APR 1 5 2019

Nathan Heeringa
Innovative Ag Services, LLC
1201 Delta View Rd, Ste 5
Hanford, CA 93230

Re: Notice of Preliminary Decision - Authority to Construct
Facility Number: S-6473
Project Number: S-1182820

Dear Mr. Heeringa:

Enclosed for your review and comment is the District's analysis of Bar VP Heifer Ranch's application for an Authority to Construct for the construction of a heifer ranch consisting of 4,310 cattle, at 9181 Road 104, Pixley.

The notice of preliminary decision for this project will be published approximately three days from the date of this letter. 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: Brian Clerico, CARB (w/ enclosure) via email

Joe Vander Poel
Bar VP Heifer Ranch
8001 Road 104
Pixley, CA 93256

San Joaquin Valley Air Pollution Control District
Authority to Construct Application Review
New Heifer Ranch Facility

Facility Name:	Bar VP Heifer Ranch	Date:	March 4, 2019
Mailing Address:	8001 Road 104 Pixley, CA 93256	Engineer: Lead Engineer:	John Yoshimura Joven Refuerzo
Contact Person:	Joe Vander Poel		
Telephone:	(559) 757-3268		
Application #s:	S-6473-2-1, '-3-2, '-4-2, and '-5-2		
Project #:	S-1182820		
Deemed Complete:	September 13, 2018		

I. Proposal

Bar VP Heifer Ranch (Bar VP) has requested an Authority to Construct (ATC) to permit a heifer ranch consisting of 4,310 cattle housed in open corrals. As explained below, the heifer ranch and all associated operations will be processed as new emissions units subject to District Rule 2201 requirements.

Bar VP was originally issued ATCs to construct a dairy consisting of a cow housing operation with 3,200 milk cows, 640 dry cows, and 2,900 support stock (S-6473-2), a liquid manure handling system (S-6473-3), a solid manure handling system (S-6473-4), and a feed storage and handling operation (S-6473-5) (processed as project S-1050497). However, Bar VP constructed a heifer ranch instead of the proposed cow housing operation. As a result, the facility does not have a valid cow housing permit, but the other units were converted into Permits to Operate (PTOs). To ensure the proposed heifer ranch complies with all District Rule 2201 requirements, the existing liquid manure, solid manure, and feed storage and handling operations will be processed as new emissions units as well. The following conditions will be placed on the proposed ATCs:

S-6473-2-1 (Cow Housing)
- Upon implementation of this Authority to Construct (ATC), ATC S-6473-2-0 shall be cancelled. [District Rule 2201]

S-6473-3-2 (Liquid Manure Handling)
- Upon implementation of this Authority to Construct (ATC), Permit to Operate S-6473-3-0 shall be cancelled. [District Rule 2201]

S-6473-4-2 (Solid Manure Handling)
- Upon implementation of this Authority to Construct (ATC), Permit to Operate S-6473-4-0 shall be cancelled. [District Rule 2201]

S-6473-5-2 (Feed Storage and Handling)
- Upon implementation of this Authority to Construct (ATC), Permit to Operate S-6473-5-0 shall be cancelled. [District Rule 2201]

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 9181 Road 104 in Pixley, 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

Bar VP is proposing to permit a heifer ranch facility. The primary function of a heifer ranch is to raise young cows to be sold to a dairy operation as a replacement to cows that have stopped producing milk, known as dry cows, and/or to help manage the replacement of beef heifers/cattle that affect future productivity of an entire herd. A heifer is known as a young cow that has never give birth to a calf.

<u>Cow Housing</u>
The heifers in this ranch will be housed in open corrals. 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.

<u>Liquid Manure Handling System</u>
The liquid manure handling system at this heifer ranch will consist of settling basin(s), mechanical separator(s), one anaerobic treatment lagoon, and one storage pond.

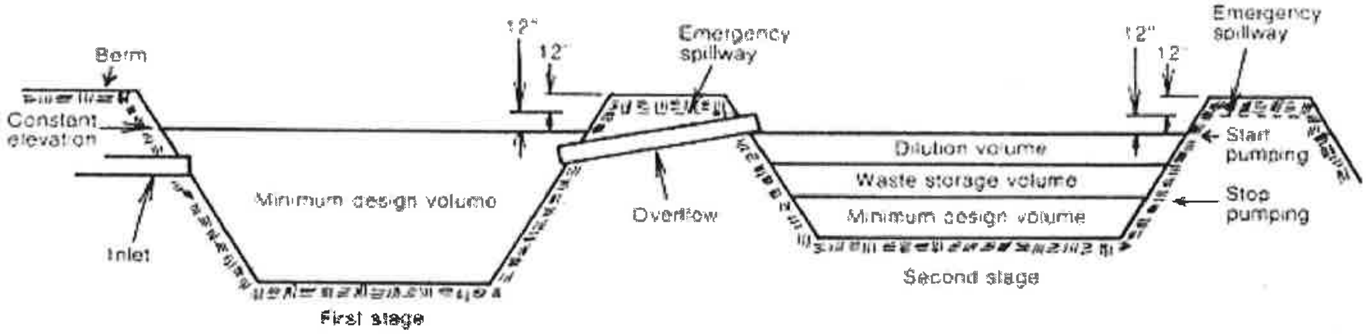
<u>Solids Separation/Mechanical Separator(s)</u>
Mechanical separators separate solids out from the liquid/slurry stream. There are many different versions of separators on the market. The percentage of separation varies depending on screen size and type of separation system. However, a fifty percent 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.

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. This process of anaerobic decomposition results in the preferential conversion of organic compounds in the manure into methane, carbon dioxide, 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 anaerobic treatment lagoons:

1) Minimum treatment volume - The minimum design volume must account for all potential sludge, treatment, precipitation, and runoff volumes;
2) Minimum hydraulic retention time - The retention time of the material in the lagoon must be adequate to provide environmentally safe utilization of waste;
3) Maximum Volatile Solids (VS) loading rate - The VS loading rate shall be based on maximum daily loading considering all waste sources that will be treated by the lagoon. The suggested loading rate for the San Joaquin Valley is 6.5-11 lb-VS/1000 ft^3/day depending on the type of system and solids separation; and
4) Minimum operating depth of at least 12 feet - Maximizing the depth of the lagoon has the following advantages: 1) The surface area in contact with the atmosphere is minimized, which will reduce volatilization of air pollutants; 2) The smaller surface area reduces the effects of the environment on the lagoon, which provides a more stable and favorable environment for anaerobic bacteria; 3) There is better mixing of lagoon due to rising gas bubbles; 4) and a deeper lagoon requires less land for the required treatment volume.

For the project, the applicant has proposed an anaerobic treatment lagoon system designed in accordance with the specifications set forth in NRCS practice standard 359. The anaerobic treatment lagoon system will consist of one 557 ft x 303 ft x 18 ft anaerobic treatment lagoon, followed by one storage pond. The anaerobic treatment lagoon will be designed to maintain a constant liquid level to ensure a stable bacterial population, which will promote more efficient anaerobic digestion. The effluent from the lagoon will overflow into the storage pond, which is designed for liquid storage. The liquid level of the storage pond fluctuates and can be emptied when necessary. Effluent from the storage pond is used for the irrigation of cropland. All the manure at the heifer ranch will be pumped to the anaerobic treatment lagoon.



Anaerobic Lagoon Design Check

As shown in Appendix I, the volume of the anaerobic treatment lagoon is as follows:

Total Lagoon Treatment Volume		
Anaerobic Treatment Lagoon (557 ft x 303 ft x 18 ft)	=	2,511,702 ft^3

And the minimum treatment volume is as follows:

Minimum Treatment Volume		
Minimum Treatment Volume	=	667,658 ft^3

Therefore, the proposed anaerobic treatment lagoon will provide sufficient anaerobic treatment lagoon volume to handle the total post-project manure flushed to the lagoon.

Storage Pond
The storage pond is designed to have sufficient volume to hold all of the following: all manure and wastewater accumulated at the heifer ranch for a period of 120 days; normal precipitation and any drainage to the lagoon system minus evaporation from the surface of lagoons; and precipitation during a 25 year, 24 hour storm event. The liquid manure from the storage pond will be used to irrigate crops.

Land Application
Liquid manure from the anaerobic treatment lagoon 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 System

Manure Stock Piles (Storage) and Land Application
The solid manure stockpiled at this heifer ranch will include the separated solids from the mechanical separator. 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 ready to be used.

Feed Storage & Handling

Silage Piles and Commodity Barns
The feed consists primarily of silage, which is made from 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

ATC Equipment Description

S-6473-2-1: HEIFER RANCH – 4,310 CATTLE WHICH INCLUDES UP TO 2,810 LARGE HEIFERS WITH FLUSH/SCRAPE SYSTEM

S-6473-3-2: LIQUID MANURE HANDLING SYSTEM CONSISTING OF PROCESSING PIT(S), FLUSH PIT(S), MECHANICAL SEPARATOR(S), ONE ANAEROBIC TREATMENT LAGOON (557' X 303' X 18'), AND ONE STORAGE POND; MANURE IS LAND APPLIED THROUGH FLOOD IRRIGATION AND FURROW IRRIGATION

S-6473-4-2: SOLID MANURE HANDLING CONSISTING OF MANURE STOCK PILES; SOLID MANURE APPLICATION TO LAND AND/OR HAULED OFFSITE

S-6473-5-2: FEED STORAGE AND HANDLING CONSISTING OF COMMODITY BARNS AND SILAGE PILES 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 confined animal operations.

Gaseous pollutant emissions at a confined animal operation result from the ruminant digestive processes (enteric emissions), from the decomposition and fermentation of feed, and also from decomposition of organic material in cattle 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 heifer ranch. Various management practices are used to control emissions at this heifer ranch. Examples of some of these practices are discussed below:

Cow Housing

The heifers at the facility will be housed in open corrals. The practices that will be utilized to reduce emissions at the heifer ranch are described below:

Shade Structures and Scraping of Corrals/Pens

The heifers will be housed in open corrals with concrete lanes and shade structures. Providing shade for the animals reduces movement and unnecessary activity during hot weather, which reduces PM_{10} emissions.

The surfaces of the open corrals will be scraped in the morning hours on a biweekly basis, except during wet conditions. Frequent scraping of the open corrals will reduce the amount of dry manure on the surfaces that may be pulverized by the cows' hooves and emitted as PM_{10}. This practice will also reduce the chance of anaerobic conditions developing in the manure pack of the corral surface, potentially reducing VOC emissions.

Frequent Flushing
Manure, which is a source of emissions, will be removed from all of the open corral feed lanes and walkways by flushing. Because of ammonia's high affinity for and solubility in water, flushing the lanes and walkways will also reduce volatilization of ammonia from the manure deposited in the corral lanes. The feed lanes and walkways for all heifers in the open corrals will be flushed at least once every seven days.

Feeding Animals According to NRC Guidelines
Additionally, all animals will be fed in accordance with National Research Council (NRC) guidelines using routine nutritional analysis for rations. Feeding the cows in accordance with NRC guidelines minimizes undigested protein and other undigested nutrients in the manure, which would emit NH_3 and VOCs upon decomposition. Per District practice, based on limited data a conservative control efficiency of 10% for VOC emissions and 28% for ammonia emissions will be applied to the facility's overall VOC and ammonia emission factors for feeding animals in accordance with NRC guidelines.

Sprinkling
The sprinkler system will reduce dust by maintaining adequate moisture in the layer of manure and earth on the corral surface. Studies have shown that increasing the moisture of the corral surface greatly reduces the entrainment of PM_{10} into the atmosphere as a result of animal movement. The sprinkler system will be designed to apply moisture over 75% of the surface of the open corrals.

Liquid Manure Handling

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.

Solids Separation (Mechanical Separator)
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.

Anaerobic Treatment Lagoon System
A properly designed and operated anaerobic treatment lagoon system reduces VOC emissions by optimizing the anaerobic activity that favors the complete conversion of organic compounds in the manure into methane, carbon dioxide, and water instead of partial conversion into various intermediate metabolites that are predominantly VOC. Pursuant to the design check analysis shown in Appendix I, the proposed anaerobic treatment lagoon system is expected to meet the standard requirements.

Liquid Manure Land Application

Liquid manure will be applied to cropland at agronomic rates, in compliance with the facility'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

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

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 has proposed to comply with all applicable Phase II mitigation measure requirements of District Rule 4570.

All mitigation measures are expected to result in VOC emissions reductions; reductions in ammonia emissions are also expected. In order to streamline this evaluation, a specific evaluation for each mitigation measure will not be provided. Please see Appendix E for the mitigation measures the heifer ranch has proposed to implement.

VII. General Calculations

A. Assumptions

- Potential to Emit for the heifer ranch will be based on the maximum design capacity of the number and types of cows at the heifer ranch;
- All PM_{10} emissions from the heifer ranch will be allocated to the cow housing permit unit;
- For the heifer ranch, only emissions from the anaerobic treatment lagoon/storage pond (S-6473-3-2) will be used in determining if this facility will be a major source since the

[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)

lagoon/storage pond is considered to be the only non-fugitive emissions at this heifer ranch;

- The PM_{10} emission factors for the heifer ranch cattle are based on a District document titled "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;
- The VOC emission factors for the cows are based on the District document entitled "Air Pollution Control Officer's Revision of the Dairy VOC Emissions Factor".

B. Emission Factors

PM_{10}, VOC, NH_3, and H_2S

The emissions calculations shown in Appendix E include the PM_{10}, VOC, NH_3, and H_2S emission factors from the animals and feed at this facility. 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 heifer ranch.

C. Calculations

1. Pre-Project Potential to Emit (PE1)

As previously stated, Bar VP does not have a valid permit for their cow housing operation and the remaining units will be processed as new emissions units. Therefore, PE1=0 for all permit units.

2. Post Project Potential to Emit (PE2)

A summary of the post-project emissions from the proposed units are shown in the following table and are included in Appendix E:

Daily PE2 (lb/day)							
Permit #	NOx	SOx	PM_{10}	CO	VOC	NH_3	H_2S
S-6473-2-1 (cow housing)	0.0	0.0	45.8	0.0	51.8	72.7	0.0
S-6473-3-2 (liquid manure handling)	0.0	0.0	0.0	0.0	7.7	15.2	0.3
S-6473-4-2 (solid manure handling)	0.0	0.0	0.0	0.0	2.6	8.9	0.0
S-6473-5-2 (feed storage and handling)	0.0	0.0	0.0	0.0	127.4	0.0	0.0

Annual PE2 (lb/year)							
Permit #	NOx	SOx	PM_{10}	CO	VOC	NH_3	H_2S
S-6473-2-1 (cow housing)	0	0	16,827	0	18,792	26,378	0
S-6473-3-2 (liquid manure handling)	0	0	0	0	2,802	5,517	137
S-6473-4-2 (solid manure handling)	0	0	0	0	948	3,233	0
S-6473-5-2 (feed storage and handling)	0	0	0	0	46,481	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.

As previously mentioned, the District is processing this heifer ranch as a new facility. Therefore, Bar VP does not have valid ATCs or PTOs.

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

Pursuant to District Rule 2201, the SSPE2 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 SSPE2 for this facility is based on the PE values shown in Appendix E (for permit units S-6473-2 through '-5). The SSPE2 is summarized in the following table:

Post-Project Stationary Source Potential to Emit (SSPE2)							
Permit Unit	NO_X (lb/yr)	SO_X (lb/yr)	PM_{10} (lb/yr)	CO (lb/yr)	VOC (lb/yr)	NH_3 (lb/yr)	H_2S (lb/yr)
S-6473-2-1	0	0	16,827	0	18,792	26,378	0
S-6473-3-2	0	0	0	0	2,802	5,517	137
S-6473-4-2	0	0	0	0	948	3,233	0
S-6473-5-2	0	0	0	0	46,481	0	0
SSPE2	**0**	**0**	**16,827**	**0**	**69,023**	**35,128**	**137**

5. Major Source Determination

Rule 2201 Major Source Determination

Pursuant to Section 3.24 of District Rule 2201, a major source is a stationary source with post-project emissions or a post-project Stationary Source Potential to Emit (SSPE2), equal to or exceeding one or more of the following threshold values. However, Section 3.24.2 states, "for the purposes of determining major source status, the SSPE2 shall not include the quantity of emission reduction credits (ERC) which have been banked since September 19, 1991 for Actual Emissions Reductions that have occurred at the source, and which have not been used on-site.

Since emissions at a heifer ranch are not actually collected, a determination of whether emissions could be reasonably collected must be made by the permitting authority. The California Air Pollution Control Association (CAPCOA) prepared guidance in 2005 for estimating potential to emit of Volatile Organic Compounds from heifer ranches. The guidance states that *"VOC emissions from the milking centers, cow housing areas, corrals, common manure storage areas, and land application of manure are not physically contained and could not reasonably pass through a stack, chimney, vent, or other functionally-equivalent opening. No collection technologies currently exist for VOC emissions from these emissions units. Therefore, the VOC emissions from these sources* *are considered fugitive."* The guidance also concludes that, because VOC collection technologies do exist for liquid waste systems at heifer ranches, *"... the VOC emissions from waste lagoons and storage ponds are considered non-fugitive."* The District has researched this issue and concurs with the CAPCOA assessment, as discussed in more detail below.

Cow Housing: Although there are smaller dairy farms that have partially enclosed freestall barns, these barns are not fully enclosed and none of the barns have been found to vent the exhaust through a collection device. The airflow requirements through dairy barns are extremely high, primarily for herd health purposes. The airflow requirements will be even higher in the San Joaquin valley, where temperatures reach in excess of 110 degrees in the hot summer. Collection and control of the exhaust including the large amounts of airflow have not yet been achieved by any facility. Due to this difficultly, the District cannot reasonably demonstrate that emissions can pass through a stack, chimney, vent, or other functionally equivalent opening.

It must also be noted that EPA has determined that emissions from open-air cattle feedlots are fugitive in nature.[2] In the District's judgment, this determination for emissions from open feedlots necessitates a similar determination for the open-sided freestalls (usually with open access to corrals or pens and free movement of cattle in and out of the covered area) typical of the San Joaquin Valley since the typical open freestall barn in the San Joaquin Valley bears a far greater resemblance to an extensive shade structure located in a large open lot than an actual enclosed building. Therefore, emissions from open freestall barns are most appropriately treated as fugitive.

Manure Storage Areas: Many heifer ranches have been found to cover dry manure piles. Covering dry manure piles is also a mitigation measure included in District Rule 4570. However, the District was not able to find any facility, which currently captures the emissions from the storage or handling of manure piles. Although some of these piles are covered, the emissions cannot reasonably be captured. Therefore, the District cannot reasonably demonstrate that these emissions can pass through a stack, chimney, vent, or other functionally equivalent opening. In addition, emissions from manure piles have been shown to be insignificant in recent studies.

Land Application: Emissions generated from the application of manure on land cannot reasonably be captured due to the extremely large areas, in some cases thousands of acres, of cropland at heifer ranches. Therefore, the District cannot reasonably demonstrate that these emissions can pass through a stack, chimney, vent, or other functionally equivalent opening.

Feed Handling and Storage: The majority of heifer ranches store the silage piles underneath a tarp or in an Ag-bag. The entire pile is covered except for the face of the pile. The face of the pile is kept open due to the continual need to extract the silage for feed purposes. The silage pile is disturbed 2-3 times per day. Because of the ongoing disturbance to these piles, it makes it extremely difficult to design a system

[2] Letter from William Wehrum, EPA Acting Administrator, to Terry Stokes, Chief Executive Officer – National Cattlemen's Beef Association (November 2, 2006) (http://www.epa.gov/Region7/programs/artd/air/nsr/nsrmemos/cowdust.pdf)

to capture the emissions from these piles. In fact, as far as the District is aware, no system has been designed to successfully extract the gases from the face of the pile to capture them, and, as important, no study has assessed the potential impacts on silage quality of a continuous air flow across the silage pile, as would be required by such a collection system. Therefore, the District cannot demonstrate that these emissions can be reasonably expected to pass through a stack, chimney, vent, or other functionally equivalent opening.

As discussed above, the VOC emissions from the cows housing, manure storage areas, land application of manure and feed handling and storage are considered fugitive. The District has determined that control technology to capture emissions from lagoons (biogas collection systems, for instance) is in use; therefore, these emissions can be reasonably collected and are not fugitive. Therefore, only emissions from the non-fugitive sources, such as lagoons will be used to determine if heifer ranches are major sources. See Appendix E for major source emissions for units S-6473-2 through '-5. The Post-Project major source determination is summarized in the following table:

Rule 2201 Major Source Determination						
Category	**NO_X**	**SO_X**	**PM_{10}**	**$PM_{2.5}$**	**CO**	**VOC**
SSPE1 (lb/yr)	0	0	0	0	0	0
SSPE2 (lb/yr)	0	0	0	0	0	1,337
Major source threshold (lb/yr)	20,000	140,000	140,000	140,000	200,000	20,000
Major Source? (Y/N)	N	N	N	N	N	N

Note: $PM_{2.5}$ assumed to be equal to PM_{10}

As shown 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)(i). Therefore fugitive emissions shall be excluded in determining if the facility is a PSD Major Source, and the following PSD Major Source thresholds are applicable:

PSD Major Source Determination (tons/year)						
	NO_2	VOC	SO_2	CO	PM	PM_{10}
Estimated Facility PE before Project Increase	0	0	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 major source for PSD for at least one pollutant. Therefore the facility is not an existing major source for PSD.

6. Baseline Emissions (BE)

The BE calculation (in lb/year) is performed on a pollutant-by-pollutant basis to determine the amount of offsets required, where necessary, when the SSPE1 is greater than the offset threshold. This project is exempt from offsets pursuant to Rule 2201, Section 4.6.9. Therefore, BE calculations are not required.

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)

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). Therefore fugitive emissions shall be excluded in determining if the facility is a PSD Major Source. 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	0.7	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 G.

VIII. Compliance Determination

Rule 1070 Inspections

This rule applies to any source operation, which emits or may emit air contaminants. 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 retained on each permit 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.

Rule 2020 Exemptions

This rule specifies emissions units that are not required to obtain an Authority to Construct (ATC) or Permit to Operate (PTO). This rule is applicable to any source that emits or may emit air contaminants.

Per Section 6.20, no permit is required for agricultural sources at a stationary source that, in aggregate, produce actual emissions less than one-half of the major source thresholds. For the purposes of determining permitting applicability, fugitive emissions, except fugitive dust emissions, are included in determining aggregate emissions. As shown in section VII.C.4, facility emissions exceed ½ the major source threshold for at least one pollutant; therefore, this facility is not exempt from permitting requirements. No further discussion is required.

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

<u>S-6473-2-1 (Cow Housing)</u>
The facility has proposed to construct 27 new open corrals, #1 through 27. As shown in Appendix E, BACT is required for VOC for open corrals #1-6, 10-12, 15-18, and 25-27; BACT is required for NH_3 for open corrals #1-6, 10-12, 15-20, and 25-27; finally, BACT is required for PM_{10} emissions for open corrals #1-6, 11, 12, and 15-18.

<u>S-6473-3-2 (Liquid Manure Handling)</u>
As shown in Appendix E, BACT is required for VOC and NH_3 emissions for the Lagoons/Storage Ponds, and VOC and NH_3 emissions for the Land Application.

<u>S-6473-4-2 (Solid Manure Handling)</u>
As shown in Appendix E, BACT is required for NH_3 emissions for the Solid Manure Storage/Separated Solids Piles, and NH_3 emissions for the Land Application.

<u>S-6473-5-2 (Feed Storage and Handling)</u>
As shown in Appendix E, BACT is required for VOC emissions for Silage and VOC emissions for TMR.

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

There are no modified units with this project, therefore, BACT is not required for AIPE > 2 lb/day for any permit unit.

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 5.8.3, applies to the open corrals in the cow housing operation. [Cow Housing – Open Corrals] (See Appendix B)

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

BACT Guideline 5.8.7, applies to the liquid/slurry land application in the liquid manure handling system. [Liquid Manure Handling – Lagoon/Storage Pond] (See Appendix B)

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 B)

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

BACT Guideline 5.8.10, applies to the silage piles in the feed storage and handling operation. [Feed Storage and Handling – Silage Piles] (See Appendix B)

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 B)

3. Top-Down BACT Analysis

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

Cow Housing (S-6473-2-1)

Open Corrals #1-6, 10-12, 15-18, and 25-27 (VOC)

VOC:
1) Concrete feed lanes and walkways;
2) Flushing the feed lanes and walkways for the heifers at least once per day (or for heifer ranches that cannot use a flush system, scraping 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 open 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 open corrals to maintain a dry surface;
5) Scraping open corrals every two weeks using pull-type scraper in the morning hours except when prevented by wet conditions; and
6) VOC mitigation measures required by District Rule 4570.

Open Corrals #1-6, 10-12, 15-20, and 25-27 (NH_3)

NH_3:
1) Concrete feed lanes and walkways;
2) Flushing the feed lanes and walkways for the heifers at least once per day (or for heifer ranches that cannot use a flush system, scraping 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 open 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 open corrals to maintain a dry surface;
5) Scraping open corrals every two weeks using pull-type scraper in the morning hours except when prevented by wet conditions; and

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

1) Concrete feed lanes and walkways

- Permittee shall pave feed lanes, where present, for a width of at least 6 feet along the corral side of the feed lane for heifers. [District Rules 2201 and 4570]

2) Flushing the feed lanes and walkways at least once per day

- Permittee shall flush/scrape the feed lanes and walkways of open corrals #1-6, 10-12, 15-20, and 25-27 at least once per day. [District Rule 2201]
- Permittee shall keep records or maintain an operating plan that requires the feed lanes and walkways of open corrals #1-6, 10-12, 15-20, and 25-27 to be flushed/scraped at least once per day. [District Rules 2201]

3) Feed heifers near dusk

- At least one of the feedings of the heifers shall be within one hour of dusk. [District Rule 2201]

- Permittee shall maintain records of: (1) number of times feed lanes are flushed, vacuumed or scraped per day; (2) the frequency of scraping and manure removal from corral surfaces; and (3) a schedule listing the times when heifers are fed within one hour of dusk. [District Rule 2201]

4) Properly sloping corrals or managing corrals to maintain a dry surface

- 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 open 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 corrals are maintained to ensure proper drainage preventing water from standing for more than forty-eight hours or 2) maintain records of dates corrals are groomed (i.e. harrowed, raked, or scraped, etc.). [District Rules 2201 and 4570]

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

- Permittee shall scrape the corrals 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 maintain sufficient records to demonstrate that the corrals are scraped at least once every two weeks, except when prevented by wet conditions. [District Rule 2201]

6) VOC mitigation measures required by District Rule 4570

Inspect water pipes and troughs and repair leaks at least once every 7 days.

- Permittee shall inspect water pipes and troughs and repair leaks at least once every seven (7) days. [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]

Scrape corrals twice a year with at least 90 days between cleanings, excluding in-corral mounds.

- Permittee shall scrape corrals, excluding the removal of in-corral mounds at least two (2) times per year with at least ninety (90) days between each cleaning. [District Rules 2201 and 4570]
- Permittee shall demonstrate that manure from corrals are cleaned at least two (2) times per year with at least ninety (90) days between each cleaning. [District Rules 2201 and 4570]

Clean concreted lanes such that the depth of manure does not exceed twelve (12) inches at any point or time.

- Permittee shall clean concreted lanes such that the depth of manure does not exceed twelve (12) inches at any point or time. [District Rules 2201 and 4570]
- Permittee shall measure and document the depth of manure on the concrete lanes at least once every ninety (90) days. [District Rules 2201 and 4570]

Shade structures in corrals.

- 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]
- 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]

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.

- 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]
- Permittee shall measure and document the depth of manure in the corrals at least once every ninety (90) days. [District Rules 2201 and 4570]

Open Corrals #1-6, 11, 12, and 15-18 (PM_{10})

PM_{10}:
1) Concrete feed lanes and walkways;
2) Scraping of corrals every two weeks using a pull-type scraper in the morning hours except when prevented by wet conditions
3) Shade structures in corrals;
4) Feeding heifers in corrals near dusk (within 1 hour of dusk);
5) Windbreaks controlling dust from corrals (when feasible, supported by soil conditions, and there is adequate space at existing facilities) or an alternative measure with equivalent PM control (e.g. sprinkling/water application over at least 25% of the corral surface or average corral surface moisture content (wet-based) ≥ 16%)

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

1) Concrete feed lanes and walkways

- Permittee shall pave feed lanes, where present, for a width of at least 6 feet along the corral side of the feed lane for heifers. [District Rules 2201 and 4570]

2) Scraping corrals every two weeks using pull-type scraper in the morning hours except when prevented by wet conditions

- Permittee shall scrape the corrals 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 maintain sufficient records to demonstrate that the corrals are scraped at least once every two weeks, except when prevented by wet conditions. [District Rule 2201]

3) Shade structures in corrals

- Except for open corrals #21 and 22, all other corrals at this heifer ranch shall be equipped with at least one shade structure. [District Rule 2201]
- 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]
- 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 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]

4) Feed young near dusk

- At least one of the feedings of the heifers shall be within one hour of dusk. [District Rule 2201]
- Permittee shall maintain records of: (1) number of times feed lanes and feed aprons are flushed, vacuumed or scraped per day; (2) the frequency of scraping and manure removal from corral surfaces; and (3) a schedule listing the times when heifers are fed within one hour of dusk. [District Rule 2201]

5) Windbreaks controlling dust from corrals (when feasible, supported by soil conditions, and there is adequate space at existing facilities) or an alternative measure with equivalent PM control (e.g. sprinkling/water application over at least 25% of the corral surface or average corral surface moisture content (wet-based) ≥ 16%)

- Permittee shall sprinkle water over at least 75% of area of the unpaved area of the corrals. Sprinkling rate shall match with the local wet soil evaporation rate (70-80% of the local wet pan evaporation rate) to keep sufficient moisture content in the surface of the corrals. Sprinkling of corrals is not required during wet conditions. [District Rule 2201]

- Sprinklers or water trucks shall be designed to spray the corrals uniformly to prevent inconsistent distribution of water. [District Rule 2201]
- Permittee shall maintain records of the daily local evaporation rate/soil evaporation rate and the amount of water (inches or cm) applied to the corral surface. Records of sprinkler run time and flow rate may be used to satisfy this requirement. [District Rule 2201]

Liquid Manure Handling System (S-6473-3-2)

Lagoon/Storage Pond (VOC)

VOC: 1) Anaerobic treatment lagoon designed according to Natural Resources Conservation Service (NRCS) guideline, and solids removal/separation system (mechanical separator(s) or settling basin(s)/weeping wall(s)).

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

1) Anaerobic treatment lagoon (VOC)

- Permittee shall use an anaerobic treatment lagoon designed according to NRCS Guideline No. 359. [District Rules 2201, 4102, and 4570]

Lagoon/Storage Pond (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]

Land Application (VOC)

VOC:1) Irrigation of crops using liquid/slurry manure from a secondary lagoon/holding/storage pond where preceded by an uncovered anaerobic treatment lagoon designed to meet Natural Resources Conservation Service (NRCS) standards.

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 (VOC)

- Permittee shall only land apply liquid manure that has been treated with an anaerobic treatment lagoon. [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]

Solid Manure Handling System (S-6473-4-2)

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]

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 immediately (within two hours) after application. [District Rules 2201 and 4570]
- Permittee shall feed all animals according to National Research Council (NRC) guidelines. [District Rules 2201 and 4570]

Feed Storage and Handling (S-6473-5-2)

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 remove uneaten wet feed from feed bunks within twenty-four (24) hours after the end of a rain event. [District Rules 2201 and 4570]

Silage Piles (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 remove uneaten wet feed 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 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	0	0	16,827	0	69,023
Offset Thresholds	20,000	54,750	29,200	200,000	20,000
Offsets triggered?	No	No	No	No	Yes

C. Public Notification

1. Applicability

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. Since this is not a new facility, 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. There are no new emissions units associated with this project. Therefore public noticing is not required for this project for PE > 100 lb/day.

c. Offset Threshold

The SSPE1 and SSPE2 are compared to the offset thresholds in the following table.

Offset Thresholds				
Pollutant	SSPE1 (lb/year)	SSPE2 (lb/year)	Offset Threshold	Public Notice Required?
NO_X	0	0	20,000 lb/year	No
SO_X	0	0	54,750 lb/year	No
PM_{10}	0	16,827	29,200 lb/year	No
CO	0	0	200,000 lb/year	No
VOC	0	69,023	20,000 lb/year	Yes

As detailed above, the VOC offset threshold was surpassed with this project; therefore public noticing is 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	0	0	0	20,000 lb/year	No
SO_X	0	0	0	20,000 lb/year	No
PM_{10}	16,827	0	16,827	20,000 lb/year	No
CO	0	0	0	20,000 lb/year	No
VOC	69,023	0	69,023	20,000 lb/year	Yes
NH_3	35,128	0	35,128	20,000 lb/year	Yes
H_2S	137	0	137	20,000 lb/year	No

As demonstrated above, the SSIPEs for VOC and NH_3 were 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 the VOC offset threshold being surpassed and VOC and NH_3 emissions increasing over 20,000 lb/year. Therefore, public notice documents will be submitted to the California Air Resources Board (CARB) and a public notice will be published in a local newspaper of general circulation 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.

For confined animal facilities, the DEL is satisfied based on the number and types of cows at the facility, and any proposed mitigation measures. The number and types of cows are listed in the permit equipment description for the cow housing permit.

The following District Rule 2201 rule references will be added to the ATCs to ensure compliance with applicable BACT requirements and/or control efficiencies attributed to mitigation measures implemented at the facility. Some of the following conditions may reference District Rule 4570, as these are mitigation measures the facility has selected to comply with that rule.

S-6473-2-1 (Cow Housing)

- Permittee shall feed all animals according to National Research Council (NRC) guidelines. [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]
- Permittee shall flush/scrape the feed lanes and walkways of open corrals #1-6, 10-12, 15-20, and 25-27 at least once per day. [District Rule 2201]
- Permittee shall scrape corrals, excluding the removal of in-corral mounds at least two (2) times per year with at least ninety (90) days between each cleaning. [District Rules 2201 and 4570]
- Permittee shall demonstrate that manure from corrals are cleaned at least two (2) times per year with at least ninety (90) days between each cleaning. [District Rules 2201 and 4570]
- Permittee shall pave feed lanes, where present, for a width of at least 6 feet along the corral side of the feed lane for heifers. [District Rules 2201 and 4570]
- 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 Rules 2201 and 4570]
- 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 corrals are groomed (i.e. harrowed, raked, or scraped, etc.). [District Rules 2201 and 4570]

- Permittee shall scrape, vacuum or flush concrete lanes in corrals at least once every seven (7) days for support stock. [District Rules 2201 and 4570]
- Permittee shall scrape the corrals 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 scrape the corrals at least once every two weeks using a pull-type scraper in the morning hours except when prevented by wet conditions. [District Rule 2201]
- Except for open corrals #21 and 22, this heifer ranch shall be equipped with at least one shade structure. [District Rule 2201]
- 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]
- 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 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 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]
- Permittee shall clean concreted lanes such that the depth of manure does not exceed twelve (12) inches at any point or time. [District Rules 2201 and 4570]
- At least once of the feedings of the heifers at this facility shall be within one hour of dusk. [District Rule 2201]
- Permittee shall maintain records of: (1) number of times feed lanes are flushed, vacuumed or scraped per day; (2) the frequency of scraping and manure removal from corral surfaces; (3) a schedule listing the times when heifers are fed within one hour of dusk. [District Rule 2201]
- Permittee shall sprinkle water over at least 75% of area of the unpaved area of the corrals. Sprinkling rate shall match with the local wet soil evaporation rate (70-80% of the local wet pan evaporation rate) to keep sufficient moisture content in the surface of the corrals. Sprinkling of corrals is not required during wet conditions. [District Rule 2201]
- Sprinklers or water trucks shall be designed to spray the corrals uniformly to prevent inconsistent distribution of water. [District Rule 2201]
- Permittee shall maintain records of the daily local evaporation rate/soil evaporation rate and the amount of water (inches or cm) applied to the corral surface. Records of sprinkler run time and flow rate may be used to satisfy this requirement. [District Rule 2201]

S-6473-3-2 (Liquid Manure Handling)

- Permittee shall feed all animals according to National Research Council (NRC) guidelines. [District Rules 2201 and 4570]

- 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 use an anaerobic treatment lagoon designed according to NRCS Guideline No. 359. [District Rules 2201, 4102, and 4570]
- Permittee shall only land apply liquid manure that has been treated with an anaerobic treatment lagoon. [District Rules 2201 and 4570]

S-6473-4-2 (Solid Manure Handling)

- Permittee shall feed all animals according to National Research Council (NRC) guidelines. [District Rules 2201 and 4570]
- Solid manure applied to fields shall be incorporated into the soil immediately (within two hours) after application. [District Rules 2201 and 4570]

S-6473-5-2 (Feed Storage and Handling)

- Permittee shall feed all animals according to National Research Council (NRC) guidelines. [District Rules 2201 and 4570]
- Permittee shall 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 Rule 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 one 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

<u>S-6473-2-1 (Cow Housing)</u>

- 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 2201]
- 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]
- Permittee shall keep records or maintain an operating plan that requires the feed lanes and walkways of open corrals #1-6, 10-12, 15-20, and 25-27 to be flushed/scraped at least once per day. [District Rule 2201]

- Permittee shall demonstrate that manure from corrals are cleaned at least two (2) times per year with at least ninety (90) days between each cleaning. [District Rules 2201 and 4570]
- Permittee shall maintain records demonstrating that concrete lanes in corrals are scraped, vacuumed, or flushed at least once every seven (7) days for support stock. [District Rules 2201 and 4570]
- Permittee shall measure and document the depth of manure on the concrete lanes at least once every ninety (90) days. [District Rules 2201 and 4570]
- 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 Rules 2201 and 4570]
- Permittee shall maintain sufficient records to demonstrate that the open corrals are scraped at least once every two weeks, except when prevented by wet conditions. [District Rule 2201]
- 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 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 records of: (1) number of times feed lanes are flushed, vacuumed or scraped per day; (2) the frequency of scraping and manure removal from corral surfaces; (3) a schedule listing the times when heifers are fed within one hour of dusk. [District Rule 2201]
- Permittee shall maintain records of the daily local evaporation rate/soil evaporation rate and the amount of water (inches or cm) applied to the corral surface. Records of sprinkler run time and flow rate may be used to satisfy this requirement. [District Rule 2201]
- 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]

<u>S-6473-3-2 (Liquid Manure Handling)</u>

- 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 2201]
- 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, such as design specifications, calculations, including Minimum Treatment Volume (MTV), Hydraulic Retention Time (HRT) demonstrating that the anaerobic treatment lagoon meets the requirements listed in the NRCS Field Office Technical Guide Code 359. [District Rules 2201, 4102, and 4570]

- Permittee shall test any other parameters determined necessary by the APCO, ARB, and EPA to demonstrate compliance with rule requirements as frequently as determined necessary by the APCO, ARB, and EPA. [District Rule 4570]
- Permittee shall maintain records that only liquid manure treated with an anaerobic treatment 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-6473-4-2 (Solid Manure 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 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-6473-5-2 (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 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]
- 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 manufacturers 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)

An AAQA shall 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 D 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 2530 Federally Enforceable Potential to Emit

The purpose of this rule is to restrict the emissions of a stationary source so that the source may elect to be exempt from the requirements of Rule 2520. Pursuant to Rule 2530, since this facility has elected exemption from the requirements of Rule 2520 by ensuring actual emissions from the stationary source in every 12-month periods to not exceed the following: ½ the major source thresholds for NOx, VOCs, CO, and PM_{10}; 50 tons per year SO2; 5 tons per year of a single HAP; 12.5 tons per year of any combination of HAPs; 50 percent of any lesser threshold for a single HAP as the EPA may establish by rule; and 50 percent of the major source threshold for any other regulated air pollutant not listed in Rule 2530.

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 PM10 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-6473-2-1	2.24 per million	No*
S-6473-3-2	3.58 per million	Yes
S-6473-4-2	0.0 per million	No
S-6473-5-2	There is no risk associated with this unit	No

*T-BACT is determined on a corral-by-corral basis and all corrals have a risk under 1.0 per million

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 permit units '-2-1, '-4-2, and '-5-2 because the HRA indicates that the risk is not above the District's thresholds for triggering T-BACT requirements. However, T-BACT is required for VOC emissions from the lagoons/storage ponds (permit unit '-3-2); T-BACT is satisfied with the use of an anaerobic treatment lagoon.

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. However, the following condition will be placed on the cow housing permit unit to ensure compliance:

- The properties with the following Assessor's Parcel Numbers (APNs) shall be leased or under control by the facility and only used for the production of crops or raising of fowl or animals: 293-150-016 and 293-150-017. [District Rules 2201 and 4102]

Rule 4550 Conservation Management Practices (CMP)

This rule applies to agricultural operations located within the San Joaquin Valley Air Basin. The purpose of this rule is to limit fugitive dust emissions from agricultural operations.

Pursuant to Section 4.2, dairies with at least 500 mature cows or cattle facilities with at least 190 cattle are subject to the provisions of this rule. Therefore, this facility is currently subject to the provisions of this rule as a heifer ranch, and will continue to be subject to the provisions of this rule as a heifer ranch.

Pursuant to Section 5.1, effective on and after July 1, 2004, an owner/operator shall implement the applicable CMPs selected pursuant to Section 6.2 for each agricultural operation site.

Pursuant to Section 5.2, an owner/operator shall prepare and submit a CMP application for each agricultural operation site to the APCO for approval.

Bar VP received District approval for its heifer ranch CMP plan on January 24, 2012.

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).

Section 5.0 Requirements

Pursuant to Section 5.1, owners/operators of any CAF shall submit, for approval by the APCO, a permit application for each Confined Animal Facility.

Pursuant to Section 5.1.2, a thirty-day public noticing and commenting period shall be required for all large CAF's receiving their initial Permit-to-Operate or Authority-to-Construct.

This heifer/calf ranch has less than 7,500 cattle. Therefore it is not considered a large CAF, and public noticing is not required.

Pursuant to Section 5.1.3, owners/operators shall submit a facility emissions mitigation plan of the Permit-to-Operate application or Authority-to-Construct application. The mitigation plan shall contain the following information:

- The name, business address, and phone number of the owners/operators responsible for the preparation and the implementation of the mitigation measures listed in the permit.
- The signature of the owners/operators attesting to the accuracy of the information provided and adherence to implementing the activities specified in the mitigation plan at all times and the date that the application was signed.
- A list of all mitigation measures shall be chosen from the application portions of Sections 5.5 or 5.6.

Pursuant to Section 5.1.4, the Permit-to-Operate or Authority-to-Construct application shall include the following information, which is in addition to the facility emission mitigation plan:

- The maximum number of animals at the facility in each production stage (facility capacity).
- Any other information necessary for the District to prepare an emission inventory of all regulated air pollutants emitted from the facility as determined by the APCO.
- The approved mitigation measures from the facility's mitigation plan will be listed on the Permit to Operate or Authority-to-Construct as permit conditions.
- The District shall act upon the Authority to Construct application or Permit to Operate application within six (6) months of receiving a complete application.

Pursuant to Section 5.1.6, the District shall act upon the Authority to Construct application or Permit to Operate application within six (6) months of receiving a complete application.

Pursuant to Section 5.3, owners/operators of any CAF shall implement all VOC emission mitigation measures, as contained in the permit application, on and after 365 days from the date of issuance of either the Authority-to-Construct or the Permit-to Operate whichever is sooner.

Pursuant to Section 5.4, an owner/operator may temporarily suspend use of mitigation measure(s) provided all of the following requirements are met:

- It is determined by a licensed veterinarian, certified nutritionist, CDFA, or USDA that any mitigation measure being suspended is detrimental to animal health or necessary for the animal to molt, and a signed written copy of this determination shall be retained on-site and made available for inspection upon request.
- The owner/operator notifies the District, within forty-eight (48) hours of the determination that the mitigation measure is being temporarily suspended; the specific health condition requiring the mitigation measure to be suspended; and the duration that the measure must be suspended for animal health reasons,
- The emission mitigation measure is not suspended for longer than recommended by the licensed veterinarian or certified nutritionist for animal health reasons,
- If such a situation exists, or is expected to exist for longer than thirty (30) days, the owners/operators shall, within that thirty (30) day period, submit a new emission mitigation plan designating a mitigation measure to be implemented in lieu of the mitigation measure that was suspended, and
- The APCO, ARB, and EPA approve the temporary suspension of the mitigation measure for the time period requested by the owner/operator and a signed written copy of this determination shall be retained on site.

The following condition will be placed on each permit.

- {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 permittee shall submit a new emission mitigation plan designating a mitigation measure to be implemented in lieu of the suspended mitigation measure. [District Rule 4570]

Section 7.0 Administrative Requirements

Section 7.2 General Records for CAFs Subject to Section 5.0 Requirements:

- Copies of all of the facility's permits
- Copies of all laboratory tests, calculations, logs, records, and other information required to demonstrate compliance with all applicable requirements of this rule, as determined by the APCO, ARB, EPA.
- Records of the number of animals of each species and production group at the facility on the permit issuance date. Quarterly records of any changes to this information shall also be maintained, (e.g. Dairy Herd Improvement Association records, animal inventories done for financial purposes, etc.)

The following condition will be placed on the cow housing permit:

- {4449} 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]

Specific recordkeeping and monitoring conditions are shown below under the appropriate mitigation measures.

Pursuant to Section 7.9, owners/operators of a CAF subject to the requirements of Section 5.0 shall keep and maintain the required records in Sections 7.1 through 7.8.4, as applicable, for a minimum of five (5) years and the records shall be made available to the APCO and EPA upon request. Therefore, the following condition will be placed on the permit:

- {4453} 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]

Section 7.10 requires specific monitoring or source testing conditions for each mitigation measure. These conditions are shown below with each mitigation measure.

The heifer ranch has chosen the following mitigation measures. All conditions required for compliance with Rule 4570 for the mitigation measures selected by the applicant are shown below. These conditions will be placed on the appropriate permits.

General Conditions

- {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 permittee shall submit a new emission mitigation plan designating a mitigation measure to be implemented in lieu of the suspended mitigation measure. [District Rule 4570]
- {4453} 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]

Corrals

Feed according to National Research Council (NRC) guidelines.

- 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]

Inspect water pipes and troughs and repair leaks at least once every seven (7) days.

- Permittee shall inspect water pipes and troughs and repair leaks at least once every seven (7) days. [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]

Scrape corrals twice a year with at least 90 days between cleanings, excluding the removal of in-corral mounds.

- Permittee shall scrape corrals, excluding the removal of in-corral mounds at least two (2) times per year with at least ninety (90) days between each cleaning. [District Rules 2201 and 4570]
- Permittee shall maintain records deomstrating that manure from corrals are cleaned at least two (2) times per year with at least ninety (90) days between each cleaning. [District Rules 2201 and 4570]

Scrape, vacuum or flush concrete lanes in corrals at least once every seven (7) days.

- Permittee shall scrape, vacuum or flush concrete lanes in corrals at least once every seven (7). [District Rules 2201 and 4570]
- Permittee shall maintain records demonstrating that concrete lanes in corrals are scraped, vacuumed, or flushed at least once every seven (7) days. [District Rules 2201 and 4570]

Clean concreted lanes such that the depth of manure does not exceed twelve (12) inches at any point or time.

- Permittee shall clean concreted lanes such that the depth of manure does not exceed twelve (12) inches at any point or time. [District Rules 2201 and 4570]
- Permittee shall measure and document the depth of manure on the concrete lanes at least once every ninety (90) days. [District Rules 2201 and 4570]

Implement one of the following three 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 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.

- 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 or when the corrals have not held animals in the last thirty days. [District Rules 2201 and 4570]
- 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 Rules 2201 and 4570]

Install all shade structures uphill of any slope in the corral.

- 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]
- 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]

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. The facility must resume management of the manure depth of 12 inches or lower immediately upon the corral becoming accessible.

- 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]
- Permittee shall measure and document the depth of manure in the corrals at least once every ninety (90) days. [District Rules 2201 and 4570]

Lanes

Feed according to National Research Council (NRC) guidelines.

- 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]

Concrete feed lanes and walkways

- Permittee shall pave feed lanes, where present, for a width of at least 6 feet along the corral side of the feed lane for heifers. [District Rules 2201 and 4570]

Liquid Manure

Lagoon/Storage Ponds

Feed according to National Research Council (NRC) guidelines.

- 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]

Use an anaerobic treatment lagoon designed according to NRCS Guideline No. 359.

- Permittee shall use an anaerobic treatment lagoon designed according to NCRCS Guideline No. 359. [District Rules 2201 and 4570]
- Permittee shall maintain records, such as design specifications, calculations, including Minimum Treatment Volume (MTV), Hydraulic Retention Time (HRT) demonstrating that the anaerobic treatment lagoon meets the requirements listed in the NRCS Field Office Technical Guide Code 359. [District Rules 2201 and 4570]
- Permittee shall test any other parameters determined necessary by the APCO, ARB, and EPA to demonstrate compliance with rule requirements as frequently as determined necessary by the APCO, ARB, and EPA. [District Rules 2201 and 4570]

Remove solids from the waste system with a solid separator system, prior to the waste entering the lagoon.

- Permittee shall remove solids with a solid separator system, prior to the manure entering the lagoon. [District Rules 2201 and 4570]

Land Application

Feed according to National Research Council (NRC) guidelines.

- 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]

Allow liquid manure to stand in the fields for no more than twenty-four (24) hours after irrigation.

- 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 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]

<u>**Solid Manure**</u>

Storage and Separated Piles

Feed according to National Research Council (NRC) guidelines.

- 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

Feed according to National Research Council (NRC) guidelines.

- 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]

Incorporate all solid manure within seventy-two (72) hours of land application.

- Permittee shall incorporate all solid manure within seventy-two (72) hours of land application. [District Rules 2201 and 4570]
- Permittee shall maintain records to demonstrate that all solid manure has been incorporated within seventy-two (72) hours of land application. [District Rules 2201 and 4570]

<u>Feed Storage and Handling</u>

TMR

Feed according to National Research Council (NRC) guidelines.

- 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]

Remove uneaten wet feed from feed bunks within twenty-four (24) hours after the end of a rain event.

- 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]

Silage

Utilize a sealed feed storage system (e.g. Ag-Bag) for bagged silage.

- For bagged silage/feedstuff, permittee shall utilize a sealed feed storage system (e.g., ag bag). [District Rules 2201 and 4570]

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.

- 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 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]

Build silage piles such that the average bulk density of silage piles 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, or 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, or incorporate the following practices when creating silage piles:

- ➢ Harvest silage crop at ≥ 65% moisture for corn; and ≥ 60% moisture for alfalfa/grass and other silage crops; and
- ➢ Manage silage material delivery such that no more than six (6) inches of materials are un-compacted on top of the pile.
- ➢ Incorporate the following parameters for Theoretical Length of Chop (TLC) and roller opening, as applicable, for the crop being harvested:

Crop Harvested	TLC (inches)	Roller Opening (mm)
Corn with no processing	≤ 1/2 in	N/A
Processed Corn <35% dry matter	≤ 3/4 in	1 – 4 mm
Alfalfa/Grass	≤ 1.0 in	N/A
Wheat/Cereal Grains/Other	≤ 1/2 in	N/A

- 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 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, 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, 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, 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, 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 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]
- 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]

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 square feet.

Manage multiple uncovered silage piles such that the total exposed surface area of all silage piles is less than 4,300 square feet.

Maintain silage working face use a shaver/facer to remove silage from the silage pile.

Maintain silage working face; maintain a smooth vertical surface on the working face of the silage pile.

Silage Additives: 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.

Silage Additives: Apply propionic acid, benzoic acid, sorbic acid, sodium benzoate, or potassium sorbate at a rate specified by the manufacturer to reduce yeast counts when forming silage pile.

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.

- Permittee shall select and implement at least one 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]
- 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 building 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 building 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 Rules 2201 and 4570]

Therefore this facility is in compliance with this Rule.

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

District Responsible Agency – Notice of Exemption

The County of Tulare (County) is the public agency having principal responsibility for approving the Project. As such, the County served as the Lead Agency for the Project. The County determined the project to be exempt from CEQA according to CEQA Guidelines §15301 (Existing Facilities), CEQA Guidelines §15303 (New Construction or Conversion of Small Structures) and the Project is exempt per the general rule that CEQA applies only to projects which have the potential for causing a significant effect on the environment (CEQA Guidelines §15061(b)(3)). Consistent with CEQA Guidelines §15062 filed), a Notice of Exemption was prepared and adopted by the County.

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).

The District's engineering evaluation of the project (this document) demonstrates that compliance with District rules and permit conditions would reduce Stationary Source emissions from the project. Thus, the District concludes that through a combination of project design elements and permit conditions, project specific stationary source emissions will be reduced. The District does not have authority over any of the other project impacts and has, therefore, determined that no additional findings are required (CEQA Guidelines §15096(h)).

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 will be reduced, and there is minimal potential for public concern for this particular type of facility/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. Issue ATC S-6473-2-1, '-3-2, '-4-2, 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-6473-2-1	3020-06	Miscellaneous – Cow Housing	$122
S-6473-3-2	3020-06	Miscellaneous – Liquid Manure Handling	$122
S-6473-4-2	3020-06	Miscellaneous – Solid Manure Handling	$122
S-6473-5-2	3020-06	Miscellaneous – Feed Storage and Handling	$122

Appendixes

A: Draft ATCs
B: BACT Guidelines
C: BACT Analysis
D: HRA/AAQA Summary
E: Heifer Ranch Potential to Emit Calculations
F: Lease Agreement
G: Quarterly Net Emissions Change
H: Anaerobic Lagoon Design Check

APPENDIX A
Draft ATCs

San Joaquin Valley
Air Pollution Control District

AUTHORITY TO CONSTRUCT

PERMIT NO: S-6473-2-1 **ISSUANCE DATE:** DRAFT

LEGAL OWNER OR OPERATOR: BAR VP HEIFER RANCH
MAILING ADDRESS: 8001 AVENUE 104
PIXLEY, CA 93256

LOCATION: ROAD 104 AND AVENUE 96
(9181 ROAD 104)
PIXLEY, CA

EQUIPMENT DESCRIPTION:
HEIFER RANCH - 4,310 CATTLE WHICH INCLUDES UP TO 2,810 LARGE HEIFERS WITH FLUSH/SCRAPE SYSTEM

CONDITIONS

1. Upon implementation of this Authority to Construct (ATC), ATC S-6473-2-0 shall be cancelled. [District Rule 2201]
2. The properties with the following Assessor's Parcel Numbers (APNs) shall be leased or under control by the facility and only used for the production of crops or raising of fowl or animals: 293-150-016 and 293-150-017. [District Rules 2201 and 4102]
3. {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]
4. {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]
5. {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

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6. {4449} 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]

7. Permittee shall feed all animals according to National Research Council (NRC) guidelines. [District Rules 2201 and 4570]

8. 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]

9. Permittee shall inspect water pipes and troughs and repair leaks at least once every seven (7) days. [District Rules 2201 and 4570]

10. 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]

11. Permittee shall flush/scrape the feed lanes and walkways of open corrals #1-6, 10-12, 15-20, and 25-27 at least once per day. [District Rule 2201]

12. Permittee shall keep records or maintain an operating plan that requires the feed lanes and walkways of open corrals #1-6, 10-12, 15-20, and 25-27 to be flushed/scraped at least once per day. [District Rule 2201]

13. Permittee shall scrape corrals, excluding the removal of in-corral mounds at least two (2) times per year with at least ninety (90) days between each cleaning. [District Rules 2201 and 4570]

14. Permittee shall maintain records demonstrating that manure from corrals are cleaned at least two (2) times per year with at least ninety (90) days between each cleaning. [District Rules 2201 and 4570]

15. Permittee shall scrape, vacuum or flush concrete lanes in corrals at least once every seven (7). [District Rules 2201 and 4570]

16. Permittee shall maintain records demonstrating that concrete lanes in corrals are scraped, vacuumed, or flushed at least once every seven (7) days. [District Rules 2201 and 4570]

17. Permittee shall clean concreted lanes such that the depth of manure does not exceed twelve (12) inches at any point or time. [District Rules 2201 and 4570]

18. Permittee shall measure and document the depth of manure on the concrete lanes at least once every ninety (90) days. [District Rules 2201 and 4570]

19. 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 open corrals sufficiently to maintain a dry surface except during periods of rainy weather or when the corrals have not held animals in the last thirty days. [District Rules 2201 and 4570]

20. 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 corrals are groomed (i.e. harrowed, raked, or scraped, etc.). [District Rules 2201 and 4570]

21. Except for open corrals #21 and 22, all other corrals at this heifer ranch shall be equipped with at least one shade structure. [District Rule 2201]

22. 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]

CONDITIONS CONTINUE ON NEXT PAGE

23. 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]

24. 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]

25. Permittee shall measure and document the depth of manure in the corrals at least once every ninety (90) days. [District Rules 2201 and 4570]

26. Permittee shall pave feed lanes, where present, for a width of at least 6 feet along the corral side of the feed lane for heifers. [District Rules 2201 and 4570]

27. Permittee shall scrape the corrals and exercise pens at least once every two weeks using a pull-type scraper in the morning hours except when prevented by wet conditions. [District Rule 2201]

28. Permittee shall maintain sufficient records to demonstrate that the corrals are scraped at least once every two weeks, except when prevented by wet conditions. [District Rule 2201]

29. Permittee shall sprinkle water over at least 75% of area of the unpaved area of the corrals. Sprinkling rate shall match with the local wet soil evaporation rate (70-80% of the local wet pan evaporation rate) to keep sufficient moisture content in the surface of the corrals. Sprinkling of corrals is not required during wet conditions. [District Rule 2201]

30. Sprinklers or water trucks shall be designed to spray the corrals uniformly to prevent inconsistent distribution of water. [District Rule 2201]

31. Permittee shall maintain records of the daily local evaporation rate/soil evaporation rate and the amount of water (inches or cm) applied to the corral surface. Records of sprinkler run time and flow rate may be used to satisfy this requirement. [District Rule 2201]

32. At least one of the feedings of the heifers shall be within one hour of dusk. [District Rules 2201 and 4570]

33. Permittee shall maintain records of: (1) number of times feed lanes are flushed, vacuumed or scraped per day; (2) the frequency of scraping and manure removal from corral surfaces; and (3) a schedule listing the times when heifers are fed within one hour of dusk. [District Rules 2201 and 4570]

34. {4453} 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]

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San Joaquin Valley
Air Pollution Control District

AUTHORITY TO CONSTRUCT

PERMIT NO: S-6473-3-2 **ISSUANCE DATE:** DRAFT

LEGAL OWNER OR OPERATOR: BAR VP HEIFER RANCH
MAILING ADDRESS: 8001 AVENUE 104
PIXLEY, CA 93256

LOCATION: ROAD 104 AND AVENUE 96
(9181 ROAD 104)
PIXLEY, CA

EQUIPMENT DESCRIPTION:
LIQUID MANURE HANDLING SYSTEM CONSISTING OF PROCESSING PIT(S), FLUSH PIT(S), MECHANICAL SEPARATOR(S), ONE ANAEROBIC TREATMENT LAGOON (557' X 303' X 20'), AND ONE STORAGE POND; MANURE IS LAND APPLIED THROUGH FLOOD IRRIGATION AND FURROW IRRIGATION: EVALUATE THE LIQUID MANURE EMISSIONS FROM 4,310 SUPPORT STOCK

CONDITIONS

1. Upon implementation of this Authority to Construct (ATC), Permit to Operate S-6473-3-0 shall be cancelled. [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]

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

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Arnaud Marjollet, Director of Permit Services

S-6473-3-2 Mar 12 2019 8:21AM -- 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 use an anaerobic treatment lagoon designed according to NRCS Guideline No. 359. [District Rules 2201, 4102, and 4570]
8. Permittee shall maintain records, such as design specifications, calculations, including Minimum Treatment Volume (MTV), Hydraulic Retention Time (HRT) demonstrating that the anaerobic treatment lagoon meets the requirements listed in the NRCS Field Office Technical Guide Code 359. [District Rules 2201, 4102, and 4570]
9. {4537} Permittee shall test any other parameters determined necessary by the APCO, ARB, and EPA to demonstrate compliance with rule requirements as frequently as determined necessary by the APCO, ARB, and EPA. [District Rule 4570]
10. Permittee shall remove solids with a solid separator system, prior to the manure entering the lagoon. [District Rules 2201 and 4570]
11. 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]
12. 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]
13. Permittee shall only land apply liquid manure that has been treated with an anaerobic treatment lagoon. [District Rules 2201 and 4570]
14. Permittee shall maintain records that only liquid manure treated with an anaerobic treatment lagoon is applied to fields. [District Rules 2201 and 4570]
15. {4453} 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]

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San Joaquin Valley
Air Pollution Control District

AUTHORITY TO CONSTRUCT

PERMIT NO: S-6473-4-2 **ISSUANCE DATE:** DRAFT

LEGAL OWNER OR OPERATOR: BAR VP HEIFER RANCH
MAILING ADDRESS: 8001 AVENUE 104
PIXLEY, CA 93256

LOCATION: ROAD 104 AND AVENUE 96
(9181 ROAD 104)
PIXLEY, CA

EQUIPMENT DESCRIPTION:
SOLID MANURE HANDLING CONSISTING OF MANURE STOCK PILES; SOLID MANURE APPLICATION TO LAND AND/OR HAULED OFFSITE: EVALUATE THE SOLID MANURE EMISSIONS FROM 4,310 SUPPORT STOCK

CONDITIONS

1. Upon implementation of this Authority to Construct (ATC), Permit to Operate S-6473-4-0 shall be cancelled. [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 feed all animals according to National Research Council (NRC) guidelines. [District Rules 2201 and 4570]

CONDITIONS CONTINUE ON NEXT PAGE

YOU <u>MUST</u> 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

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Arnaud Marjollet, Director of Permit Services

S-6473-4-2 Mar 12 2019 8:21AM -- YOSHIMUJ Joint Inspection NOT Required

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. Solid manure applied to fields shall be incorporated into the soil immediately (within two hours) after application. [District Rules 2201 and 4570]
8. Permittee shall maintain records to demonstrate that all solid manure has been incorporated within two hours of land application. [District Rules 2201 and 4570]
9. {4453} 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

AUTHORITY TO CONSTRUCT

PERMIT NO: S-6473-5-2 **ISSUANCE DATE:** DRAFT

DRAFT

LEGAL OWNER OR OPERATOR: BAR VP HEIFER RANCH
MAILING ADDRESS: 8001 AVENUE 104
PIXLEY, CA 93256

LOCATION: ROAD 104 AND AVENUE 96
(9181 ROAD 104)
PIXLEY, CA

EQUIPMENT DESCRIPTION:
FEED STORAGE AND HANDLING CONSISTING OF COMMODITY BARNS AND SILAGE PILES AND TOTAL MIXED RATION FEEDING: EVALUATE THE FEED EMISSIONS FROM 4,310 SUPPORT STOCK

CONDITIONS

1. Upon implementation of this Authority to Construct (ATC), Permit to Operate S-6473-5-0 shall be cancelled. [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 feed all animals according to National Research Council (NRC) guidelines. [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

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Arnaud Marjollet, Director of Permit Services
S-6473-5-2 : Apr 3 2019 10:05AM – YOSHIMUJ : Joint Inspection NOT Required

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 remove uneaten wet feed from feed bunks within twenty-four (24) hours after the end of a rain event. [District Rules 2201 and 4570]
8. 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]
9. For bagged silage/feedstuff, permittee shall utilize a sealed feed storage system (e.g. ag bag). [District Rules 2201 and 4570]
10. 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]
11. 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]
12. 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]
13. 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]
14. 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]
15. 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]
16. 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]
17. 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]
18. 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]

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CONDITIONS CONTINUE ON NEXT PAGE

19. 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]

20. 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]

21. Permittee shall select and implement at least one 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]

22. 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]

23. 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]

24. 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 Rules 2201 and 4570]

25. {4453} 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]

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APPENDIX B
BACT Guidelines

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
PM10	1) Concrete feed lanes and walkways; 2) Scraping of open corrals every two weeks using a pull-type scraper in the morning hours except when prevented by wet conditions; 3) Shade structures in open corrals; 4) Feeding heifers in corrals near dusk (within 1 hour of dusk); and 5) Windbreaks controlling dust from corrals (when feasible, supported by soil conditions, and there is adequate space at existing facilities); or 6) An alternative measure with equivalent PM control (e.g. sprinkling/water application over at least 25% of the corral surface or average corral surface moisture content (wet-based) = 16%) may be applied as a replacement for the previous measures		
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 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; 5) Scraping corrals and exercise pens every two weeks using		

Pollutant	Achieved in Practice or in the SIP	Technologically Feasible	Alternate Basic Equipment
	pull-type scraper in the morning hours except when prevented by wet conditions; and 6) Rule 4570 Measures (only for facilities subject to Rule 4570)		
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 s 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		

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 s 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 <u>Details Page</u>.

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 s 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 s 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 <u>Details Page</u>.

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
VOC	Rapid incorporation of solid manure into the soil after land application	1a) Land Application of Solid Manure Processed by Either an Open or Enclosed Negatively-Aerated Static Pile (ASP) Vented to a biofilter (or equivalent) = 80% destruction efficiency With Rapid Incorporation of the Manure Into the Soil After Land Application; 1b) Land Application of Solid Manure Processed by In-Vessel/Enclosed Negatively-Aerated Static Piles vented to biofilter = 80% destruction efficiency; 2) Land Application of Solid Manure Processed by Open Negatively-Aerated Static Piles vented to biofilter = 80% destruction efficiency; 3) Land Application of Solid Manure Processed by an Open Negatively-Aerated Static Piles (ASP) (With Thick Layer of Bulking Agent or Equivalent) With Rapid Incorporation of the Manure Into the Soil After Land Application	
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 s 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 5.8.10
Last Update: 12/18/2013

Feed Storage and Handling - Silage Piles

Pollutant	**Achieved in Practice or in the SIP**	**Technologically Feasible**	**Alternate Basic Equipment**
VOC	District Rule 4570 Measures for Silage		

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 s 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 s 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 C
BACT Analysis

Top-Down BACT Analysis for Confined Animal Facility – Open Corrals for PM_{10} Emissions

a. Identify All Possible Control Technologies

Step 1 - Identify all control technologies

Design and Management Practices
1. Concrete feed lanes and walkways
2. Scraping of open corrals every two weeks using a pull-type scraper in the morning hours except when prevented by wet conditions
3. Shade structures in open corrals
4. Feeding heifers in corrals near dusk (within 1 hour of dusk)
5. Windbreaks controlling dust from corrals (when feasible, supported by soil conditions, and there is adequate space at existing facilities) or an alternative measure with equivalent PM control (e.g. sprinkling/water application over at least 25% of the corral surface or average corral surface moisture content (wet-based) ≥ 16%)

Description of Control Technologies

1. Concrete Feedlanes and Walkways

Dairy animals are typically housed in freestall barns or open corrals. An open corral is a large open area where cows are confined with unlimited access to feed and water.

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 and Open Corrals with a Pull-Type Scraper

As stated above, dairy animals are typically housed in freestall barns or open corrals. The surface of the corrals and freestall 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 corral 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 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 NO_X and PM emitted from combustion of fuel for the tractor and PM emissions resulting from use of the tractor on the corral surface.

3. Shade Structures in Open Corrals

Installing shade structures in corral areas helps to decrease PM_{10} emissions. Dairy animals are easily susceptible to heat stress and will tend to seek out shade to reduce the effects of heat, particularly in the warmer months when higher PM_{10} emissions are expected because of drier conditions. PM_{10} emissions are reduced because the cows will spend less time walking on the dry corral surface.

4. Feeding Heifers in Corrals Near Dusk (within 1 hour of dusk)

Feeding the heifers near dusk will reduce their activity during this time, which is the time when the corral surface is the driest and there is greater chance for particulate matter from the corral to be entrained into the atmosphere.

5. Shelterbelts/Windbreaks Controlling Dust from Corrals or an Equivalent Alternative

A windbreak, or shelterbelt, is composed of one or more rows of trees or shrubs, which are planted in a manner that breaks up wind and reduces the force of wind on downwind of the windbreak. Windbreaks can be used to prevent soil erosion, improve air quality by intercepting dust, chemicals, and odors, to protect crops, and to provide habitat for wildlife. The District has worked with NRCS to establish guidelines for windbreaks used for dust control around dairies. In general, the guidelines require that a downwind shelterbelt with three rows be installed, the first row consisting of shrubs, second row consisting of a medium size tree and the last row consisting of an evergreen (larger tree). NRCS also requires that an irrigation system be maintained so that there is greater survivability and rapid growth of the trees and shrubs. A windbreak will reduce the amount of particulate matter entrained into the atmosphere.

There may be instances where windbreaks are not practical or feasible for a particular operation such as existing dairy facilities that is expanding but lacks adequate space for a windbreak. The soil conditions in the area where installation of the windbreak would be required should also be considered when determining if establishment of windbreaks is feasible for a particular dairy. Soil properties that should be considered include, but are not limited to, the pH and salinity or electrical conductivity of the soil. It is best to consult the National Resources Conservation Services (NRCS) or other experts to determine if a particular area can reasonably sustain windbreaks. NRCS also maintains information on the soil properties and vegetative productivity of agricultural areas, which is available online through their Web Soil Survey[3]. Another possible factor that may need to be considered when determining if windbreaks are feasible in a particular area is if insufficient water is available for establishment of a windbreak because of sustained drought conditions. Windbreaks will not be required if an operation demonstrates satisfactorily that they are infeasible or impractical for the particular operation. Additionally, because there are a number of factors (soil conditions, drought/water availability of sufficient water, climate, etc.) that are specific to each site that must be considered when determining if an effective windbreak can be established and maintained, as with other BACT requirements dairies will be allowed to substitute an alternative measure that can achieve equivalent PM10 reductions.

6. Sprinklers/Water Application in Corrals

Sprinkling or water application can reduce dust by maintaining adequate moisture in the layer of manure and earth on the corral surface. Studies have shown that increasing the moisture of the corral surface greatly reduces the entrainment of PM_{10} into the atmosphere as a result of animal movement. Installation of a sprinkler system for dust control is an

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[3] The NRCS Web Soil Survey can be accessed at http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm

effective mitigation measure that reduces PM_{10} emissions. However, because of concerns for animal health and welfare, water application is not commonly used. Excess moisture from sprinkling systems can potentially accumulate in shaded areas where the cows lie down, which will lead to a breeding ground for pathogens and vermin, which will increase nuisance conditions and instances of disease. Excessive moisture also increases the chances of clinical mastitis - infections of the udder tissue that result in swelling, pain, and/or redness of the udder. For these reasons, sprinkler systems have not been commonly used to control dust at dairies.

Step 2 - Eliminate Technologically Infeasible Options

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

Step 3 - Rank Remaining Control Technologies by Control Effectiveness

After eliminating the technologically infeasible options, the remaining options are ranked according to their control efficiency.

Design and Management Practices

1. Concrete feed lanes and walkways
2. Scraping of open corrals every two weeks using a pull-type scraper in the morning hours except when prevented by wet conditions
3. Shade structures in open corrals
4. Feeding heifers in corrals near dusk (within 1 hour of dusk)
5. Windbreaks controlling dust from corrals (when feasible and there is adequate space at existing facilities) or an alternative measure with equivalent PM control (e.g. sprinkling/water application over at least 25% of the corral surface or average corral surface moisture content (wet-based) ≥ 16%)

Step 4 - Cost Effectiveness Analysis

Design and Management Practices

1. Concrete feed lanes and walkways
2. Scraping of open corrals every two weeks using a pull-type scraper in the morning hours except when prevented by wet conditions
3. Shade structures in open corrals
4. Feeding heifers in corrals near dusk (within 1 hour of dusk)
5. Windbreaks controlling dust from corrals (when feasible, supported by soil conditions, and there is adequate space at existing facilities) or an alternative measure with equivalent PM control (e.g. sprinkling/water application over at least 25% of the corral surface or average corral surface moisture content (wet-based) ≥ 16%)

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

Step 5 - Select BACT

BACT for PM_{10} from open corrals is satisfied with:

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

3) Shade structures in open corrals
4) Feeding heifers in corrals near dusk (within 1 hour of dusk)
5) Windbreaks controlling dust from corrals (when feasible, supported by soil conditions, and there is adequate space at existing facilities) or an alternative measure with equivalent PM control (e.g. sprinkling/water application over at least 25% of the corral surface or average corral surface moisture content (wet-based) ≥ 16%)

Top-Down BACT Analysis for Confined Animal Facility – Open Corrals for PM_{10} Emissions

a. Identify All Possible Control Technologies

Step 1 - Identify all control technologies

Design and Management Practices

1. Concrete feed lanes and walkways
2. Scraping of open corrals every two weeks using a pull-type scraper in the morning hours except when prevented by wet conditions
3. Shade structures in open corrals
4. Feeding heifers in corrals near dusk (within 1 hour of dusk)
5. Windbreaks controlling dust from corrals (when feasible, supported by soil conditions, and there is adequate space at existing facilities) or an alternative measure with equivalent PM control (e.g. sprinkling/water application over at least 25% of the corral surface or average corral surface moisture content (wet-based) ≥ 16%)

Description of Control Technologies

1. Concrete Feedlanes and Walkways

Animals are typically housed in freestall barns or open corrals. An open corral is a large open area where cows are confined with unlimited access to feed and water.

Constructing the feed lanes and walkways of concrete causes the 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 and Open Corrals with a Pull-Type Scraper

As stated above, animals are typically housed in freestall barns or open corrals. The surface of the corrals and freestall 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 corral 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 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 NO_x and PM emitted from combustion of fuel for the tractor and PM emissions resulting from use of the tractor on the corral surface.

3. Shade Structures in Open Corrals

Installing shade structures in corral areas helps to decrease PM_{10} emissions. Animals are easily susceptible to heat stress and will tend to seek out shade to reduce the effects of heat, particularly in the warmer months when higher PM_{10} emissions are expected because of drier conditions. PM_{10} emissions are reduced because the cows will spend less time walking on the dry corral surface.

4. Feeding Heifers in Corrals Near Dusk (within 1 hour of dusk)

Feeding the heifers near dusk will reduce their activity during this time, which is the time when the corral surface is the driest and there is greater chance for particulate matter from the corral to be entrained into the atmosphere.

5. Shelterbelts/Windbreaks Controlling Dust from Corrals or an Equivalent Alternative

A windbreak, or shelterbelt, is composed of one or more rows of trees or shrubs, which are planted in a manner that breaks up wind and reduces the force of wind on downwind of the windbreak. Windbreaks can be used to prevent soil erosion, improve air quality by intercepting dust, chemicals, and odors, to protect crops, and to provide habitat for wildlife. The District has worked with NRCS to establish guidelines for windbreaks used for dust control around dairies. In general, the guidelines require that a downwind shelterbelt with three rows be installed, the first row consisting of shrubs, second row consisting of a medium size tree and the last row consisting of an evergreen (larger tree). NRCS also requires that an irrigation system be maintained so that there is greater survivability and rapid growth of the trees and shrubs. A windbreak will reduce the amount of particulate matter entrained into the atmosphere.

There may be instances where windbreaks are not practical or feasible for a particular operation such as existing dairy facilities that is expanding but lacks adequate space for a windbreak. The soil conditions in the area where installation of the windbreak would be required should also be considered when determining if establishment of windbreaks is feasible for a particular dairy. Soil properties that should be considered include, but are not limited to, the pH and salinity or electrical conductivity of the soil. It is best to consult the National Resources Conservation Services (NRCS) or other experts to determine if a particular area can reasonably sustain windbreaks. NRCS also maintains information on the soil properties and vegetative productivity of agricultural areas, which is available online through their Web Soil Survey[1]. Another possible factor that may need to be considered when determining if windbreaks are feasible in a particular area is if insufficient water is available for establishment of a windbreak because of sustained drought conditions. Windbreaks will not be required if an operation demonstrates satisfactorily that they are infeasible or impractical for the particular operation. Additionally, because there are a number of factors (soil conditions, drought/water availability of sufficient water, climate, etc.) that are specific to each site that must be considered when determining if an effective windbreak can be established and maintained, as with other BACT requirements dairies will be allowed to substitute an alternative measure that can achieve equivalent PM10 reductions.

6. Sprinklers/Water Application in Corrals

Sprinkling or water application can reduce dust by maintaining adequate moisture in the layer of manure and earth on the corral surface. Studies have shown that increasing the moisture of the corral surface greatly reduces the entrainment of PM_{10} into the atmosphere as a result of animal movement. Installation of a sprinkler system for dust control is an

[1] The NRCS Web Soil Survey can be accessed at http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm

effective mitigation measure that reduces PM_{10} emissions. However, because of concerns for animal health and welfare, water application is not commonly used. Excess moisture from sprinkling systems can potentially accumulate in shaded areas where the cows lie down, which will lead to a breeding ground for pathogens and vermin, which will increase nuisance conditions and instances of disease. Excessive moisture also increases the chances of clinical mastitis - infections of the udder tissue that result in swelling, pain, and/or redness of the udder. For these reasons, sprinkler systems have not been commonly used to control dust at dairies.

Step 2 - Eliminate Technologically Infeasible Options

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

Step 3 - Rank Remaining Control Technologies by Control Effectiveness

After eliminating the technologically infeasible options, the remaining options are ranked according to their control efficiency.

Design and Management Practices

1. Concrete feed lanes and walkways
2. Scraping of open corrals every two weeks using a pull-type scraper in the morning hours except when prevented by wet conditions
3. Shade structures in open corrals
4. Feeding heifers in corrals near dusk (within 1 hour of dusk)
5. Windbreaks controlling dust from corrals (when feasible and there is adequate space at existing facilities) or an alternative measure with equivalent PM control (e.g. sprinkling/water application over at least 25% of the corral surface or average corral surface moisture content (wet-based) ≥ 16%)

Step 4 - Cost Effectiveness Analysis

Design and Management Practices

1. Concrete feed lanes and walkways
2. Scraping of open corrals every two weeks using a pull-type scraper in the morning hours except when prevented by wet conditions
3. Shade structures in open corrals
4. Feeding heifers in corrals near dusk (within 1 hour of dusk)
5. Windbreaks controlling dust from corrals (when feasible, supported by soil conditions, and there is adequate space at existing facilities) or an alternative measure with equivalent PM control (e.g. sprinkling/water application over at least 25% of the corral surface or average corral surface moisture content (wet-based) ≥ 16%)

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

Step 5 - Select BACT

BACT for PM_{10} from open corrals is satisfied with:

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

3) Shade structures in open corrals
4) Feeding heifers in corrals near dusk (within 1 hour of dusk)
5) Windbreaks controlling dust from corrals (when feasible, supported by soil conditions, and there is adequate space at existing facilities) or an alternative measure with equivalent PM control (e.g. sprinkling/water application over at least 25% of the corral surface or average corral surface moisture content (wet-based) ≥ 16%)

Top-Down BACT Analysis for Confined Animal Facility – Open Corrals for VOC Emissions

a. Identify All Possible Control Technologies

Step 1 - Identify all control technologies

Since specific VOC emissions control efficiencies have not been identified in the literature for dairy cow housing areas, the control efficiencies will be estimated based on the control efficiencies of similar processes and engineering judgment. Unless specifically noted, for practices required to reduce VOC emissions, a 10% control efficiency will be assumed for the specific portion of the emission source or process affected by the measure.

The facility has proposed to only house support stock (heifers), therefore, all requirements specific to mature cows have been removed. The following options were identified as possible controls for VOC emissions from the cow housing (cow housing permit unit):

1) Feed and Manure Management Practices
   - Concrete feed lanes and walkways
   - Frequent Cleaning of lanes and walkways
     a) Lanes and walkways for support stock (heifers) flushed at least once per day; or
     b) Lanes and walkways for support stock (heifers) scraped at least once per day; or
     c) Lanes and walkways for support stock (heifers) scraped with a tractor/skid steer at least once per day; or
     d) Lanes and walkways for support stock (heifers) vacuumed at least once per day;
   - All animals fed in accordance with National Research Council (NRC) or other District-approved guidelines
   - Exercise pens and open corrals properly sloped to promote drainage (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 managed to maintain a dry surface (except during periods of rainy weather)
   - Scraping of exercise pens and open corrals every two weeks using a pull-type scraper in the morning hours except when prevented by wet conditions
   - VOC mitigation measures required by District Rule 4570

<u>Description of Control Technologies</u>

1) <u>Feed and Manure Management Practices</u>

<u>Concrete Feed Lanes and Walkways</u>

Cattle 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). Although concrete feed lanes and walkways are necessary for an effective manure removal system, they do not individually reduce emissions of gaseous pollutants; therefore, no VOC control efficiency is assigned for this practice.

Frequent Cleaning of Lanes and Walkways

Many heifer ranches use flush or scrape systems to remove manure from the corral and freestall lanes and walkways. When heifer ranches 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. A smaller number of dairies may also use vacuum trucks to remove manure from the cow housing areas. Manure vacuumed from the lanes can be applied to adjacent cropland, transported offsite, or placed in a digester. 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 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, scrape, or vacuum 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.

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.[2] 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.

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.

<u>Scraping of Exercise Pens and Open Corrals with a Pull-Type Scraper</u>

Many dairies use equipment pulled by tractors to periodically scrape the surfaces of corrals. Frequent scraping the freestall exercise pens and corrals 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. The frequency that corrals are scraped at dairies can vary from as little as once a year to every week.

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 NO_x 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 Options

There are no technologically infeasible options to eliminate from step 1. However, the following options will be eliminated from consideration because the emissions from increased use of tractors are expected to offset the benefits of any VOC reductions from these practices.

a) Lanes and walkways for support stock (heifers) scraped at least once per day with a tractor/skid steer;
b) Lanes and walkways for support stock (heifers) vacuumed at least once per day.

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

c. Step 3 - Rank remaining options by control effectiveness

After eliminating the technologically infeasible options, the remaining options are ranked according to their control efficiency.

1) Feed and Manure Management Practices
   a. Concrete feed lanes and walkways
   b. Frequent cleaning of lanes and walkways
      Flushing is generally the most effective method of using frequent cleaning of the lanes to reduce emissions; however, because some dairies may be unable to flush at increased frequencies because of water constraints, use of automatic scarping system will be allowed when dairies demonstrate that they are unable to flush at increased frequencies.
      a) Lanes and walkways for support stock (heifers) flushed at least once per day; or
      b) For dairies that are not able to use a flush system, lanes and walkways for support stock (heifers) scraped at least once per day with an automatic scraper (or equivalent).
   c. All animals fed in accordance with National Research Council (NRC) or other District-approved guidelines
   d. Exercise pens and open corrals properly sloped to promote drainage (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 managed to maintain a dry surface (except during periods of rainy weather)
   e. Scraping of exercise pens and open corrals every two weeks using pull-type scraper in the morning hours except when prevented by wet conditions
   f. VOC mitigation measures required by District Rule 4570

d. Step 4 - Cost Effectiveness Analysis

The options are ranked according to their control efficiency.

<u>Feed and Manure Management Practices:</u>

1. Concrete feed lanes and walkways
2. Lanes and walkways for support stock (heifers) flushed at least once per day; or for facilities that are not able to use a flush system, lanes and walkways for support stock (heifers) cleaned at least once per day with an automatic scraper (or equivalent)
3. All animals fed in accordance with National Research Council (NRC) or other District-approved guidelines
4. Exercise pens and open corrals properly sloped to promote drainage (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 managed to maintain a dry surface (except during periods of rainy weather)
5. Scraping of exercise pens and open corrals every two weeks using pull-type scraper in the morning hours except when prevented by wet conditions
6. VOC mitigation measures required by District Rule 4570

e. Step 5 - Select BACT

BACT for VOC from Open Corrals:

1) Concrete feed lanes and walkways;
2) Flushing the lanes and walkways for the support stock once per day (or for facilities that cannot use a flush system, scraping 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

Additionally, District Rule 2201 defines BACT as including the most stringent emission limitation or control technique, including process and equipment changes, which have been found by the APCO to be cost effective and technologically feasible for such class or category of sources or for a specific source. The District has found that the basic mitigation measures required by District Rule 4570 are cost effective and technologically feasible for confined animal facilities and the applicant has proposed these options. Therefore, in addition to the BACT requirements determined in the Top-Down BACT Analysis above, implementation of the mitigation measures that the facility has selected to comply with Rule 4570 will also be required as part of BACT for VOC emissions from the cow housing permit.

Top-Down BACT Analysis for Confined Animal Facility – Open Corrals for NH_3 Emissions

a. Identify All Possible Control Technologies

Step 1 - Identify all control technologies

A cost effectiveness threshold has not been established for ammonia. Therefore, only options that meet the District's definition of Achieved-in-Practice controls will be evaluated.

The following management practices have been identified as possible control options for the NH_3 emissions from the cow housing permit unit:

1) Feed and Manure Management Practices
   - Concrete feed lanes and walkways
   - Frequent Cleaning of lanes and walkways
     a) Lanes and walkways for support stock (heifers) flushed at least once per day; or
     b) Lanes and walkways for support stock (heifers) scraped at least once per day; or
     c) Lanes and walkways for support stock (heifers) scraped with a tractor/skid steer at least once per day; or
     d) Lanes and walkways for support stock (heifers) vacuumed at least once per day;
   - All animals fed in accordance with National Research Council (NRC) or other District-approved guidelines
   - Exercise pens and open corrals properly sloped to promote drainage (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 managed to maintain a dry surface (except during periods of rainy weather)
   - Scraping of exercise pens and open corrals every two weeks using pull-type scraper in the morning hours except when prevented by wet conditions

Description of Control Technologies

1) Feed and Manure Management Practices

Concrete Feed Lanes and Walkways

Cattle 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).

Frequent Cleaning of Lanes and Walkways

Many heifer ranches 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 heifer ranches 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. A smaller number of heifer ranches may also use vacuum trucks to remove manure from the cow housing areas. Manure vacuumed from the lanes can be applied to adjacent cropland, transported offsite, or placed in a digester. 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.

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.

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

Frequent scraping the freestall exercise pens and corrals 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.

a. Step 2 - Eliminate technologically infeasible options

There are no technologically infeasible options to eliminate from step 1. However, the following options will be eliminated from consideration because the emissions from increased use of tractors are expected to offset the benefits of any NH_3 reductions from these practices.

a) Lanes and walkways for support stock (heifers) scraped at least once per day with a tractor/skid steer; or
b) Lanes and walkways for support stock (heifers) vacuumed at least once per day

b. Step 3 - Rank remaining options by control effectiveness

After eliminating the technologically infeasible options, the remaining options are ranked according to their control efficiency.

1) Feed and Manure Management Practices
   a. Concrete feed lanes and walkways
   b. Frequent cleaning of lanes and walkways

      Flushing is generally the most effective method of using frequent cleaning of the lanes to reduce emissions; however, because some dairies may be unable to flush at increased frequencies because of water constraints, use of automatic scarping system will be allowed when dairies demonstrate that they are unable to flush at increased frequencies.

      a) Lanes and walkways for support stock (heifers) flushed at least once per day; or
      b) For dairies that are not able to use a flush system, lanes and walkways for support stock (heifers) scraped at least once per day with an automatic scraper (or equivalent).
   c. All animals fed in accordance with National Research Council (NRC) or other District-approved guidelines
   d. Exercise pens and open corrals properly sloped to promote drainage (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 managed to maintain a dry surface (except during periods of rainy weather)
   e. Scraping of exercise pens and open corrals every two weeks using pull-type scraper in the morning hours except when prevented by wet conditions

c. Step 4 - Cost Effectiveness Analysis

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

d. Step 5 - Select BACT

BACT for NH_3 from Open Corrals:

1. Concrete feed lanes and walkways
2. Lanes and walkways for support stock (heifers) flushed at least once per day; or for facilities that are not able to use a flush system, lanes and walkways for support

stock (heifers) cleaned at least once per day with an automatic scraper (or equivalent)

2) All animals fed in accordance with National Research Council (NRC) or other District-approved guidelines
3) Exercise pens and open corrals properly sloped to promote drainage (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 managed to maintain a dry surface (except during periods of rainy weather)
4) Scraping of exercise pens and open corrals every two weeks using pull-type scraper in the morning hours except when prevented by wet conditions

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

a. Identify All Possible Control Technologies

Step 1 - Identify all 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) <u>Anaerobic Treatment Lagoon Designed to Meet Natural Resources Conservation Service (NRCS) Standards</u>

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.

4) 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.

5) Phototropic Lagoon

Phototropic lagoons or red water lagoons can be identified by their characteristic purple, pink or rose color. Phototropic are the result of naturally occurring phenomena that lead to higher concentrations of purple sulfur and purple non-sulfur bacteria in municipal wastewater lagoons, lagoons treating animal waste, as well as natural lagoons and estuaries, etc. Purple sulfur bacteria utilize hydrogen sulfide and volatile organic acids as an electron source for anoxygenic photosynthesis. Under anaerobic conditions purple sulfur bacteria utilize volatile organic acids and alcohols as a carbon source and ammonia as a nitrogen source for cell growth. This reduces the concentration of these compounds at the surface of the lagoons and reduces the rate of volatilization of these compounds to the atmosphere. A number of studies have found reduced odors and emissions of volatile organic acids from lagoons with higher concentrations of phototropic bacteria. Some of these studies have also found reduced emissions of ammonia from phototropic lagoons.

In nature blooms of purple sulfur and purple non-sulfur bacteria are transitory. These blooms occur when the appropriate conditions are present to promote the growth of these bacteria (e.g. limited oxygen availability, sufficient light penetration, generally warmer temperatures, dilute nutrient loading, etc.). Although phototropic lagoons have shown promise for reduction of emissions from lagoons, there remain limitations to the continuous use of this option. As mentioned above, blooms of phototropic bacteria are generally transitory and the blooms cannot reliably be predicted in different lagoons, even when the lagoons are operated under similar conditions. Phototropic lagoons depend on living organisms to function; therefore, the effectiveness of the system is affected by several factors that are not always under the operator control. Establishment of an effective concentration of phototropic can take several months to more than a year and if this population dies off for any reason it can take the same amount of time for a population of phototropic bacteria to become re-established. Because of uncertainty related to successful establishment of an effective population of phototropic bacteria and the other difficulties related to the continuous use of this option, phototropic lagoons will not be required as BACT at this time; however, phototropic lagoons will remain an option that may be proposed by the operator.

b. Eliminate technologically infeasible options

A phototropic lagoon will be removed as an option.

c. 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)
4) Solids Removal/Separation

d. Cost Effectiveness Analysis

1) <u>Aerobic Treatment Lagoon or Mechanically Aerated Lagoon</u>

The following analysis is based on the treatment of manure from 4,310 milk cows in naturally aerobic lagoons and mechanically aerated lagoons.

<u>Space Requirement for a Naturally Aerobic Lagoon Treating Manure from 4,310 Dairy Cows</u>

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 4,310 milk cows in the San Joaquin Valley can be calculated as follows:

BOD_5 loading (lb/day) = 4,310 milk cows x 2.9 lb-BOD_5/cow-day x 0.80
= 9,999 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 =
9,999 lb-BOD_5/day ÷ 55 lb-BOD_5/acre-day = 182 acres

Minimum Surface Area (acres) in areas of the San Joaquin Valley with a maximum loading rate of 45 lb-BOD_5/acre-day =
9,999 lb-BOD_5/day ÷ 45 lb-BOD_5/acre-day = 222 acres

As shown above the minimum surface area required for a naturally aerobic lagoon treating manure from 4,310 milk cows in the San Joaquin Valley would range from approximately 182 to 222 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 4,310 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 4,310 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 4,310 milk cows will have a loading rate of approximately 9,999 lb-BOD_5/day (4,545 kg-BOD_5/day).

Energy Requirement a Mechanically Aerated Lagoon Treating Manure from 4,310 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 4,310 milk cows is calculated as follows:

High Efficiency Aerator
4,545 kg-BOD_5/day ÷ (0.68 kg-O2/kW-hr) x (365 day/year) = 2,439,596 kW-hr/year

Low Efficiency Aerator
4,545 kg-BOD_5/day ÷ (0.10 kg-O2/kW-hr) x (365 day/year) = 16,589,250 kW-hr/year

Cost of Electricity for a Mechanically Aerated Lagoon Treating Manure from 4,310 Milk cows:

The cost for electricity will be based upon the average price for industrial electricity in California as of September 2013, 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 = $0.1115/kW-hr

The electricity costs for complete aeration are calculated as follows:

Low Cost Estimate (High Efficiency Aerator)
2,439,596 kW-hr/year x $0.1115/kW-hr = $272,015/year

High Cost Estimate (Low Efficiency Aerator)
16,589,250 kW-hr/year x $0.1115/kW-hr = $1,849,701/year

VOC Emission Reductions from a Mechanically Aerated Lagoon Treating Manure from 4,310 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 4,310 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)	4,310	x	1.3	x	90%	=	**5,043**

Cost of VOC Emission Reductions
Low Estimate = ($272,015/year)/[(5,043 lb-VOC/year)(1 ton/2000 lb)]
= $107,878/ton of VOC reduced

High Estimate = ($1,879,701/year)/[(5,043 lb-VOC/year)(1 ton/2000 lb)]
= $733,654/ton of VOC reduced

As shown above, the electricity cost alone for a mechanically aerated lagoon would cause the cost of the VOC reductions to be greater than $107,890/ton. 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 Lagoon Digester Vented to a Control Device

The costs associated with treating the manure excreted by milk cows in a covered lagoon digester vented to a control device are analyzed below. Because it may be possible to generate power from the system to offset some of the costs associated with installation, this potential benefit is included in the analysis below. The following analysis is based on the treatment of manure from 4,310 milk cows in a covered lagoon anaerobic digester with power generation.

Capital Cost for Installation of a Covered Lagoon Digester for Dairy Cows

The capital cost estimates for installation of a covered lagoon digester are based on information from the United States EPA AgSTAR publication "Anaerobic Digestion Capital Costs for Dairy Farms" (May 2010)[3] and the California Energy Commission (CEC) Public Interest Energy Research (PIER) Program Dairy Methane Digester System Program Evaluation Report (Feb 2009)[4]. The formula in the AgSTAR publication results in a capitol cost of $1,032 per cow for a covered lagoon anaerobic digester treating manure from 4,310 cows. This estimate excludes costs of solids separation after digestion, hydrogen sulfide removal, and utility charges including line upgrades and interconnection costs and fees. Based on information from installations in California, the CEC PIER Dairy Methane Digester Program Evaluation Report gives an average cost of $585 per cow for installation of covered lagoon anaerobic digesters (see Table 9 - Total Project Costs and Cost per Cow and per kW). Therefore, for purposes of this analysis the capital cost for installation of a covered lagoon digester system for 7,278 cows will be assumed to be between $585/cow and $1,032/cow. The capital cost estimates of a covered lagoon digester treating the manure of 4,310 milk cows is calculated as follows:

Low capital cost estimate: $585/cow x 4,310 cows = $2,521,350
High capital cost estimate: $1,032/cow x 4,310 cows = $4,447,920

The annualized capital cost estimates will be calculated below. The capital cost for the installation of the covered lagoon digester will be spread over the expected life of the system using the capital recovery equation. The expected life of the entire system will be estimated at 10 years though the cover may require replacement during this period. A

[3] "Anaerobic Digestion Capital Costs for Dairy Farms" (May 2010), EPA AgSTAR http://www.epa.gov/agstar/pdf/digester_cost_fs.pdf

[4] "Dairy Power Production Program – Dairy Methane System Program Evaluation Report" (February 2009). Western United Resource Development, Inc prepared for the California Energy Commission (CEC) Public Interest Energy Research Program. (CEC-500-2009-009) http://www.energy.ca.gov/2009publications/CEC-500-2009-009/CEC-500-2009-009.PDF

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.

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

Low Annual Capital Cost Estimate = [$4,257,630 x 0.1(1.1)^10]/[(1.1)^10-1]
= $410,980/year

High Annual Capital Cost Estimate = [$4,447,920 x 0.1(1.1)^10]/[(1.1)^10-1]
= $725,011/year

Potential Production of Electricity from a Covered Lagoon Digester Treating Manure from 4,310 Milk Cows:

It may be possible to offset some of the installation costs of a covered lagoon anaerobic digester with revenue from generation of electricity. Based on the information given in the CEC PIER Dairy Methane Digester Program Evaluation Report, Table 7 – Actual Generation per Cow Comparisons, California dairies that used a covered lagoon digester to produce electricity generated between 429.1 and 1,031.8 kW-hr/yr per lactating cow with an overall per facility average generation rate of 670.3 kW-hr/yr per lactating cow. This average annual generation rate is actually higher than all the facilities included in the average except one that had a very high generation rate. In addition, this average may overestimate the per-cow generation potential because the contributions of support stock to the digesters were not accounted for. However, for more conservative calculations, this average will be used to calculate the potential annual savings in electricity costs. The potential production of electricity from a covered lagoon digester treating manure from 7,278 milk cows is calculated as follows:

Electrical Production: 670.3 kW-hr/(milk cow-yr) x 4,310 milk cows = 2,888,993 kW-hr/yr

Potential Cost Savings from Production of Electricity from a Covered Lagoon Digester Treating Manure from 4,310 Milk Cows:
Based on the reference given above, the value of electricity used for this analysis will be = $0.1115/kW-hr

The potential annual cost savings from electricity generation from a covered lagoon digester treating manure from 4,310 milk cows is calculated as follows:

Potential Annual Cost Savings from Electrical Production:
2,888,993 kW-hr/yr x $0.1115/kW-hr = $322,123/yr

Annualized Capital Cost for a Covered Lagoon Digester Treating Manure from 4,310 Milk Cows minus Potential Savings from Generation of Electricity:

Low Annual Capital Cost Estimate minus Savings from Potential Generation
= $410,980/yr - $322,123/yr = $88,857/year

High Annual Capital Cost Estimate minus Savings from Potential Generation
= $725,011/yr - $322,123/yr = $402,888/year

VOC Emission Reductions from a Covered Lagoon Anaerobic Digester Treating Manure from 4,310 Milk Cows:

The annual VOC Emission Reductions for covered lagoon anaerobic digester treating the manure from 4,310 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 [Covered Lagoon Digester Control Efficiency for Lagoon/Storage Pond]

VOC Reductions for a Covered Lagoon Vented to Control Device							
Type of Cow	**# of cows**	**x**	**Lagoon EF (lb/cow-yr)**	**x**	**Control (%)**	**=**	**lb-VOC/yr**
Milk Cow (freestall)	4,310	x	1.3	x	80%	=	**4,482**

Cost of VOC Emission Reductions

Low Estimate = ($88,857/year)/[(4,482 lb-VOC/year)(1 ton/2000 lb)]
= $39,651/ton of VOC reduced

High Estimate = ($402,888/year)/[(4,482 lb-VOC/year)(1 ton/2000 lb)]
= $179,780/ton of VOC reduced

As shown above, the capital cost alone for a covered lagoon digester for a heifer ranch would cause the cost of the VOC reductions to be greater than $39,651/ton. This cost includes the potential revenue generated by electrical production but does not include the additional maintenance required for the system. Additionally, this analysis did not consider the additional pollution that would be generated by any combustion equipment that would utilize the gas, which may offset any reductions in VOCs. Therefore, this control technology would not be cost effective.

3) Anaerobic Treatment Lagoon Designed to Meet Natural Resources Conservation Service (NRCS) Standards

The technology/practice is currently used at multiple dairies located throughout the valley, therefore a cost effective analysis is not required.

4) Solids Removal/Separation

The technology/practice is currently used at multiple dairies located throughout the valley, therefore a cost effective analysis is not required.

e. Select BACT

Achieved in Practice option is determined to be BACT. Therefore, BACT for this operation is an anaerobic treatment lagoon designed to meet Natural Resources Conservation Service (NRCS) standards. Additionally, solids removal/separation using mechanical separation, settling basin(s), or weeping wall(s) is determined to be BACT.

Top Down BACT Analysis for Confined Animal Facility – Liquid Manure Handling – Lagoon/Storage Ponds for NH_3 Emissions

a. Identify All Possible Control Technologies

Step 1 - Identify all control technologies

A cost effectiveness threshold has not been established for ammonia. Therefore, although there is ongoing research for multiple ammonia control technologies, only options that meet the District's definition of Achieved-in-Practice controls will be considered for ammonia at this time.

The following practices have been identified as possible control options for NH3 emissions from the lagoon and storage pond(s). No other control technologies that meet the definition of Achieved-in-Practice have been identified for the lagoon or storage pond(s).

1) <u>Phototropic Lagoon</u>

Phototropic lagoons or red water lagoons can be identified by their characteristic purple, pink or rose color. Phototropic are the result of naturally occurring phenomena that lead to higher concentrations of purple sulfur and purple non-sulfur bacteria in municipal wastewater lagoons, lagoons treating animal waste, as well as natural lagoons and estuaries, etc. Purple sulfur bacteria utilize hydrogen sulfide and volatile organic acids as an electron source for an oxygenic photosynthesis. Under anaerobic conditions purple sulfur bacteria utilize volatile organic acids and alcohols as a carbon source and ammonia as a nitrogen source for cell growth. This reduces the concentration of these compounds at the surface of the lagoons and reduces the rate of volatilization of these compounds to the atmosphere. A number of studies have found reduced odors and emissions of volatile organic acids from lagoons with higher concentrations of phototropic bacteria. Some of these studies have also found reduced emissions of ammonia from phototropic lagoons.

In nature blooms of purple sulfur and purple non-sulfur bacteria are transitory. These blooms occur when the appropriate conditions are present to promote the growth of these bacteria (e.g. limited oxygen availability, sufficient light penetration, generally warmer temperatures, dilute nutrient loading, etc.). Although phototropic lagoons have shown promise for reduction of emissions from lagoons, there remain limitations to the continuous use of this option. As mentioned above, blooms of phototropic bacteria are generally transitory and the blooms cannot reliably be predicted in different lagoons, even when the lagoons are operated under similar conditions. Phototropic lagoons depend on living organisms to function; therefore, the effectiveness of the system is affected by several factors that are not always under the operator control. Establishment of an effective concentration of phototropic can take several months to more than a year and if this population dies off for any reason it can take the same amount of time for a population of phototropic bacteria to become re-established. Because of uncertainty related to successful establishment of an effective population of phototropic bacteria and the other difficulties related to the continuous use of this option, phototropic lagoons will not be required as BACT at this time; however, phototropic lagoons will remain an option that may be proposed by the operator.

2) Animals fed in accordance with National Research Council (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, which will reduce ammonia emissions from liquid manure applied to cropland.

b. Step 2 - Eliminate technologically infeasible options

A phototropic lagoon will be removed as an option.

c. Step 3 - Rank remaining options by control effectiveness

All options are ranked according to their control efficiency.

1) Animals fed in accordance with National Research Council (NRC) or other District-approved Guidelines

d. Step 4 - Cost Effectiveness Analysis

1) All animals fed in accordance with National Research Council (NRC) or other District-approved Guidelines

The technology/practice is currently used at all heifer ranches located throughout the valley, therefore a cost effective 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 National Research Council (NRC) or other District-approved guidelines are determined to be BACT.

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

a. Identify All Possible Control Technologies

Step 1 - Identify all 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.

4) <u>Irrigation of crops using liquid/slurry manure from the primary lagoon and/or secondary lagoon</u>

Currently, this is the practice for many existing dairies, especially dairies that only have one lagoon at their facility. However, some dairies with multiple lagoons still flush their cropland with liquid manure from either of their lagoons including the primary lagoon.

Control efficiency is unknown at this time and is expected to depend on treatment volume in the lagoon and residence time (digestion time) prior to application, as well as overall loading rate (dilution). However, control efficiency may be much lower from this system than a two-stage anaerobic treatment lagoon system.

5) Land application of lagoon water such that there is no standing water

During land application, minimize or eliminate standing water in an irrigated field within 24 hours, which reduces the potential to volatilize into the atmosphere and/or emit due to anaerobic conditions.

Control efficiency is unknown at this time and additional study will be required. While emission rates are not well known for land application practices, new data may be available soon from on-going research in California. In the absence of emission rates, emission reductions could potentially be assumed to occur where practices are used that decrease the time, temperature or area of water surface from which VOCs could be emitted.

6) Injection of liquid and slurry manure

Liquid and slurry manure is used to irrigate crops on land farmed by dairies. Manure can either be injected into the soil or left on the surface of the soil and allowed to soak in. Because the liquid and slurry manure is high in Nitrogen, Phosphorus, and Potassium (N-P-K), it supplies nutrients needed by crops. Dairies have nutrient management programs to regulate the amount of liquid and slurry manure applied to cropland. This program is used to balance the specific nutrients applied to the crops, such as nitrogen, with the amount of nutrients that the crops can utilize. Balancing the needs of the crop with what is supplied helps to minimize contamination of ground water. During the process of liquid and slurry manure application to the crops, VOC and NH_3 are emitted. Injecting manure hinders volatilization and speeds the uptake of nutrients that would degrade into gaseous pollutants. It is estimated that injection of manure will reduce VOC emissions from land application of manure by 50%.

The manure can only be injected during the time when the crop is not fully mature. This is because a tractor must be used to pull a cultivator with the liquid and slurry manure shanks. Once the crop is planted and grown to a certain height, it is no longer feasible for the tractor to get into the field due to the potential of damaging the crop. Ron Prong of Till-Tech Systems [(519) 775-2575] states that his company's liquid and slurry manure injection system can be used up to four weeks after planting of the crops without causing damage. Therefore, injection of slurry manure can only be required until the crops become so tall that damage will occur.

a. Eliminate technologically infeasible options

Injection of Liquid and Slurry Manure

The Dairy Permitting Advisory Group (DPAG) found that injection of flushed manure was not be a feasible BACT option in their report of BACT options for dairies in the San Joaquin Valley.[5]

Injection is typically restricted to slurry manure that has been vacuumed from the cow housing or that has been removed from settling basins and/or weeping walls. Injection of flushed liquid manure from the lagoons is not considered feasible because the additional water from flushing increases the amount of liquid that must be transported by the trucks or honeywagons, which will generate more emissions. Because of the added time and expense, injection is not used for flushed liquid manure; therefore, this option will be removed from consideration at this time.

b. 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)
4) Irrigation of crops using liquid/slurry manure from the primary lagoon and/or secondary lagoon
5) Land application of lagoon water such that there is no standing water

c. 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 4,310 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.

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[5] Page 150 of the Final DPAG Report - "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)

Space Requirement for a Naturally Aerobic Lagoon Treating Manure from 4,310 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 7,278 milk cows in the San Joaquin Valley can be calculated as follows:

BOD_5 loading (lb/day) = 4,310 milk cows x 2.9 lb-BOD_5/cow-day x 0.80
= 9,999 lb-BOD_5/day

Minimum Surface Area (acres) in areas of the San Joaquin Valley with a maximum loading rate of 55 lb-BOD_5/acre-day =
9,999 lb-BOD_5/day ÷ 55 lb-BOD_5/acre-day = 182 acres

Minimum Surface Area (acres) in areas of the San Joaquin Valley with a maximum loading rate of 45 lb-BOD_5/acre-day =
9,999 lb-BOD_5/day ÷ 45 lb-BOD_5/acre-day = 222 acres

As shown above the minimum surface area required for a naturally aerobic lagoon treating manure from 4,310 milk cows in the San Joaquin Valley would range from approximately 182 to 222 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 4,310 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 4,310 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 4,310 milk cows will have a loading rate of approximately 9,999 lb-BOD_5/day (4,545 kg-BOD_5/day).

Energy Requirement a Mechanically Aerated Lagoon Treating Manure from 4,310 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 7,278 milk cows is calculated as follows:

High Efficiency Aerator

4,545 kg-BOD_5/day ÷ (0.68 kg-O2/kW-hr) x (365 day/year) = 2,439,596 kW-hr/year

Low Efficiency Aerator

4,545 kg-BOD_5/day ÷ (0.10 kg-O2/kW-hr) x (365 day/year) = 16,589,250 kW-hr/year

Cost of Electricity for a Mechanically Aerated Lagoon Treating Manure from 4,310 Milk cows:

The cost for electricity will be based upon the average price for industrial electricity in California as of May 2012, 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 = $0.1115/kW-hr

The electricity costs for complete aeration are calculated as follows:

Low Cost Estimate (High Efficiency Aerator)
2,439,596 kW-hr/year x $0.1115/kW-hr = $272,015/year

High Cost Estimate (Low Efficiency Aerator)
16,589,250 kW-hr/year x $0.1115/kW-hr = $1,849,701/year

VOC Emission Reductions from a Mechanically Aerated Lagoon Treating Manure from 4,310 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 4,310 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)	4,310	x	1.4	x	90%	=	**5,431**

Cost of VOC Emission Reductions
Low Estimate = ($272,015/year)/[(5,431 lb-VOC/year)(1 ton/2000 lb)]
= $100,171/ton of VOC reduced

High Estimate = ($1,849,701/year)/[(5,431 lb-VOC/year)(1 ton/2000 lb)]
= $681,164/ton of VOC reduced

As shown above, the electricity cost alone for a mechanically aerated lagoon would cause the cost of the VOC reductions to be greater than $100,171/ton. 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 costs associated with treating the manure excreted by milk cows in a covered lagoon digester vented to a control device are analyzed below. Because it may be possible to generate power from the system to offset some of the costs associated with installation, this potential benefit is included in the analysis below. The following analysis is based on the treatment of manure from 4,310 milk cows in a covered lagoon anaerobic digester with power generation. Because the liquid/slurry manure applied to land will come from a storage pond after being treated in a covered lagoon/digester, it will be assume the reduction in VOC emissions from the lagoon/digester will result in similar VOC reductions to land application.

Capital Cost for Installation of a Covered Lagoon Digester for Dairy Cows

The capital cost estimates for installation of a covered lagoon digester are based on information from the United States EPA AgSTAR publication "Anaerobic Digestion Capital Costs for Dairy Farms" (May 2010)[6] and the California Energy Commission (CEC) Public Interest Energy Research (PIER) Program Dairy Methane Digester System Program Evaluation Report (Feb 2009)[7]. The formula in the AgSTAR publication results in a capitol cost of $1,032 per cow for a covered lagoon anaerobic digester treating manure from 1,000 cows. This estimate excludes costs of solids separation after digestion, hydrogen sulfide removal, and utility charges including line upgrades and interconnection costs and fees. Based on information from installations in California, the CEC PIER Dairy Methane Digester Program Evaluation Report gives an average cost of $585 per cow for installation of covered lagoon anaerobic digesters (see Table 9 - Total Project Costs and Cost per Cow and per kW). Therefore, for purposes of this analysis the capital cost for installation of a covered lagoon digester system for 1,000 cows will be assumed to be between $585/cow and $1,032/cow. The capital cost estimates of a covered lagoon digester treating the manure of 4,310 milk cows is calculated as follows:

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[6] "Anaerobic Digestion Capital Costs for Dairy Farms" (May 2010), EPA AgSTAR http://www.epa.gov/agstar/pdf/digester_cost_fs.pdf

[7] "Dairy Power Production Program – Dairy Methane System Program Evaluation Report" (February 2009). Western United Resource Development, Inc prepared for the California Energy Commission (CEC) Public Interest Energy Research Program. (CEC-500-2009-009) http://www.energy.ca.gov/2009publications/CEC-500-2009-009/CEC-500-2009-009.PDF

Low capital cost estimate: $585/cow x 7,278 cows = $2,521,350
High capital cost estimate: $1,032/cow x 7,278 cows = $4,447,920

The annualized capital cost estimates will be calculated below. The capital cost for the installation of the covered lagoon digester will be spread over the expected life of the system using the capital recovery equation. The expected life of the entire system will be estimated at 10 years though the cover may require replacement during this period. 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.

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

$$\text{Low Annual Capital Cost Estimate} = [\$2,521,350 \times 0.1(1.1)^{10}]/[(1.1)^{10}-1] = \$410,980/\text{year}$$

$$\text{High Annual Capital Cost Estimate} = [\$4,447,920 \times 0.1(1.1)^{10}]/[(1.1)^{10}-1] = \$725,011/\text{year}$$

Potential Production of Electricity from a Covered Lagoon Digester Treating Manure from 4,310 Milk Cows:

It may be possible to offset some of the installation costs of a covered lagoon anaerobic digester with revenue from generation of electricity. Based on the information given in the CEC PIER Dairy Methane Digester Program Evaluation Report, Table 7 – Actual Generation per Cow Comparisons, California dairies that used a covered lagoon digester to produce electricity generated between 429.1 and 1,031.8 kW-hr/yr per lactating cow with an overall per facility average generation rate of 670.3 kW-hr/yr per lactating cow. This average annual generation rate is actually higher than all the facilities included in the average except one that had a very high generation rate. In addition, this average may overestimate the per-cow generation potential because the contributions of support stock to the digesters were not accounted for. However, for more conservative calculations, this average will be used to calculate the potential annual savings in electricity costs. The potential production of electricity from a covered lagoon digester treating manure from 4,310 milk cows is calculated as follows:

Electrical Production: 670.3 kW-hr/(milk cow-yr) x 4,310 milk cows = 2,888,993 kW-hr/yr

Potential Cost Savings from Production of Electricity from a Covered Lagoon Digester Treating Manure from 4,310 Milk Cows:

Based on the reference given above, the value of electricity used for this analysis will be = $0.1115/kW-hr

The potential annual cost savings from electricity generation from a covered lagoon digester treating manure from 4,310 milk cows is calculated as follows:

Potential Annual Cost Savings from Electrical Production:
2,888,993 kW-hr/yr x $0.1115/kW-hr = $322,123/yr

Annualized Capital Cost for a Covered Lagoon Digester Treating Manure from 4,310 Milk Cows minus Potential Savings from Generation of Electricity:

Low Annual Capital Cost Estimate minus Savings from Potential Generation
= $410,980/yr - $322,123/yr = $88,857/year

High Annual Capital Cost Estimate minus Savings from Potential Generation
= $725,011/yr - $322,122/yr = $402,888/year

VOC Emission Reductions from a Covered Lagoon Anaerobic Digester Treating Manure from 4,310 Milk Cows that will be applied to land:

The annual VOC Emission Reductions for covered lagoon anaerobic digester treating the manure from 4,310 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 [Covered Lagoon Digester Control Efficiency for Lagoon/Storage Pond]

VOC Reductions for a Covered Lagoon Vented to Control Device							
Type of Animal	**# of cows**	**x**	**Liquid Manure Land Application EF (lb/cow-yr)**	**x**	**Control (%)**	**=**	**lb-VOC/yr**
Milk Cow (freestall)	4,310	x	1.4	x	80%	=	**4,827**

Cost of VOC Emission Reductions
Low Estimate = ($88,857/year)/[(4,827 lb-VOC/year)(1 ton/2000 lb)]
= $36,817/ton of VOC reduced

High Estimate = ($402,888/year)/[(4,827 lb-VOC/year)(1 ton/2000 lb)]
= $166,931/ton of VOC reduced

As shown above, the capital cost alone for a covered lagoon digester for a dairy would cause the cost of the VOC reductions to be greater than $36,817/ton. This cost includes the potential revenue generated by electrical production but does not include the additional maintenance required for the system. Additionally, this analysis did not consider the additional pollution that would be generated by any combustion equipment that would utilize the gas, which may offset any reductions in VOCs. Therefore, this control technology would not be cost effective.

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

The technology/practice is currently used at multiple dairies located throughout the valley, and is therefore cost effective.

4) Irrigation of crops using liquid/slurry manure from the primary lagoon and/or secondary lagoon

The technology/practice is currently used at multiple dairies located throughout the valley, and is therefore cost effective.

5) Land application of lagoon water such that there is no standing water

This technology is currently required by the Central Valley Regional Water Quality Control Board, and is therefore cost effective.

d. Select BACT

Achieved in Practice option is determined to be BACT. Therefore, BACT for this operation is the option with the greatest VOC control: irrigation of crops using liquid 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.

Top Down BACT Analysis for Confined Animal Facility – Liquid Manure Handling – Land Application for NH_3 Emissions

1. Identify All Possible Control Technologies

Step 1 - Identify all control technologies

A cost effectiveness threshold has not been established for ammonia. Therefore, although there is ongoing research for multiple ammonia control technologies, only options that meet the District's definition of Achieved-in-Practice controls will be considered for ammonia at this time.

The following practice has been identified as a possible control option for NH_3 emissions from the lagoon and storage pond(s). No other control technologies that meet the definition of Achieved-in-Practice have been identified for the lagoon or storage pond(s).

1) Animals fed in accordance with National Research Council (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, 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

All options are ranked according to their control efficiency.

1) Animals fed in accordance with National Research Council (NRC) or other District-approved Guidelines

d. Step 4 - Cost Effectiveness Analysis

1) Animals fed in accordance with National Research Council (NRC) or other District-approved Guidelines

The technology/practice is currently used at all heifer ranches located throughout the valley, therefore, a cost effective 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 National Research Council (NRC) or other District-approved guidelines are determined to be BACT.

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

a. Identify All Possible Control Technologies

Step 1 - Identify all control technologies

1) 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 VOC control efficiency of up to 58%.[8]

2) Land Application of Solid Manure Processed by an Open Negatively-Aerated Static Piles (ASP) (With Thick Layer of Bulking Agent or Equivalent)

Aerated static piles are piles that are aerated directly with forced or drawn air systems to speed up the compost process. The aerated static pile is constructed to allow forced airflow (low pressure-high volume blowers and a piping system) so that the oxygen supply can be more accurately controlled. The material is piled over perforated pipes connected to a blower to withdraw air from the pile. The result is improved control of aerobic degradation or decomposition of organic waste and biomass bulking agents. This is considered a more efficient composting method than the industry standard of windrow composting.

VOC emissions primarily occur during the active and curing phases of the composting. To ensure consistent temperatures and prevent escape of odors and VOCs, the piles should be covered with a thick layer (12 to 18 inches) of finished compost or bulking agent.

With positive pressure aeration, contaminated air is pushed through the pile to the outer surface; therefore, making it difficult to be collected for odor treatment. However, positive pressure aeration is more effective at cooling the pile because it provides better airflow.

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[8] Page 87 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).

With negative aeration, air is pulled through the pile from the outer surface. Contaminated air is collected in the aeration pipes and can be directed to an odor treatment system. To avoid clogging, condensed moist air drawn from the pile must be removed before reaching the blower. Negative aeration might create uneven drying of the pile due to its airflow patterns.

A study conducted by City of Columbus, Ohio, demonstrated that the weighted-average odor emissions from an outdoor negative aeration pile is approximately 67% lower than those from an outdoor positive aeration pile. Negative aeration is usually used during the beginning of the composting process to greatly reduce odors. In enclosed active composting area, negative pressure aeration also reduces moisture released into the building, and thus, reduces fogging. Positive aeration is used mostly near the end of the composting cycle for more efficient drying of the compost.[9]

An odor and emissions study done at the City of Philadelphia biosolids co-composting facility by the Department of Water[10] also concluded that controlling the temperature by controlling the oxygen availability using negative aeration composting is expected to result in lower emissions than those from open windrow composting.

The control efficiency can be estimated from the Technology Assessment for SCAQMD Proposed Rule 1133 Table 3-2 which uses a capture efficiency of 25 to 33% from an open ASP and multiplies it by a conservative 80% control equipment efficiency. The average control efficiency for open aerated static piles based on the Technology Assessment is 23.2%. Additional emission reduction potential from open ASPs cannot be quantified at this time. Therefore, a conservative control efficiency of 23.2% will be applied to the ASP.

No control is expected from the land application of the manure since the manure is not being injected or incorporated into the soil. However, since the manure has gone through a pre-control system, the control efficiency of that system would carry over to land application

3) <u>Land Application of Solid Manure Processed by an Open Negatively-Aerated Static Piles (ASP) (With Thick Layer of Bulking Agent or Equivalent) Vented to a Biofilter (or Equivalent)</u>

This technology is the same as that described above for negatively aerated static piles except that the exhaust gases are vented to a biofilter. As discussed above negative aeration appears to be more efficient in reducing odors and emissions than positive aeration.

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[9] Technology Assessment for SCAQMD proposed Rule 1133 Table 3-2

[10] Conclusion # 2, "Measurement and Control of Odor and VOC emissions from the largest municipal aerated-static pile biosolids composting facility in the United States". William Toffey, Philadelphia Water Department; Lawrence Hentz, Post, Buckley, Shuh and Jerigan.

Biofiltration is an air pollution control technology that uses a solid media to absorb and adsorb compounds in the air stream and retains them for subsequent biological oxidation. A biofilter consists of a series of perforated pipes laid in a bed of gravel and covered with an organic media. As the air stream flows up through the media, the odorous compounds are removed by a combination of physical, chemical and biological processes. However, depending upon the airflow from the composting material and the design and material selection for the biofilter, the organic matter could quickly deteriorate.

In the biofiltration process, live bacteria biodegrade organic contaminants from air into carbon dioxide and water. Bacterial cultures (microorganisms that typically consist of several species coexisting in a colony) that use oxygen to biodegrade organics are called aerobic cultures. These bacteria are found in soil, peat, compost and natural water bodies including ponds, lakes, rivers and oceans. They are environmentally friendly and non-harmful to humans unless ingested. Chemically, the biodegradation reaction for aerobic cultures is written as:

> Organic(s) + Oxygen + Nutrients + Microorganisms => CO_2 + H_2O + Microorganisms

The organic(s) are air contaminants, the oxygen is in air, the nutrients are nitrogen and phosphorus mineral salts needed for microbial growth and the microorganisms are live bacteria on the biofilter media.

Biofiltration is a well-established emission and control technology in Europe where over two hundred biofilters were in use as of 1984 and even more are expected today. In the United States, biofilters have been mainly utilized for the treatment of odors as well as VOCs in wastewater treatment plants. Based on the information collected by SCAQMD, existing biofilter composting applications have achieved control efficiencies of about 80% to 90% for VOC and 70% to over 90% for ammonia (one of this composting applications reported an initial control efficiency of 65 percent for VOC but was later improved to achieve an 80 percent control efficiency). This specific field example along with other available data presented in SCAQMD's Technology Assessment Report demonstrates that a well-designed, well-operated, and well-maintained biofilter is capable of achieving 80% control efficiency for VOC and ammonia.[11]

No control is expected from the land application of the manure since the manure is not being injected or incorporated into the soil. However, since the manure has gone through an ASP vented to biofilter, the 80% control efficiency of that system would carry over to land application.

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[11] SCAQMD Final Staff Report for Rule 1133, page 18

4) Land Application of Solid Manure Processed by an Enclosed Aerated Static Piles (AgBag, Gore Cover, or Equivalent)

An enclosed aerated static pile uses the same forced aeration principle of an open ASP, except that the entire pile is fully enclosed, either inside a building or with a tarp around it.

There are a few companies that are promoting this type of system. In this analysis, the following two companies will be discussed: AgBag International Ltd and the Gore Cover. Both technologies are briefly described below:

AgBag International Ltd.

The AgBag system was developed by Compost Technology International and is based in Oregon. The system has controlled aeration capabilities and has minimal space requirements. It is suited for small to mid-size composting. The system is comprised of the following components:

- Large sealed bags (pods) of adjustable length up to 200 ft, either 5 ft or 10 ft diameter
- 9 mm recyclable plastic (not re-usable)
- Adjustable aeration system with inserted valved vents
- Hopper, mixer & compost compactor

The Ag-Bag Environmental system provides a cycle time of as little as 8 weeks. Curing adds another 30 to 60 days. AgBag states that three annual composting cycles could be obtained. The area needed to compost is determined by the volume of waste material.

Mixing – A composite mix of materials needs to be balanced for proper carbon to nitrogen (C:N) ratio. This means a mix of greens (nitrogen sources) to browns (carbon sources). The best ratio that AgBag recommends is between 20 to 40:1, with 30:1 being ideal.

The oxygen supply is replenished by forced aeration. This eliminates the labor-intensive need to turn piles. Temperature monitors indicate when the airflow needs adjusting to maintain proper temperatures. Moisture is adjusted at time of filling or added to the total mixture upon blending. The compost matrix is sufficient in size to maintain heat, even in cold climates. The system contains vents throughout to allow air to escape. These vents are controlled by the operator. Ag-Bag is considered an in-vessel system.

After 8-12 weeks of composting, the compost cycle is completed. The "Pod", as AgBag likes to call it, is opened and the material is static piled for 30-60 days to cure or mature.

A representative of AgBag has claimed very high control efficiencies for both VOCs and ammonia and has claimed that the system acts as its own biofilter, thus reducing emissions. However, VOC and ammonia control efficiencies are not readily available at this time. Furthermore, AgBag has not provided any technical information to support their claimed level of control.

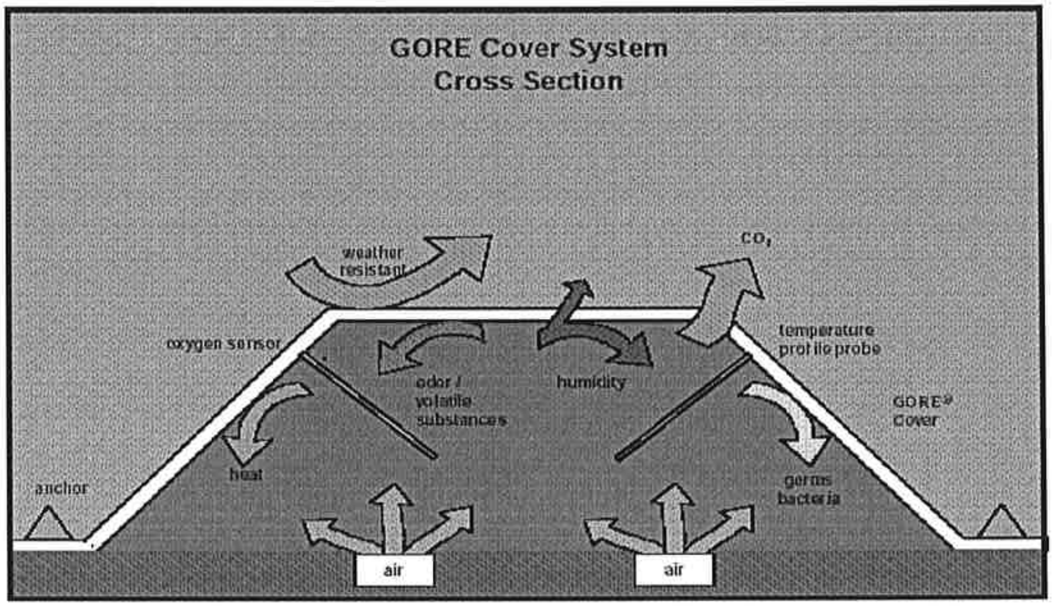
AgBag is working closely with SCAQMD and the Milk Producers Council to perform a pilot study to evaluate the efficiency of this technology. Until the study is completed, this technology will be conservatively assumed to control emissions by at least 10% more than open aerated static piles, with a minimum control efficiency of 33.2%. Once the study is completed, the District will be able to more accurately determine the control efficiency for this technology.

Gore Cover

The Gore Cover, manufactured by Gore Creative Technologies Worldwide, utilizes positive aeration and a specially designed cover to create an enclosed system that controls odors, microorganisms and creates a consistent product unaffected by outside environmental conditions. Medium pressure aerators connect to aeration pipes on the floor or aeration ducts in the floor. Stainless steel probes inserted into the pile monitor oxygen and temperature parameters. The data is relayed to and stored in a computer. This data controls the aerators to keep pile conditions consistent. The Gore Cover system can significantly reduce odors by the controlled use of a semi permeable membrane that is permeable to oxygen but impermeable to large molecules. The cover protects the pile from weather conditions, but allows release of CO_2. These controlled conditions allow consistent product to be produced without risk of damp pockets that may create anaerobic conditions and increased odors.

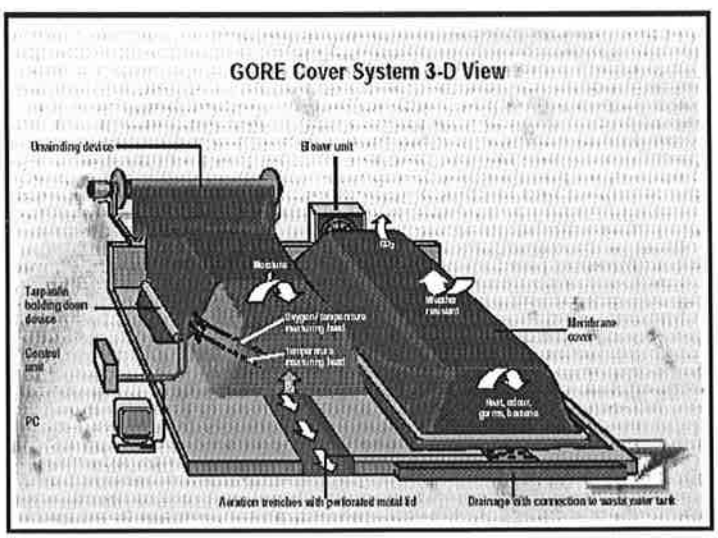
In addition to the membrane, which covers the organic material during composting, the system includes a concrete floor and wall, blowers for aeration, and a winder for efficient movement of the cover. The system also requires consistent management including preparation of materials to achieve a homogenous mixture with moisture content of 55-60% and monitoring of temperature and oxygen levels. With this system, the composting process takes eight weeks. The “heap” of organic material is covered by the membrane, which is secured to the ground, allowed to compost for four weeks, then moved and re-covered for two weeks for stabilization. During the final two weeks of curing, the heap is uncovered.

A fine film of condensation develops during the composting process that collects on the inside cover. According to the manufacturer, the moisture helps to dissolve the gases. The condensation then drips back onto the pile, where they can continue to be broken down by the composting process.



The system, according to Gore Cover, shortens the time required to produce finished, premium compost, as follows:

- First zone – Four weeks – Material stays on the initial placement zone in-vessel
- Second zone – Two weeks – Material moved to another in-vessel zone with minimizing addition of water. Water addition is nominal because the in-vessel system retains the initial moisture within the system and only releases minimal amounts.
- Third zone – Two weeks – the final move is to a third uncovered zone.
- Screening – Material will be screened then ready to sell within 15 days.



There is no control efficiency available at this time for enclosed aerated static piles. A study is under way by SQAQMD and the Milk Producers Council to determine the control efficiencies for VOC and ammonia emissions from enclosed aerated composting systems. Until the study is completed, this technology will be conservatively assumed to control emissions by 10% more than open aerated static piles, with a minimum control efficiency of 33.2% until additional data are available.

No control is expected from the land application of the manure since the manure is not being injected or incorporated into the soil. However, since the manure has gone through a pre-control system, the control efficiency of that system would carry over to land application

5) Land Application of Solid Manure Processed by an In-Vessel/Enclosed (Building, AgBag, Gore Cover, or Equivalent) Negatively-Aerated Static Piles Vented to a Biofilter

An in-vessel aerated static pile uses the same forced aeration principle of an open ASP, except that the entire pile is fully enclosed, either inside of a building or with a tarp around it. In addition to the in-vessel ASP, the biogas must be sent to a biofilter capable of reducing at least 80% emissions.

According to the SCAQMD Rule 1133.2 final staff report (page 18) "Technology Assessment Report states a well-designed, well operated, and well-maintained biofilter is capable of achieving 80% destruction efficiency for VOC and NH3." The overall control efficiency of this technology is equal to the combined control efficiencies of the enclosed aerated system (33.2% - calculated above in section 19) and the biofilter (80%), calculated as follows:

$$CE = (0.332) + (1-0.332)*0.8 = 86.6\%$$

No control is expected from the land application of the manure since the manure is not being injected or incorporated into the soil. However, since the manure has gone through a pre-control system, the control efficiency of that system would carry over to land application.

6) Land Application of Solid Manure Processed by Open Negatively-Aerated Static Piles (ASP) (With Thick Layer of Bulking Agent or Equivalent) With Rapid Incorporation of the Manure Into the Soil After Land Application

This technology is the same as described in Option 3 above but with the added control of rapid incorporation of the manure into the soil.

As discussed in Option 1, the VOC control efficiency from immediate incorporation is up to 58%. The overall control efficiency of the combination of both practices is equal to the combined control efficiencies of the open aerated system (23%) and the control efficiency of immediate incorporation.

$$\text{VOC Overall Control efficiency } (0.23) + (1-0.23)*(58\%) = 67.7\%$$

7) <u>Land Application of Solid Manure Processed by Either an Open or Enclosed Negatively-Aerated Static Pile (ASP) Vented to a Biofilter With Rapid Incorporation of the Manure Into the Soil After Land Application</u>

This technology is the same as described in Options 4 and 6 above but with the added control of rapid incorporation of the manure into the soil.

As discussed in Option 1, the VOC control efficiency from immediate incorporation is up to 58%. The overall control efficiency of the combination of both practices is equal to the combined control efficiencies of the ASP and biofilter system (80%) and the control efficiency of immediate incorporation.

VOC Overall Control efficiency (0.80) + (1-0.80)*(58%) = 91.6%

b. Eliminate technologically infeasible options

There are no technologically infeasible options to eliminate in Step 1.

c. Rank remaining options by control effectiveness

1) Land Application of Solid Manure Processed by Either an Open or Enclosed Negatively-Aerated Static Pile (ASP) Vented to a Biofilter With Rapid Incorporation of the Manure Into the Soil After Land Application (91.6%)
2) Land Application of Solid Manure Processed by In-Vessel/Enclosed Negatively-Aerated Static Piles vented to biofilter ≥ 80% destruction efficiency for both active and curing phases (or a combination of controls) (≈86.6%)
3) Land Application of Solid Manure Processed by Open Negatively-Aerated Static Piles vented to biofilter ≥ 80% destruction efficiency for both active and curing phases (or a combination of controls) (≈80%)
4) Land Application of Solid Manure Processed by an Open Negatively-Aerated Static Piles (ASP) (With Thick Layer of Bulking Agent or Equivalent) With Rapid Incorporation of the Manure Into the Soil After Land Application (67.7%)
5) Rapid incorporation of solid manure into the soil after land application (58%)
6) Land Application of Solid Manure Processed by Enclosed Negatively-Aerated Static Pile (≈33.2%)
7) Land Application of Solid Manure Processed by Open Negatively-Aerated Static Pile (ASP) (≈23.2%)

d. Cost Effectiveness Analysis

1) Options 1, 2, and 3: Land Application of In-Vessel/Enclosed Negatively-Aerated Static Piles Vented to Biofilter or Open Negatively-Aerated Static Piles Vented to Biofilter (With Rapid Incorporation of the Manure Into the Soil After Land Application)

The following costs are taken from the final staff report for District Rule 4565 - Biosolids, Animal Manure, and Poultry Litter Operations (May 30, 2007).[12] The cost information is based on a large composting facility with a throughput of 200,000 wet tons per year. On a per ton basis the costs for smaller composting facilities would be higher since there would not be the economies of scale for building and operations created by large composting facilities.

Low Cost Scenario: ASP & Biofilter (200,000 wet ton/yr)	
Total Capital Cost	$7,775,000
Annualized capital cost (10% interest - 10 years)	$1,265,345
Total Annual O & M Cost	$124,305
Total Annualized Cost - ASP & Biofilter (Low-Estimate of Annual Costs) ($/yr/facility)	**$1,389,650**

High Cost Scenario: In-Vessel and RTO (200,000 wet ton/yr)	
Total Capital Cost	$21,185,000
Annualized capital cost (10% interest - 10 years)	$3,447,761
Total Annual O & M Cost	$285,910
Total Annualized Cost - In-Vessel & RTO (High-Estimate of Annual Costs) ($/yr/facility)	**$3,733,671**

The final staff report for District Rule 4565 stated that the use of ASPs and in-vessel composting would have unreasonably high costs for facilities that have a throughput of less than 100,000 wet tons per year. The costs given above are for a facility with a throughput of 200,000 wet tons per year. It will conservatively be assumed that the cost for a facility with a throughput of 100,000 wet tons per year will be half of the values given above. Therefore, the cost estimates for a facility with a throughput of 100,000 are as follows:

[12] The capitol and operation costs for ASP and in-vessel composting given in the final staff report were taken from: United States Environmental Protection Agency, "Biosolids Technology Fact Sheet: Use of Composting for Biosolids Management" EPA 832-F-02-024, September 2002, http://water.epa.gov/scitech/wastetech/upload/2002_10_15_mtb_combioman.pdf. These costs were not adjusted for inflation

Low Annual Capital Cost Estimate (100,000 wet ton/yr) = $694,825/year

High Annual Capital Cost Estimate (100,000 wet ton/yr) = $1,866,836/year

Because it has been determined that composting or storing solid manure removed from dairy cow housing in an ASP or enclosure vented to a control device would not be cost-effective for a facility with a throughput of less than 100,000 tons per year, this analysis will be based on a dairy facility that can produce 100,000 tons of solid manure per year.

Number of Cows to Produce 100,000 ton/yr of Solid Manure

According to the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) Agricultural Waste Management Field Handbook (AWMFH), Chapter 4 - Agricultural Waste Characteristics (March 2008), dairy cows in scraped open corrals produce approximately 77 lb per day of solid manure that can be removed and transferred for storage or composting. The amount of solid manure removed for dairy cows housed in corrals or freestall barns with a flush system would be much less. The number of cows needed to produce 100,000 ton/year of solid manure is calculated as follows:

(100,000 ton/year x 2,000 lb/ton) ÷ (77 lb/cow-day x 365 day/yr) = 7,116 cows

VOC Emission Reductions from an ASP or Enclosure Handling Solid Manure from 7,116 Milk Cows:

The annual VOC Emission Reductions for ASP or in-vessel enclosure handling the solid manure from 7,116 milk cows are calculated as follows and shown in the table below:

[Number of cows] x [Solid Manure VOC EF (lb/cow-year)] x [ASP/In-Vessel Capture Efficiency] x [Control Device VOC Control Efficiency]

VOC Reductions for Dairy Solid Manure in ASP or Enclosure Vented to a Biofilter									
Type of Animal	**# of cows**	**x**	**Solid Manure Land Application EF (lb/cow-yr)**	**x**	**Capture (%)***	**x**	**Control (%)**	**=**	**lb-VOC/yr**
Milk Cow	7,116	x	0.33	x	50%	x	80%	=	939

*The capture efficiency is conservatively assumed to be 50%. The technical assessment of SCAQMD Rule 1133.2 and the staff report for District Rule 4565 give a capture efficiency of 33% for composting facilities, which would result in lower emission reductions.

Cost of VOC Emission Reductions

Low Estimate = ($694,825/year)/[(939 lb-VOC/year)(1 ton/2000 lb)]
= $1,479,925/ton of VOC reduced

High Estimate = ($1,866,836/year)/[(939 lb-VOC/year)(1 ton/2000 lb)]
= $3,976,222/ton of VOC reduced

As shown above, the cost alone of an ASP or in-vessel enclosure vented to a biofilter to handle the solid manure at a dairy would cause the cost of the VOC reductions to be greater than $1,479,925/ton. The excessively high costs of this option make it impractical for most confined animal facilities. Therefore, this control technology is not cost effective.

2) Options 4, 7, and 8: Land Application of Solid Manure Processed by an Open Negatively-Aerated Static Pile (ASP) or Enclosed Negatively-Aerated Static Pile (With Rapid Incorporation of the Manure Into the Soil After Land Application)

A cost effectiveness was evaluated by SCAQMD for a variety of controls for new and existing co-composting facilities based on implementation of several possible scenarios. The cost effectiveness for new co-composting facilities was estimated to be about $24,000 to $27,000 per ton of VOC reduced or $11,000 to $12,000 per ton of VOC and ammonia reduced based on fabric or concrete type of enclosure for the active phase of composting and forced aeration system for the active and curing phases vented to a bio-filter.[13]

For existing co-composting operations, SCAQMD analyzed a few different scenarios. Under one of the scenarios, assuming enclosure without an aeration system for active phase of composting and a forced aeration system for curing phase (both vented to a biofilter) and depending on the type of enclosure, the cost-effectiveness ranged from $11,400 to $15,400 per ton of VOC and ammonia reduced, or $30,000 to $40,000 per ton of VOC reduced. Under another scenario, using enclosure and aeration system for active phase, and aeration system for curing phase, both vented to biofilter, the cost effectiveness ranged from $8,700 to $10,000 per ton of VOC and ammonia reduced or $23,000 to $26,500 per ton of VOC reduced (depending on the type of enclosure). Under another scenario, assuming that forced aeration system (in combination with process controls, optimized feedstock mix ratios, and best management practices) for both active and curing phases (combined with a biofiltration system) could achieve the required reductions (i.e., 70% for VOC and ammonia), the cost-effectiveness could be as low as $6,500 per ton of VOC and ammonia reduced or $17,000 per ton of VOC reduced. However, SCAQMD stated that additional test data would be necessary to validate the efficiency of such control methods.[14]

The VOC and ammonia baseline emission factors, used in determining the cost effective analysis (also included in Rule 1133.2), were developed based on the AQMD source tests conducted in 1995 and 1996 for three windrow co-composting facilities (1.78 pounds of VOC and 2.93 pounds of ammonia per ton of throughput). These emission factors do not accurately represent the baseline emissions of manure storage piles from dairy/calf facilities. The emission factor for manure piles may in fact be lower.

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[13] Final Staff report for proposed Rule 1133, 1133.1, and 1133.2)

[14] The cost assumptions used in this analysis (capital and operating cost) are included in the Technology Assessment Report for SCAQMD PR1133 (Attachment A to the Final Staff Report)

Enclosed ASP or in-vessel systems with control equipment, while feasible and effective at significantly reducing emissions, are costly. There may be additional emission reductions associated with ASP systems that have not been quantified in this evaluation. Additional testing of ASP systems, such as the ones discussed in this evaluation would allow the emission reduction potential of all control scenarios to be refined.

Therefore, these aerated static composting systems will be eliminated at this time.

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

This practice is currently used at many dairies and can easily be incorporated into existing and new heifer ranches. Therefore, a cost effective analysis will not be performed.

e. 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.

Top Down BACT Analysis for Confined Animal Facility – Solid Manure Handling – Land Application for NH_3 Emissions

a. Identify All Possible Control Technologies

Step 1 - Identify all control technologies

A cost effectiveness threshold has not been established for ammonia. Therefore, although there is ongoing research for multiple ammonia control technologies, only options that meet the District's definition of Achieved-in-Practice controls will be considered for ammonia at this time.

The following practices have been identified as possible control options for NH_3 emissions from solid manure land application. No other control technologies that meet the definition of Achieved-in-Practice have been identified for solid manure land application.

1) 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%.[15]

2) All animals fed in accordance with National Research Council (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

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[15] 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).

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 National Research Council (NRC) or other District-approved guidelines

d. Step 4 - Cost Effectiveness Analysis

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

The technology/practice is currently used at multiple heifer ranches located throughout the valley, therefore a cost effective analysis is not required.

2) All animals fed in accordance with National Research Council (NRC) or other District-approved guidelines

The technology/practice is currently used at all heifer ranches located throughout the valley, therefore a cost effective 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 heifer ranch in accordance with National Research Council (NRC) or other District-approved guidelines.

Top Down BACT Analysis for Confined Animal Facility – Solid Manure Handling – Solid Manure Storage/Separated Solids Piles for NH_3 Emissions

a. Identify All Possible Control Technologies

Step 1 - Identify all control technologies

A cost effectiveness threshold has not been established for ammonia. Therefore, although there is ongoing research for multiple ammonia control technologies, only options that meet the District's definition of Achieved-in-Practice controls will be considered for ammonia at this time.

The following practices have been identified as possible control options for NH_3 emissions from solid manure storage/separated solids piles. No other control technologies that meet the definition of Achieved-in-Practice have been identified for solid manure storage/separated solids piles.

1) <u>All animals fed in accordance with National Research Council (NRC) or other District-approved guidelines</u>

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

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

d. Step 4 - Cost Effectiveness Analysis

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

The technology/practice is currently used at all heifer ranches located throughout the valley, therefore a cost effective 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 National Research Council (NRC) or other District-approved guidelines.

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

a. Step 1 - Identify all control technologies

Since specific VOC emissions control efficiencies have not been identified in the literature for dairy TMR, the control efficiencies will be estimated based on the control efficiencies of similar processes and engineering judgment.

The following options were identified as possible controls for VOC emissions from the Total Mixed Ration (TMR) (Feed Handling and Storage permit):

1) Enclosed Buildings for Animals and TMR with Emissions Vented to a Control Device (e.g. incinerator, biofilter, e.g) (≈64-72%; 80% Capture and 80-90% Control of emissions from cow housing and total mixed ration (TMR) feed placed in the cow housing unit)

Total Mixed Ration (TMR) refers to feed (primarily silage with grains, oils, minerals, and other additives) that has been mixed to meet the nutritional needs of dairy animals and placed in the feeding areas of the cow housing unit for consumption by the cattle. Because the TMR is placed in the cow housing areas, if emissions from enclosed freestall barns could be captured and vented to a control device, emissions from the TMR could also be controlled.

Description of Dairy Housing

In a freestall barn, cows are grouped in large pens with free access to feed bunks, water, and stalls for resting. In the mild climate of the San Joaquin Valley, the typical freestall barn is an open structure (roof but no sides). The primary freestall design consists of a roof that provides shade with all sides open to allow air to flow through, which keeps the cows cool. The open freestall barns take advantage of natural summer winds in the San Joaquin Valley that are generally greater than four mph. The natural winds result in an excellent summer ventilation rate that is equivalent to 1,000 cfm per cow more, which is why open dairy barns are generally recommended in the San Joaquin Valley. In colder climates enclosed or partially enclosed barns may be utilized to protect cows from winter extremes. However, no completely enclosed freestall barns that were installed at a California dairy were identified.

Although the potential to enclose cows and TMR in a barn may exist, the feasibility of reasonably collecting the gas through a stack, chimney, or vent remains in question considering the extremely large amounts of airflow going through the barns needed to keep the cows cool. The airflow requirements would be even higher in the San Joaquin valley, where temperatures can exceed 110° F in the hot summer. If the barn exhaust can be properly captured it may be possible to vent it to a VOC control device. It is estimated that up to 80% of the gases emitted from enclosed freestall barns can be captured by the mechanical ventilation system and sent to a control device, such as an incinerator or biofilter.

Thermal incineration is a well-established VOC control technique. During combustion, gaseous hydrocarbons are oxidized to form CO_2 and water. In addition to the difficulty of capturing all of the gases in a freestall barn, a disadvantage of thermal incineration is that when concentrations of combustible VOCs in the gas stream are very low very large amounts of supplemental fuel must be used to sufficiently increase the temperature of all of the ventilation air in order to incinerate these VOCs. This generally renders incineration cost prohibitive for large flows of dilute VOCs, such as in the ventilation air from a freestall barn. Because of this biofilters have generally been found to be more cost-effective for handling dilute streams of biodegradable VOCs. 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 microorganisms oxidize the gaseous organic contaminants, ammonia, and sulfur compounds in the exhaust air resulting in carbon dioxide, nitrogen, water, salt, and biomass. Additional information on biofiltration is given above in the analysis for the cow housing permit unit for enclosed freestall barns vented to a control device. One of the disadvantages related to the use of a biofilter to control emissions from enclosed livestock barns is the large space requirement for the traditional biofilter design. To illustrate this, a low-cost natural bed biofilter designed to treat the VOC emissions from 1,000 milk cows and 180 dry cows with no support stock would cover more than 5.4 acres and would need to be maintained free of pests and approved by the appropriate permitting agencies. To avoid such expansive land requirements, the dairy would likely need to use much more expensive bio-trickling filters or bio-scrubbers.

Although many questions remain about the feasibility of requiring animals and TMR to be confined in buildings and capturing the exhaust gas and venting it to a control device, it will be considered for purposes of this analysis.

2) Rule 4570 Management Practices for 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 feed lane 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 mooisture content, which reduces VOCs since most of the compounds emitted are higly soluable in water. More details about these management practices are included in the District document Final Staff Report – Revised Proposed Amendments to Rule 4570 (Confined Animal Facilities), dated October 21, 2010.

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

After eliminating the technologically infeasible options, the remaining options are ranked according to their control efficiency.

1) Enclosed Buildings for Animals and TMR with Emissions Vented to a Control Device (e.g. incinerator, biofilter, e.g) (≈64-72%; 80% Capture and 80-90% Control of emissions from cow housing and total mixed ration (TMR) feed placed in the cow housing unit)
2) Rule 4570 Management Practices for TMR

d. Step 4 - Cost Effectiveness Analysis

Enclosed Freestall Barns Vented to a Control Device (Biofilter)
The cost analysis performed for the BACT analysis for VOC emissions from the cow housing permit demonstrated that this option exceeded the District VOC cost effective threshold by a significant amount. (See BACT analysis for the Cow Housing Permit for details of the analysis.) This analysis included VOC reductions from Total Mixed Ration (TMR) as well as the cow housing since enclosed freestall barns vented to a control device would control emissions from both sources because the TMR is placed in the cow housing areas to feed the cows. Therefore, no further cost analysis is required for enclosed freestall barns to control emissions from TMR.

Rule 4570 Management Practices for TMR:
This option is achieved in practice; therefore a cost analysis is not required.

e. Step 5 - Select BACT

BACT for VOC from TMR is to implement the management practices required by District Rule 4570 to reduce VOC emissions from the TMR.

Top Down BACT Analysis for Confined Animal Facility – Feed Storage and Handling System – Silage Piles for VOC Emissions

a. Step 1 - Identify all control technologies

The following options were identified as possible controls for VOC emissions from silage:

1) Fully Enclosed Silage Vented to a Control Device
2) Rule 4570 Management Practices for Silage

Description of Control Technologies

1) Fully Enclosed Silage Vented to a Control Device

This control would entail total containment of the silage in a sealed space such as a silo, plastic bag, or building. The containment would then be ducted and vented appropriately to ensure that any emissions coming off the silage is captured and directed to a VOC control device such as a thermal oxidizer or biofilter, as already described in preceding parts of this analysis.

2) Rule 4570 Management Practices for Silage

District Rule 4570 requires the implementation of various management practices to reduce VOC emissions from silage. These practices include building silage piles with higher bulk densities, using silage additives or inoculants, limiting the open area of silage pile faces exposed for access purposes, managing the open silage face so that it is clean and relatively smooth, and covering silage piles or using sealed silage bags. These management practices reduce the quantities of VOCs produced in the silage and/or reduce the rate at which the VOC present in the silage are emitted to the atmosphere. More details about these management practices are included in the District document Final Staff Report – Revised Proposed Amendments to Rule 4570 (Confined Animal Facilities), dated October 21, 2010.

b. Step 2 - Eliminate technologically infeasible options

Fully Enclosed Silage Vented to a Control Device cannot reasonably be considered technologically feasible because of the reasons given below.

Production of silage is an anaerobic process whose purpose is to move the ensiled plant material from an aerobic phase to an anaerobic phase as quickly as possible and achieve a rapid drop in pH that will hinder further microbial decomposition in order to preserve the nutritive value of the forage. The rapid drop in pH is primarily caused by conversion of soluble carbohydrates to nonvolatile lactic acid.

Infiltration of air into the ensiled material is highly undesirable as this encourages the growth of aerobic microbes which cause decomposition (spoilage) of the feed. The resulting heat and carbon dioxide produced by aerobic microbes are indicative of lost dry matter and energy content. Aerobic deterioration and heating of silage in bunkers or piles are well-known problems. Many steps are taken to prevent this loss of nutritive value. Active venting of silage would therefore be completely counterproductive to the silage making process as it would introduce oxygen into the silage and result in spoilage and the losses of nutritive value that producers are attempting to avoid.

Passive venting of silage to a control device may be considered to be more feasible but this option is not currently reasonable. Because of the need to maintain anaerobic conditions to preserve the nutritive value of the silage, silage piles are usually tightly compacted and covered with plastic to prevent air penetration. Because most of the surface area of silage piles will usually have a compacted surface covered by plastic, the vast majority of emissions will be from the part of the pile that is uncovered to allow removal of feed. Machinery must access this open portion of the silage pile at various times throughout the day to obtain feed for the animals; therefore, enclosing this portion of the pile to allow passive ventilation is not reasonable.

c. Step 3 - Rank remaining options by control effectiveness

After eliminating the technologically infeasible options, the remaining options are ranked according to their control efficiency.

1) Rule 4570 Management Practices for Silage

d. Step 4 - Cost Effectiveness Analysis

Since the remaining control option has been achieved in practice, a cost effectiveness analysis is not required.

e. Step 5 - Select BACT

BACT for VOC from Silage is to implement the management practices required by District Rule 4570 to reduce VOC emissions from the Silage.

APPENDIX D
HRA/AAQA Summary

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

To:	John Yoshimura – Permit Services
From:	Will Worthley – Technical Services
Date:	January 30, 2019
Facility Name:	BAR VP HEIFER RANCH
Location:	ROAD 104 AND AVENUE 96, (9181 ROAD 104), PIXLEY
Application #(s):	S-6473-2-1, -3-2, -4-2, -5-2
Project #:	S-1182820

1. SUMMARY

1.1 RMR

Units	Prioritization Score	Acute Hazard Index	Chronic Hazard Index	Maximum Individual Cancer Risk	T-BACT Required	Special Permit Requirements
2-1	0.78	0.04	0.07	2.24E-06	No*	No
3-2	1.16	0.00	0.00	3.58E-06	Yes	No
4-2	0.78	0.00	0.00	0.00E+00	No	No
Project Totals	>1	0.04	0.07	5.82E-06		
Facility Totals	>1	0.19	0.14	1.76E-05		

*T-BACT is determined on a corral-by-corral basis and all corrals have a risk under 1.00E-06.

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

Notes:
1. Results were taken from the attached AAQA Report.
2. The criteria pollutants are below EPA's level of significance as found in 40 CFR Part 51.165 (b)(2) unless otherwise noted below.
3. Modeled PM10 and PM2.5 concentrations were below the District SIL for fugitive sources of 10.4 μg/m^3 for the 24-hour average concentration and 2.08 μg/m^3 for the annual concentration.

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

<u>Unit #2-1, 3-2, & 4-2</u>

1. No special requirements.

T-BACT is required for this unit because of emissions of 1,3-Butadiene, which is a VOC.

2. Project Description

Technical Services received a request on September 13, 2018 to perform a Risk Management Review (RMR) and Ambient Air Quality Analysis (AAQA) for the following:

- Unit -2-1: COW HOUSING - HEIFER RANCH CONSISTING OF 4,310 SUPPORT STOCK (HEIFERS AND CALVES) WHICH INCLUDES 2,810 LARGE HEIFERS
- Unit -3-2: LIQUID MANURE HANDLING SYSTEM CONSISTING OF A ONE STORAGE POND (1302' X 303' X 20'), ONE LAGOON (557' X 303' X 20'), ONE FLUSH PIT (342' X 64' X 20'), ONE PROCESSING PIT (40' X 15' X 15') AND ONE MECHANICAL SEPARATOR. MANURE IS LAND APPLIED THROUGH FLOOD IRRIGATION AND FURROW IRRIGATION: EVALUATE THE LIQUID MANURE EMISSIONS FROM 4,310 SUPPORT STOCK
- Unit -4-2: SOLID MANURE HANDLING: EVALUATE THE SOLID MANURE EMISSIONS FROM 4,310 SUPPORT STOCK
- Unit -5-2: FEED STORAGE AND HANDLING CONSISTING OF COMMODITY BARNS AND SILAGE PILES: EVALUATE THE FEED EMISSIONS FOR 4,310 SUPPORT STOCK

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 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, Feedlot, or from Livestock Dust) 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 2007-2011 from Tipton (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:

Source Process Rates

Housing Name(s) or #(s)	VOC (lb/hr)	VOC (lb/yr)	NH3 (lb/hr)	NH3 (lb/yr)	PM10 (lb/hr)	PM10 (lb/yr)
VP1	0.1000	864	0.1417	1,224	0.104166667	925
VP2	0.1000	864	0.1417	1,224	0.104166667	925
VP3	0.1000	864	0.1417	1,224	0.104166667	925
VP4	0.1000	864	0.1417	1,224	0.104166667	925
VP5	0.1000	864	0.1417	1,224	0.104166667	925
VP6	0.1000	864	0.1417	1,224	0.104166667	925
VP7	0.0500	432	0.0708	612	0.054166667	463
VP8	0.0500	432	0.0708	612	0.054166667	463
VP9	0.0500	432	0.0708	612	0.054166667	463
VP10	0.1000	864	0.1417	1,224	0.079166667	702
VP11	0.1083	950	0.1542	1,346	0.087500000	773

VP12	0.1083	950	0.1542	1,346	0.087500000	773
VP13	0.0250	216	0.0333	306	0.020833333	176
VP14	0.0250	216	0.0333	306	0.020833333	176
VP15	0.1250	1,080	0.1750	1,530	0.100000000	878
VP16	0.125	1080	0.175	1530	0.100000000	878
VP17	0.125	1080	0.175	1530	0.100000000	878
VP18	0.15	1296	0.208333333	1836	0.120833333	1054
VP19	0.075	648	0.104166667	918	0.058333333	527
VP20	0.075	648	0.104166667	918	0.058333333	527
VP21	0.01666667	130	0.020833333	184	0.012500000	115
VP22	0.01666667	130.00	0.020833333	184	0.012500000	115
VP23	0.01666667	130.00	0.020833333	184	0.012500000	105
VP24	0.01666667	130.00	0.020833333	184	0.012500000	105
VP25	0.1	864.00	0.141666667	1,224	0.079166667	702
VP26	0.1	864	0.141666667	1,224	0.079166667	702
VP27	0.1	864.00	0.141666667	1,224	0.079166667	702
Liquid Manure Handling (Unit 3-2)						
Lagoon	0.3	2227	0.2	1351	-	-
Land App Liquid	0.3	2409	0.8	7118	-	-
Solid Manure Handling (Unit 4-2)						
Solid Pile Storage	0.04	329	0.2	1497	-	-
Land App Solid	0.1	548	0.2	1679	-	-

Polygon Area Source Parameters

Unit ID	Unit Description	Release Height (m)	No. Vertices	Area (m^2)
2	VP17	1.00	4	9178
2	VP2	1.00	4	4785
2	VP3	1.00	4	4276
2	VP4	1.00	4	4607
2	VP5	1.00	4	5550
2	VP6	1.00	4	5331
2	VP7	1.00	4	2921
2	VP8	1.00	4	2531
2	VP9	1.00	4	2531
2	VP10	1.00	4	7485
2	VP11	1.00	4	9096
2	VP12	1.00	4	9490
2	VP13	1.00	4	1656
2	VP14	1.00	5	1649
2	VP1	1.00	4	4572
2	VP23	1.00	6	799
2	VP27	1.00	4	8311
2	VP26	1.00	4	8136
2	VP15	1.00	4	9419
2	VP24	1.00	4	923
2	VP16	1.00	5	8805
2	VP22	1.00	4	1428
2	VP21	1.00	4	1580
2	VP20	1.00	4	6420
2	VP19	1.00	4	6206
2	VP18	1.00	4	13322
2	VP25	1.00	4	8853
3	Land App Liquid	0.00	6	1932292
3	Lagoon 1	0.00	6	41712
4	Soild Pile Storage	0.00	4	2065
4	Land App Solid	0.00	6	1932292

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:

Monitoring Stations

Pollutant	Station Name	County	City	Measurement Year
PM10	Visalia - N. Church	Tulare	Visalia	2016
PM2.5	Visalia - N. Church	Tulare	Visalia	2016

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

Emission Rates (lbs/hour)

Unit ID	Process	NOx	SOx	CO	PM10	PM2.5
1	1	0.00	0.00	0.00	0.15	0.15
2	1	0.00	0.00	0.00	0.17	0.17
3	1	0.00	0.00	0.00	0.17	0.17
4	1	0.00	0.00	0.00	0.15	0.15
5	1	0.00	0.00	0.00	0.15	0.15
6	1	0.00	0.00	0.00	0.17	0.17
7	1	0.00	0.00	0.00	0.08	0.08
8	1	0.00	0.00	0.00	0.08	0.08
9	1	0.00	0.00	0.00	0.08	0.08
10	1	0.00	0.00	0.00	0.11	0.11
11	1	0.00	0.00	0.00	0.14	0.14
12	1	0.00	0.00	0.00	0.14	0.14
13	1	0.00	0.00	0.00	0.03	0.03
14	1	0.00	0.00	0.00	0.02	0.02
15	1	0.00	0.00	0.00	0.14	0.14
16	1	0.00	0.00	0.00	0.13	0.13
17	1	0.00	0.00	0.00	0.13	0.13
18	1	0.00	0.00	0.00	0.16	0.16
19	1	0.00	0.00	0.00	0.08	0.08
20	1	0.00	0.00	0.00	0.08	0.08
21	1	0.00	0.00	0.00	0.02	0.02
22	1	0.00	0.00	0.00	0.02	0.02
23	1	0.00	0.00	0.00	0.01	0.01
24	1	0.00	0.00	0.00	0.02	0.02
25	1	0.00	0.00	0.00	0.10	0.10
26	1	0.00	0.00	0.00	0.10	0.10
27	1	0.00	0.00	0.00	0.10	0.10

Emission Rates (lbs/year)

Unit ID	Process	NOx	SOx	CO	PM10	PM2.5
1	1	000	000	000	1,295	1,295
2	1	000	000	000	1,480	1,480
3	1	000	000	000	1,480	1,480
4	1	000	000	000	1,295	1,295
5	1	000	000	000	1,295	1,295
6	1	000	000	000	1,480	1,480
7	1	000	000	000	740	740
8	1	000	000	000	740	740
9	1	000	000	000	648	648
10	1	000	000	000	983	983
11	1	000	000	000	1,236	1,236
12	1	000	000	000	1,236	1,236
13	1	000	000	000	281	281
14	1	000	000	000	141	141
15	1	000	000	000	1,229	1,229
16	1	000	000	000	1,089	1,089
17	1	000	000	000	1,159	1,159
18	1	000	000	000	1,391	1,391
19	1	000	000	000	695	695
20	1	000	000	000	695	695
21	1	000	000	000	152	152
22	1	000	000	000	152	152
23	1	000	000	000	084	084
24	1	000	000	000	139	139
25	1	000	000	000	927	927
26	1	000	000	000	927	927
27	1	000	000	000	871	871

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 2007-2011 from Tipton (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)
1	VP1	1.00	4	164320
2	VP1	1.00	4	171984
3	VP1	1.00	4	153662
4	VP1	1.00	4	165563
5	VP1	1.00	4	199473
6	VP1	1.00	4	191608
7	VP1	1.00	4	206062
8	VP1	1.00	4	178540
9	VP1	1.00	4	178540
10	VP1	1.00	4	269012
11	VP1	1.00	4	279455
12	VP1	1.00	4	291562
13	VP1	1.00	4	197122
14	VP1	1.00	5	196309
15	VP1	1.00	4	309320
16	VP1	1.00	5	289151
17	VP1	1.00	4	301405
18	VP1	1.00	4	357398
19	VP1	1.00	4	337735
20	VP1	1.00	4	349406
21	VP1	1.00	4	250765
22	VP1	1.00	4	226644
23	VP1	1.00	6	169099
24	VP1	1.00	4	159760
25	VP1	1.00	4	318188
26	VP1	1.00	4	292406
27	VP1	1.00	4	298686

5. Conclusion

5.1 RMR

Unit 3-2

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. However, the cancer risk for one or more units in this project is greater than 1.0 in a million. **In accordance with the District's Risk Management Policy, the project is approved with Toxic Best Available Control Technology (T-BACT).**

Units 2-1 & 4-2

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, the 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.

5.2 AAQA

The ambient air quality impacts from PM_{10} & $PM_{2.5}$ emissions at the proposed dairy does not exceed the District's 24-hour or Annual interim threshold for fugitive dust sources.

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

E. AAQA results

APPENDIX E
Dairy Potential to Emit Calculations

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					0
Dry Cows					0
Support Stock (Heifers, Calves, and Bulls)					0
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							0

Total Herd Summary	
Total Milk Cows	0
Total Mature Cows	0
Support Stock (Heifers, Calves, and Bulls)	0
Total Calves	0
Total Dairy Head	0

Pre-Project Silage Information

Feed Type	Max # Open Piles	Max Height (ft)	Max Width (ft)
Corn			
Alfalfa			
Wheat			

Post-Project Facility Information

1. Does this facility house Holstein or Jersey cows? Holstein
   Most facilities house Holstein cows unless explicitly stated on the PTO or application.
2. Does the facility have an 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.
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					0
Dry Cows					0
Support Stock (Heifers, Calves, and Bulls)			1,500		1,500
Large Heifers			2,810		2,810
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							0

Total Herd Summary	
Total Milk Cows	0
Total Mature Cows	0
Support Stock (Heifers, Calves, and Bulls)	4,310
Total Calves	0
Total Dairy Head	4,310

Post-Project Silage Information

Feed Type	Max # Open Piles	Max Height (ft)	Max Width (ft)
Corn			
Alfalfa			
Wheat	2	20	80

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	0%	0%
		Total Control Efficiency	0%	0%
		Milking Parlor Floor Mitigations		
☐	☐	**(D)** Feed according to NRC guidelines	0%	0%
☐	☐	**(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	0%	0%

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	0%	10%
		Total Control Efficiency	0%	10%
		Corrals/Pens Mitigations		
☐	☑	Feed according to NRC guidelines	0%	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%	10%
☐	☑	**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%	10%
☐	☑	Scrape, vacuum, or flush concrete lanes in corrals at least once every day for mature cows and every seven days for support stock, or clean concrete lanes such that the depth of manure does not exceed 12 inches at any point or time. Note: No additional control given for increased cleaning frequency (e.g. BACT requirement).	0%	10%
☐	☑	Implement one of the following: 1) slope the surface of the corrals at least 3% where the available space for each animal is 400 sq ft or less and slope the surface of the corrals at least 1.5% where the available space for each animal is more than 400 sq ft; 2) maintain corrals to ensure proper drainage preventing water from standing more than 48 hrs; 3) harrow, rake, or scrape pens sufficiently to maintain a dry surface. Note: If selected for dairies > 999 milk cows, CE already included in EF.	0%	10%
☐	☐	Install shade structures such that they are constructed with a light permeable roofing material. Note: If selected for dairies > 999 milk cows, the control efficiency will be 5% since the EF used includes a partial control for this measure.	0%	10%
☐	☑	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%	10%
☐	☐	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	0.00%	52.17%
		Bedding Mitigations		
☐	☑	Feed according to NRC guidelines	0%	10%
☐	☐	Use non-manure-based bedding and non-separated solids based bedding for at least 90% of the bedding material, by weight, for freestalls (e.g. rubber mats, almond shells, sand, or waterbeds).	0%	0%

☐	☐	For a large dairy (1,000 milk cows or larger) or a heifer/calf ranch - Remove manure that is not dry from individual cow freestall beds or rake, harrow, scrape, or grade freestall bedding at least once every 7 days.	0%	0%
☐	☐	**(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	0.00%	10.00%
		Lanes Mitigations		
☐	☑	Feed according to NRC guidelines	0%	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.	0%	0%
☐	☐	**(D)** Have no animals in exercise pens or corrals at any time.	0%	0%
		Total Control Efficiency	0.00%	10.00%

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	0%	10%
☐	☐	Use phototropic lagoon	0%	0%
☐	☑	Use an anaerobic treatment lagoon designed according to NRCS Guideline No. 359	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%	10%
☐	☐	Maintain lagoon pH between 6.5 and 7.5	0%	0%
		Total Control Efficiency	0.00%	51.40%
		Liquid Manure Land Application Mitigations		
☐	☑	Feed according to NRC guidelines	0%	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%	10%
☐	☐	Apply liquid/slurry manure via injection with drag hose or similar apparatus	0%	0%
		Total Control Efficiency	0.00%	51.40%

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	0%	10%
☐	☐	**LARGE CAFO ONLY**: Within 72 hours of removal from housing, either a) remove dry manure from the facility, or b) cover dry manure outside the housing with a weatherproof covering from October through May, except for times when wind events remove the covering, not to exceed 24 hours per event.	0%	0%
		Total Control Efficiency	0.00%	10.00%
		Separated Solids Piles Mitigations		
☐	☑	Feed according to NRC guidelines	0%	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	0.00%	10.00%
		Solid Manure Land Application Mitigations		
☐	☑	Feed according to NRC guidelines	0%	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%	10%
☐	☐	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	0.00%	19.00%

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 <u>two</u> of the following: For heifer/calf ranches - implement <u>one</u> of the following: <u>Manage Exposed Silage</u>. 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. <u>Maintain Silage Working Face</u>. 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 <u>Silage Additive</u>: 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.	0.0%	32.5%
		Total Control Efficiency*	0.00%	32.50%

*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.	0%	0%
☐	☐	**(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.	0%	10%
☐	☐	**(D)** For total mixed rations that contain at least 30% by weight of silage, feed animals total mixed rations that contain at least 45% moisture.	0%	0%
☐	☑	Feed according to NRC guidelines. Note: If selected for dairies, control efficiency already included in EF.	0%	10%
		Total Control Efficiency	0.00%	10.00%

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	0%	0%
		Total Control Efficiency	0%	0%

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	0%	28%
☐	☑	Clean manure from corrals at least four times per year with at least 60 days between cleaning, or clean corrals at least once between April and July and at least once between September and December. **OR** Use lime or a similar absorbent material in the corral according to the manufacturer's recommendation to minimize moisture in the corrals. **OR** Apply thymol to the corral soil in accordance with the manufacturer's recommendation.	0%	50%
		Total Control Efficiency	0%	64%
		Bedding Mitigations		
☐	☑	Feed according to NRC guidelines	0%	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.	0.0%	0.0%
		Total Control Efficiency	0.00%	28.00%
		Lanes Mitigations		
☐	☑	Feed according to NRC guidelines	0%	28%
		Total Control Efficiency	0%	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	0%	28%
☐	☑	Use phototropic lagoon **OR** Remove solids from the waste system with a solid separator system, prior to the waste entering the lagoon.	0%	80%
		Total Control Efficiency	0.0%	85.6%
		Liquid Manure Land Application Mitigations		
☐	☑	Feed according to NRC guidelines	0%	28%
☐	☑	Only apply liquid manure that has been treated with an anaerobic treatment lagoon	0%	42%
		Total Control Efficiency	0.00%	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	0%	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	0.00%	28.00%

lb/hd-yr Dairy Emissions Factors for Holstein Cows

			Milk Cows				Dry Cows				Large Heifers (15 to 24 months)			
			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
Milking Parlor	VOC	Enteric Emissions in Milking Parlors	0.43	0.41	0.43	0.43	-	-	-	-	-	-	-	-
		Milking Parlor Floor	0.04	0.03	0.04	0.04	-	-	-	-	-	-	-	-
		Total	0.47	0.44	0.47	0.47	-	-	-	-	-	-	-	-
	NH3	Total	0.19	0.19	0.19	0.19	-	-	-	-	-	-	-	-
Cow Housing	VOC	Enteric Emissions in Cow Housing	3.89	3.69	3.89	3.50	2.33	2.23	2.33	2.10	1.81	1.71	1.81	1.63
		Corrals/Pens	10.00	6.60	10.00	4.78	5.40	3.59	5.40	2.58	4.20	2.76	4.20	2.01
		Bedding	1.05	1.00	1.05	0.95	0.57	0.54	0.57	0.51	0.44	0.42	0.44	0.40
		Lanes	0.84	0.80	0.84	0.76	0.45	0.44	0.45	0.41	0.35	0.33	0.35	0.32
		Total	15.78	12.09	15.78	9.98	8.75	6.80	8.75	5.60	6.81	5.22	6.81	4.36
	NH3	Enteric Emissions in Cow Housing	-	-	-	-	-	-	-	-	-	-	-	-
		Corrals/Pens	41.90	41.90	41.90	15.08	21.20	21.20	21.20	7.63	11.00	11.00	11.00	3.96
		Bedding	6.30	6.30	6.30	4.54	3.20	3.20	3.20	2.30	1.70	1.70	1.70	1.22
		Lanes	5.10	5.10	5.10	3.67	2.60	2.60	2.60	1.87	1.30	1.30	1.30	0.94
		Total	53.30	53.30	53.30	23.29	27.00	27.00	27.00	11.81	14.00	14.00	14.00	6.12
Liquid Manure Handling	VOC	Lagoons/Storage Ponds	1.52	1.30	1.52	0.74	0.82	0.71	0.82	0.40	0.64	0.54	0.64	0.31
		Liquid Manure Land Application	1.64	1.40	1.64	0.80	0.89	0.76	0.89	0.43	0.69	0.58	0.69	0.33
		Total	3.16	2.70	3.16	1.54	1.71	1.47	1.71	0.83	1.33	1.13	1.33	0.65
	NH3	Lagoons/Storage Ponds	8.20	8.20	8.20	1.18	4.20	4.20	4.20	0.60	2.20	2.20	2.20	0.32
		Liquid Manure Land Application	8.90	8.90	8.90	3.72	4.50	4.50	4.50	1.88	2.30	2.30	2.30	0.96
		Total	17.10	17.10	17.10	4.90	8.70	8.70	8.70	2.48	4.50	4.50	4.50	1.28
Solid Manure Handling	VOC	Solid Manure Storage	0.16	0.15	0.16	0.14	0.09	0.08	0.09	0.08	0.07	0.06	0.07	0.06
		Separated Solids Piles	0.06	0.06	0.06	0.05	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.02
		Solid Manure Land Application	0.39	0.33	0.39	0.32	0.21	0.18	0.21	0.17	0.16	0.14	0.16	0.13
		Total	0.61	0.54	0.61	0.51	0.33	0.29	0.33	0.28	0.26	0.23	0.26	0.22
	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
		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
		Solid Manure Land Application	2.09	2.09	2.09	1.50	1.06	1.06	1.06	0.76	0.55	0.55	0.55	0.40
		Total	3.42	3.42	3.42	2.83	1.73	1.73	1.73	1.43	0.90	0.90	0.90	0.75

			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	
			<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	-	-	-	-		-	-	-		-	-	-		-	-	-
		Milking Parlor Floor	-	-	-	-		-	-	-		-	-	-		-	-	-
		Total	-	-	-	-		-	-	-		-	-	-		-	-	-
	NH3	Total	-	-	-	-		-	-	-		-	-	-		-	-	-
Cow Housing	VOC	Enteric Emissions in Cow Housing	1.23	1.17	1.23	1.11	0.69	0.65	0.69	0.62	0.32	0.31	0.32	0.29	1.10	1.04	1.10	0.99
		Corrals/Pens	2.85	1.88	2.85	1.36	1.60	1.04	1.60	0.77	0.75	0.50	0.75	0.36	2.55	1.67	2.55	1.22
		Bedding	0.30	0.28	0.30	0.27	0.17	0.16	0.17	0.15	0.08	0.08	0.08	0.07	0.27	0.25	0.27	0.24
		Lanes	0.24	0.23	0.24	0.22	0.13	0.13	0.13	0.12	0.06	0.06	0.06	0.06	0.21	0.20	0.21	0.19
		Total	4.62	3.56	4.62	2.96	2.59	1.98	2.59	1.66	1.22	0.95	1.22	0.78	4.13	3.16	4.13	2.64
	NH3	Enteric Emissions in Cow Housing	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Corrals/Pens	7.90	7.90	7.90	2.84	6.00	6.00	6.00	2.16	1.80	1.80	1.80	0.65	15.30	15.30	15.30	5.51
		Bedding	1.20	1.20	1.20	0.86	0.90	0.90	0.90	0.65	0.30	0.30	0.30	0.22	2.30	2.30	2.30	1.66
		Lanes	1.00	1.00	1.00	0.72	0.70	0.70	0.70	0.50	0.20	0.20	0.20	0.14	1.90	1.90	1.90	1.37
		Total	10.10	10.10	10.10	4.43	7.60	7.60	7.60	3.31	2.30	2.30	2.30	1.01	19.50	19.50	19.50	8.53
Liquid Manure Handling	VOC	Lagoons/Storage Ponds	0.43	0.37	0.43	0.21	0.24	0.21	0.24	0.12	0.11	0.10	0.11	0.06	0.40	0.33	0.40	0.19
		Liquid Manure Land Application	0.47	0.40	0.47	0.23	0.26	0.22	0.26	0.13	0.12	0.11	0.12	0.06	0.42	0.35	0.42	0.20
		Total	0.90	0.77	0.90	0.44	0.51	0.43	0.51	0.25	0.24	0.21	0.24	0.12	0.82	0.68	0.82	0.40
	NH3	Lagoons/Storage Ponds	1.50	1.50	1.50	0.22	1.20	1.20	1.20	0.17	0.35	0.35	0.35	0.05	3.00	3.00	3.00	0.43
		Liquid Manure Land Application	1.70	1.70	1.70	0.71	1.30	1.30	1.30	0.54	0.37	0.37	0.37	0.15	3.23	3.23	3.23	1.35
		Total	3.20	3.20	3.20	0.93	2.50	2.50	2.50	0.72	0.72	0.72	0.72	0.20	6.23	6.23	6.23	1.78
Solid Manure Handling	VOC	Solid Manure Storage	0.05	0.04	0.05	0.04	0.03	0.02	0.03	0.02	0.01	0.01	0.01	0.01	0.04	0.04	0.04	0.04
		Separated Solids Piles	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	0.11	0.09	0.11	0.09	0.06	0.05	0.06	0.05	0.03	0.03	0.03	0.02	0.10	0.08	0.10	0.08
		Total	0.17	0.15	0.17	0.15	0.10	0.09	0.10	0.08	0.05	0.04	0.05	0.04	0.16	0.14	0.16	0.14
	NH3	Solid Manure Storage	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	0.07	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	0.39	0.39	0.39	0.28	0.30	0.30	0.30	0.22	0.09	0.09	0.09	0.06	0.76	0.76	0.76	0.55
		Total	0.64	0.64	0.64	0.53	0.48	0.48	0.48	0.40	0.15	0.15	0.15	0.12	1.25	1.25	1.25	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	34,681	23,410
		Alfalfa Silage	17,458	17,458	11,784
		Wheat Silage	43,844	43,844	29,595
		TMR	13,056	13,056	11,750

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	12.5%
Feeding young stock (heifers and calves) near dusk	10%

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	VP1	open corral	support stock	200	200		☑	☐	☐	☐	☐	☐	☑	☑	☑
2	VP2	open corral	support stock	200	200		☑	☐	☐	☐	☐	☐	☑	☑	☑
3	VP3	open corral	support stock	200	200		☑	☐	☐	☐	☐	☐	☑	☑	☑
4	VP4	open corral	support stock	200	200		☑	☐	☐	☐	☐	☐	☑	☑	☑
5	VP5	open corral	support stock	200	200		☑	☐	☐	☐	☐	☐	☑	☑	☑
6	VP6	open corral	support stock	200	200		☑	☐	☐	☐	☐	☐	☑	☑	☑
7	VP7	open corral	support stock	100	100		☑	☐	☐	☐	☐	☐	☑	☑	☑
8	VP8	open corral	support stock	100	100		☑	☐	☐	☐	☐	☐	☑	☑	☑
9	VP9	open corral	support stock	100	100		☑	☐	☐	☐	☐	☐	☑	☑	☑
10	VP10	open corral	large heifers	200	200		☑	☐	☐	☐	☐	☐	☑	☑	☑
11	VP11	open corral	large heifers	220	220		☑	☐	☐	☐	☐	☐	☑	☑	☑
12	VP12	open corral	large heifers	220	220		☑	☐	☐	☐	☐	☐	☑	☑	☑
13	VP13	open corral	large heifers	50	50		☑	☐	☐	☐	☐	☐	☑	☑	☑
14	VP14	open corral	large heifers	50	50		☑	☐	☐	☐	☐	☐	☑	☑	☑
15	VP15	open corral	large heifers	250	250		☑	☐	☐	☐	☐	☐	☑	☑	☑
16	VP16	open corral	large heifers	250	250		☑	☐	☐	☐	☐	☐	☑	☑	☑
17	VP17	open corral	large heifers	250	250		☑	☐	☐	☐	☐	☐	☑	☑	☑
18	VP18	open corral	large heifers	300	300		☑	☐	☐	☐	☐	☐	☑	☑	☑
19	VP19	open corral	large heifers	150	150		☑	☐	☐	☐	☐	☐	☑	☑	☑
20	VP20	open corral	large heifers	150	150		☑	☐	☐	☐	☐	☐	☑	☑	☑
21	VP21	open corral	large heifers	30	30		☐	☐	☐	☐	☐	☐	☑	☑	☑
22	VP22	open corral	large heifers	30	30		☐	☐	☐	☐	☐	☐	☑	☑	☑
23	VP23	open corral	large heifers	30	30		☑	☐	☐	☐	☐	☐	☑	☑	☑
24	VP24	open corral	large heifers	30	30		☑	☐	☐	☐	☐	☐	☑	☑	☑
25	VP25	open corral	large heifers	200	200		☑	☐	☐	☐	☐	☐	☑	☑	☑
26	VP26	open corral	large heifers	200	200		☑	☐	☐	☐	☐	☐	☑	☑	☑
27	VP27	open corral	large heifers	200	200		☑	☐	☐	☐	☐	☐	☑	☑	☑

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
		Post-Project Total # of Cows	4,310				4,310							

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	VP1	open corral	support stock	200	200	10.550	8.3%						15%	37.5%	10%	4.63
2	VP2	open corral	support stock	200	200	10.550	8.3%						15%	37.5%	10%	4.63
3	VP3	open corral	support stock	200	200	10.550	8.3%						15%	37.5%	10%	4.63
4	VP4	open corral	support stock	200	200	10.550	8.3%						15%	37.5%	10%	4.63
5	VP5	open corral	support stock	200	200	10.550	8.3%						15%	37.5%	10%	4.63
6	VP6	open corral	support stock	200	200	10.550	8.3%						15%	37.5%	10%	4.63
7	VP7	open corral	support stock	100	100	10.550	8.3%						15%	37.5%	10%	4.63
8	VP8	open corral	support stock	100	100	10.550	8.3%						15%	37.5%	10%	4.63
9	VP9	open corral	support stock	100	100	10.550	8.3%						15%	37.5%	10%	4.63
10	VP10	open corral	large heifers	200	200	8.010	8.3%						15%	37.5%	10%	3.51
11	VP11	open corral	large heifers	220	220	8.010	8.3%						15%	37.5%	10%	3.51
12	VP12	open corral	large heifers	220	220	8.010	8.3%						15%	37.5%	10%	3.51
13	VP13	open corral	large heifers	50	50	8.010	8.3%						15%	37.5%	10%	3.51
14	VP14	open corral	large heifers	50	50	8.010	8.3%						15%	37.5%	10%	3.51
15	VP15	open corral	large heifers	250	250	8.010	8.3%						15%	37.5%	10%	3.51
16	VP16	open corral	large heifers	250	250	8.010	8.3%						15%	37.5%	10%	3.51
17	VP17	open corral	large heifers	250	250	8.010	8.3%						15%	37.5%	10%	3.51
18	VP18	open corral	large heifers	300	300	8.010	8.3%						15%	37.5%	10%	3.51
19	VP19	open corral	large heifers	150	150	8.010	8.3%						15%	37.5%	10%	3.51
20	VP20	open corral	large heifers	150	150	8.010	8.3%						15%	37.5%	10%	3.51
21	VP21	open corral	large heifers	30	30	8.010							15%	37.5%	10%	3.83
22	VP22	open corral	large heifers	30	30	8.010							15%	37.5%	10%	3.83
23	VP23	open corral	large heifers	30	30	8.010	8.3%						15%	37.5%	10%	3.51
24	VP24	open corral	large heifers	30	30	8.010	8.3%						15%	37.5%	10%	3.51
25	VP25	open corral	large heifers	200	200	8.010	8.3%						15%	37.5%	10%	3.51
26	VP26	open corral	large heifers	200	200	8.010	8.3%						15%	37.5%	10%	3.51
27	VP27	open corral	large heifers	200	200	8.010	8.3%						15%	37.5%	10%	3.51

Post-Project PM10 Control Efficiencies and Emission Factors for New Housing Emissions Units

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	VP1	support stock	200	4.36	6.12	4.63	2.4	872	3.4	1,224	2.5	925
2	VP2	support stock	200	4.36	6.12	4.63	2.4	872	3.4	1,224	2.5	925
3	VP3	support stock	200	4.36	6.12	4.63	2.4	872	3.4	1,224	2.5	925
4	VP4	support stock	200	4.36	6.12	4.63	2.4	872	3.4	1,224	2.5	925
5	VP5	support stock	200	4.36	6.12	4.63	2.4	872	3.4	1,224	2.5	925
6	VP6	support stock	200	4.36	6.12	4.63	2.4	872	3.4	1,224	2.5	925
7	VP7	support stock	100	4.36	6.12	4.63	1.2	436	1.7	612	1.3	463
8	VP8	support stock	100	4.36	6.12	4.63	1.2	436	1.7	612	1.3	463
9	VP9	support stock	100	4.36	6.12	4.63	1.2	436	1.7	612	1.3	463
10	VP10	large heifers	200	4.36	6.12	3.51	2.4	872	3.4	1,224	1.9	702
11	VP11	large heifers	220	4.36	6.12	3.51	2.6	959	3.7	1,346	2.1	773
12	VP12	large heifers	220	4.36	6.12	3.51	2.6	959	3.7	1,346	2.1	773
13	VP13	large heifers	50	4.36	6.12	3.51	0.6	218	0.8	306	0.5	176
14	VP14	large heifers	50	4.36	6.12	3.51	0.6	218	0.8	306	0.5	176
15	VP15	large heifers	250	4.36	6.12	3.51	3.0	1,090	4.2	1,530	2.4	878
16	VP16	large heifers	250	4.36	6.12	3.51	3.0	1,090	4.2	1,530	2.4	878
17	VP17	large heifers	250	4.36	6.12	3.51	3.0	1,090	4.2	1,530	2.4	878
18	VP18	large heifers	300	4.36	6.12	3.51	3.6	1,308	5.0	1,836	2.9	1,054
19	VP19	large heifers	150	4.36	6.12	3.51	1.8	654	2.5	918	1.4	527
20	VP20	large heifers	150	4.36	6.12	3.51	1.8	654	2.5	918	1.4	527
21	VP21	large heifers	30	4.36	6.12	3.83	0.4	131	0.5	184	0.3	115
22	VP22	large heifers	30	4.36	6.12	3.83	0.4	131	0.5	184	0.3	115
23	VP23	large heifers	30	4.36	6.12	3.51	0.4	131	0.5	184	0.3	105
24	VP24	large heifers	30	4.36	6.12	3.51	0.4	131	0.5	184	0.3	105
25	VP25	large heifers	200	4.36	6.12	3.51	2.4	872	3.4	1,224	1.9	702
26	VP26	large heifers	200	4.36	6.12	3.51	2.4	872	3.4	1,224	1.9	702
27	VP27	large heifers	200	4.36	6.12	3.51	2.4	872	3.4	1,224	1.9	702
	Post-Project # of Cows (non-expansion)		4,310				51.8	18,792	72.7	26,378	45.8	16,827

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)
Total # of Cows From Expansion		0				0.0	0	0.0	0	0.0	0

Post-Project Totals						
Total # of Cows	VOC (lb/day)	VOC (lb/yr)	NH3 (lb/day)	NH3 (lb/yr)	PM10 (lb/day)	PM10 (lb/yr)
4,310	51.8	18,792	72.7	26,378	45.8	16,827

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 Potential to Emit (PE2)

Post-Project Herd Size					
Herd	**Flushed Freestalls**	**Scraped Freestalls**	**Flushed Corrals**	**Scraped Corrals**	**Total # of Animals**
Milk Cows	0	0	0	0	0
Dry Cows	0	0	0	0	0
Support Stock (Heifers, Calves, and Bulls)	0	0	1,500	0	1,500
Large Heifers	0	0	2,810	0	2,810
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	0	0	0	0	0

Silage Information				
Feed Type	Maximum # Open Piles	Maximum Height (ft)	Maximum Width (ft)	Open Face Area (ft^2)
Corn	0	0	0	
Alfalfa	0	0	0	
Wheat	2	20	80	2,500

Milking Parlor				
Cow	VOC		NH3	
Milk Cows	lb/day	lb/yr	lb/day	lb/yr
Total	**0.0**	**0**	**0.0**	**0**

Cow Housing						
	VOC		NH3		PM10	
	lb/day	lb/yr	lb/day	lb/yr	lb/day	lb/yr
Total	**51.8**	**18,792**	**72.7**	**26,378**	**45.8**	**16,827**

Liquid Manure Handling						
Cow	VOC		NH3		H2S	
	lb/day	lb/yr	lb/day	lb/yr	lb/day	lb/yr
Milk Cows	0.0	0	0.0	0	0	0
Dry Cows	0.0	0	0.0	0	0	0
Support Stock (Heifers, Calves, and Bulls)	2.7	975	5.3	1,920	0.1	48
Large Heifers	5.0	1,827	9.9	3,597	0.2	89
Medium Heifers	0.0	0	0.0	0	0	0
Small Heifers	0.0	0	0.0	0	0	0
Calves	0.0	0	0.0	0	0	0
Bulls	0.0	0	0.0	0	0	0
Total	**7.7**	**2,802**	**15.2**	**5,517**	**0.3**	**137**

Solid Manure Handling				
Cow	VOC		NH3	
	lb/day	lb/yr	lb/day	lb/yr
Milk Cows	0.0	0	0.0	0
Dry Cows	0.0	0	0.0	0
Support Stock (Heifers, Calves, and Bulls)	0.9	330	3.1	1,125
Large Heifers	1.7	618	5.8	2,108
Medium Heifers	0.0	0	0.0	0
Small Heifers	0.0	0	0.0	0
Calves	0.0	0	0.0	0
Bulls	0.0	0	0.0	0
Total	**2.6**	**948**	**8.9**	**3,233**

Feed Handling and Storage		
	Daily PE (lb-VOC/day)	Annual PE (lb-VOC/yr)
Corn Emissions	0.0	0
Alfalfa Emissions	0.0	0
Wheat Emissions	21.8	7,948
TMR	105.6	38,533
Total	**127.4**	**46,481**

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	0.0	0.0	0.0
Cow Housing	0.0	0.0	45.8	0.0	51.8	72.7	0.0
Liquid Manure	0.0	0.0	0.0	0.0	7.7	15.2	0.3
Solid Manure	0.0	0.0	0.0	0.0	2.6	8.9	0.0
Feed Handling	0.0	0.0	0.0	0.0	127.4	0.0	0.0
Total	**0.0**	**0.0**	**45.8**	**0.0**	**189.5**	**96.8**	**0.3**

Major Source Emissions (lb/yr)					
Permit	**NOx**	**SOx**	**PM10**	**CO**	**VOC**
Milk Parlor	0	0	0	0	0
Cow Housing	0	0	0	0	0
Liquid Manure	0	0	0	0	1,337
Solid Manure	0	0	0	0	0
Feed Handling	0	0	0	0	0
Total	**0**	**0**	**0**	**0**	**1,337**

Total Annual Post-Project Potential to Emit (lb/yr)							
Permit	**NOx**	**SOx**	**PM10**	**CO**	**VOC**	**NH3**	**H2S**
Milking Parlor	0	0	0	0	0	0	0
Cow Housing	0	0	16,827	0	18,792	26,378	0
Liquid Manure	0	0	0	0	2,802	5,517	137
Solid Manure	0	0	0	0	948	3,233	0
Feed Handling	0	0	0	0	46,481	0	0
Total	**0**	**0**	**16,827**	**0**	**69,023**	**35,128**	**137**

BACT Applicability

Milking Parlor					
VOC Emissions					
	PE2 (lb/day)	PE1 (lb/day)	EF2	EF1	PE2 (lb/day)
Milk Cows	0.0	N/A	N/A	N/A	0.0
				Total	0.0
NH3 Emissions					
	PE2 (lb/day)	PE1 (lb/day)	EF2	EF1	PE2 (lb/day)
Milk Cows	0.0	N/A	N/A	N/A	0.0
				Total	0.0

Cow Housing
See detailed cow housing AIPE calculations on following pages.

Liquid Manure Handling					
VOC Emissions - Lagoon/Storage Pond(s)					
	PE2 (lb/day)	PE1 (lb/day)	EF2	EF1	PE2 (lb/day)
Milk Cows	0.0	N/A	N/A	N/A	0.0
Dry Cows	0.0	N/A	N/A	N/A	0.0
Support Stock (Heifers, Calves, and Bulls)	1.3	N/A	N/A	N/A	1.3
Large Heifers	2.4	N/A	N/A	N/A	2.4
Medium Heifers	0.0	N/A	N/A	N/A	0.0
Small Heifers	0.0	N/A	N/A	N/A	0.0
Calves	0.0	N/A	N/A	N/A	0.0
Bulls	0.0	N/A	N/A	N/A	0.0
BACT triggered for VOC for Lagoon/Storage Ponds				Total	3.7
VOC Emissions - Land Application					
	PE2 (lb/day)	PE1 (lb/day)	EF2	EF1	PE2 (lb/day)
Milk Cows	0.0	N/A	N/A	N/A	0.0
Dry Cows	0.0	N/A	N/A	N/A	0.0
Support Stock (Heifers, Calves, and Bulls)	1.4	N/A	N/A	N/A	1.4
Large Heifers	2.6	N/A	N/A	N/A	2.6
Medium Heifers	0.0	N/A	N/A	N/A	0.0
Small Heifers	0.0	N/A	N/A	N/A	0.0
Calves	0.0	N/A	N/A	N/A	0.0
Bulls	0.0	N/A	N/A	N/A	0.0
BACT triggered for VOC for Liquid Manure Land Application				Total	4.0
NH3 Emissions - Lagoon/Storage Pond(s)					
	PE2 (lb/day)	PE1 (lb/day)	EF2	EF1	PE2 (lb/day)
Milk Cows	0.0	N/A	N/A	N/A	0.0
Dry Cows	0.0	N/A	N/A	N/A	0.0
Support Stock (Heifers, Calves, and Bulls)	1.3	N/A	N/A	N/A	1.3
Large Heifers	2.4	N/A	N/A	N/A	2.4
Medium Heifers	0.0	N/A	N/A	N/A	0.0
Small Heifers	0.0	N/A	N/A	N/A	0.0
Calves	0.0	N/A	N/A	N/A	0.0
Bulls	0.0	N/A	N/A	N/A	0.0
BACT triggered for NH3 for Lagoon/Storage Ponds				Total	3.7
NH3 Emissions - Land Application					
	PE2 (lb/day)	PE1 (lb/day)	EF2	EF1	PE2 (lb/day)
Milk Cows	0.0	N/A	N/A	N/A	0.0
Dry Cows	0.0	N/A	N/A	N/A	0.0
Support Stock (Heifers, Calves, and Bulls)	3.9	N/A	N/A	N/A	3.9
Large Heifers	7.4	N/A	N/A	N/A	7.4
Medium Heifers	0.0	N/A	N/A	N/A	0.0
Small Heifers	0.0	N/A	N/A	N/A	0.0
Calves	0.0	N/A	N/A	N/A	0.0
Bulls	0.0	N/A	N/A	N/A	0.0
BACT triggered for NH3 for Liquid Manure Land Application				Total	11.3
H2S Emissions - Lagoon/Storage Pond(s)					
	PE2 (lb/day)	PE1 (lb/day)	EF2	EF1	PE2 (lb/day)
Milk Cows	0.0	N/A	N/A	N/A	0.0
Dry Cows	0.0	N/A	N/A	N/A	0.0
Support Stock (Heifers, Calves, and Bulls)	0.1	N/A	N/A	N/A	0.1
Large Heifers	0.2	N/A	N/A	N/A	0.2
Medium Heifers	0.0	N/A	N/A	N/A	0.0
Small Heifers	0.0	N/A	N/A	N/A	0.0
Calves	0.0	N/A	N/A	N/A	0.0
Bulls	0.0	N/A	N/A	N/A	0.0
				Total	0.3

Solid Manure Handling					
VOC Emissions - Solid Manure Storage/Separated Solids Piles					
	PE2 (lb/day)	PE1 (lb/day)	EF2	EF1	PE2 (lb/day)
Milk Cows	0.0	N/A	N/A	N/A	0.0
Dry Cows	0.0	N/A	N/A	N/A	0.0
Support Stock (Heifers, Calves, and Bulls)	0.3	N/A	N/A	N/A	0.3
Large Heifers	0.6	N/A	N/A	N/A	0.6
Medium Heifers	0.0	N/A	N/A	N/A	0.0
Small Heifers	0.0	N/A	N/A	N/A	0.0
Calves	0.0	N/A	N/A	N/A	0.0
Bulls	0.0	N/A	N/A	N/A	0.0
				Total	0.9
VOC Emissions - Land Application					
	PE2 (lb/day)	PE1 (lb/day)	EF2	EF1	PE2 (lb/day)
Milk Cows	0.0	N/A	N/A	N/A	0.0
Dry Cows	0.0	N/A	N/A	N/A	0.0
Support Stock (Heifers, Calves, and Bulls)	0.5	N/A	N/A	N/A	0.5
Large Heifers	1.0	N/A	N/A	N/A	1.0
Medium Heifers	0.0	N/A	N/A	N/A	0.0
Small Heifers	0.0	N/A	N/A	N/A	0.0
Calves	0.0	N/A	N/A	N/A	0.0
Bulls	0.0	N/A	N/A	N/A	0.0
				Total	1.5
NH3 Emissions - Solid Manure Storage/Separated Solids Piles					
	PE2 (lb/day)	PE1 (lb/day)	EF2	EF1	PE2 (lb/day)
Milk Cows	0.0	N/A	N/A	N/A	0.0
Dry Cows	0.0	N/A	N/A	N/A	0.0
Support Stock (Heifers, Calves, and Bulls)	1.4	N/A	N/A	N/A	1.4
Large Heifers	2.7	N/A	N/A	N/A	2.7
Medium Heifers	0.0	N/A	N/A	N/A	0.0
Small Heifers	0.0	N/A	N/A	N/A	0.0
Calves	0.0	N/A	N/A	N/A	0.0
Bulls	0.0	N/A	N/A	N/A	0.0
BACT triggered for NH3 for Solid Manure Storage				Total	4.1
NH3 Emissions - Land Application					
	PE2 (lb/day)	PE1 (lb/day)	EF2	EF1	PE2 (lb/day)
Milk Cows	0.0	N/A	N/A	N/A	0.0
Dry Cows	0.0	N/A	N/A	N/A	0.0
Support Stock (Heifers, Calves, and Bulls)	1.6	N/A	N/A	N/A	1.6
Large Heifers	3.0	N/A	N/A	N/A	3.0
Medium Heifers	0.0	N/A	N/A	N/A	0.0
Small Heifers	0.0	N/A	N/A	N/A	0.0
Calves	0.0	N/A	N/A	N/A	0.0
Bulls	0.0	N/A	N/A	N/A	0.0
BACT triggered for NH3 for Solid Manure Land Application				Total	4.6

Feed Storage and Handling					
VOC Emissions - Silage					
	PE2 (lb/day)	PE1 (lb/day)	EF2	EF1	PE2 (lb/day)
Corn Silage	0.0	N/A	N/A	N/A	0.0
Alfalfa Silage	0.0	N/A	N/A	N/A	0.0
Wheat Silage	21.8	N/A	N/A	N/A	21.8
BACT triggered for VOC for Silage				Total	21.8
VOC Emissions - TMR					
	PE2 (lb/day)	PE1 (lb/day)	EF2	EF1	PE2 (lb/day)
TMR	105.6	N/A	N/A	N/A	105.6
BACT triggered for VOC for TMR				Total	105.6

	Cow Housing - VOC Emissions						
	Housing Name(s) or #(s)	PE2 (lb/day)	PE1 (lb/day)	EF2	EF1	PE2 (lb/day)	BACT Triggered?
1	VP1	2.4	N/A	N/A	N/A	2.4	Yes
2	VP2	2.4	N/A	N/A	N/A	2.4	Yes
3	VP3	2.4	N/A	N/A	N/A	2.4	Yes
4	VP4	2.4	N/A	N/A	N/A	2.4	Yes
5	VP5	2.4	N/A	N/A	N/A	2.4	Yes
6	VP6	2.4	N/A	N/A	N/A	2.4	Yes
7	VP7	1.2	N/A	N/A	N/A	1.2	No
8	VP8	1.2	N/A	N/A	N/A	1.2	No
9	VP9	1.2	N/A	N/A	N/A	1.2	No
10	VP10	2.4	N/A	N/A	N/A	2.4	Yes
11	VP11	2.6	N/A	N/A	N/A	2.6	Yes
12	VP12	2.6	N/A	N/A	N/A	2.6	Yes
13	VP13	0.6	N/A	N/A	N/A	0.6	No
14	VP14	0.6	N/A	N/A	N/A	0.6	No
15	VP15	3.0	N/A	N/A	N/A	3.0	Yes
16	VP16	3.0	N/A	N/A	N/A	3.0	Yes
17	VP17	3.0	N/A	N/A	N/A	3.0	Yes
18	VP18	3.6	N/A	N/A	N/A	3.6	Yes
19	VP19	1.8	N/A	N/A	N/A	1.8	No
20	VP20	1.8	N/A	N/A	N/A	1.8	No
21	VP21	0.4	N/A	N/A	N/A	0.4	No
22	VP22	0.4	N/A	N/A	N/A	0.4	No
23	VP23	0.4	N/A	N/A	N/A	0.4	No
24	VP24	0.4	N/A	N/A	N/A	0.4	No
25	VP25	2.4	N/A	N/A	N/A	2.4	Yes
26	VP26	2.4	N/A	N/A	N/A	2.4	Yes
27	VP27	2.4	N/A	N/A	N/A	2.4	Yes
	New Units from Expansion						
	Housing Name(s) or #(s)	PE2 (lb/day)	PE1 (lb/day)	EF2	EF1	PE2 (lb/day)	BACT Triggered?

Cow Housing - NH3 Emissions						
Housing Name(s) or #(s)	PE2 (lb/day)	PE1 (lb/day)	EF2	EF1	PE2 (lb/day)	BACT Triggered?
VP1	3.4	N/A	N/A	N/A	3.4	Yes
VP2	3.4	N/A	N/A	N/A	3.4	Yes
VP3	3.4	N/A	N/A	N/A	3.4	Yes
VP4	3.4	N/A	N/A	N/A	3.4	Yes
VP5	3.4	N/A	N/A	N/A	3.4	Yes
VP6	3.4	N/A	N/A	N/A	3.4	Yes
VP7	1.7	N/A	N/A	N/A	1.7	No
VP8	1.7	N/A	N/A	N/A	1.7	No
VP9	1.7	N/A	N/A	N/A	1.7	No
VP10	3.4	N/A	N/A	N/A	3.4	Yes
VP11	3.7	N/A	N/A	N/A	3.7	Yes
VP12	3.7	N/A	N/A	N/A	3.7	Yes
VP13	0.8	N/A	N/A	N/A	0.8	No
VP14	0.8	N/A	N/A	N/A	0.8	No
VP15	4.2	N/A	N/A	N/A	4.2	Yes
VP16	4.2	N/A	N/A	N/A	4.2	Yes
VP17	4.2	N/A	N/A	N/A	4.2	Yes
VP18	5.0	N/A	N/A	N/A	5.0	Yes
VP19	2.5	N/A	N/A	N/A	2.5	Yes
VP20	2.5	N/A	N/A	N/A	2.5	Yes
VP21	0.5	N/A	N/A	N/A	0.5	No
VP22	0.5	N/A	N/A	N/A	0.5	No
VP23	0.5	N/A	N/A	N/A	0.5	No
VP24	0.5	N/A	N/A	N/A	0.5	No
VP25	3.4	N/A	N/A	N/A	3.4	Yes
VP26	3.4	N/A	N/A	N/A	3.4	Yes
VP27	3.4	N/A	N/A	N/A	3.4	Yes
New Units from Expansion						
Housing Name(s) or #(s)	PE2 (lb/day)	PE1 (lb/day)	EF2	EF1	PE2 (lb/day)	BACT Triggered?

*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.

	Cow Housing - PM10 Emissions						
	Housing Name(s) or #(s)	PE2 (lb/day)	PE1 (lb/day)	EF2	EF1	PE2 (lb/day)	BACT Triggered?
1	VP1	2.5	N/A	N/A	N/A	2.5	Yes
2	VP2	2.5	N/A	N/A	N/A	2.5	Yes
3	VP3	2.5	N/A	N/A	N/A	2.5	Yes
4	VP4	2.5	N/A	N/A	N/A	2.5	Yes
5	VP5	2.5	N/A	N/A	N/A	2.5	Yes
6	VP6	2.5	N/A	N/A	N/A	2.5	Yes
7	VP7	1.3	N/A	N/A	N/A	1.3	No
8	VP8	1.3	N/A	N/A	N/A	1.3	No
9	VP9	1.3	N/A	N/A	N/A	1.3	No
10	VP10	1.9	N/A	N/A	N/A	1.9	No
11	VP11	2.1	N/A	N/A	N/A	2.1	Yes
12	VP12	2.1	N/A	N/A	N/A	2.1	Yes
13	VP13	0.5	N/A	N/A	N/A	0.5	No
14	VP14	0.5	N/A	N/A	N/A	0.5	No
15	VP15	2.4	N/A	N/A	N/A	2.4	Yes
16	VP16	2.4	N/A	N/A	N/A	2.4	Yes
17	VP17	2.4	N/A	N/A	N/A	2.4	Yes
18	VP18	2.9	N/A	N/A	N/A	2.9	Yes
19	VP19	1.4	N/A	N/A	N/A	1.4	No
20	VP20	1.4	N/A	N/A	N/A	1.4	No
21	VP21	0.3	N/A	N/A	N/A	0.3	No
22	VP22	0.3	N/A	N/A	N/A	0.3	No
23	VP23	0.3	N/A	N/A	N/A	0.3	No
24	VP24	0.3	N/A	N/A	N/A	0.3	No
25	VP25	1.9	N/A	N/A	N/A	1.9	No
26	VP26	1.9	N/A	N/A	N/A	1.9	No
27	VP27	1.9	N/A	N/A	N/A	1.9	No
	New Units from Expansion						
	Housing Name(s) or #(s)	PE2 (lb/day)	PE1 (lb/day)	EF2	EF1	PE2 (lb/day)	BACT Triggered?

*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.

Increase in Emissions

SSIPE (lb/yr)							
	NOx	SOx	PM10	CO	VOC	NH3	H2S
Milking Parlor	0	0	0	0	0	0	0
Cow Housing	0	0	16,827	0	18,792	26,378	0
Liquid Manure	0	0	0	0	2,802	5,517	137
Solid Manure	0	0	0	0	948	3,233	0
Feed Handling	0	0	0	0	46,481	0	0
Total	**0**	**0**	**16,827**	**0**	**69,023**	**35,127**	**137**

Total Daily Change in Emissions (lb/day)							
	NOx	SOx	PM10	CO	VOC	NH3	H2S
Milking Parlor	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cow Housing	0.0	0.0	45.8	0.0	51.8	72.7	0.0
Liquid Manure	0.0	0.0	0.0	0.0	7.7	15.2	0.3
Solid Manure	0.0	0.0	0.0	0.0	2.6	8.9	0.0
Feed Handling	0.0	0.0	0.0	0.0	127.4	0.0	0.0
Total	**0.0**	**0.0**	**45.8**	**0.0**	**189.5**	**96.8**	**0.3**

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	1,337	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**	**1,337**	**0**	**0**

APPENDIX F
Lease Agreement

BAR VP FEEDLOT
8001 Road 104
Pixley, CA 93256

January 17, 2019

SJVAPCD
Attn: Mr. Johnathan Yoshimura
1900 E. Gettysburg Ave.
Fresno, CA 93726

Dear Mr. Yoshimura,

This letter is to acknowledge and inform you of a land use agreement between Bar VP Feedlot and K&M Visser Dairy. Bar VP Feedlot is located at 9181 Road 105, Pixley CA and operates as a Confined Animal Feeding Operation on Tulare County APN 313-200-006. This facility operates under the SJVAPCD permit ID S-6473.

K&M Visser Dairy is the owner of the property North of Bar VP Feedlot, including Tulare County APNs: 293-150-016 and 293-150-017 (see attached map). This land is used for crop production and operates on a CMMP Plan with the SJVAPCD under permit ID S-7241. The crops produced on these fields are used to support the raising of heifers at Bar VP Feedlot.

This Land Use Agreement allows Bar VP Feedlot to operate on the land owned by K&M Visser Dairy. At present, there is no intent to modify or terminate this agreement between Bar VP Feedlot and K&M Visser Dairy. It is understood that any modification of this agreement or termination of the agreement may affect the SJVAPCD permits at Bar VP Feedlot.

This letter is signed and acknowledged by both land owners noted below. Please feel free to contact us or our agent with any questions.

Thank you,

Mr. Ron Vander Poel	Mr. Keith Visser
BAR VP Feedlot	K&M Visser Dairy

CC: Innovative Ag Services
Encl: Bar VP Feedlot Land Use Map

2014 Aerial Photography provided by the USDA's National Ag Imagery Program

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:

	Cow Housing					
	NOx	SOx	PM10	CO	VOC	NH3
Annual PE2 (lb/yr)	0	0	16,827	0	18,792	26,378
Daily PE2 (lb/day)	0.0	0.0	45.8	0.0	51.8	72.7
Quarterly Net Emissions Change (lb/qtr) 1:	0.0	0.0	4,206.75	0.0	4,698.0	6,594.5
2:	0.0	0.0	4,206.75	0.0	4,698.0	6,594.5
3:	0.0	0.0	4,206.75	0.0	4,698.0	6,594.5
4:	0.0	0.0	4,206.75	0.0	4,698.0	6,594.5

	Liquid Manure Handling						
	NOx	SOx	PM10	CO	VOC	NH3	H2S
Annual PE2 (lb/yr)	0	0	0	0	2,802	5,517	137
Daily PE2 (lb/day)	0.0	0.0	0.0	0.0	7.7	15.2	0.3
Quarterly Net Emissions Change (lb/qtr) 1:	0.0	0.0	0.0	0.0	1688.75	3,080.5	34.25
2:	0.0	0.0	0.0	0.0	1688.75	3,080.5	34.25
3:	0.0	0.0	0.0	0.0	1688.75	3,080.5	34.25
4:	0.0	0.0	0.0	0.0	1688.75	3,080.5	34.25

	Solid Manure Handling					
	NOx	SOx	PM10	CO	VOC	NH3
Annual PE2 (lb/yr)	0	0	0	0	948	3,233
Daily PE2 (lb/day)	0.0	0.0	0.0	0.0	2.6	8.9
Quarterly Net Emissions Change (lb/qtr) 1:	0.0	0.0	0.0	0.0	328.5	1,172.75
2:	0.0	0.0	0.0	0.0	328.5	1,172.75
3:	0.0	0.0	0.0	0.0	328.5	1,172.75
4:	0.0	0.0	0.0	0.0	328.5	1,172.75

	Feed Storage and Handling					
	NOx	SOx	PM10	CO	VOC	NH3
Annual PE2 (lb/yr)	0	0	0	0	46,481	0
Daily PE2 (lb/day)	0.0	0.0	0.0	0.0	127.4	0.0
Quarterly Net Emissions Change (lb/qtr) 1:	0.0	0.0	0.0	0.0	11,620.25	0.0
2:	0.0	0.0	0.0	0.0	11,620.25	0.0
3:	0.0	0.0	0.0	0.0	11,620.25	0.0
4:	0.0	0.0	0.0	0.0	11,620.25	0.0

APPENDIX H
Anaerobic 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	557	ft
Width	303	ft
Depth	18	ft
Slope	2	ft

(Subtract 2 feet from the actual lagoon depth for run-off or miscellaneous water.)

Primary Lagoon Volume	**2,511,702 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	0	x	17	x	71%	x	50%	=	**0**
Dry Cow	0	x	9.2	x	71%	x	50%	=	**0**
Heifer (15 to 24 months)	4,310	x	7.1	x	48%	x	50%	=	**7,344**
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)	0	x	1.0	x	100%	x	50%	=	**0**
Bulls	0	x	9.2	x	48%	x	50%	=	**0**
Total for Dairy									**7,344**

[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	0	÷	0.011	=	**0**
Dry Cow	0	÷	0.011	=	**0**
Heifer (15 to 24 months)	7,344	÷	0.011	=	**667,658**
Heifer (7 to 14 months)	0	÷	0.011	=	**0**
Heifer (3 to 6 months)	0	÷	0.011	=	**0**
Calf (under 3 months)	0	÷	0.011	=	**0**
Bulls	0	÷	0.011	=	**0**
Total for Dairy					**667,658**

[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 =	**2,511,702**		**667,658 =**	**1,844,044 (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	0	x	2.40	ft^3	=	-	ft^3/day
Dry Cows	0	x	1.30	ft^3	=	-	ft^3/day
Heifers (15-24 mo)	4,310	x	0.78	ft^3	=	3,362	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	0	x	0.15	ft^3	=	-	ft^3/day
Bulls	0	x	1.30	ft^3	=	-	ft^3/day
Total	4,310					**3,362**	**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	#	x	ft3	+	ft3
Milk Cow*Day	Milk Cows		gallon		day

Total HFR:

50 ~~gal~~	0 ~~milk cows~~	x	ft3	+	3,362 ~~ft3~~
~~milk cow *~~ day			7.48 ~~gal~~		day
			=	3,361.8	ft3/day

Formula:

MTV (ft3)	/	(day)	=
		HFR ~~(ft3)~~	

HRT:

667,658 ~~ft3~~	day	=	=	198.601399	days
	3,361.8 ~~ft3~~				