Estimate (High Efficiency Aerator)
4,041,301 kW-hr/year x $0.1225/kW-hr = $495,059/year

High Cost Estimate (Low Efficiency Aerator)
27,480,850 kW-hr/year x $0.1225/kW-hr = $3,366,404/year

VOC Emission Reductions from a Mechanically Aerated Lagoon Treating Manure from 7,140 Milk Cows:

It will be conservatively assumed that a mechanically aerated lagoon providing 1 lb of oxygen for every 1 lb of BOD_5 loading will control 90% of the VOC emissions from the lagoon/storage pond. However, as noted above, it is generally accepted that the oxygen provided should be twice the BOD_5 loading rate for complete aeration; therefore, the actual control from providing 1 lb of oxygen for every 1 lb of BOD_5 loading is probably closer to 50%.

The annual VOC Emission Reductions for mechanically aerated lagoon(s) treating the manure from 7,140 milk cows are calculated as follows and shown in the table below:

[Number of cows] x [Lagoon/Storage Pond VOC EF (lb/cow-year)] x [Complete Aeration Control Efficiency for Lagoon/Storage Pond]

VOC Reductions for a Mechanically Aerated Lagoon							
Type of Animal	**# of cows**	**x**	**Lagoon EF (lb/cow-yr)**	**x**	**Control (%)**	**=**	**lb-VOC/yr**
Milk Cow (freestall)	7,140	x	1.3	x	90%	=	**8,354**

Cost of VOC Emission Reductions
Low Estimate = ($495,059/year)/[(8,354 lb-VOC/year)(1 ton/2000 lb)]
= $118,520/ton of VOC reduced

High Estimate = ($3,366,404/year)/[(8,354 lb-VOC/year)(1 ton/2000 lb)]
= $805,938/ton of VOC reduced

As shown above, the electricity cost alone for a mechanically aerated lagoon would cause the cost of the VOC reductions ($118,520/ton) to be greater than the $17,500/ton cost effectiveness threshold of the District BACT policy. This cost does not include the additional electricity cost for nitrification that would naturally occur as the lagoons were aerated or equipment costs. Even without these costs, this control technology would not be cost effective.

2) Covered Anaerobic Digester Lagoon

The facility has proposed to construct a covered anaerobic digester lagoon that will be used to treat all the liquid manure at the dairy. However, instead of venting the biogas (emissions) to a control device with minimum 95% VOC control efficiency, the facility will transport the biogas offsite through a pipeline system. The District assumes 100% of the biogas is collected and transported offsite and as a result, there are no additional combustion emissions from a control device. The District considers the proposed covered anaerobic digester lagoon to be equivalent to the Technologically Feasible option. Since the facility has proposed to implement this option, a cost effectiveness analysis is not required.

e. Select BACT

The facility has proposed to implement a covered anaerobic digester lagoon. As previously discussed above, the proposed option is equivalent to the current Technologically Feasible option. Therefore, BACT is satisfied.

2. Top-Down BACT Analysis for NH_3 Emissions:

This BACT discussion applies to the liquid manure handling system consisting of one lagoon and one covered anaerobic digester lagoon.

a. Step 1 - Identify all control technologies

The following options were identified as possible controls for NH_3 emissions from the lagoons in the liquid manure handling system:

1) All animal fed in accordance with NRCS or other District-approved guidelines

Description of Control Technologies

1) Animals fed in accordance with NRCS or other District-approved Guidelines

Nutritional management of dairy feed is routinely practiced to improve milk production and herd health. The potential for ammonia emissions can be reduced by reducing the amount of undigested nitrogen compounds in the manure. The level of microbial action in the manure corresponds to the level of organic nitrogen content in the manure; the lower the level of nitrogen the lower the level of microbial action and the lower the production of ammonia and VOCs.

A diet that is formulated to feed proper amounts of ruminantly degradable protein will result in improved nitrogen utilization by the animal and corresponding reduction in urea and organic nitrogen content of the manure, which will reduce the production of VOCs and ammonia. The latest National Research Council (NRC) guidelines for the selection of an optimal bovine diet should be followed to the maximum extent possible. The diet recommendations made in this publication seek to achieve the maximum uptake of protein by the animal and the minimum carryover of nitrogen into the manure, which will reduce ammonia emissions from liquid manure applied to cropland.

b. Step 2 - Eliminate technologically infeasible options

There are no technologically infeasible options.

c. Step 3 - Rank remaining options by control effectiveness

There is only one BACT option, therefore, ranking is unnecessary.

d. Step 4 - Cost Effectiveness Analysis

The only option listed above is achieved in practice; therefore a cost analysis is not required.

e. Step 5 - Select BACT

The facility has proposed to implement this option to satisfy BACT.

Top Down BACT Analysis for Confined Animal Facility – Liquid Manure Handling – Liquid/Slurry Manure Land Application

1. Top-Down BACT Analysis for VOC Emissions:

This BACT discussion applies to the liquid/slurry manure taken from the liquid manure handling system and applied to land.

a. Step 1 - Identify all control technologies

The following options were identified as possible controls for VOC emissions from the liquid/slurry land application:

1) Irrigation of crops using liquid/slurry manure from an aerobic treatment lagoon or mechanically aerated lagoon
2) Irrigation of crops using liquid/slurry manure from a holding/storage pond after being treated in a covered lagoon/digester
3) Irrigation of crops using liquid/slurry manure from the secondary lagoon/holding/storage pond where preceded by an uncovered anaerobic treatment lagoon designed to meet Natural Resources Conservation Service (NRCS) standards

Description of Control Technologies

1) Irrigation of crops using liquid/slurry manure from an aerobic treatment lagoon or mechanically aerated lagoon

An aerobic lagoon is a waste treatment lagoon that is designed to facilitate the decomposition of wastewater by microbes in the presence of oxygen (O_2). The process of aerobic decomposition results in the conversion of organic compounds in the wastewater into carbon dioxide (CO_2), and (H_2O), nitrates, sulfates, and inert biomass (sludge). The process of aerobic digestion is sometimes referred to as nitrification (especially when discussing NH_3 transformation). Complete aerobic digestion (100% aeration) removes nearly all malodors and also virtually eliminates VOCs, H_2S, and NH_3 emissions from liquid waste.

In completely aerated lagoons, sufficient oxygen must be provided to sustain the aerobic microorganisms. NRCS Practice Standard Code 359 specifies that naturally aerobic lagoons have a minimum surface area determined by regional climate and daily Biological Oxygen Demand (BOD_5) and requires the depth of naturally aerobic lagoons have a maximum depth no greater than five feet. For mechanically aerated lagoons NRCS Practice Standard Code 359 specifies that the aeration equipment shall provide a minimum of 1 pound of oxygen for each pound of daily BOD_5 loading. The mechanical aerators that provide the required oxygen may float on the lagoon surface or be submerged in the lagoon. Aeration can also be performed by injection of tiny air bubbles into the lagoon water, mixing of the lagoon water, or spraying of the water into

the air. According to Dr. Ruihong Zhang, a researcher at the University of California, Davis, at least 95% VOC control can be achieved if the dissolved oxygen (DO) concentration of the liquid manure is 2.0 mg/L or more. However, the DO concentrations achieved in mechanically aerated lagoons treating manure are typically much less than this and will therefore have lower control efficiencies.

2) Irrigation of crops using liquid/slurry manure from a holding/storage pond after being treated in a covered lagoon/digester

This practice would only allow the irrigation of liquid manure to cropland from the secondary lagoon after proper treatment has taken place in a covered lagoon/anaerobic digester. Covered treatment lagoons are one type of anaerobic digester. An anaerobic digester is an enclosed basin or tank that is designed to facilitate the decomposition of wastewater by microbes in the absence of oxygen. The process of anaerobic decomposition results in the preferential conversion of organic compounds in the wastewater into methane (CH4), carbon dioxide (CO2), and water rather than intermediate metabolites (VOCs). The gas generated by this process is known as biogas, waste gas or digester gas. In addition to methane and carbon dioxide, biogas also contains small amounts of Nitrogen (N2), Oxygen (O2), Hydrogen Sulfide (H2S), and Ammonia (NH3). Biogas will also include trace amounts of various Volatile Organic Compounds (VOCs) that remain from incomplete digestion of the volatile solids in the incoming wastewater. The small amounts of undigested solids that remain after digestion are removed from the digester as sludge.

Assumptions:

- 80% of the Volatile Solids (VS) can be removed from the covered anaerobic digestion process.
- 20% of the remaining VS will be assumed to be in the manure during land application. This will be considered worst-case because further digestion of the VS is likely to occur from the secondary lagoon.
- As a worst-case scenario, it will be assumed that all remaining VS will be emitted as VOCs during land application.

Since 80% of the VS is removed or digested in the covered lagoon and the remaining VS have been assumed to be emitted as VOCs, a control efficiency of 80% can be applied when applying liquid manure to land from a holding/storage pond after a covered lagoon.

3) Irrigation of crops using liquid/slurry manure from the secondary lagoon/holding/storage pond where preceded by an uncovered anaerobic treatment lagoon designed to meet Natural Resources Conservation Service (NRCS) standards

This practice would only allow the irrigation of liquid manure to cropland from the secondary lagoon after going through a treatment phase in an anaerobic treatment lagoon, or the primary lagoon.

An anaerobic treatment lagoon is a waste treatment lagoon that is designed to facilitate the decomposition of manure by microbes in the absence of oxygen. The process of anaerobic decomposition results in the preferential conversion of organic compounds in the wastewater into methane (CH_4), carbon dioxide (CO_2), and water rather than intermediate metabolites (VOCs).

The National Resource Conservation Service (NRCS) California Field Office Technical Guide Code 359 - Waste Treatment Lagoon specifies the following criteria for the design of anaerobic treatment lagoons:

- Required volume: The minimum design volume should account for all potential sludge, treatment, precipitation, and runoff volumes.
- Treatment period: retention time of the material in the lagoon shall be the time required to provide environmentally safe utilization of waste. The minimum hydraulic retention time for a covered lagoon in the San Joaquin Valley is about 38 days.
- Waste loading: shall be based on the maximum daily loading considering all waste sources that will be treated by the lagoon. The loading rate is typically based on volatile solids (VS) loading per unit of volume. The suggested loading rate for the San Joaquin Valley is 6.5-11 lb-VS/1000 ft^3/day depending on separation and type of system.
- The operating depth of the lagoon shall be 12 feet or greater. Maximizing the depth of the lagoon minimizes the surface area, which in turn minimizes the cover size and cost. Increasing the lagoon depth has the following advantages:

    - Minimizes surface area in contact with the atmosphere, thus reducing surface available to convection, evaporation
    - Smaller surface areas provide a more favorable and stable environment for methane bacteria
    - Better mixing of lagoon due to rising gas bubbles
    - Requires less land
    - More efficient for mechanical mixing

The lagoon design shall also consider location, soils and foundation, erosion, and depth to groundwater as required by the regional water control board.

The NRCS guideline suggests that this system consist of two cells, a treatment lagoon (primary lagoon) and a storage pond (secondary lagoon). The first stage of the lagoon system is the biological treatment stage and is designed with a constant liquid level to stabilize the anaerobic digestion. The effluent from the first stage overflows into a second lagoon designed for liquid storage capacity. Effluent from the second lagoon is used in the flush lanes and for the irrigation of cropland. The secondary (overflow) lagoon acts as the storage pond, which can be emptied when necessary.

A properly designed anaerobic treatment lagoon will reduce the Volatile Solids (VS) by at least 50% and will reduce the biological oxygen demand (BOD), which will result in greater efficiency in degrading compounds that contain carbon into methane and

carbon dioxide rather than VOCs. Since 50% of the Volatile Solids in the liquid manure will have been removed or digested in the lagoon, there will be less Volatile Solids remaining in the effluent to decompose into VOCs. Although, the Volatile Solids reduction will be at least 50%, to be conservative a 40% control will be applied to irrigation from a storage pond after an anaerobic treatment lagoon.

b. Step 2 - Eliminate technologically infeasible options

No technologically feasible options were removed.

c. Step 3 - Rank remaining options by control effectiveness

1) Irrigation of crops using liquid/slurry manure from an aerobic treatment lagoon or mechanically aerated lagoon (95% VOC control efficiency)
2) Irrigation of crops using liquid/slurry manure from a holding/storage pond after being treated in a covered lagoon/digester (80% VOC control efficiency)
3) Irrigation of crops using liquid/slurry manure from the secondary lagoon/holding/storage pond where preceded by an uncovered anaerobic treatment lagoon designed to meet Natural Resources Conservation Service (NRCS) standards (40% VOC control efficiency)

d. Step 4 - Cost Effectiveness Analysis

1) Irrigation of crops using liquid/slurry manure from an aerobic treatment lagoon or mechanically aerated lagoon

The following analysis is based on the treatment of manure from 7,140 milk cows in naturally aerobic lagoons and mechanically aerated lagoons. Because the liquid/slurry manure applied to land will come from an aerobic treatment lagoon or mechanically aerated lagoon, it will be assumed the reduction in VOC emissions from the lagoon will result in similar VOC reductions to land application.

Space Requirement for a Naturally Aerobic Lagoon Treating Manure from 7,140 Dairy Cows

NRCS Practice Standard Code 359 requires that naturally aerobic lagoons be designed to have a minimum treatment surface area as determined on the basis of daily BOD5 loading per unit of lagoon surface. The standard specifies that the maximum loading rate of naturally aerobic lagoons shall not exceed the loading rate indicated by the NRCS Agricultural Waste Management Field Handbook (AWMFH) or the maximum loading rate according to state regulatory requirements, whichever is more stringent. According to Figure 10-30 (August 2009) of the latest version of the AWMFH, the maximum aerobic lagoon loading rate for the San Joaquin Valley is 45 - 55 lb-BOD_5/acre-day. According to Table 4-5 (March 2008) of the NRCS AWMFH, the total daily manure produced by a milk cow will have 2.9 lb-BOD_5/day. Assuming that 80% of the manure will be flushed to the lagoon system, the minimum lagoon surface area required for a naturally aerobic lagoon treating manure from 7,140 milk cows in the San Joaquin Valley can be calculated as follows:

BOD_5 loading (lb/day) = 7,140 milk cows x 2.9 lb-BOD_5/cow-day x 0.80
= 16,565 lb-BOD/day

Minimum Surface Area (acres) in areas of the San Joaquin Valley with a maximum loading rate of 55 lb-BOD_5/acre-day =
16,565 lb-BOD_5/day ÷ 55 lb-BOD_5/acre-day = 301 acres

Minimum Surface Area (acres) in areas of the San Joaquin Valley with a maximum loading rate of 45 lb-BOD_5/acre-day =
16,565 lb-BOD_5/day ÷ 45 lb-BOD_5/acre-day = 368 acres

As shown above the minimum surface area required for a naturally aerobic lagoon treating manure from 7,140 milk cows in the San Joaquin Valley would range from approximately 301 to 368 acres. This does not include the additional surface area that would be required to treat manure from support stock onsite. Based on the space requirements alone it is clear that this option cannot reasonably be required and no further analysis is needed.

Analysis for a Mechanically Aerated Lagoon Treating Manure from 7,140 Dairy Cows

As discussed above, the very large space requirements for naturally aerobic lagoons cause this option to be infeasible for most confined animal facilities. Mechanically aerating a lagoon can achieve some of the benefits of a naturally aerobic lagoon without the large space requirements. However, the costs of energy for complete aeration have also caused this option to be infeasible. The amount of energy required for aeration is based on the amount of volatile solids excreted by animals that must be treated; thus, this cost will be directly proportional to the number of animals at a site. The following analysis will determine the cost of emission reductions that can be achieved from a mechanically aerated lagoon treating manure from 5,500 milk cows.

Biological Oxygen Demand (BOD_5)

In order to effectively calculate the costs of this control option, the energy requirement for complete aeration must be determined. It should be noted that approximately 1.5 to 2.5 pounds of oxygen is required to digest 1 pound of Biological Oxygen Demand (BOD_5) with additional oxygen required for conversion of ammonia to nitrate (nitrification). It is generally accepted that at least twice the BOD should be provided for complete aeration. According to Dr. Ruihong Zhang of the University of California, Davis, 2.4 lbs (1.1 kg) of oxygen (O2) per cow must be provided each day for removal of BOD and an additional 3 lbs (1.4 kg) per cow for oxidation of 70% of the nitrogen. [22]

The proposed rule specifies that an aerobic lagoon be designed and operated in accordance with NRCS Practice Standard Code 359. NRCS Practice Standard Code 359 requires that mechanically aerated lagoons use aeration equipment that provides a minimum of one pound of oxygen for each pound of daily BOD loading. As discussed above, the total daily manure produced by a milk cow will have a BOD_5 of 2.9 lb/day and a lagoon handling flushed manure from 7,140 milk cows will have a loading rate of approximately 16,565 lb-BOD_5/day (7,529 kg-BOD_5/day).

Energy Requirement a Mechanically Aerated Lagoon Treating Manure from 7,140 Milk cows:

Based on the data gathered in a UC Davis study on aerator performance for wastewater lagoons, aeration efficiencies for mechanical aerators ranged from 0.10 to 0.68 kg of oxygen provided per kW-hr of energy utilized. The most efficient aerator tested that had been installed in dairy lagoons had an aeration efficiency of 0.49 kg-O2/kW-hr. These efficiency tests were performed in clean water and lower aeration efficiencies are expected in liquid manure because of the significant amount of solids that it contains. The yearly energy requirement mechanically aerated lagoon treating flushed manure from 7,140 milk cows is calculated as follows:

High Efficiency Aerator
7,529 kg-BOD_5/day ÷ (0.68 kg-O2/kW-hr) x (365 day/year) = 4,041,301 kW-hr/year

Low Efficiency Aerator
7,529 kg-BOD_5/day ÷ (0.10 kg-O2/kW-hr) x (365 day/year) = 27,480,850 kW-hr/year

Cost of Electricity for a Mechanically Aerated Lagoon Treating Manure from 7,140 Milk cows:

The cost for electricity will be based upon the average price for industrial electricity in California as of September 2019, as taken from the Energy Information Administration (EIA) Website:
http://www.eia.gov/electricity/monthly/epm_table_grapher.cfm?t=epmt_5_06_b

Average Cost for electricity = $0.1225/kW-hr

The electricity costs for complete aeration are calculated as follows:

Low Cost Estimate (High Efficiency Aerator)
4,041,301 kW-hr/year x $0.1115/kW-hr = $495,059/year

High Cost Estimate (Low Efficiency Aerator)
27,480,850 kW-hr/year x $0.1115/kW-hr = $3,366,404/year

VOC Emission Reductions from a Mechanically Aerated Lagoon Treating Manure from 7,140 Milk Cows that will be applied to land:

It will be conservatively assumed that a mechanically aerated lagoon providing 1 lb of oxygen for every 1 lb of BOD_5 loading will control 90% of the VOC emissions from the lagoon/storage pond. However, as noted above, it is generally accepted that the oxygen provided should be twice the BOD_5 loading rate for complete aeration; therefore, the actual control from providing 1 lb of oxygen for every 1 lb of BOD_5 loading is probably closer to 50%.

The annual VOC Emission Reductions for a mechanically aerated lagoon treating land applied manure from 7,140 milk cows are calculated as follows and shown in the table below:

[Number of cows] x [Liquid Manure Land Application VOC EF (lb/cow-year)] x [Complete Aeration Control Efficiency for Lagoon/Storage Pond]

VOC Reductions for a Mechanically Aerated Lagoon							
Type of Animal	**# of cows**	**x**	**Liquid Manure Land Application EF (lb/cow-yr)**	**x**	**Control (%)**	**=**	**lb-VOC/yr**
Milk Cow (freestall)	7,140	x	1.4	x	90%	=	**8,996**

Cost of VOC Emission Reductions
Low Estimate = ($495,059/year)/[(8,996 lb-VOC/year)(1 ton/2000 lb)]
= $110,062/ton of VOC reduced

High Estimate = ($3,366,404/year)/[(8,996 lb-VOC/year)(1 ton/2000 lb)]
= $748,422/ton of VOC reduced

As shown above, the electricity cost alone for a mechanically aerated lagoon would cause the cost of the VOC reductions ($110,062/ton) to be greater than the $17,500/ton cost effectiveness threshold of the District BACT policy. This cost does not include the additional electricity cost for nitrification that would naturally occur as the lagoons were aerated or equipment costs. Even without these costs, this control technology would not be cost effective.

2) Irrigation of crops using liquid/slurry manure from a holding/storage pond after being treated in a covered lagoon/digester

The facility has proposed to irrigate their crops using liquid/slurry manure from a lagoon after being treated in a covered lagoon/digester. Since the facility has proposed to implement this option, a cost effectiveness analysis is not required.

e. Step 5 - Select BACT

The facility has proposed to irrigate their crops using liquid/slurry manure from a lagoon after being treated in a covered lagoon/digester, which is a Technologically Feasible option. Therefore, BACT is satisfied.

2. Top-Down BACT Analysis for NH_3 Emissions:

This BACT discussion applies to the liquid/slurry manure taken from the liquid manure handling system and applied to land.

a. Step 1 - Identify all control technologies

The following options were identified as possible controls for NH_3 emissions from the liquid/slurry land application:

1) All animal fed in accordance with NRCS or other District-approved guidelines

Description of Control Technologies

1) Animals fed in accordance with NRCS or other District-approved Guidelines

Nutritional management of dairy feed is routinely practiced to improve milk production and herd health. The potential for ammonia emissions can be reduced by reducing the amount of undigested nitrogen compounds in the manure. The level of microbial action in the manure corresponds to the level of organic nitrogen content in the manure; the lower the level of nitrogen the lower the level of microbial action and the lower the production of ammonia and VOCs.

A diet that is formulated to feed proper amounts of ruminantly degradable protein will result in improved nitrogen utilization by the animal and corresponding reduction in urea and organic nitrogen content of the manure, which will reduce the production of VOCs and ammonia. The latest National Research Council (NRC) guidelines for the selection of an optimal bovine diet should be followed to the maximum extent possible. The diet recommendations made in this publication seek to achieve the maximum uptake of protein by the animal and the minimum carryover of nitrogen into the manure, which will reduce ammonia emissions from liquid manure applied to cropland.

b. Step 2 - Eliminate technologically infeasible options

There are no technologically infeasible options to eliminate from step 1.

c. Step 3 - Rank remaining options by control effectiveness

There is only one BACT option, therefore, ranking is unnecessary.

d. Step 4 - Cost Effectiveness Analysis

The only option listed above is achieved in practice; therefore a cost analysis is not required.

e. Step 5 - Select BACT

Achieved in Practice option is determined to be BACT. Therefore, BACT for this operation is feeding all animals in accordance with NRCS or other District-approved guidelines. The facility has proposed to implement this option to satisfy BACT.

Top Down BACT Analysis for Confined Animal Facility – Solid Manure Handling – Land Application

1. Top-Down BACT Analysis for NH_3 Emissions:

This BACT discussion applies to the solid manure that applied to land.

a. Step 1 - Identify all control technologies

The following options were identified as possible controls for NH_3 emissions from the solid manure handling – land application:

1) Rapid incorporation of solid manure into the soil after land application, and all animals fed in accordance with NRCS or other District-approved guidelines.

Description of Control Technologies

1) Rapid incorporation of solid manure into the soil after land application, and all animals fed in accordance with NRCS or other District-approved guidelines.

Rapid incorporation of solid manure into the soil after land application

Various types of spreading techniques, such as box spreaders, flail type spreaders, side discharge spreaders, and spinner spreaders, are used to apply solid manure to cropland. Regardless of which technique is used, this practice requires the immediate incorporation of the manure into the soil, reducing emissions and surface run-off while minimizing the loss of nitrogen into the atmosphere. Based on a study by a local Valley dairy, there is a great potential of reducing emissions by incorporating slurry manure rapidly into the soil. A similar reduction may be obtained by the rapid incorporation of solid manure. This technology is expected to yield a NH3 control efficiency ranging from 49% to upwards of 98%.[1]

All animals fed in accordance with NRCS or other District-approved guidelines

Nutritional management of dairy feed is routinely practiced to improve milk production and herd health. The potential for ammonia emissions can be reduced by reducing the amount of undigested nitrogen compounds in the manure. The level of microbial action in the manure corresponds to the level of organic nitrogen content in the manure; the lower the level of nitrogen the lower the level of microbial action and the lower the production of ammonia and VOCs.

A diet that is formulated to feed proper amounts of ruminantly degradable protein will result in improved nitrogen utilization by the animal and corresponding reduction in urea and organic nitrogen content of the manure, which will reduce the production of VOCs and ammonia. The latest NRCS guidelines for the selection of an optimal bovine diet should

[1] Page 81 of "Recommendations to the San Joaquin Valley Air Pollution Control Officer Regarding Best Available Control Technology for Dairies in the San Joaquin Valley" January 31, 2006 (http://www.valleyair.org/busind/pto/dpag/dpag_idx.htm).

be followed to the maximum extent possible. The diet recommendations made in this publication seek to achieve the maximum uptake of protein by the animal and the minimum carryover of nitrogen into the manure, which will reduce ammonia emissions from solid manure.

b. Step 2 - Eliminate technologically infeasible options

There are no technologically infeasible options to eliminate from step 1.

c. Step 3 - Rank remaining options by control effectiveness

1) Rapid incorporation of solid manure into the soil after land application
2) All animals fed in accordance with NRCS or other District-approved guidelines

d. Step 4 - Cost Effectiveness Analysis

1) Rapid incorporation of solid manure into the soil after land application

This option is achieved in practice; therefore a cost analysis is not required.

2) All animals fed in accordance with NRCS or other District-approved guidelines

This option is achieved in practice; therefore a cost analysis is not required.

e. Step 5 - Select BACT

Achieved in Practice option is determined to be BACT. Therefore, BACT for this operation is rapid incorporation of solid manure into the soil after land application, and to feed all animals at the dairy in accordance with NRCS or other District-approved guidelines. The facility has proposed to implement these options to satisfy BACT.

Top Down BACT Analysis for Confined Animal Facility – Solid Manure Handling – Solid Manure Storage/Separated Solids Piles

1. Top-Down BACT Analysis for NH_3 Emissions:

This BACT discussion applies to the solid manure stored in piles or separated solids stored in piles.

Step 1 - Identify all control technologies

The following options were identified as possible controls for NH_3 emissions from the solid manure handling – solid manure storage/separated solids piles:

1) All animals fed in accordance with NRCS or other District-approved guidelines.

Description of Control Technologies

1) All animals fed in accordance with NRCS or other District-approved guidelines

Nutritional management of dairy feed is routinely practiced to improve milk production and herd health. The potential for ammonia emissions can be reduced by reducing the amount of undigested nitrogen compounds in the manure. The level of microbial action in the manure corresponds to the level of organic nitrogen content in the manure; the lower the level of nitrogen the lower the level of microbial action and the lower the production of ammonia and VOCs.

A diet that is formulated to feed proper amounts of ruminantly degradable protein will result in improved nitrogen utilization by the animal and corresponding reduction in urea and organic nitrogen content of the manure, which will reduce the production of VOCs and ammonia. The latest National Research Council (NRC) guidelines for the selection of an optimal bovine diet should be followed to the maximum extent possible. The diet recommendations made in this publication seek to achieve the maximum uptake of protein by the animal and the minimum carryover of nitrogen into the manure, which will reduce ammonia emissions from solid manure.

b. Step 2 - Eliminate technologically infeasible options

There are no technologically infeasible options to eliminate from step 1.

c. Step 3 - Rank remaining options by control effectiveness

There is only one option listed, therefore, ranking is unnecessary.

d. Step 4 - Cost Effectiveness Analysis

This option is achieved in practice; therefore a cost analysis is not required.

e. Step 5 - Select BACT

Achieved in Practice option is determined to be BACT. Therefore, BACT for this operation is to feed all animals at the dairy in accordance with NRCS or other District-approved guidelines. The facility has proposed to implement this option to satisfy BACT.

Top Down BACT Analysis for Confined Animal Facility – Feed Storage and Handling System – Total Mixed Ration (TMR)

1. Top-Down BACT Analysis for VOC Emissions:

This BACT discussion applies to the TMR that is stored and used to feed the cows at the dairy.

a. Step 1 - Identify all control technologies

The following options were identified as possible controls for VOC emissions from feed storage and handling system - TMR:

1) District Rule 4570 measures for Feed/TMR.

Description of Control Technologies

1) District Rule 4570 measures for Feed/TMR

District Rule 4570 requires the implementation of various management practices to reduce VOC emissions from TMR. These practices include pushing feed so that it is within three feet of feedlane fence within two hours of putting out the feed or use a feed trough or other feeding structure designed to maintain feed within reach of the animals, so the area of the feed is minimized and the feed can be consumed by the cows in a shorter time period instead of continuing to emit VOCs; beginning feeding total mixed rations within two hours of grinding and mixing rations, reducing the time that fresh feed emits VOCs; storing grain in a weatherproof storage structure or under a weatherproof covering from October through May; feeding stream-flaked, dry rolled, cracked or ground corn or other ground cereal grains; removal of uneaten wet feed from feeding areas; and preparing TMR with a minimum moisture content, which reduces VOC since most of the compounds emitted are higly soluble in water.

b. Step 2 - Eliminate technologically infeasible options

There are no technologically infeasible options to eliminate from step 1.

c. Step 3 - Rank remaining options by control effectiveness

There is only one option listed, therefore, ranking is unnecessary.

d. Step 4 - Cost Effectiveness Analysis

This option is achieved in practice; therefore a cost analysis is not required.

e. Step 5 - Select BACT

The facility has proposed to implement this options to satisfy BACT.

APPENDIX E
RMR/AAQA Summary

San Joaquin Valley Air Pollution Control District
Revised Risk Management Review and Ambient Air Quality Analysis

To:	John Yoshimura – Permit Services
From:	Will Worthley – Technical Services
Date:	May 15, 2019
Facility Name:	DOUBLE "J" DAIRY
Location:	6656 AVENUE 328, VISALIA
Application #(s):	S-5836-1-4, -2-3, -3-5, -4-3, -5-2
Project #:	S-1191790

1. Summary

1.1 RMR

Units	Prioritization Score	Acute Hazard Index	Chronic Hazard Index	Maximum Individual Cancer Risk	T-BACT Required	Special Permit Requirements
1-4	0.02	0.00	0.00	2.54E-08	No	No
2-3	0.57	0.05	0.02	1.12E-06	No[2]	No
3-5	3.17	0.00	0.00	0.00E+00	No	No
4-3	0.00	0.01	0.00	0.00E+00	No	No
5-2	NA[1]	NA[1]	NA[1]	NA[1]	No	No
Project Totals	3.76	0.06	0.02	1.15E-06		
Facility Totals	>1	0.06	0.02	1.15E-06		

Notes:
1. There is no risk associated with Unit 5 as the District does not have an approved toxic speciation profile for dairy feed and storage handling operations.
2. T-BACT is not required for unit 2 as it is determined on a housing unit by housing basis and none of the individual housing units have a cancer score over 1 in a million.

1.2 AAQA

Pollutant	Air Quality Standard (State/Federal)				
	1 Hour	3 Hours	8 Hours	24 Hours	Annual
PM10				Pass	Pass
PM2.5				Pass	Pass

To ensure that human health risks will not exceed District allowable levels; the following shall be included as requirements for:

Unit # 1-4, 2-3, 3-5, 4-3, & 5-2

1. No special requirements.

2. Project Description

Technical Services received a request on May 08, 2019 to perform a Risk Management Review (RMR) and Ambient Air Quality Analysis (AAQA) for the following:

- Unit -1-4: MODIFICATION OF 4,730 COW MILKING OPERATION WITH ONE 128 STALL PARABONE MILKING PARLOR AND ONE 12 STALL HOSPITAL MILKING PARLOR: INCREASE MILK COW HERD SIZE TO 7,140 AND CONSTRUCT A 114 STALL CAROUSEL MILKING PARLOR
- Unit -2-3: MODIFICATION OF COW HOUSING - 4,730 MILK COWS NOT TO EXCEED A COMBINED TOTAL OF 5,610 MATURE COWS (MILK AND DRY COWS); 5,490 SUPPORT STOCK (HEIFERS, CALVES, AND BULLS); 2 FREESTALL BARNS AND 2 HALF FREESTALL BARNS WITH FLUSH/SCRAPE SYSTEM: INCREASE MILK COW HERD SIZE TO 7,140; INCREASE MATURE COW HERD SIZE TO 8,130 (MILK AND DRY COWS); DECREASE SUPPORT STOCK TO 4,540 (HEIFERS, CALVES, AND BULLS) WHICH INCLUDES 800 CALVES HOUSED IN EXISTING ONGROUND CALF HUTCHES; CONSTRUCT 3 HALF FREESTALL BARNS OVER EXISTING OPEN CORRALS; CONSTRUCT 3 SAUDI STYLE BARNS OVER EXISTING OPEN CORRALS; CONSTRUCT A SPECIAL NEEDS SAUDI STYLE BARN
- Unit -3-5: MODIFICATION OF LIQUID MANURE HANDLING SYSTEM CONSISTING OF SETTLING BASIN(S); MECHANICAL SEPARATOR(S); ONE LAGOON AND ONE COVERED DIGESTER LAGOON PERMITTED AS S-9125-2-0; MANURE IS LAND APPLIED THROUGH FLOOD AND FURROW IRRIGATION: ALLOW FOR INCREASE IN LIQUID MANURE DUE TO HERD INCREASE AUTHORIZED BY AUTHORITY TO CONSTRUCT S-5836-2-3
- Unit -4-3: MODIFICATION OF SOLID MANURE HANDLING CONSISTING OF MANURE STOCK PILES; SOLID MANURE APPLICATION TO LAND: ALLOW INCREASE IN MANURE DUE TO INCREASE IN HERD SIZE AUTHORIZED BY AUTHORITY TO CONSTRUCT S-5836-2-3
- Unit -5-2: MODIFICATION OF FEED STORAGE AND HANDLING CONSISTING OF COMMODITY BARN(S), SILAGE PILE(S), AND TOTAL MIXED RATION FEEDING: INCREASE IN FEED AND TMR DUE TO INCREASE IN HERD SIZE AUTHORIZED BY AUTHORITY TO CONSTRUCT S-5836-2-3

3. RMR Report

3.1 Analysis

The District performed an analysis pursuant to the District's Risk Management Policy for Permitting New and Modified Sources (APR 1905, May 28, 2015) to determine the possible cancer and non-cancer health impact to the nearest resident or worksite. This policy requires that an assessment be performed on a unit by unit basis, project basis, and on a facility-wide basis. If a preliminary prioritization analysis demonstrates that:

- A unit's prioritization score is less than the District's significance threshold and;
- The project's prioritization score is less than the District's significance threshold and;
- The facility's total prioritization score is less than the District's significance threshold

Then, generally no further analysis is required.

The District's significant prioritization score threshold is defined as being equal to or greater than1.0. If a preliminary analysis demonstrates that either the unit(s) or the project's or the facility's total prioritization score is greater than the District threshold, a screening or a refined assessment is required

If a refined assessment is greater than one in a million but less than 20 in one million for carcinogenic impacts (Cancer Risk) and less than 1.0 for the Acute and Chronic hazard indices(Non-Carcinogenic) on a unit by unit basis, project basis and on a facility-wide basis the proposed application is considered less than significant. For unit's that exceed a cancer risk of 1 in one million, Toxic Best Available Control Technology (TBACT) must be implemented.

Toxic emissions for this project were calculated using the following methods:

- Toxic emissions from this proposed unit were calculated using District approved emission factors derived from a 2007 VOC profile "Dairies-Flushing Lanes" in EPA's speciation program.
- Toxic emissions for the Cow Housing, Lagoon(s), and Milk Parlor(s) were calculated using emission factors derived from the District's evaluation of dairy research studies conducted by California colleges and universities. PM based toxic emissions for the Cow Housing were calculated using emission factors generated from using the worst case composite of the 1997 EPA speciation of Kern County feedlot soil.
- PM based toxic emissions for the Cow Housing were calculated using emission factors generated from using the worst case composite of the 1997 EPA speciation of Kern County feedlot soil.

These emissions were input into the San Joaquin Valley APCD's Hazard Assessment and Reporting Program (SHARP). In accordance with the District's Risk Management Policy, risks from the proposed unit's toxic emissions were prioritized using the procedure in the 2016 CAPCOA Facility Prioritization Guidelines. The prioritization score for this proposed facility was greater than 1.0 (see RMR Summary Table). Therefore, a refined health risk assessment was required.

The AERMOD model was used, with the parameters outlined below and meteorological data for 2007-2010 from Visalia (rural dispersion coefficient selected) to determine the dispersion factors (i.e., the predicted concentration or X divided by the normalized source strength or Q) for a receptor grid. These dispersion factors were input into the SHARP Program, which then used the Air Dispersion Modeling and Risk Tool (ADMRT) of the Hot Spots Analysis and Reporting Program Version 2 (HARP 2) to calculate the chronic and acute hazard indices and the carcinogenic risk for the project.

The following parameters were used for the review:

Housing Name(s) or #(s)	Type of Cow	VOC (lb/hr)	VOC (lb/yr)	NH_3 (lb/hr)	NH_3 (lb/yr)	PM_{10} (lb/hr)	PM_{10} (lb/yr)
Corrals 32 and 33	support stock	0.0375	342	0.0500	443	NA[1]	NA[1]
39B	support stock	NA[1]	NA[1]	NA[1]	NA[1]	0.0167	138
4 New Freestalls (total)	milk cows	2.2708	19,906	5.2333	45,836	NA[1]	NA[1]
Special Needs Barn	milk cows	0.1125	986	0.2417	2,113	0.1042	897

[1]Units had a decrease in emissions.

Polygon Area Source Parameters				
Unit ID	**Unit Description**	**Release Height (m)**	**No. Vertices**	**Area (m^2)**
1	Milk Parlor 1	1.00	4	2458
2	Special Needs Barn	1.00	4	2044
2	4 New Freestalls (total)	1.00	4	64890
2	39B	1.00	4	2018
2	38	1.00	4	10246
2	Corrals 32 and 33	1.00	4	19175
3	Land App Liquid	0.00	18	13028297
3	Lagoon 1	0.00	4	7557
4	Soild Pile Storage	0.00	4	5177
4	Soild Pile Storage	0.00	4	4902
4	Land App Solid	0.00	18	13028297

4. AAQA Report

The District modeled the impact of the proposed project on the National Ambient Air Quality Standard (NAAQS) and/or California Ambient Air Quality Standard (CAAQS) in accordance with District Policy APR-1925 (Policy for District Rule 2201 AAQA Modeling) and EPA's Guideline for Air Quality Modeling (Appendix W of 40 CFR Part 51). The District uses a progressive three level approach to perform AAQAs. The first level (Level 1) uses a very conservative approach. If this analysis indicates a likely exceedance of an AAQS or Significant Impact Level (SIL), the analysis proceeds to the second level (Level 2) which implements a more refined approach. For the 1-hour NO_2 standard, there is also a third level that can be implemented if the Level 2 analysis indicates a likely exceedance of an AAQS or SIL.

The modeling analyses predicts the maximum air quality impacts using the appropriate emissions for each standard's averaging period. Required model inputs for a refined AAQA include background ambient air quality data, land characteristics, meteorological inputs, a receptor grid, and source parameters including emissions. These inputs are described in the sections that follow.

Ambient air concentrations of criteria pollutants are recorded at monitoring stations throughout the San Joaquin Valley. Monitoring stations may not measure all necessary pollutants, so background data may need to be collected from multiple sources. The following stations were used for this evaluation:

Technical Services performed modeling for directly emitted criteria pollutants with the emission rates below:

Emission Rates (lbs/hour)							
Unit ID	**Process**	**Housing Name**	**NOx**	**SOx**	**CO**	**PM10**	**PM2.5**
2	1	39B	0.00	0.00	0.00	0.0167	0.0167
2	1	Special Needs	0.00	0.00	0.00	0.1042	0.1042

Emission Rates (lbs/year)							
Unit ID	Process	Housing Name	NOx	SOx	CO	PM10	PM2.5
2	1	39B	0.00	0.00	0.00	138	138
2	1	Special Needs	0.00	0.00	0.00	897	897

The AERMOD model was used to determine if emissions from the project would cause or contribute to an exceedance of any state of federal air quality standard. The parameters outlined below and meteorological data for 2007-2010 from Visalia (rural dispersion coefficient selected) were used for the analysis:

The following parameters were used for the review:

Polygon Area Source Parameters				
Unit ID	Unit Description	Release Height (m)	No. Vertices	Area (m^2)
2	Special Needs Barn	1.00	4	2044
2	4 New Freestalls (total)	1.00	4	64890
2	39B	1.00	4	2018
2	38	1.00	4	10246
2	Corrals 32 and 33	1.00	4	19175

5. Conclusion

5.1 RMR

The cumulative acute and chronic indices for this facility, including this project, are below 1.0; and the cumulative cancer risk for this facility, including this project, is less than 20 in a million. In addition, the cancer risk for each unit in this project is less than 1.0 in a million. **In accordance with the District's Risk Management Policy, this project is approved without Toxic Best Available Control Technology (T-BACT).**

To ensure that human health risks will not exceed District allowable levels; the permit requirements listed on page 1 of this report must be included for this proposed unit.

These conclusions are based on the data provided by the applicant and the project engineer. Therefore, this analysis is valid only as long as the proposed data and parameters do not change.

6. Attachments

A. Modeling request from the project engineer

B. Additional information from the applicant/project engineer

C. Prioritization score w/ toxic emissions summary

D. Facility Summary

APPENDIX F
SSPE Calculations

Rev. January 9, 2019

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 anaerobic 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 any scraped manure sent to a lagoon/storage pond? yes
   Answering "yes" assumes worst case.

Pre-Project Herd Size

Herd	Flushed Freestalls	Scraped Freestalls	Flushed Corrals	Scraped Corrals	Total # of Animals
Milk Cows	4,730				4,730
Dry Cows	270		610		880
Support Stock (Heifers, Calves, and Bulls)			4,690		4,690
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			800				800

Total Herd Summary	
Total Milk Cows	4,730
Total Mature Cows	5,610
Support Stock (Heifers, Calves, and Bulls)	4,690
Total Calves	800
Total Dairy Head	11,100

Pre-Project Silage Information

Feed Type	Max # Open Piles	Max Height (ft)	Max Width (ft)
Corn	3	30	125
Alfalfa	4	30	125
Wheat	6	30	125

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 anaerobic treatment lagoon? yes
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 any scraped manure sent to a lagoon/storage pond? yes
   Answering "yes" assumes worst case.
6. Does this project result in any new lagoon/storage pond(s) or an increase in surface area for any existing lagoon/storage pond(s)? no

Post-Project Herd Size

Herd	Flushed Freestalls	Scraped Freestalls	Flushed Corrals	Scraped Corrals	Total # of Animals
Milk Cows	7,140				7,140
Dry Cows	240		750		990
Support Stock (Heifers, Calves, and Bulls)			3,740		3,740
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			800				800

Total Herd Summary	
Total Milk Cows	7,140
Total Mature Cows	8,130
Support Stock (Heifers, Calves, and Bulls)	3,740
Total Calves	800
Total Dairy Head	12,670

Post-Project Silage Information

Feed Type	Max # Open Piles	Max Height (ft)	Max Width (ft)
Corn	3	30	125
Alfalfa	4	30	125
Wheat	6	30	125

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).	10%	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.	5%	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%	0%
☐	☐	Use lime or a similar absorbent material in the corral according to the manufacturer's recommendation to minimize moisture in the corrals.	0%	0%
☐	☐	Apply thymol to the corral soil in accordance with the manufacturer's recommendation.	0%	0%
		Total Control Efficiency	23.05%	23.05%
		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.	10%	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	19.00%	19.00%
		Lanes Mitigations		
☑	☑	Feed according to NRC guidelines	10%	10%
☑	☑	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.	10%	10%
☐	☐	**(D)** Have no animals in exercise pens or corrals at any time.	0%	0%
		Total Control Efficiency	19.00%	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%	40%
☑	☑	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%
		Total Control Efficiency	10.00%	46.00%
		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%	40%
☑	☑	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%	46.00%

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.	10%	10%
		Total Control Efficiency	19.00%	19.00%
		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. 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 proprionic 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.	39.0%	39.0%
		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.	0%	0%
☑	☑	Remove uneaten wet feed from feed bunks within 24 hrs after then end of a rain event.	10%	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%	19.00%

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.	50%	50%
		Total Control Efficiency	64%	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%	42%
		Total Control Efficiency	28.00%	58.24%

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

			Milk Cows				Dry Cows				Large Heifers (15 to 24 months)				Medium Heifers (7 to 14 months)				Small Heifers (3 to 6 months)				Calves (0 - 3 months)				Bulls			
			Uncontrolled		Controlled		Uncontrolled		Controlled		Uncontrolled		Controlled		Uncontrolled		Controlled		Uncontrolled		Controlled		Uncontrolled		Controlled		Uncontrolled		Controlled	
			<1000 milk cows	≥1000 milk cows	EF1	EF2	<1000 milk cows	≥1000 milk cows	EF1	EF2	<1000 milk cows	≥1000 milk cows	EF1	EF2	<1000 milk cows	≥1000 milk cows	EF1	EF2	<1000 milk cows	≥1000 milk cows	EF1	EF2	<1000 milk cows	≥1000 milk cows	EF1	EF2	<1000 milk cows	≥1000 milk cows	EF1	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	5.08	5.08	5.40	3.59	2.76	2.76	4.20	2.76	2.12	2.12	2.85	1.88	1.45	1.45	1.60	1.04	0.80	0.80	0.75	0.50	0.39	0.39	2.55	1.67	1.29	1.29
		Bedding	1.05	1.00	0.81	0.81	0.57	0.54	0.44	0.44	0.44	0.42	0.34	0.34	0.30	0.28	0.23	0.23	0.17	0.16	0.13	0.13	0.08	0.08	0.06	0.06	0.27	0.25	0.20	0.20
		Lanes	0.64	0.60	0.65	0.65	0.45	0.44	0.35	0.35	0.35	0.33	0.27	0.27	0.24	0.23	0.18	0.18	0.13	0.13	0.10	0.10	0.06	0.06	0.05	0.05	0.21	0.20	0.16	0.16
		Total	15.78	12.09	9.86	9.86	8.75	6.80	5.57	5.57	6.81	5.22	4.27	4.27	4.62	3.56	2.91	2.91	2.59	1.98	1.62	1.62	1.22	0.95	0.78	0.78	4.13	3.16	2.59	2.59
	NH3	Enteric Emissions in Cow Housing	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Corrals/Pens	41.90	41.90	15.08	15.08	21.20	21.20	7.63	7.63	11.00	11.00	3.96	3.96	7.90	7.90	2.84	2.84	6.00	6.00	2.16	2.16	1.80	1.80	0.65	0.65	15.30	15.30	5.51	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	21.13	21.13	27.00	27.00	10.71	10.71	14.00	14.00	5.54	5.54	10.10	10.10	4.02	4.02	7.60	7.60	3.00	3.00	2.30	2.30	0.90	0.90	19.50	19.50	7.74	7.74
Liquid Manure Handling	VOC	Lagoons/Storage Ponds	1.52	1.30	1.17	0.70	0.82	0.71	0.64	0.38	0.64	0.54	0.49	0.29	0.43	0.37	0.33	0.20	0.24	0.21	0.19	0.11	0.11	0.10	0.09	0.05	0.40	0.33	0.30	0.18
		Liquid Manure Land Application	1.64	1.40	1.26	0.76	0.89	0.76	0.69	0.41	0.69	0.58	0.53	0.32	0.47	0.40	0.36	0.22	0.26	0.22	0.20	0.12	0.12	0.11	0.10	0.06	0.42	0.35	0.32	0.19
		Total	3.16	2.70	2.43	1.46	1.71	1.47	1.33	0.79	1.33	1.13	1.02	0.61	0.90	0.77	0.69	0.42	0.51	0.43	0.38	0.23	0.24	0.21	0.18	0.11	0.82	0.68	0.61	0.37
	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	3.72	4.50	4.50	3.24	1.88	2.30	2.30	1.66	0.96	1.70	1.70	1.22	0.71	1.30	1.30	0.94	0.54	0.37	0.37	0.27	0.15	3.23	3.23	2.33	1.35
		Total	17.10	17.10	7.59	4.90	8.70	8.70	3.84	2.48	4.50	4.50	1.97	1.28	3.20	3.20	1.44	0.93	2.50	2.50	1.11	0.72	0.72	0.72	0.32	0.20	6.23	6.23	2.76	1.78
Solid Manure Handling	VOC	Solid Manure Storage	0.16	0.15	0.12	0.12	0.09	0.08	0.07	0.07	0.07	0.06	0.05	0.05	0.05	0.04	0.03	0.03	0.03	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.04	0.04	0.03	0.03
		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	0.02	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	0.47	0.47	0.33	0.29	0.26	0.26	0.26	0.23	0.20	0.20	0.17	0.15	0.13	0.13	0.10	0.09	0.07	0.07	0.05	0.04	0.04	0.04	0.16	0.14	0.12	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	10,575

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

PM_{10} 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	15%
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	Corrals 34 and 35	open corral	support stock	186	186	2	☐	☐	☐	☐	☐	☐	☐	☐	☐
2	Corrals 32 and 33	open corral	support stock	200	240	2	☐	☐	☐	☐	☐	☐	☐	☐	☐
3	Corrals 30A, 30B, 31	open corral	support stock	100	100	3	☐	☐	☐	☐	☐	☐	☐	☐	☐
4	Corrals 36 and 37	open corral	support stock	200	200	2	☐	☐	☐	☐	☐	☐	☐	☐	☐
5	38	open corral	support stock	200	200		☐	☐	☐	☐	☐	☐	☐	☐	☐
6	39	open corral	support stock	200	200		☐	☐	☐	☐	☐	☐	☐	☐	☐
7	39B	open corral	dry cows	50	50		☐	☐	☐	☐	☐	☐	☐	☐	☐
8	43	open corral	support stock	200	200		☐	☐	☐	☐	☐	☐	☐	☐	☐
9	42	open corral	support stock	200	200		☐	☐	☐	☐	☐	☐	☐	☐	☐
10	41	open corral	dry cows	280	280		☐	☐	☐	☐	☐	☐	☐	☐	☐
11	40	open corral	dry cows	280	280		☐	☐	☐	☐	☐	☐	☐	☐	☐
12	12 (Half)	freestall	milk cows	400	400		☐	☐	☐	☐	☐	☐	☐	☐	☐
13	11 (Half)	freestall	milk cows	370	370		☐	☐	☐	☐	☐	☐	☐	☐	☐
14	2	freestall	milk cows	400	400		☐	☐	☐	☐	☐	☐	☐	☐	☐
15	10	freestall	milk cows	370	370		☐	☐	☐	☐	☐	☐	☐	☐	☐
16	7	freestall	milk cows	400	400		☐	☐	☐	☐	☐	☐	☐	☐	☐
17	6	freestall	milk cows	370	370		☐	☐	☐	☐	☐	☐	☐	☐	☐
18	5	freestall	milk cows	400	400		☐	☐	☐	☐	☐	☐	☐	☐	☐
19	9	freestall	milk cows	370	370		☐	☐	☐	☐	☐	☐	☐	☐	☐
20	1	freestall	milk cows	400	400		☐	☐	☐	☐	☐	☐	☐	☐	☐
21	8	freestall	milk cows	370	370		☐	☐	☐	☐	☐	☐	☐	☐	☐
22	4 (Half)	freestall	milk cows	390	390		☐	☐	☐	☐	☐	☐	☐	☐	☐
23	3 (Half)	freestall	milk cows	370	370		☐	☐	☐	☐	☐	☐	☐	☐	☐
24	13	open corral	milk cows	120	120		☐	☐	☐	☐	☐	☐	☐	☐	☐
25	15	open corral	dry cows	270	270		☐	☐	☐	☐	☐	☐	☐	☐	☐
26	hutches	on ground hutches	calves	800	800		☐	☐	☐	☐	☐	☐	☐	☐	☐
27	19A	open corral	support stock	200	200		☐	☐	☐	☐	☐	☐	☐	☐	☐
28	19B	open corral	support stock	100	100		☐	☐	☐	☐	☐	☐	☐	☐	☐
29	19C, D, E	open corral	support stock	105	105	3	☐	☐	☐	☐	☐	☐	☐	☐	☐
30	19F	open corral	support stock	98	98		☐	☐	☐	☐	☐	☐	☐	☐	☐
31	21, 22, 23	open corral	support stock	135	135	3	☐	☐	☐	☐	☐	☐	☐	☐	☐
32	24, 25	open corral	support stock	210	210	2	☐	☐	☐	☐	☐	☐	☐	☐	☐
33	26, 27, 28, 29 (total)	open corral	support stock	880	880		☐	☐	☐	☐	☐	☐	☐	☐	☐
			Pre-Project Total # of Cows	11,100											

PM10 Mitigation Measures and Control Efficiencies

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	Corrals 34 and 35	open corral	support stock	186	186	10.550										10.55
2	Corrals 32 and 33	open corral	support stock	200	240	10.550										10.55
3	Corrals 30A, 30B, 31	open corral	support stock	100	100	10.550										10.55
4	Corrals 36 and 37	open corral	support stock	200	200	10.550										10.55
5	38	open corral	support stock	200	200	10.550										10.55
6	39	open corral	support stock	200	200	10.550										10.55
7	39B	open corral	dry cows	50	50	5.460										5.46
8	43	open corral	support stock	200	200	10.550										10.55
9	42	open corral	support stock	200	200	10.550										10.55
10	41	open corral	dry cows	280	280	5.460										5.46
11	40	open corral	dry cows	280	280	5.460										5.46
12	12 (Half)	freestall	milk cows	400	400	1.370										1.37
13	11 (Half)	freestall	milk cows	370	370	1.370										1.37
14	2	freestall	milk cows	400	400	1.370										1.37
15	10	freestall	milk cows	370	370	1.370										1.37
16	7	freestall	milk cows	400	400	1.370										1.37
17	6	freestall	milk cows	370	370	1.370										1.37
18	5	freestall	milk cows	400	400	1.370										1.37
19	9	freestall	milk cows	370	370	1.370										1.37
20	1	freestall	milk cows	400	400	1.370										1.37
21	8	freestall	milk cows	370	370	1.370										1.37
22	4 (Half)	freestall	milk cows	390	390	1.370										1.37
23	3 (Half)	freestall	milk cows	370	370	1.370										1.37
24	13	open corral	milk cows	120	120	5.460										5.46
25	15	open corral	dry cows	270	270	5.460										5.46
26	hutches	on ground hutches	calves	800	800	0.343										0.34
27	19A	open corral	support stock	200	200	10.550										10.55
28	19B	open corral	support stock	100	100	10.550										10.55
29	19C, D, E	open corral	support stock	105	105	10.550										10.55
30	19F	open corral	support stock	98	98	10.550										10.55
31	21, 22, 23	open corral	support stock	135	135	10.550										10.55
32	24, 25	open corral	support stock	210	210	10.550										10.55
33	26, 27, 28, 29 (total)	open corral	support stock	880	880	10.550										10.55
			Pre-Project Total # of Cows	11,100												

PM10 Mitigation Measures and Control Efficiencies

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	Corrals 34 and 35	open corral	support stock	186	186	2	☑	☐	☐	☐	☐	☐	☑	☐	☐
2	Corrals 32 and 33	open corral	support stock	240	240	2	☑	☐	☐	☐	☐	☐	☑	☐	☐
3	Corrals 30A, 30B, 31	open corral	support stock	100	100	3	☑	☐	☐	☐	☐	☐	☑	☐	☐
4	Corrals 36 and 37	open corral	support stock	200	200	2	☑	☐	☐	☐	☐	☐	☑	☐	☐
5	38	open corral	dry cows	250	250		☑	☐	☐	☐	☐	☐	☑	☐	☐
6	39	open corral	support stock	200	200		☑	☐	☐	☐	☐	☐	☑	☐	☐
7	39B	open corral	support stock	50	50		☑	☐	☐	☐	☐	☐	☑	☐	☐
8	43	open corral	support stock	200	200		☑	☐	☐	☐	☐	☐	☑	☐	☐
9	42	saudi style barn	support stock	200	200		☑	☐	☐	☐	☐	☐	☑	☐	☐
10	41	open corral	dry cows	250	280		☑	☐	☐	☐	☐	☐	☑	☐	☐
11	40	open corral	dry cows	250	280		☑	☐	☐	☐	☐	☐	☑	☐	☐
12	12 (Half)	freestall	milk cows	400	400		☐	☐	☐	☐	☐	☐	☑	☐	☐
13	11 (Half)	freestall	milk cows	360	370		☐	☐	☐	☐	☐	☐	☑	☐	☐
14	2	freestall	milk cows	400	400		☐	☐	☐	☐	☐	☐	☑	☐	☐
15	10	freestall	milk cows	360	370		☐	☐	☐	☐	☐	☐	☑	☐	☐
16	7	freestall	milk cows	400	400		☐	☐	☐	☐	☐	☐	☑	☐	☐
17	6	freestall	milk cows	360	370		☐	☐	☐	☐	☐	☐	☑	☐	☐
18	5	freestall	milk cows	400	400		☐	☐	☐	☐	☐	☐	☑	☐	☐
19	9	freestall	milk cows	360	370		☐	☐	☐	☐	☐	☐	☑	☐	☐
20	1	freestall	milk cows	400	400		☐	☐	☐	☐	☐	☐	☑	☐	☐
21	8	freestall	milk cows	360	370		☐	☐	☐	☐	☐	☐	☑	☐	☐
22	4 (Half)	freestall	milk cows	360	390		☐	☐	☐	☐	☐	☐	☑	☐	☐
23	3 (Half)	freestall	milk cows	360	370		☐	☐	☐	☐	☐	☐	☑	☐	☐
24	13	saudi style barn	milk cows	120	120		☐	☐	☐	☐	☐	☐	☑	☐	☐
25	15	saudi style barn	dry cows	240	270		☐	☐	☐	☐	☐	☐	☑	☐	☐
26	hutches	on ground hutches	calves	800	800		☐	☐	☐	☐	☐	☐	☐	☐	☐
27	19A	open corral	support stock	200	200		☑	☐	☐	☐	☐	☐	☑	☐	☐
28	19B	open corral	support stock	100	100		☑	☐	☐	☐	☐	☐	☑	☐	☐
29	19C, D, E	open corral	support stock	105	105	3	☑	☐	☐	☐	☐	☐	☑	☐	☐
30	19F	open corral	support stock	98	98		☑	☐	☐	☐	☐	☐	☑	☐	☐
31	21, 22, 23	open corral	support stock	135	135	3	☑	☐	☐	☐	☐	☐	☑	☐	☐
32	24, 25	open corral	support stock	210	210	2	☑	☐	☐	☐	☐	☐	☑	☐	☐
33	Half Freestall Barns A, B, C	freestall	milk cows	2,400	2,400		☐	☐	☐	☐	☐	☐	☑	☐	☐

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	Special Needs Barn	saudi style barn	milk cows	100	100		☐	☐	☐	☐	☐	☐	☑	☐	☐
			Post-Project Total # of Cows	12,670											

PM10 Mitigation Measures and Control Efficiencies

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	Corrals 34 and 35	open corral	support stock	186	186	10.550	8.3%						15%			8.22
2	Corrals 32 and 33	open corral	support stock	240	240	10.550	8.3%						15%			8.22
3	Corrals 30A, 30B, 31	open corral	support stock	100	100	10.550	8.3%						15%			8.22
4	Corrals 36 and 37	open corral	support stock	200	200	10.550	8.3%						15%			8.22
5	38	open corral	dry cows	250	250	5.460	16.7%						15%			3.87
6	39	open corral	support stock	200	200	10.550	8.3%						15%			8.22
7	39B	open corral	support stock	50	50	10.550	8.3%						15%			8.22
8	43	open corral	support stock	200	200	10.550	8.3%						15%			8.22
9	42	saudi style barn	support stock	200	200	1.370							15%			1.17
10	41	open corral	dry cows	250	280	5.460	16.7%						15%			3.87
11	40	open corral	dry cows	250	280	5.460	16.7%						15%			3.87
12	12 (Half)	freestall	milk cows	400	400	1.370							15%			1.17
13	11 (Half)	freestall	milk cows	360	370	1.370							15%			1.17
14	2	freestall	milk cows	400	400	1.370							15%			1.17
15	10	freestall	milk cows	360	370	1.370							15%			1.17
16	7	freestall	milk cows	400	400	1.370							15%			1.17
17	6	freestall	milk cows	360	370	1.370							15%			1.17
18	5	freestall	milk cows	400	400	1.370							15%			1.17
19	9	freestall	milk cows	360	370	1.370							15%			1.17
20	1	freestall	milk cows	400	400	1.370							15%			1.17
21	8	freestall	milk cows	360	370	1.370							15%			1.17
22	4 (Half)	freestall	milk cows	360	390	1.370							15%			1.17
23	3 (Half)	freestall	milk cows	360	370	1.370							15%			1.17
24	13	saudi style barn	milk cows	120	120	1.370							15%			1.17
25	15	saudi style barn	dry cows	240	270	1.370							15%			1.17
26	hutches	on ground hutches	calves	800	800	0.343										0.34
27	19A	open corral	support stock	200	200	10.550	8.3%						15%			8.22
28	19B	open corral	support stock	100	100	10.550	8.3%						15%			8.22
29	19C, D, E	open corral	support stock	105	105	10.550	8.3%						15%			8.22
30	19F	open corral	support stock	98	98	10.550	8.3%						15%			8.22
31	21, 22, 23	open corral	support stock	135	135	10.550	8.3%						15%			8.22
32	24, 25	open corral	support stock	210	210	10.550	8.3%						15%			8.22
33	Half Freestall Barns A, B, C	freestall	milk cows	2,400	2,400	1.370							15%			1.17

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	Special Needs Barn	saudi style barn	milk cows	100	100	1.370							15%			1.17

Pre-Project Potential to Emit - Cow Housing

	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	Corrals 34 and 35	support stock	372	4.27	5.54	10.55	4.4	1,588	5.6	2,059	10.8	3,925	*
2	Corrals 32 and 33	support stock	400	4.27	5.54	10.55	4.7	1,708	6.1	2,214	11.6	4,220	*
3	Corrals 30A, 30B, 31	support stock	300	4.27	5.54	10.55	3.5	1,281	4.6	1,661	8.7	3,165	*
4	Corrals 36 and 37	support stock	400	4.27	5.54	10.55	4.7	1,708	6.1	2,214	11.6	4,220	*
5	38	support stock	200	4.27	5.54	10.55	2.3	854	3.0	1,107	5.8	2,110	
6	39	support stock	200	4.27	5.54	10.55	2.3	854	3.0	1,107	5.8	2,110	
7	39B	dry cows	50	5.57	10.71	5.46	0.8	279	1.5	535	0.7	273	
8	43	support stock	200	4.27	5.54	10.55	2.3	854	3.0	1,107	5.8	2,110	
9	42	support stock	200	4.27	5.54	10.55	2.3	854	3.0	1,107	5.8	2,110	
10	41	dry cows	280	5.57	10.71	5.46	4.3	1,560	8.2	2,999	4.2	1,529	
11	40	dry cows	280	5.57	10.71	5.46	4.3	1,560	8.2	2,999	4.2	1,529	
12	12 (Half)	milk cows	400	9.86	21.13	1.37	10.8	3,944	23.2	8,451	1.5	548	
13	11 (Half)	milk cows	370	9.86	21.13	1.37	10.0	3,648	21.4	7,817	1.4	507	
14	2	milk cows	400	9.86	21.13	1.37	10.8	3,944	23.2	8,451	1.5	548	
15	10	milk cows	370	9.86	21.13	1.37	10.0	3,648	21.4	7,817	1.4	507	
16	7	milk cows	400	9.86	21.13	1.37	10.8	3,944	23.2	8,451	1.5	548	
17	6	milk cows	370	9.86	21.13	1.37	10.0	3,648	21.4	7,817	1.4	507	
18	5	milk cows	400	9.86	21.13	1.37	10.8	3,944	23.2	8,451	1.5	548	
19	9	milk cows	370	9.86	21.13	1.37	10.0	3,648	21.4	7,817	1.4	507	
20	1	milk cows	400	9.86	21.13	1.37	10.8	3,944	23.2	8,451	1.5	548	
21	8	milk cows	370	9.86	21.13	1.37	10.0	3,648	21.4	7,817	1.4	507	
22	4 (Half)	milk cows	390	9.86	21.13	1.37	10.5	3,845	22.6	8,240	1.5	534	
23	3 (Half)	milk cows	370	9.86	21.13	1.37	10.0	3,648	21.4	7,817	1.4	507	
24	13	milk cows	120	9.86	21.13	5.46	3.2	1,183	6.9	2,535	1.8	655	
25	15	dry cows	270	5.57	10.71	5.46	4.1	1,504	7.9	2,891	4.0	1,474	
26	hutches	calves	800	0.78	0.90	0.34	1.7	624	2.0	724	0.8	274	
27	19A	support stock	200	4.27	5.54	10.55	2.3	854	3.0	1,107	5.8	2,110	
28	19B	support stock	100	4.27	5.54	10.55	1.2	427	1.5	554	2.9	1,055	
29	19C, D, E	support stock	315	4.27	5.54	10.55	3.7	1,345	4.8	1,744	9.1	3,323	*
30	19F	support stock	98	4.27	5.54	10.55	1.1	418	1.5	543	2.8	1,034	
31	21, 22, 23	support stock	405	4.27	5.54	10.55	4.7	1,729	6.1	2,242	11.7	4,273	*
32	24, 25	support stock	420	4.27	5.54	10.55	4.9	1,793	6.4	2,325	12.1	4,431	*
33	26, 27, 28, 29 (total)	support stock	880	4.27	5.54	10.55	10.3	3,758	13.3	4,872	25.4	9,284	
	Pre-Project Total # of Cows		**11,100**				**197.6**	**72,188**	**372.7**	**136,043**	**168.8**	**61,530**	

*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)**
11,100	**197.6**	**72,188**	**372.7**	**136,043**	**168.8**	**61,530**

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

	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	Corrals 34 and 35	support stock	372	4.27	5.54	8.22	4.4	1,588	5.6	2,059	8.4	3,059
2	Corrals 32 and 33	support stock	480	4.27	5.54	8.22	5.6	2,050	7.3	2,657	10.8	3,947
3	Corrals 30A, 30B, 31	support stock	300	4.27	5.54	8.22	3.5	1,281	4.6	1,661	6.8	2,467
4	Corrals 36 and 37	support stock	400	4.27	5.54	8.22	4.7	1,708	6.1	2,214	9.0	3,289
5	38	dry cows	250	5.57	10.71	3.87	3.8	1,393	7.3	2,677	2.6	967
6	39	support stock	200	4.27	5.54	8.22	2.3	854	3.0	1,107	4.5	1,645
7	39B	support stock	50	4.27	5.54	8.22	0.6	214	0.8	277	1.1	411
8	43	support stock	200	4.27	5.54	8.22	2.3	854	3.0	1,107	4.5	1,645
9	42	support stock	200	4.27	5.54	1.17	2.3	854	3.0	1,107	0.6	233
10	41	dry cows	250	5.57	10.71	3.87	3.8	1,393	7.3	2,677	2.6	967
11	40	dry cows	250	5.57	10.71	3.87	3.8	1,393	7.3	2,677	2.6	967
12	12 (Half)	milk cows	400	9.86	21.13	1.17	10.8	3,944	23.2	8,451	1.3	466
13	11 (Half)	milk cows	360	9.86	21.13	1.17	9.7	3,550	20.8	7,606	1.1	419
14	2	milk cows	400	9.86	21.13	1.17	10.8	3,944	23.2	8,451	1.3	466
15	10	milk cows	360	9.86	21.13	1.17	9.7	3,550	20.8	7,606	1.1	419
16	7	milk cows	400	9.86	21.13	1.17	10.8	3,944	23.2	8,451	1.3	466
17	6	milk cows	360	9.86	21.13	1.17	9.7	3,550	20.8	7,606	1.1	419
18	5	milk cows	400	9.86	21.13	1.17	10.8	3,944	23.2	8,451	1.3	466
19	9	milk cows	360	9.86	21.13	1.17	9.7	3,550	20.8	7,606	1.1	419
20	1	milk cows	400	9.86	21.13	1.17	10.8	3,944	23.2	8,451	1.3	466
21	8	milk cows	360	9.86	21.13	1.17	9.7	3,550	20.8	7,606	1.1	419
22	4 (Half)	milk cows	360	9.86	21.13	1.17	9.7	3,550	20.8	7,606	1.1	419
23	3 (Half)	milk cows	360	9.86	21.13	1.17	9.7	3,550	20.8	7,606	1.1	419
24	13	milk cows	120	9.86	21.13	1.17	3.2	1,183	6.9	2,535	0.4	140
25	15	dry cows	240	5.57	10.71	1.17	3.7	1,337	7.0	2,570	0.8	280
26	hutches	calves	800	0.78	0.90	0.34	1.7	624	2.0	724	0.8	274
27	19A	support stock	200	4.27	5.54	8.22	2.3	854	3.0	1,107	4.5	1,645
28	19B	support stock	100	4.27	5.54	8.22	1.2	427	1.5	554	2.3	822
29	19C, D, E	support stock	315	4.27	5.54	8.22	3.7	1,345	4.8	1,744	7.1	2,590
30	19F	support stock	98	4.27	5.54	8.22	1.1	418	1.5	543	2.2	806
31	21, 22, 23	support stock	405	4.27	5.54	8.22	4.7	1,729	6.1	2,242	9.1	3,330
32	24, 25	support stock	420	4.27	5.54	8.22	4.9	1,793	6.4	2,325	9.5	3,454
33	Half Freestall Barns A, B, C	milk cows	2,400	9.86	21.13	1.17	64.8	23,664	138.9	50,708	7.7	2,796
	Post-Project # of Cows (non-expansion)		**12,570**				**250.3**	**91,526**	**495.0**	**180,769**	**112.1**	**40,997**

*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	Special Needs Barn	milk cows	100	9.86	21.13	1.17	2.7	986	5.8	2,113	0.3	117
	Total # of Cows From Expansion		**100**				**2.7**	**986**	**5.8**	**2,113**	**0.3**	**117**

*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)
12,670	253.0	92,512	500.8	182,882	112.4	41,114

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 Worst Case BACT Calculations - Cow Housing

This table uses the worst case emission factor for each cow type and the maximum design capacity of the housing unit. This should only be used for BACT calculation purposes.

Worst-Case Pre-Project Potential to Emit - Cow Housing

	Housing Name(s) or #(s)	Type of Cow	Capacity per housing unit	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	Corrals 34 and 35	support stock	186	9.86	21.13	10.55	5.0	1,834	10.8	3,930	5.4	1,962	*
2	Corrals 32 and 33	support stock	240	9.86	21.13	10.55	6.5	2,366	13.9	5,071	6.9	2,532	*
3	Corrals 30A, 30B, 31	support stock	100	9.86	21.13	10.55	2.7	986	5.8	2,113	2.9	1,055	*
4	Corrals 36 and 37	support stock	200	9.86	21.13	10.55	5.4	1,972	11.6	4,226	5.8	2,110	*
5	38	support stock	200	9.86	21.13	10.55	5.4	1,972	11.6	4,226	5.8	2,110	
6	39	support stock	200	9.86	21.13	10.55	5.4	1,972	11.6	4,226	5.8	2,110	
7	39B	dry cows	50	9.86	21.13	10.55	1.4	493	2.9	1,056	1.4	528	
8	43	support stock	200	9.86	21.13	10.55	5.4	1,972	11.6	4,226	5.8	2,110	
9	42	support stock	200	9.86	21.13	10.55	5.4	1,972	11.6	4,226	5.8	2,110	
10	41	dry cows	280	9.86	21.13	10.55	7.6	2,761	16.2	5,916	8.1	2,954	
11	40	dry cows	280	9.86	21.13	10.55	7.6	2,761	16.2	5,916	8.1	2,954	
12	12 (Half)	milk cows	400	9.86	21.13	10.55	10.8	3,944	23.2	8,451	11.6	4,220	
13	11 (Half)	milk cows	370	9.86	21.13	10.55	10.0	3,648	21.4	7,817	10.7	3,904	
14	2	milk cows	400	9.86	21.13	10.55	10.8	3,944	23.2	8,451	11.6	4,220	
15	10	milk cows	370	9.86	21.13	10.55	10.0	3,648	21.4	7,817	10.7	3,904	
16	7	milk cows	400	9.86	21.13	10.55	10.8	3,944	23.2	8,451	11.6	4,220	
17	6	milk cows	370	9.86	21.13	10.55	10.0	3,648	21.4	7,817	10.7	3,904	
18	5	milk cows	400	9.86	21.13	10.55	10.8	3,944	23.2	8,451	11.6	4,220	
19	9	milk cows	370	9.86	21.13	10.55	10.0	3,648	21.4	7,817	10.7	3,904	
20	1	milk cows	400	9.86	21.13	10.55	10.8	3,944	23.2	8,451	11.6	4,220	
21	8	milk cows	370	9.86	21.13	10.55	10.0	3,648	21.4	7,817	10.7	3,904	
22	4 (Half)	milk cows	390	9.86	21.13	10.55	10.5	3,845	22.6	8,240	11.3	4,115	
23	3 (Half)	milk cows	370	9.86	21.13	10.55	10.0	3,648	21.4	7,817	10.7	3,904	
24	13	milk cows	120	9.86	21.13	10.55	3.2	1,183	6.9	2,535	3.5	1,266	
25	15	dry cows	270	9.86	21.13	10.55	7.3	2,662	15.6	5,705	7.8	2,849	
26	hutches	calves	800	9.86	21.13	10.55	21.6	7,888	46.3	16,903	23.1	8,440	
27	19A	support stock	200	9.86	21.13	10.55	5.4	1,972	11.6	4,226	5.8	2,110	
28	19B	support stock	100	9.86	21.13	10.55	2.7	986	5.8	2,113	2.9	1,055	
29	19C, D, E	support stock	105	9.86	21.13	10.55	2.8	1,035	6.1	2,218	3.0	1,108	*
30	19F	support stock	98	9.86	21.13	10.55	2.6	966	5.7	2,071	2.8	1,034	
31	21, 22, 23	support stock	135	9.86	21.13	10.55	3.6	1,331	7.8	2,852	3.9	1,424	*
32	24, 25	support stock	210	9.86	21.13	10.55	5.7	2,071	12.2	4,437	6.1	2,216	*
33	26, 27, 28, 29 (total)	support stock	880	9.86	21.13	10.55	23.8	8,677	50.9	18,593	25.4	9,284	
							261.0	**95,285**	**559.7**	**204,182**	**279.6**	**101,960**	

*Multiple emissions units (freestalls, corrals, calf hutch areas, etc.) are combined in these rows. BACT applicability has been calculated for EACH emissions unit in this row.

Pre-Project Totals

VOC (lb/day)	VOC (lb/yr)	NH3 (lb/day)	NH3 (lb/yr)	PM10 (lb/day)	PM10 (lb/yr)
261.0	**95,285**	**559.7**	**204,182**	**279.6**	**101,960**

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 Worst Case BACT Calculations - Existing Cow Housing

This table uses the worst case emission factor for each cow type and the maximum design capacity of the housing unit. This should only be used for BACT calculation purposes.

	Post-Project Worst Case BACT Calculations - Existing Cow Housing																		
	Housing Name(s) or #(s)	Type of Cow	Capacity per housing unit	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)	VOC AIPE	NH3 AIPE	PM10 AIPE	BACT Triggered for VOC?	BACT Triggered for NH3?	BACT Triggered for PM10?	
1	Corrals 34 and 35	support stock	186	9.86	21.13	8.22	5.0	1,834	10.8	3,930	4.2	1,529	0.0	0.0	0.0	No	No	No	*
2	Corrals 32 and 33	support stock	240	9.86	21.13	8.22	6.5	2,366	13.9	5,071	5.4	1,974	0.0	0.0	0.0	No	No	No	*
3	Corrals 30A, 30B, 31	support stock	100	9.86	21.13	8.22	2.7	986	5.8	2,113	2.3	822	0.0	0.0	0.0	No	No	No	*
4	Corrals 36 and 37	support stock	200	9.86	21.13	8.22	5.4	1,972	11.6	4,226	4.5	1,645	0.0	0.0	0.0	No	No	No	*
5	38	dry cows	250	9.86	21.13	7.47	6.8	2,465	14.5	5,282	5.1	1,868	1.4	2.9	1.0	No	Yes	No	
6	39	support stock	200	9.86	21.13	8.22	5.4	1,972	11.6	4,226	4.5	1,645	0.0	0.0	0.0	No	No	No	
7	39B	support stock	50	9.86	21.13	8.22	1.4	493	2.9	1,056	1.1	411	0.0	0.0	0.0	No	No	No	
8	43	support stock	200	9.86	21.13	8.22	5.4	1,972	11.6	4,226	4.5	1,645	0.0	0.0	0.0	No	No	No	
9	42	support stock	200	9.86	21.13	8.97	5.4	1,972	11.6	4,226	4.9	1,794	0.0	0.0	0.0	No	No	No	
10	41	dry cows	280	9.86	21.13	7.47	7.6	2,761	16.2	5,916	5.7	2,092	0.0	0.0	0.0	No	No	No	
11	40	dry cows	280	9.86	21.13	7.47	7.6	2,761	16.2	5,916	5.7	2,092	0.0	0.0	0.0	No	No	No	
12	12 (Half)	milk cows	400	9.86	21.13	8.97	10.8	3,944	23.2	8,451	9.8	3,587	0.0	0.0	-0.1	No	No	No	
13	11 (Half)	milk cows	370	9.86	21.13	8.97	10.0	3,648	21.4	7,817	9.1	3,318	0.0	0.0	0.0	No	No	No	
14	2	milk cows	400	9.86	21.13	8.97	10.8	3,944	23.2	8,451	9.8	3,587	0.0	0.0	-0.1	No	No	No	
15	10	milk cows	370	9.86	21.13	8.97	10.0	3,648	21.4	7,817	9.1	3,318	0.0	0.0	0.0	No	No	No	
16	7	milk cows	400	9.86	21.13	8.97	10.8	3,944	23.2	8,451	9.8	3,587	0.0	0.0	-0.1	No	No	No	
17	6	milk cows	370	9.86	21.13	8.97	10.0	3,648	21.4	7,817	9.1	3,318	0.0	0.0	0.0	No	No	No	
18	5	milk cows	400	9.86	21.13	8.97	10.8	3,944	23.2	8,451	9.8	3,587	0.0	0.0	-0.1	No	No	No	
19	9	milk cows	370	9.86	21.13	8.97	10.0	3,648	21.4	7,817	9.1	3,318	0.0	0.0	0.0	No	No	No	
20	1	milk cows	400	9.86	21.13	8.97	10.8	3,944	23.2	8,451	9.8	3,587	0.0	0.0	-0.1	No	No	No	
21	8	milk cows	370	9.86	21.13	8.97	10.0	3,648	21.4	7,817	9.1	3,318	0.0	0.0	0.0	No	No	No	
22	4 (Half)	milk cows	390	9.86	21.13	8.97	10.5	3,845	22.6	8,240	9.6	3,498	0.0	0.0	0.0	No	No	No	
23	3 (Half)	milk cows	370	9.86	21.13	8.97	10.0	3,648	21.4	7,817	9.1	3,318	0.0	0.0	0.0	No	No	No	
24	13	milk cows	120	9.86	21.13	8.97	3.2	1,183	6.9	2,535	2.9	1,076	0.0	0.0	-0.1	No	No	No	
25	15	dry cows	270	9.86	21.13	8.97	7.3	2,662	15.6	5,705	6.6	2,421	0.0	0.0	0.0	No	No	No	
26	hutches	calves	800	9.86	21.13	10.55	21.6	7,888	46.3	16,903	23.1	8,440	0.0	0.0	0.0	No	No	No	
27	19A	support stock	200	9.86	21.13	8.22	5.4	1,972	11.6	4,226	4.5	1,645	0.0	0.0	0.0	No	No	No	
28	19B	support stock	100	9.86	21.13	8.22	2.7	986	5.8	2,113	2.3	822	0.0	0.0	0.0	No	No	No	
29	19C, D, E	support stock	105	9.86	21.13	8.22	2.8	1,035	6.1	2,218	2.4	863	0.0	0.0	0.1	No	No	No	*
30	19F	support stock	98	9.86	21.13	8.22	2.6	966	5.7	2,071	2.2	806	0.0	0.0	0.0	No	No	No	
31	21, 22, 23	support stock	135	9.86	21.13	8.22	3.6	1,331	7.8	2,852	3.0	1,110	0.0	0.0	0.0	No	No	No	*
32	24, 25	support stock	210	9.86	21.13	8.22	5.7	2,071	12.2	4,437	4.7	1,727	0.0	0.0	-0.1	No	No	No	*
33	Half Freestall Barns A, B, C	milk cows	2,400	9.86	21.13	8.97	64.8	23,664	138.9	50,708	59.0	21,523	41.0	88.0	37.4	Yes	Yes	Yes	
							303.4	110,765	650.6	237,353	271.8	99,291							

*Multiple emissions units (freestalls, corrals, calf hutch areas, etc.) are combined in these rows. BACT applicability has been calculated for EACH emissions unit in this row.

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)

Post-Project Worst Case BACT Calculations - New Cow Housing

This table uses the worst case emission factor for each cow type and the maximum design capacity of the housing unit. This should only be used for BACT calculation purposes.

	Post-Project Potential to Emit - Cow Housing: New Freestalls at Existing Dairy															
	Housing Name(s) or #(s)	Type of Cow	Capacity per housing unit	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)	BACT Triggered for VOC?	BACT Triggered for NH3?	BACT Triggered for PM10?	
1	Special Needs Barn	milk cows	100	9.86	21.13	8.97	2.7	986	5.8	2,113	2.5	897	Yes	Yes	Yes	
							2.7	986	5.8	2,113	2.5	897				

*Multiple emissions units (freestalls, corrals, calf hutch areas, etc.) are combined in these rows. BACT applicability has been calculated for EACH emissions unit in this row.

Post-Project Totals					
VOC (lb/day)	VOC (lb/yr)	NH3 (lb/day)	NH3 (lb/yr)	PM10 (lb/day)	PM10 (lb/yr)
306.1	111,751	656.4	239,466	274.3	100,188

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)

BACT Applicability

Milking Parlor					
VOC Emissions					
	PE2 (lb/day)	PE1 (lb/day)	EF2	EF1	AIPE (lb/day)
Milk Cows	7.8	5.2	0.40	0.40	2.6
BACT triggered for VOC for milking parlor				Total	2.6
NH3 Emissions					
	PE2 (lb/day)	PE1 (lb/day)	EF2	EF1	AIPE (lb/day)
Milk Cows	2.7	1.8	0.14	0.14	0.9
				Total	0.9

Cow Housing
See detailed cow housing AIPE calculations on the BACT Calcs page.

Liquid Manure Handling					
VOC Emissions - Lagoon/Storage Pond(s)					
	PE2 (lb/day)	PE1 (lb/day)	EF2	EF1	AIPE (lb/day)
Milk Cows	13.7	15.2	0.70	1.17	4.6
Dry Cows	1.0	1.5	0.38	0.64	0.1
Support Stock (Heifers, Calves, and Bulls)	3.0	6.3	0.29	0.49	-0.7
Large Heifers	0.0	0.0	0.29	0.49	0.0
Medium Heifers	0.0	0.0	0.20	0.33	0.0
Small Heifers	0.0	0.0	0.11	0.19	0.0
Calves	0.1	0.2	0.05	0.09	0.0
Bulls	0.0	0.0	0.18	0.30	0.0
BACT triggered for VOC for Lagoon/Storage Ponds				Total	4.0
VOC Emissions - Land Application					
	PE2 (lb/day)	PE1 (lb/day)	EF2	EF1	AIPE (lb/day)
Milk Cows	14.8	16.3	0.76	1.26	5.0
Dry Cows	1.1	1.7	0.41	0.69	0.1
Support Stock (Heifers, Calves, and Bulls)	3.2	6.8	0.32	0.53	-0.9
Large Heifers	0.0	0.0	0.32	0.53	0.0
Medium Heifers	0.0	0.0	0.22	0.36	0.0
Small Heifers	0.0	0.0	0.12	0.20	0.0
Calves	0.1	0.2	0.06	0.10	0.0
Bulls	0.0	0.0	0.19	0.32	0.0
BACT triggered for VOC for Liquid Manure Land Application				Total	4.2
NH3 Emissions - Lagoon/Storage Pond(s)					
	PE2 (lb/day)	PE1 (lb/day)	EF2	EF1	AIPE (lb/day)
Milk Cows	23.1	15.3	1.18	1.18	7.8
Dry Cows	1.6	1.5	0.60	0.60	0.1
Support Stock (Heifers, Calves, and Bulls)	3.2	4.1	0.32	0.32	-0.9
Large Heifers	0.0	0.0	0.32	0.32	0.0
Medium Heifers	0.0	0.0	0.22	0.22	0.0
Small Heifers	0.0	0.0	0.17	0.17	0.0
Calves	0.1	0.1	0.05	0.05	0.0
Bulls	0.0	0.0	0.43	0.43	0.0
BACT triggered for NH3 for Lagoon/Storage Ponds				Total	7.0
NH3 Emissions - Land Application					
	PE2 (lb/day)	PE1 (lb/day)	EF2	EF1	AIPE (lb/day)
Milk Cows	72.7	83.0	3.72	6.41	24.6
Dry Cows	5.1	7.8	1.88	3.24	0.6
Support Stock (Heifers, Calves, and Bulls)	9.8	21.3	0.96	1.66	-2.6
Large Heifers	0.0	0.0	0.96	1.66	0.0
Medium Heifers	0.0	0.0	0.71	1.22	0.0
Small Heifers	0.0	0.0	0.54	0.94	0.0
Calves	0.3	0.6	0.15	0.27	0.0
Bulls	0.0	0.0	1.35	2.33	0.0
BACT triggered for NH3 for Liquid Manure Land Application				Total	22.5
H2S Emissions - Lagoon/Storage Pond(s)					
	PE2 (lb/day)	PE1 (lb/day)	EF2	EF1	AIPE (lb/day)
Milk Cows	2.3	2.3	0.12	0.12	0.0
Dry Cows	0.2	0.2	0.06	0.06	0.0
Support Stock (Heifers, Calves, and Bulls)	0.3	0.3	0.03	0.03	0.0
Large Heifers	0.0	0.0	0.03	0.03	0.0
Medium Heifers	0.0	0.0	0.02	0.02	0.0
Small Heifers	0.0	0.0	0.02	0.02	0.0
Calves	0.0	0.0	0.01	0.01	0.0
Bulls	0.0	0.0	0.04	0.04	0.0
				Total	0.0

Solid Manure Handling					
VOC Emissions - Solid Manure Storage/Separated Solids Piles					
	PE2 (lb/day)	PE1 (lb/day)	EF2	EF1	AIPE (lb/day)
Milk Cows	3.4	2.3	0.18	0.18	1.1
Dry Cows	0.3	0.2	0.10	0.10	0.1
Support Stock (Heifers, Calves, and Bulls)	0.8	0.9	0.10	0.07	-0.1
Large Heifers	0.0	0.0	0.07	0.07	0.0
Medium Heifers	0.0	0.0	0.05	0.05	0.0
Small Heifers	0.0	0.0	0.03	0.03	0.0
Calves	0.0	0.0	0.01	0.01	0.0
Bulls	0.0	0.0	0.05	0.05	0.0
				Total	1.1
VOC Emissions - Land Application					
	PE2 (lb/day)	PE1 (lb/day)	EF2	EF1	AIPE (lb/day)
Milk Cows	5.8	3.8	0.30	0.30	2.0
Dry Cows	0.4	0.4	0.16	0.16	0.0
Support Stock (Heifers, Calves, and Bulls)	1.3	1.6	0.12	0.12	-0.3
Large Heifers	0.0	0.0	0.12	0.12	0.0
Medium Heifers	0.0	0.0	0.08	0.08	0.0
Small Heifers	0.0	0.0	0.05	0.05	0.0
Calves	0.0	0.0	0.02	0.02	0.0
Bulls	0.0	0.0	0.07	0.07	0.0
				Total	1.7
NH3 Emissions - Solid Manure Storage/Separated Solids Piles					
	PE2 (lb/day)	PE1 (lb/day)	EF2	EF1	AIPE (lb/day)
Milk Cows	26.0	17.2	1.33	1.33	8.8
Dry Cows	1.8	1.6	0.67	0.67	0.2
Support Stock (Heifers, Calves, and Bulls)	3.6	4.5	0.35	0.35	-0.9
Large Heifers	0.0	0.0	0.35	0.35	0.0
Medium Heifers	0.0	0.0	0.25	0.25	0.0
Small Heifers	0.0	0.0	0.18	0.18	0.0
Calves	0.1	0.1	0.06	0.06	0.0
Bulls	0.0	0.0	0.49	0.49	0.0
BACT triggered for NH3 for Solid Manure Storage				Total	8.1
NH3 Emissions - Land Application					
	PE2 (lb/day)	PE1 (lb/day)	EF2	EF1	AIPE (lb/day)
Milk Cows	29.4	19.5	1.50	1.50	9.9
Dry Cows	2.1	1.8	0.76	0.76	0.3
Support Stock (Heifers, Calves, and Bulls)	4.1	5.1	0.40	0.40	-1.0
Large Heifers	0.0	0.0	0.40	0.40	0.0
Medium Heifers	0.0	0.0	0.28	0.28	0.0
Small Heifers	0.0	0.0	0.22	0.22	0.0
Calves	0.1	0.1	0.06	0.06	0.0
Bulls	0.0	0.0	0.55	0.55	0.0
BACT triggered for NH3 for Solid Manure Land Application				Total	9.2

Feed Storage and Handling					
VOC Emissions - Silage					
	PE2 (lb/day)	PE1 (lb/day)	EF2	EF1	AIPE (lb/day)
Corn Silage	54.4	54.4	21,155	21,155	0.0
Alfalfa Silage	18.3	18.3	10,649	10,649	0.0
Wheat Silage	137.6	137.6	26,745	26,745	0.0
				Total	0.0
VOC Emissions - TMR					
	PE2 (lb/day)	PE1 (lb/day)	EF2	EF1	AIPE (lb/day)
TMR	261.7	227.1	10,575	10,575	34.6
BACT triggered for VOC for TMR				Total	34.6

Pre-Project Potential to Emit (PE1)

Pre-Project Herd Size							
Herd	Flushed Freestalls	Scraped Freestalls	Flushed Corrals	Scraped Corrals	Total # of Animals		
Milk Cows	4,730	0	0	0	4,730		
Dry Cows	270	0	610	0	880		
Support Stock (Heifers, Calves and Bulls)	0	0	4,690	0	4,690		
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	0	0	800	0	0	0	800

Silage Information				
Feed Type	Maximum # Open Piles	Maximum Height (ft)	Maximum Width (ft)	Open Face Area (ft^2)
Corn	3	30	125	8,740
Alfalfa	4	30	125	11,654
Wheat	6	30	125	17,481

Milking Parlor				
Cow	VOC		NH3	
Milk Cows	lb/day	lb/yr	lb/day	lb/yr
	5.2	1,892	1.8	647

Cow Housing						
Cow	VOC		NH3		PM10	
	lb/day	lb/yr	lb/day	lb/yr	lb/day	lb/yr
Total	197.6	72,188	372.7	136,043	168.8	61,530

Liquid Manure Handling						
Cow	VOC		NH3		H2S*	
	lb/day	lb/yr	lb/day	lb/yr	lb/day	lb/yr
Milk Cows	31.5	11,494	98.4	35,901	2.3	843
Dry Cows	3.2	1,170	9.3	3,379	0.2	60
Support Stock (Heifers, Calves and Bulls)	13.1	4,784	25.3	9,239	0.3	118
Large Heifers	0.0	0	0.0	0	0	0
Medium Heifers	0.0	0	0.0	0	0	0
Small Heifers	0.0	0	0.0	0	0	0
Calves	0.4	144	0.7	256	0	4
Bulls	0.0	0	0.0	0	0	0
Total	48.2	17,592	133.7	48,775	2.8	1,025

Solid Manure Handling				
Cow	VOC		NH3	
	lb/day	lb/yr	lb/day	lb/yr
Milk Cows	6.1	2,223	36.7	13,386
Dry Cows	0.6	229	3.4	1,258
Support Stock (Heifers, Calves and Bulls)	2.6	938	9.6	3,518
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	0.1	32	0.3	96
Bulls	0.0	0	0.0	0
Total	9.4	3,422	50.0	18,258

Feed Handling and Storage		
	Daily PE (lb-VOC/day)	Annual PE (lb-VOC/yr)
Corn Emissions	54.4	19,863
Alfalfa Emissions	18.3	6,666
Wheat Emissions	137.6	50,222
TMR	227.1	82,877
Total	437.4	159,628

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)

Calves are not included in TMR calculation.

Notes

*Since there will be no change to the lagoons/storage ponds surface area, no change in H2S emissions is expected. Therefore, it will be assumed that PE1 for H2S emissions is equal to PE2 for H2S emissions.

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	5.2	1.8	0.0
Cow Housing	0.0	0.0	168.8	0.0	197.6	372.7	0.0
Liquid Manure	0.0	0.0	0.0	0.0	48.2	133.7	2.8
Solid Manure	0.0	0.0	0.0	0.0	9.4	50.0	0.0
Feed Handling	0.0	0.0	0.0	0.0	437.4	0.0	0.0
Total	0.0	0.0	168.8	0.0	697.8	558.2	2.8

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	8,466
Solid Manure	0	0	0	0	0
Feed Handling	0	0	0	0	0
Total	0	0	0	0	8,466

Total Annual Pre-Project Potential to Emit (lb/yr)							
Permit	NOx	SOx	PM10	CO	VOC	NH3	H2S
Milking Parlor	0	0	0	0	1,892	647	0
Cow Housing	0	0	61,530	0	72,188	136,043	0
Liquid Manure	0	0	0	0	17,592	48,775	1,025
Solid Manure	0	0	0	0	3,422	18,258	0
Feed Handling	0	0	0	0	159,628	0	0
Total	0	0	61,530	0	254,722	203,723	1,025

Post-Project Potential to Emit (PE2)

Post-Project Herd Size					
Herd	Flushed Freestalls	Scraped Freestalls	Flushed Corrals	Scraped Corrals	Total # of Animals
Milk Cows	7,140	0	0	0	7,140
Dry Cows	240	0	750	0	990
Support Stock (Heifers, Calves, and Bulls)	0	0	3,740	0	3,740
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	0	0	800	0	0	0	800

Silage Information				
Feed Type	Maximum # Open Piles	Maximum Height (ft)	Maximum Width (ft)	Open Face Area (ft^2)
Corn	3	30	125	8,740
Alfalfa	4	30	125	11,654
Wheat	6	30	125	17,481

Milking Parlor				
Cow	VOC		NH3	
Milk Cows	lb/day	lb/yr	lb/day	lb/yr
Total	7.8	2,856	2.7	977

Cow Housing						
	VOC		NH3		PM10	
	lb/day	lb/yr	lb/day	lb/yr	lb/day	lb/yr
Total	253.0	92,512	501	182,882	112	41,114

Liquid Manure Handling						
Cow	VOC		NH3		H2S	
	lb/day	lb/yr	lb/day	lb/yr	lb/day	lb/yr
Milk Cows	28.6	10,424	95.9	34,986	2.3	843
Dry Cows	2.1	782	6.7	2,455	0.2	60
Support Stock (Heifers, Calves, and Bulls)	6.3	2,281	13.1	4,787	0.3	118
Large Heifers	0.0	0	0.0	0	0	0
Medium Heifers	0.0	0	0.0	0	0	0
Small Heifers	0.0	0	0.0	0	0	0
Calves	0.2	88	0.4	160	0	4
Bulls	0.0	0	0.0	0	0	0
Total	37.2	13,576	116.1	42,388	2.8	1,025

Solid Manure Handling				
Cow	VOC		NH3	
	lb/day	lb/yr	lb/day	lb/yr
Milk Cows	9.2	3,356	55.4	20,206
Dry Cows	0.7	257	3.9	1,416
Support Stock (Heifers, Calves, and Bulls)	2.0	748	7.7	2,805
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	0.1	32	0.3	96
Bulls	0.0	0	0.0	0
Total	12.0	4,393	67.3	24,523

Feed Handling and Storage		
	Daily PE (lb-VOC/day)	Annual PE (lb-VOC/yr)
Corn Emissions	54.4	19,863
Alfalfa Emissions	18.3	6,666
Wheat Emissions	137.6	50,222
TMR	261.7	95,510
Total	472.0	172,261

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 ft^2) x (0.0929 m^2/ft^2) 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 m^2) x (525,600 min/yr) x (2.20E-9 lb/µg)

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

Calves are not included in TMR calculation.

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	7.8	2.7	0.0
Cow Housing	0.0	0.0	112.4	0.0	253.0	500.8	0.0
Liquid Manure	0.0	0.0	0.0	0.0	37.2	116.1	2.8
Solid Manure	0.0	0.0	0.0	0.0	12.0	67.3	0.0
Feed Handling	0.0	0.0	0.0	0.0	472.0	0.0	0.0
Total	0.0	0.0	112.4	0.0	782.0	686.9	2.8

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	6,501
Solid Manure	0	0	0	0	0
Feed Handling	0	0	0	0	0
Total	0	0	0	0	6,501

Total Annual Post-Project Potential to Emit (lb/yr)							
Permit	NOx	SOx	PM10	CO	VOC	NH3	H2S
Milking Parlor	0	0	0	0	2,856	977	0
Cow Housing	0	0	41,114	0	92,512	182,882	0
Liquid Manure	0	0	0	0	13,576	42,388	1,025
Solid Manure	0	0	0	0	4,393	24,523	0
Feed Handling	0	0	0	0	172,261	0	0
Total	0	0	41,114	0	285,598	250,770	1,025

Increase in Emissions

SSIPE (lb/yr)							
	NOx	SOx	PM10	CO	VOC	NH3	H2S
Milking Parlor	0	0	0	0	964	330	0
Cow Housing	0	0	-20,416	0	20,324	46,839	0
Liquid Manure	0	0	0	0	-4,016	-6,387	0
Solid Manure	0	0	0	0	971	6,265	0
Feed Handling	0	0	0	0	12,633	0	0
Total	**0**	**0**	**-20,416**	**0**	**30,876**	**47,047**	**0**

Total Daily Change in Emissions (lb/day)							
	NOx	SOx	PM10	CO	VOC	NH3	H2S
Milking Parlor	0.0	0.0	0.0	0.0	2.6	0.9	0.0
Cow Housing	0.0	0.0	-56.4	0.0	55.4	128.1	0.0
Liquid Manure	0.0	0.0	0.0	0.0	-11.0	-17.6	0.0
Solid Manure	0.0	0.0	0.0	0.0	2.6	17.3	0.0
Feed Handling	0.0	0.0	0.0	0.0	34.6	0.0	0.0
Total	**0.0**	**0.0**	**-56.4**	**0.0**	**84.2**	**128.7**	**0.0**

Total Annual Change in Non-Fugitive Emissions (Major Source Emissions) (lb/yr)							
	NOx	SOx	PM10	CO	VOC	NH3	H2S
Milking Parlor	0	0	0	0	0	0	0
Cow Housing	0	0	0	0	0	0	0
Liquid Manure	0	0	0	0	-1,965	0	0
Solid Manure	0	0	0	0	0	0	0
Feed Handling	0	0	0	0	0	0	0
Total	**0**	**0**	**0**	**0**	**-1,965**	**0**	**0**

S-5836-6-0: 587 BHP CATERPILLAR MODEL 3406C DITA (S/N 4ZR05066) DIESEL-FIRED EMERGENCY STANDBY IC ENGINE POWERING AN ELECTRICAL GENERATOR

A. Assumptions

Non-emergency operating schedule:	100 hours/year (current PTO)
Density of diesel fuel:	7.1 lb/gal
EPA F-factor (adjusted to 60°F):	9,051 dscf/MMBtu
Fuel heating value:	137,000 Btu/gal
BHP to Btu/hr conversion:	2,542.5 Btu/hp·hr
Thermal efficiency of engine:	commonly ≈ 35%
PM_{10} fraction of diesel exhaust:	0.96 (CARB, 1988)

B. Emission Factors

Diesel-fired IC Engine Emission Factors		
	g/hp·hr*	Source
NO_x	14.1	AP-42 (10/96) Table 3.3-1
SO_x	0.0051	Mass Balance Equation Below
PM_{10}	1.0	AP-42 (10/96) Table 3.3-1
CO	3.04	AP-42 (10/96) Table 3.3-1
VOC	1.14	AP-42 (10/96) Table 3.3-1

*g/hp·hr is calculated using the lb/hp·hr value multiplied by 453.6 g/lb.

$$0.0015\%S \times \frac{7.1\,lb \cdot fuel}{gallon} \times \frac{2\,lb \cdot SO_2}{1\,lb \cdot S} \times \frac{1\,gal}{137{,}000\,Btu} \times \frac{1\,hp\,input}{0.35\,hp\,out} \times \frac{2{,}542.5\,Btu}{hp \cdot hr} \times \frac{453.6\,g}{lb} = 0.0051 \frac{g \cdot SO_x}{hp \cdot hr}$$

C. Annual Potential to Emit

Annual Potential to Emit								
NO_x	14.1	(g/hp·hr) x	587	(hp) x	100	(hr/yr) ÷ 453.6 (g/lb) =	1,825	(lb/yr)
SO_x	0.0051	(g/hp·hr) x	587	(hp) x	100	(hr/yr) ÷ 453.6 (g/lb) =	1	(lb/yr)
PM_{10}	1.0	(g/hp·hr) x	587	(hp) x	100	(hr/yr) ÷ 453.6 (g/lb) =	129	(lb/yr)
CO	3.04	(g/hp·hr) x	587	(hp) x	100	(hr/yr) ÷ 453.6 (g/lb) =	393	(lb/yr)
VOC	1.14	(g/hp·hr) x	587	(hp) x	100	(hr/yr) ÷ 453.6 (g/lb) =	148	(lb/yr)

APPENDIX G
Quarterly Net Emissions Change (QNEC)

Quarterly Net Emissions Change (QNEC)

The Quarterly Net Emissions Change is used to complete the emission profile screen for the District's PAS database. The QNEC shall be calculated as follows:

QNEC = PE2 - PE1, where:

QNEC = Quarterly Net Emissions Change for each emissions unit, lb/qtr
PE2 = Post-Project Potential to Emit for each emissions unit, lb/qtr
PE1 = Pre-Project Potential to Emit for each emissions unit, lb/qtr

The quaterly PE values are calculated as follows: PE (lb/yr) ÷ 4 (qtr/yr)

Using the annual PE2 and PE1 values previously calculated, the QNEC (lb/qtr) for each permit unit is shown below:

	Milking Parlor					
	NOx	SOx	PM10	CO	VOC	NH3
Annual PE2 (lb/yr)	0	0	0	0	2,856	977
Daily PE2 (lb/day)	0.0	0.0	0.0	0.0	7.8	2.7
Quarterly Net Emissions Change (lb/qtr) 1:	0.0	0.0	0.0	0.0	241.00	82.50
2:	0.0	0.0	0.0	0.0	241.00	82.50
3:	0.0	0.0	0.0	0.0	241.00	82.50
4:	0.0	0.0	0.0	0.0	241.00	82.50

	Cow Housing					
	NOx	SOx	PM10	CO	VOC	NH3
Annual PE2 (lb/yr)	0	0	41,114	0	92,512	182,882
Daily PE2 (lb/day)	0.0	0.0	112.4	0.0	253.0	500.8
Quarterly Net Emissions Change (lb/qtr) 1:	0.0	0.0	-5,104.00	0.0	5,081.00	11,709.75
2:	0.0	0.0	-5,104.00	0.0	5,081.00	11,709.75
3:	0.0	0.0	-5,104.00	0.0	5,081.00	11,709.75
4:	0.0	0.0	-5,104.00	0.0	5,081.00	11,709.75

	Liquid Manure Handling						
	NOx	SOx	PM10	CO	VOC	NH3	H2S
Annual PE2 (lb/yr)	0	0	0	0	13,576	42,388	1,025
Daily PE2 (lb/day)	0.0	0.0	0.0	0.0	37.2	116.1	2.8
Quarterly Net Emissions Change (lb/qtr) 1:	0.0	0.0	0.0	0.0	-1,004.00	-1,596.75	0.0
2:	0.0	0.0	0.0	0.0	-1,004.00	-1,596.75	0.0
3:	0.0	0.0	0.0	0.0	-1,004.00	-1,596.75	0.0
4:	0.0	0.0	0.0	0.0	-1,004.00	-1,596.75	0.0

	Solid Manure Handling					
	NOx	SOx	PM10	CO	VOC	NH3
Annual PE2 (lb/yr)	0	0	0	0	4,393	24,523
Daily PE2 (lb/day)	0.0	0.0	0.0	0.0	12.0	67.3
Quarterly Net Emissions Change (lb/qtr) 1:	0.0	0.0	0.0	0.0	242.75	1,566.25
2:	0.0	0.0	0.0	0.0	247.75	1,566.25
3:	0.0	0.0	0.0	0.0	247.75	1,566.25
4:	0.0	0.0	0.0	0.0	247.75	1,566.25

	Feed Storage and Handling					
	NOx	SOx	PM10	CO	VOC	NH3
Annual PE2 (lb/yr)	0	0	0	0	172,261	0
Daily PE2 (lb/day)	0.0	0.0	0.0	0.0	472.0	0.0
Quarterly Net Emissions Change (lb/qtr) 1:	0.0	0.0	0.0	0.0	3,158.25	0.0
2:	0.0	0.0	0.0	0.0	3,158.25	0.0
3:	0.0	0.0	0.0	0.0	3,158.25	0.0
4:	0.0	0.0	0.0	0.0	3,158.25	0.0

APPENDIX H
Covered Anaerobic Digester Lagoon Design Check

Lagoon Design Check in Accordance with NRCS Guideline #359

Proposed Lagoon Volume

Volume of treatment lagoon = $(L \times W \times D) - (S \times D^2) \times (W + L) + (4 \times S^2 \times D^3 \div 3)$

Primary Treatment Lagoon Dimensions

Length	611	ft
Width	480	ft
Depth	21	ft
Slope	3	ft

(Subtract 2 feet from the actual lagoon depth for run-off or miscellaneous water.)

Primary Lagoon Volume	**4,826,619 ft3**

INSTRUCTIONS

* only input yellow fields

Step 1 Enter primary lagoon dimensions on this sheet

Step 2 Go to "Net Volatile Solids Loading" sheet and enter number of animals flushing manure to lagoon

Step 3 Adjust % in flush and separation as necessary (see notes on sheet)

Step 4 Go to "Minimum Treatment Volume"

Step 5 Minimum treatment volume should be less than lagoon volume to be considered anaerobic treatment lagoon

Step 6 Go to "Hydraulic Retention Time"

Step 7 Adjust fresh water as applicable

Step 8 Hydraulic retention time should be greater than 34 days to be considered anaerobic treatment lagoon.

Lagoon Design Check in Accordance with NRCS Guideline #359

Net Volatile Solids loading Calculation

Net Volatile Solids (VS) Loading of Treatment Lagoons									
Breed: Holstein Type of Cow	**Number of Animals**	**x**	VS Excreted[1] (lb/day)	**x**	% Manure in Flush[2]	**x**	(1 - % VS Removed in Separation[3])	**=**	**Net VS Loading (lb/day)**
Milk Cows (Freestall Barns)	6,920	x	17	x	71%	x	50%	=	**41,762**
Milk Cows (Saudi Style Barns)	220		17		60%		50%		**1,122**
Dry Cow (Freestall Barns)	750	x	9.2	x	71%	x	50%	=	**2,450**
Dry Cow (Saudi Style Barns)	240		9.2		60%		50%		**662**
Heifer (15 to 24 months)	3,740	x	7.1	x	48%	x	50%	=	**6,373**
Heifer (7 to 14 months)	0	x	4.9	x	48%	x	50%	=	**0**
Heifer (3 to 6 months)	0	x	2.7	x	48%	x	50%	=	**0**
Calf (under 3 months)	800	x	1.0	x	100%	x	50%	=	**400**
Bulls	0	x	9.2	x	48%	x	50%	=	**0**
Total for Dairy									**52,769**

[1]The Volatile Solids (VS) excretion rates for Holstein cattle are based on Table 1.b – Section 3 of ASAE D384.2 (March 2005). VS excretion rates for milk cows, dry cows, & heifers 15-24 months were taken from directly from the table. The VS excretion rate for heifers 3-6 months was estimated based on total solids excretion. The VS excretion rate for heifers 7-14 months was estimated as the average of heifers 15-24 months and heifers 3-6 months. The table did not give values for total solids or volatile solids excreted by baby calves. The VS excretion rate for baby calves was estimated based on an estimated dry matter intake (DMI) of 1.7% of body weight and the ratio of DMI to VS excretion for 150 kg calves. The VS excretion rate for mature bulls was assumed to be similar to dry cows.

[2] The % manure was taken from Table 3-1 of the California Regional Water Quality Control Board Document "Managing Dairy Manure in the Central Valley of California", UC Davis, June 2005. This document estimated that 21-48% of the manure in open corral dairies is handled as a liquid. Therefore, as a worst case assumption, 48% will be used for all cows housed in open corrals with flush lanes. The document also estimates a range of 42-100% manure handled as a liquid in the freestalls. For freestalls without exercise pens, 100% of manure as a liquid in the flush will be used; for freestalls with exercise pens, the average of the range ((100+42)/2 = 71%) will be used. (http://groundwater.ucdavis.edu/Publications/uc-committee-of-experts-final-report%202006.pdf) Saudi style/loafing barns are hybrids between freestalls and open corrals, the percentage of manure collected on the concrete feed lanes will be averaged between the values from the cows housed in freestall barns and open corrals. Therefore the % of manure deposited on the concrete lanes is equal to 60% [(71+48)/2].

[3] Chastain, J.P., Vanotti, M. B., and Wingfield, M. M., Effectiveness of Liquid-Solid Separation For Treatment of Flushed Dairy Manure: A Case Study, Applied Engineering in Agriculture, Vol 17(3): 343-354 - This document outlines a VS removal rate of 50.1% to 70% depending on the type of separation system used, however to be conservative, a 50% VS removal will be used for all systems.

Lagoon Design Check in Accordance with NRCS Guideline #359

Minimum Treatment Volume Calculation

MTV = TVS/VSLR

Where:

MTV = Minimum Treatment Volume (ft^3)

TVS = daily Total Volatile solids Loading (lb/day) = 0.011 lb/ft3-day

VSLR = Volatile Solids Loading Rate (lb/1000 ft3-day)

Minimum Treatment Volume in Primary Lagoon					
Breed: Holstein **Type of Cow**	**Net VS Loading (lb/day)**		**VSLR** (lb/ft3-day)[1]		**MTV (ft^3)**
Milk Cows	41,762	÷	0.011	=	**3,796,564**
Dry Cow	2,450	÷	0.011	=	**222,682**
Heifer (15 to 24 months)	6,373	÷	0.011	=	**579,360**
Heifer (7 to 14 months)	0	÷	0.011	=	**0**
Heifer (3 to 6 months)	0	÷	0.011	=	**0**
Calf (under 3 months)	400	÷	0.011	=	**36,364**
Bulls	0	÷	0.011	=	**0**
Total for Dairy					**4,634,969**

[1] VSLR for an anaerobic treatment lagoon in San Joaquin Valley would be 6.5 lb VS/1000 ft3-day to 11 lb VS/1000 ft3-day according to the NRCS and USDA AWTFH. Based on phone conversation with Matt Summers (USDA) on July 14, 2006, he suggested that the 11 lb VS VS/1000 ft3-day

Lagoon Design Check in Accordance with NRCS Guideline #359

Sludge Accumulation Volume

The sludge accumulation volume accounts for the solids contained in the manure that cannot be fully digested by bacteria and that gradually settle to the bottom of the lagoon as sludge. The sludge accumulation volume for lagoon systems without solids separation can be calculated from the USDA Field Handbook. However, there are no accepted guidelines for calculating the sludge accumulation volume for lagoon systems with solids separation, but many designers of digester expect it to be minimal.

This facility has an efficient solids separation system consisting prior to the anaerobic treatment lagoon system. The separation system will remove a large portion of the fibers, lignin, cellulose, and other fibrous materials from the manure. These are the materials that would otherwise cause sludge accumulation from the lack of digestion in a lagoon or digester. Because fibrous materials and other solids will not enter the lagoon system, the sludge accumulation volume required will be minimized and can be considered negligible.

Nevertheless, the primary lagoon will have sufficient space remaining for sludge accumulation, as shown by the following calculation:

SAV = VPL - MTV

Where:

SAV = Sludge Accumulation Volume (ft^3)
VPL = total Volume of Primary Lagoon (ft^3)
MTV = Minimum Treatment Volume (ft^3)

SAV =	**VPL**	**-**	**MTV**	
SAV =	**4,826,619**	**4,634,969**	**=**	**191,650 (ft3)**

Lagoon Design Check in Accordance with NRCS Guideline #359

Hydraulic Retention Time (HRT) Calculation

The anaerobic treatment lagoon and covered lagoon anaerobic digester must be designed to provide sufficient Hydraulic Retention Time (HRT) to adequately treat the waste entering the lagoon and to allow environmentally safe utilization of this waste. The NRCS Technical Guide Code 365 – Anaerobic Digester – Ambient Temperature specifies a minimum HRT 38 days in the San Joaquin Valley.

The Hydraulic Retention Time (HRT) is calculated as follows:

HRT = MTV/HFR

where:
HFR = Hydraulic flow rate (1000ft^3/day)
HRT = Hydraulic Retention Time (day)

The Hydraulic Flow Rate is Calculated below

Type	# of cows		Amount of Manure*			HFR	
Milk Cows	6,920	x	2.40	ft^3	=	16,608	ft^3/day
Dry Cows	750	x	1.30	ft^3	=	975	ft^3/day
Heifers (15-24 mo)	3,740	x	0.78	ft^3	=	2,917	ft^3/day
Heifers (7-14 mo)	0	x	0.78	ft^3	=	-	ft^3/day
Heifers (3-6 mo)	0	x	0.30	ft^3	=	-	ft^3/day
Calves	800	x	0.15	ft^3	=	120	ft^3/day
Bulls	0	x	1.30	ft^3	=	-	ft^3/day
Total	12,210					**20,620**	**ft^3/day**
Fresh water per milk cow used in flush at milk parlor			**50**	gal/day			

*Table 1.b - Section 3 of ASAE D384.2 (March 2005). The calf manure was estimated to be 1/2 of the calf number found in the table, since the average weight of these calves is approx. 1/2 of the calves identified in the table.

Lagoon Design Check in Accordance with NRCS Guideline #359 Cont.

Formula:

Gallon / Milk Cow*Day	# / Milk Cows	x	ft3 / gallon	+	ft3 / day

Total HFR:

50 gal / milk cow * day	6920 milk cows	x	ft3 / 7.48 gal	+	20,620 ft3 / day	
				=	**66,876.9**	**ft3/day**

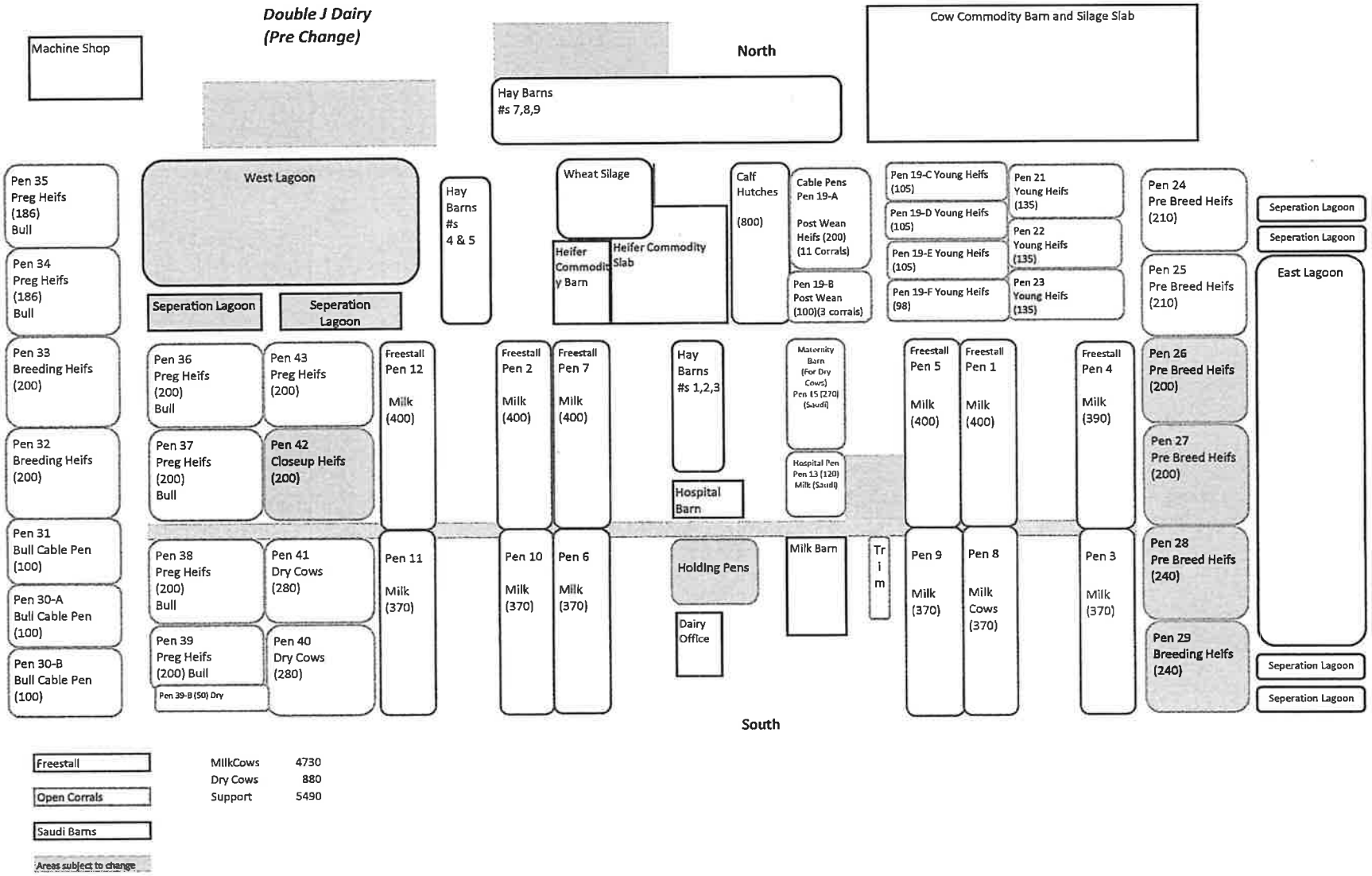
Formula:

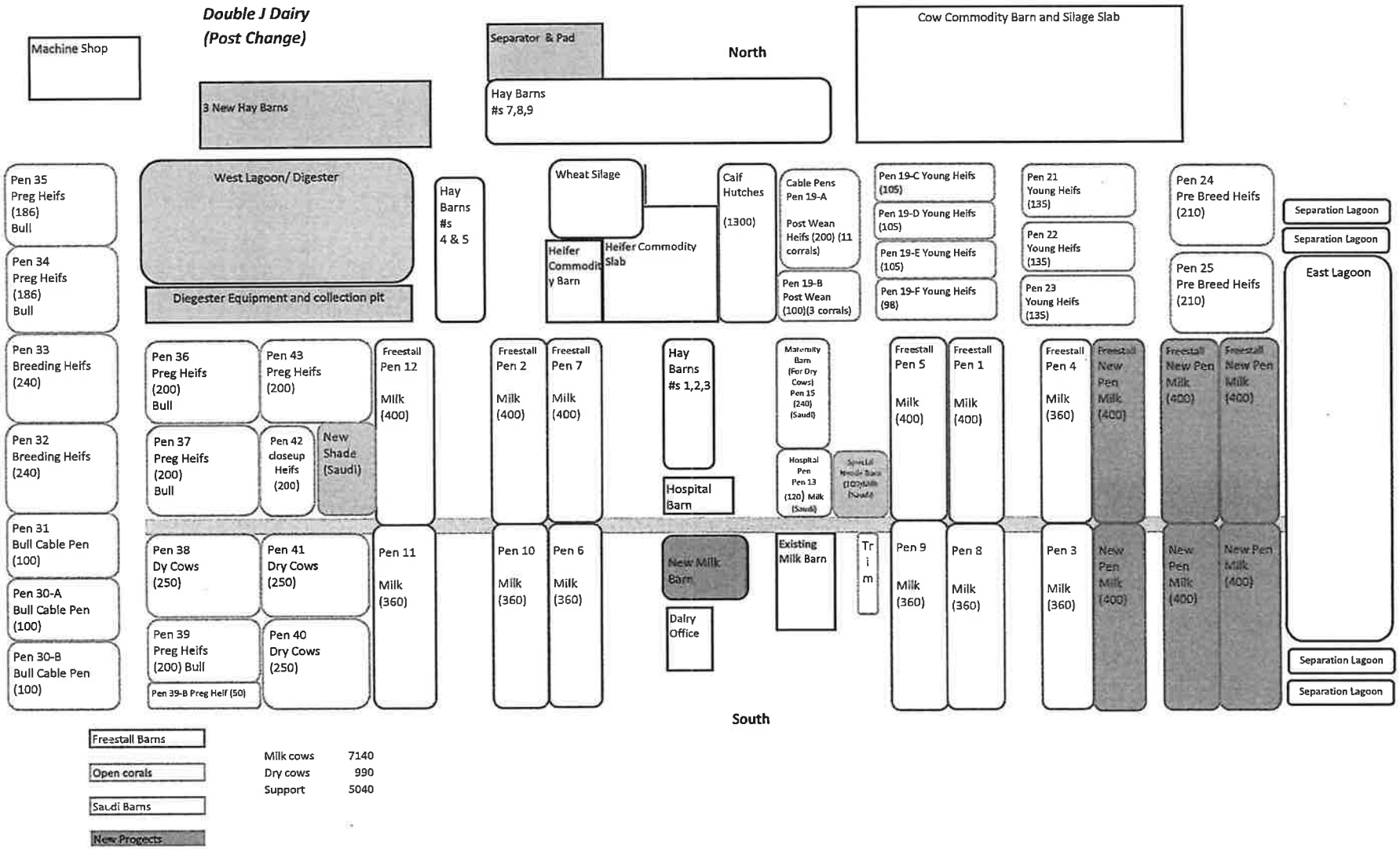
MTV (ft3) / HFR (ft3)	(day)	=

HRT:

4,634,969 ft3 / 66,876.9 ft3	day	=	=	**69.305996**	**days**

APPENDIX I
Pre- and Post-Project Site Maps


Double J Dairy
(Pre Change)
Machine Shop
North
Hay Barns
#s 7,8,9
Cow Commodity Barn and Silage Slab
Pen 35
Preg Heifs
(186)
Bull
Pen 34
Preg Heifs
(186)
Bull
Pen 33
Breeding Heifs
(200)
Pen 32
Breeding Heifs
(200)
Pen 31
Bull Cable Pen
(100)
Pen 30-A
Bull Cable Pen
(100)
Pen 30-B
Bull Cable Pen
(100)
West Lagoon
Seperation Lagoon
Seperation Lagoon
Hay
Barns
#s
4 & 5
Wheat Silage
Heifer Commodity Barn
Heifer Commodity Slab
Calf
Hutches
(800)
Cable Pens
Pen 19-A
Post Wean
Heifs (200)
(11 Corrals)
Pen 19-B
Post Wean
(100)(3 corrals)
Pen 19-C Young Heifs
(105)
Pen 19-D Young Heifs
(105)
Pen 19-E Young Heifs
(105)
Pen 19-F Young Heifs
(98)
Pen 21
Young Heifs
(135)
Pen 22
Young Heifs
(135)
Pen 23
Young Heifs
(135)
Pen 24
Pre Breed Heifs
(210)
Pen 25
Pre Breed Heifs
(210)
Pen 26
Pre Breed Heifs
(200)
Pen 27
Pre Breed Heifs
(200)
Pen 28
Pre Breed Heifs
(240)
Pen 29
Breeding Heifs
(240)
Seperation Lagoon
Seperation Lagoon
East Lagoon
Seperation Lagoon
Seperation Lagoon
Pen 36
Preg Heifs
(200)
Bull
Pen 37
Preg Heifs
(200)
Bull
Pen 38
Preg Heifs
(200)
Bull
Pen 39
Preg Heifs
(200) Bull
Pen 39-B (50) Dry
Pen 43
Preg Heifs
(200)
Pen 42
Closeup Heifs
(200)
Pen 41
Dry Cows
(280)
Pen 40
Dry Cows
(280)
Freestall
Pen 12
Milk
(400)
Pen 11
Milk
(370)
Freestall
Pen 2
Milk
(400)
Freestall
Pen 7
Milk
(400)
Pen 10
Milk
(370)
Pen 6
Milk
(370)
Hay
Barns
#s 1,2,3
Hospital
Barn
Holding Pens
Dairy
Office
Maternity
Barn
(For Dry
Cows)
Pen 15 (270)
(Saudi)
Hospital Pen
Pen 13 (120)
Milk (Saudi)
Milk Barn
Tr
i
m
Freestall
Pen 5
Milk
(400)
Freestall
Pen 1
Milk
(400)
Pen 9
Milk
(370)
Pen 8
Milk
Cows
(370)
Freestall
Pen 4
Milk
(390)
Pen 3
Milk
(370)
South
Freestall
Open Corrals
Saudi Barns
Areas subject to change
MilkCows 4730
Dry Cows 880
Support 5490


Double J Dairy
(Post Change)
Machine Shop
3 New Hay Barns
Separator & Pad
North
Hay Barns
#s 7,8,9
Cow Commodity Barn and Silage Slab
Pen 35
Preg Heifs
(186)
Bull
Pen 34
Preg Heifs
(186)
Bull
Pen 33
Breeding Heifs
(240)
Pen 32
Breeding Heifs
(240)
Pen 31
Bull Cable Pen
(100)
Pen 30-A
Bull Cable Pen
(100)
Pen 30-B
Bull Cable Pen
(100)
West Lagoon/ Digester
Diegester Equipment and collection pit
Hay
Barns
#s
4 & 5
Wheat Silage
Heifer
Commodit
y Barn
Heifer Commodity
Slab
Calf
Hutches
(1300)
Cable Pens
Pen 19-A
Post Wean
Heifs (200) (11
corrals)
Pen 19-B
Post Wean
(100)(3 corrals)
Pen 19-C Young Heifs
(105)
Pen 19-D Young Heifs
(105)
Pen 19-E Young Heifs
(105)
Pen 19-F Young Heifs
(98)
Pen 21
Young Heifs
(135)
Pen 22
Young Heifs
(135)
Pen 23
Young Heifs
(135)
Pen 24
Pre Breed Heifs
(210)
Pen 25
Pre Breed Heifs
(210)
Separation Lagoon
Separation Lagoon
East Lagoon
Separation Lagoon
Separation Lagoon
Pen 36
Preg Heifs
(200)
Bull
Pen 43
Preg Heifs
(200)
Pen 37
Preg Heifs
(200)
Bull
Pen 42
closeup
Heifs
(200)
New
Shade
(Saudi)
Freestall
Pen 12
Milk
(400)
Pen 38
Dy Cows
(250)
Pen 41
Dry Cows
(250)
Pen 39
Preg Heifs
(200) Bull
Pen 40
Dry Cows
(250)
Pen 39-B Preg Heif (50)
Pen 11
Milk
(360)
Freestall
Pen 2
Milk
(400)
Freestall
Pen 7
Milk
(400)
Pen 10
Milk
(360)
Pen 6
Milk
(360)
Hay
Barns
#s 1,2,3
Hospital
Barn
New Milk
Barn
Dairy
Office
Maternity
Barn
(For Dry
Cows)
Pen 15
(240)
(Saudi)
Hospital
Pen
Pen 13
(120) Milk
(Saudi)
Existing
Milk Barn
Tr
i
m
Freestall
Pen 5
Milk
(400)
Freestall
Pen 1
Milk
(400)
Pen 9
Milk
(360)
Pen 8
Milk
(360)
Freestall
Pen 4
Milk
(360)
Freestall
New
Pen
Milk
(400)
Pen 3
Milk
(360)
New
Pen
Milk
(400)
Freestall
New Pen
Milk
(400)
Freestall
New Pen
Milk
(400)
New
Pen
Milk
(400)
New Pen
Milk
(400)
South
Freestall Barns
Open corals
Saudi Barns
New Projects
Milk cows 7140
Dry cows 990
Support 5040