NOV 16 2011

Willem De Boer
Riverside Dairy
14976 Avenue 168
Tulare, CA 93274-9518

Re: Notice of Preliminary Decision - Authority to Construct
Project Number: S-1055541

Dear Mr. De Boer:

Enclosed for your review and comment is the District's analysis of Riverside Dairy's application for an Authority to Construct for the conversion of an existing 1,500 head heifer ranch into a 3,600 milk cow (7,185 total head) dairy, at Avenue 84 and Road 64 in Pixley.

The notice of preliminary decision for this project will be published approximately three days from the date of this letter. Please submit your written comments on this project within the 30-day public comment period which begins on the date of publication of the public notice.

Thank you for your cooperation in this matter. If you have any questions regarding this matter, please contact Mr. Jonah Aiyabei of Permit Services at (559) 230-5910.

Sincerely,

David Warner
Director of Permit Services

DW:jka

Enclosures

San Joaquin Valley
AIR POLLUTION CONTROL DISTRICT

NOV 16 2011

Mike Tollstrup, Chief
Project Assessment Branch
Stationary Source Division
California Air Resources Board
PO Box 2815
Sacramento, CA 95812-2815

Re: Notice of Preliminary Decision - Authority to Construct
Project Number: S-1055541

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David Warner
Director of Permit Services

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Enclosure

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Executive Director/Air Pollution Control Officer

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4800 Enterprise Way
Modesto, CA 95356-8718
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Fresno, CA 93726-0244
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2700 M Street, Suite 275
Bakersfield, CA 93301-2373
Tel: (661) 326-6900 FAX: (661) 326-6985

Visalia Times-Delta
Visalia Times-Delta

NOTICE OF PRELIMINARY DECISION
FOR THE PROPOSED ISSUANCE OF
AN AUTHORITY TO CONSTRUCT

NOTICE IS HEREBY GIVEN that the San Joaquin Valley Unified Air Pollution Control District solicits public comment on the proposed issuance of Authority to Construct to Riverside Dairy for the conversion of an existing 1,500 head heifer ranch into a 3,600 milk cow (7,185 total head) dairy, at Avenue 84 and Road 64 in Pixley.

The analysis of the regulatory basis for this proposed action, Project #S-1055541, is available for public inspection at http://www.valleyair.org/notices/public_notices_idx.htm and the District office at the address below. Written comments on this project must be submitted within 30 days of the publication date of this notice to **DAVID WARNER, DIRECTOR OF PERMIT SERVICES, SAN JOAQUIN VALLEY UNIFIED AIR POLLUTION CONTROL DISTRICT, 1990 EAST GETTYSBURG AVENUE, FRESNO, CA 93726.**

San Joaquin Valley Air Pollution Control District
Authority to Construct
Application Review
Heifer Ranch Conversion to a Dairy

Facility Name:	Riverside Dairy	Date:	November 10, 2011
Mailing Address:	14976 Avenue 168	Engineer:	Jonah Aiyabei
	Tulare, CA 93274-9518	Lead Engineer:	Martin Keast
Contact Person:	Willem De Boer, Gen. Partner		
Telephone:	(559) 687-1253		
Application #s:	S-6746-1-0, -2-0, -3-0, -4-0 and -5-0		
Project #:	S-1055541		
Deemed Complete:	November 17, 2009		

I. Proposal

Riverside Dairy requests Authority to Construct (ATC) permits to convert their existing 1,500 head heifer ranch into a new 7,185 cow dairy farm that includes 3,600 milk cows, 535 dry cows, and 2,500 support stock (heifers and bulls), and 550 calves (under 3 months of age), at Avenue 84 and Road 64 Pixley, Tulare County. The new dairy facility, including milk barn, freestalls, corrals, liquid manure handling system, solid manure handling, and feed storage areas will occupy the existing 36 acre and an additional 74 acres of the 839 agricultural site.

Riverside Dairy will construct a milking center equipped with one 80-stall rotary milking parlor. For cow housing, the dairy will construct seven freestall barns and a maternity barn with flush systems, construct shade structures on the existing open corrals with flush system and aboveground flushed calf hutches. The liquid manure handling system will consist of a mechanical separator, a processing pit, three settling ponds, and a two-stage anaerobic treatment lagoon system designed in accordance with the NRCS Conservation Practice Standard Code 359–Waste Treatment Lagoon. The separated solids from the liquid manure handling system will be placed in windrows to dry and used as bedding. The dairy will construct commodity barns, and silage stacking slabs for the storage of animal feed. Downwind shelter belts will be established on the east and south perimeter of the dairy. Additionally, the mitigation measures that the applicant has selected to comply with District Rule 4570 Phase II will be incorporated into the ATCs for the new dairy.

Pursuant to Senate Bill 700 and District Rule 2201, *New Source Review Rule*, all agricultural operations including Confined Animal Feeding Operations (CAFO) that commenced construction after January 1, 2004 with emissions greater than ½ the major source threshold levels (12.5 tons of NOx or VOC) were required to obtain an Authority to Construct (ATC) permit.

The remodeled facility will result in an increase in VOC, NH_3, PM_{10}, and H_2S emissions greater than 2.0 lb/day from the milking operation, cow housing, and the liquid manure handling system. Therefore, BACT is triggered for VOC, NH_3, PM_{10}, and H_2S emissions from these permit units. In addition, the applicant concedes that the capital cost of the modifications will be greater than 50% of the capital cost of a similar new facility. As a result, the facility becomes a reconstructed source. Reconstructed sources are treated as new sources and are subject all New Source Review requirements such as Best Available Control Technology (BACT).

The project triggers the public notice requirements of District Rule 2201. Therefore, the preliminary decision for the project will be submitted to the California Air Resources Board (CARB), a public notice will be published in a local newspaper of general circulation in the county of the project, and a 30-day public comment period will be completed prior to issuance of the ATCs.

II. Applicable Rules

Rule 2010	Permits Required (12/17/92)
Rule 2201	New and Modified Stationary Source Review Rule (4/21/11)
Rule 2520	Federally Mandated Operating Permits (6/21/01)
Rule 2550	Federally Mandated Preconstruction Review for Major Sources of Air Toxics (6/18/98)
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

Senate Bill 700 (SB 700)
California Environmental Quality ACT (CEQA)

III. Project Location

The facility is located at Avenue 84 and Road 64 in Pixley, Tulare County. The equipment is not located within 1,000 feet of the outer boundary of a K-12 school. Therefore, the public notification requirement of California Health and Safety Code 42301.6 is not applicable to this project.

IV. Process Description

The primary function of Riverside Dairy is the production of milk, which requires a herd of mature dairy cows that are lactating. In order to produce milk, the cows must be bred and give birth. The gestation period for a cow is 9 months, and dairy cows are bred again 4 months after calving. Thus, a mature dairy cow produces a calf every 12 to 14 months, which is why there will be different ages and types of cows at the dairy, including lactating cows, dry cows, heifers, and calves.

A milk cow generates around 150 pounds of manure per day. Manure accumulates in confinement areas such as freestalls, open corrals (dry lots), and the milking center. Manure is primarily deposited in areas where the herd is fed and given water. How the manure is collected, stored and treated depends directly on the manure management techniques used at a particular dairy.

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

Cow Housing

The 3,600 milk cows will be housed in freestalls with flush system. In freestall barns, cows are grouped in large pens with free access to feed bunks, water, and stalls for resting. A standard freestall barn design has a feed alley in the center of the barn separating two feed bunks on each side. The 535 dry cows and 3,050 total support stock (heifers and calves) are housed in open corrals with flush system. An open corral is a large open area where cows are confined with unlimited access to feed and water. The open corrals include structures that provide shade for all animals. The corral lanes will be flushed twice daily to remove the manure.

Special Needs Housing

The special needs area serves the gestating cows at the dairy or any cows that are in need of medical condition. This area acts as a veterinary area. It is also the area in which cows are given special attention as they progress from dry cow, a mature cow that is gestating and not lactating, to maternity, to milking status or until their health improves.

Milking Parlor

The milking parlor is a separate building, apart from the lactating cow confinement. The milking parlor is designed to facilitate changing the groups of cows milked and to allow workers access to the cows during milking. A holding area confines the cows that are ready for milking. The holding area is covered with open sides and is part of the milking parlor, which in turn, is located in the immediate vicinity of the cow housing. The cows at dairy will be milked in two double 36 stall (72 stalls each) herringbone milk parlor. The lactating cows will be milked two to three times per day in the milking parlor. The milking parlor will have concrete floors sloped to a drain. Manure that is deposited in the milking parlor will be sprayed or flushed into the drain using fresh water after each milking. The effluent from the milking parlor will be carried through pipes to the liquid manure handling system.

Liquid Manure handling System

The liquid manure handling system at the dairy includes the following:

- One processing pit
- One mechanical separator
- Three settling basins for solids separation
- One anaerobic treatment lagoon
- One storage pond

The dairy is proposing to flush the freestall lanes four times a day.

Processing Pit

The dairy will have one processing pit. A processing pit is a small basin that temporarily stores the flush water from the milking parlor and the freestall. The processing pit allows this water to be reused to flush the concrete feed lanes in the corrals. After each flush, the flush water, including the waste from the feed lanes, is returned to the processing pit to be recycled in the next flush. As the volume of flush water in the processing pit increases, pumps and agitators are turned on. The agitators mix the contents in the processing pit so that the solids in the processing pit do not settle. The accumulated flush water is then pumped to the mechanical separator to remove the fibrous and heavy solids prior to the settling basis for further solid separation. This is done daily or several times a day to prevent excessive solids buildup and to ensure that the water used for flushing the corral feed lanes is relatively clean. The processing pit decreases the amount of piping and energy required by recycling the flush water and pumping water from a central location.

Solids Separation

Solids separation removes material from the waste stream that would prematurely fill a lagoon or storage pond. The efficiency of treatment would be significantly lower without separation, resulting in more odors and potentially more VOC emissions from the liquid manure handling system. Most of the separated solids are fibrous material that leads to excessive sludge buildup or the formation of crusts on the surface of the storage ponds, both of which interfere with pumping operations. Separation reduces the land area required when designing a liquid manure treatment system since the volume to be treated is less. As a final benefit, the separated solids may be recycled and used for soil amendments, re-feeding, bedding, etc.

Mechanical Separators:

Liquid manure from all flushed areas of the dairy are collected at the processing pit, from where it will be pumped up onto mechanical screen separators for solids separation prior to entering the lagoon system. A mechanical separator may achieve a solids removal rate of 20-50%. The mechanical separators are equipped with roller presses to minimize the moisture content of the separated solids. Conveyors will pile the solids onto the concrete stacking pad. The pad will be sloped to ensure drainage of any remaining liquid. The separated solids will be removed from the stacking pad on a weekly basis. The solids are generally spread out in thin layers to dry. The dried solids are then piled up for storage and may be used for bedding in the freestalls.

Settling Basins

From the mechanical separator, the liquid manure drains into one of three gravity settling basins. The settling basins serve to further separate the remaining solids prior to the lagoons/storage ponds. Settling basins are structures designed to separate solids from liquid manure by sedimentation. The inflow of manure is restricted to allow some of the solids to settle out. The liquids from the settling basins will gradually drain to the treatment lagoons. Solids remaining in both the settling basins are left to dry and then are removed. The separated solids will be dried in windrows and kill off any remaining bacteria. Again, this dried manure is then piled up for storage.

Manure Stock Piles (Storage)

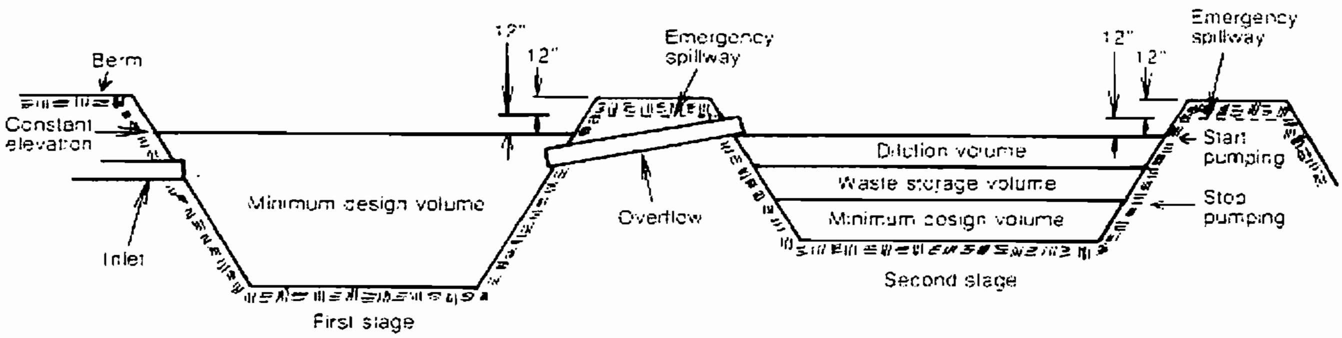
The scraped manure will either be immediately applied and incorporated into cropland at the dairy or will be dried and stockpiled for use as fertilizer at a later time. The separated solids will be dried and used as fertilizer or as bedding in the freestalls. The applicant proposes to cover the separated solid piles with weatherproof coverings from October through May, so that the solids will remain dry until it is ready to be used.

Anaerobic Treatment Lagoon

Riverside Dairy is proposing to convert the existing lagoon and add a new storage pond to an anaerobic treatment lagoon system. 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.

The anaerobic treatment lagoon system consists of two stages, a treatment lagoon (primary lagoon) and a storage pond (secondary lagoon). The effluent from the treatment lagoon (180 ft x 1000 ft x 21 ft) overflows into the storage pond/secondary lagoon (100 ft x 1380 ft x 21 ft), which is designed for liquid storage. The liquid level of the storage pond/secondary lagoon fluctuates and can be emptied when necessary. Effluent from the storage pond is used for the irrigation of cropland. All the liquid manure at the dairy is pumped to the anaerobic treatment lagoon system.



Storage Pond/Secondary Lagoon

Storage ponds are designed to have sufficient volume to hold all of the following: all manure and wastewater accumulated at the dairy 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.

V. Equipment Listing

New Dairy:

Project Equipment Description:

S-6746-1

S-6746-1-0: 3,600 COW MILKING OPERATION WITH ONE 80-STALL ROTARY MILKING PARLOR.

S-6746-2

S-6746-2-0: COW HOUSING - 3,600 MILK COWS; 535 DRY COWS; 2,500 SUPPORT STOCK (HEIFERS AND BULLS); AND 550 CALVES (UNDER 3 MONTHS OF AGE); AND SEVEN FREESTALL BARNS AND CORRALS A WITH FLUSH/SCRAPE SYSTEM.

S-6746-3

S-6746-3-0: LIQUID MANURE HANDLING SYSTEM CONSISTING OF ONE MECHANICAL SEPARATOR, ONE PROCESSING PIT, THREE SETTLING BASINS, ONE ANAEROBIC TREATMENT LAGOON (180'X1000'X21'), AND ONE STORAGE POND; MANURE LAND APPLIED THROUGH FURROW IRRIGATION.

S-6746-4

S-6746-4-0: SOLID MANURE HANDLING CONSISTING OF MANURE STOCK PILES, WINDROW COMPOSTING, SOLID MANURE APPLICATION TO LAND AND/OR OFFSITE HAULING.

S-6746-5

S-6746-5-0: FEED STORAGE AND HANDLING CONSISTING OF COMMODITY BARNS AND SILAGE PILES.

VI. Emission Control Technology Evaluation

PM_{10}, VOC, NH_3, and H_2S are the major pollutants of concern from dairy operations. Gaseous pollutant emissions at a dairy result from the ruminant digestive processes (enteric emissions), decomposition and fermentation of feed and decomposition of organic material in the 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. Hydrogen sulfide and other reduced sulfur compounds are produced as manure decomposes anaerobically. There are two primary sources of sulfur in animal manures. One is the sulfur amino acids contained in the feed. The other is inorganic sulfur compounds, such as copper sulfate and zinc sulfate, which are used as feed additives to supply trace minerals and serve as growth stimulants. A possible third source of sulfur in some locations is trace minerals in drinking water. The quantity of emissions from manure decomposition depends on the amount of manure generated, which also depends on the number and types of cows. Therefore, the total herd size and composition is the critical factor in quantifying emissions from a dairy.

Various management practices are used to control emissions at this dairy. Some of these practices are discussed below:

Milking Parlor

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

Cow Housing and Feed

Housing

All of the milk cows at the dairy will be housed in freestall barns with concrete lanes. Particulate matter emissions from freestall barns are greatly reduced because the cows will be on a paved surface rather than on dry dirt. Additionally, flushing of the freestall lanes creates a moist environment; which further decrease particulate matter emissions. All dry cows and heifers will be housed in open corrals with concrete lanes. The open corral lanes will be flushed and will also reduce particulate matter emissions.

Shade Structures and Scraping

Dry cows and heifers are housed in open corrals with shade structures. Providing shade for the animals reduces movement and unnecessary activity during hot weather, which reduces PM_{10} emissions. The surfaces of exercise corrals will be scraped in the morning hours on a weekly basis except during wet conditions. Frequent scraping of the corrals will reduce the amount of dry manure on the corral surfaces that may be pulverized by the cow's 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 and H_2S emissions.

Windbreaks

Riverside Dairy proposes downwind windbreaks along the Eastern and Southern boundaries of the dairy. The windbreaks plan is attached as Appendix C.

Windbreaks are single or multiple rows of trees in linear configuration planted on the windward or downwind side of a given site. The windbreaks are proposed in accordance with the National Research Conservation Service (NRCS) standard #380. Guidelines from this standard in conjunction with guidelines discussed with the local NRCS office are summarized as follows:

- Windbreak density on the leeward side of the source and windward of the area to be protected should be at least 65%. This density will provide the optimum PM interception. "Density", when viewing through the windbreak from 60 feet to 100 feet away upwind of the rows, is the percentage of the background view that is obscured or hidden.
- In order to reach a density of 65%, three rows are required consisting of the following:

Row	Type of tree/shrub	Spacing[1]	Height
First Row	Low shrubs Tall shrubs	3' to 5' apart 8' to 12' apart	5' +
Second Row	Tall shrubs or medium size trees	8' to 12' apart	8'-25'
Third Row	Large Evergreens	Varies	35' +

- Spacing between rows should be sufficient to accommodate cultivation equipment.
- Windbreaks should be irrigated to provide the greatest survivability and the most rapid growth of the trees and shrubs.
- Weed control in the windbreak must be completed as well as rapid replacement of any dead trees or shrubs.
- Each row should plant trees that are offset of one another.

A downwind windbreak/shelterbelt will be established along the Eastern and Southern boundaries of the dairy. The applicant proposes to plant a row of Arizona Cypress trees and a row of Chinese Pistache trees approximately 2,440 feet along the Eastern boundary of the dairy, starting from the Northeast corner of the existing heifer corrals, going South along the Eastern border; and a row of Arizona Cypress trees and row of Interior Live Oak trees approximately 1,050 feet along the Southern boundary of the dairy, starting from the Southeast

[1]These are general spacing requirements and vary depending on type of tree.

going West. Each row shall be offset from the adjacent row. The applicant will maintain an irrigation system for greater survivability and rapid growth of the trees and shrubs. The following conditions will be placed on the permit:

- Permittee shall establish a 2,440 foot windbreak along the dairy's east perimeter, starting at the Northeastern corner of the existing heifer corrals and going South along the Eastern border; and a 1,050 foot windbreak along the Southern perimeter, starting from the Southeastern corner of the dairy, going West along the Southern border. East windbreaks shall consist of the following two rows with the first row closest to the dairy: first row shall consist of Arizona Cypress trees, planted 10 feet apart and the second row shall consist of Chinese Pistache trees, planted 14 feet apart. South windbreaks shall consist of the following two rows with the first row closest to the dairy: first row shall consist of Arizona Cypress trees, planted 10 feet apart and the second row shall consist of Interior Live Oak trees, planted 20 feet apart. Each row shall be offset from the adjacent row. Spacing between rows shall be sufficient to accommodate cultivation equipment. This spacing shall not exceed 24 feet. An alternative windbreak proposal must be approved by the District. [District Rule 2201] N

Frequent Flushing

Manure, which is a source of emissions, will be removed from the freestall and corral lanes 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 lanes and walkways in the new freestalls will be flushed four times per day and the lanes and walkways in the open corrals for dry cows and heifers and lanes in the calf hutches will be flushed twice per day.

Feeding Animals in Accordance with the NRC Guidelines

All animals housed at the dairy 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. Diet is formulated to feed the proper amounts of ruminantly degradable protein, which results in improved nitrogen utilization by the animal and corresponding reduction in manure ammonia, urea and organic nitrogen content. 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, VOC and H_2S. Refused feed will be removed from the feed lanes on a daily basis to minimize gaseous emissions from decomposition. The surface area of silage exposed to the atmosphere will be minimized by enclosing silage or covering it with tarps, except for the face of the pile where feed is being removed.

Liquid Manure Handling System (S-6746-3)

All emissions from the liquid manure handling system are the result of manure decomposition.

Anaerobic Treatment Lagoon

Riverside Dairy proposes a liquid manure handling system utilizing an anaerobic treatment lagoon, which consists of a two-stage anaerobic lagoon treatment system designed in accordance with the specifications set forth in NRCS practice standard 359. A properly designed and operated anaerobic treatment lagoon system will reduce VOC emissions because the organic compounds in the manure will be mostly converted into methane, carbon dioxide, and water rather than a significant amount of VOCs. A two-stage anaerobic treatment lagoon system also has an air pollution benefit over single lagoon systems. Odorous emissions are reduced with a two-stage system since the primary lagoon has a constant treatment volume, which promotes more efficient anaerobic digestion. The proposed anaerobic treatment lagoon meets the design requirements (see design check in Appendix A).

Solids Separation

The liquid manure handling system is equipped with three settling basins for solids separation. Solids separation prevents excessive loading of volatile solids in lagoon treatment systems. Excessive loading of volatile solids in lagoons inhibits the activity of the methanogenic bacteria and leads to increased rates of volatile solids production. When the activity of the methanogenic bacteria is not inhibited, most of the VOCs are metabolized to simpler compounds, and the potential for VOC emissions is reduced.

Liquid Manure Land Application

Liquid manure from the storage pond will be applied through furrow irrigation. The dairy will apply liquid manure to cropland at agronomic rates. Liquid manure will be applied in thin layers and will be blended with irrigation water in compliance with the dairy's comprehensive nutrient management plan and the requirements of the Regional Water Quality Control Board. These practices will reduce odors and result in faster uptake of nutrients, including organic nitrogen, which can emit VOCs and ammonia during decomposition, and ammonium nitrogen, which is readily lost to the atmosphere as gaseous ammonia.

Rapid Incorporation of Solid Manure Applied to Land:

Based on the information currently available, emissions from solid manure applied to cropland are expected to be small. However, to ensure that any possible emissions are minimized, this dairy will be required to incorporate solid manure applied to cropland immediately (within two hours) after application. Immediate incorporation of the manure into the soil will reduce any volatilization of gaseous pollutants, including ammonia and VOC. Reduction in gaseous emissions is achieved by minimizing the amount of time that the manure is exposed to the atmosphere. Once manure has been incorporated into the soil, VOC is absorbed onto particles of soil providing the opportunity for the VOC to be oxidized into carbon dioxide and water.[2]

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

Covered Lagoon Anaerobic Digester:

Pursuant to Section 5.3 of the Settlement Agreement (9/20/2004) between the District and the Western United Dairyman and the Alliance of Western Milk Producers Inc., installation of an anaerobic digester will only be required if this technology is proven effective in reducing emissions and is required by the final Dairy BACT Guideline.[3] The applicant has agreed to install a lagoon cover if it is required. The proposed lagoon system has been designed so that it can be retrofitted with a cover and converted to a covered lagoon digester meeting the specifications set forth in NRCS practice standard 365 – Anaerobic Digester – Ambient Temperature. If an anaerobic digester is required by the final Dairy BACT Guideline, the applicant shall submit the details of the proposed covered lagoon anaerobic digester system and combustion device to the District and shall install the system in accordance with the timeframes and procedures established by the APCO in the Dairy BACT Guideline.

Feed Handling and Storage:

The proposed emission reduction measures for feed handling and storage include best management practices such as minimizing the surface area of silage exposed to the atmosphere. This can be done by covering the silage pile securely with a tarp and removing feed only from a small area of the pile (face of pile). Leftover feed at the feed bunks will also be cleaned up and disposed of appropriately to avoid decomposition that can result in increased emissions.

VII. General Calculations

A. Assumptions

- Potential to Emit for the dairy will be based on the maximum design capacity of the number and types of cows at the dairy.
- Only emissions from the lagoons/storage ponds at the dairy will be used to determine if the facility is a major source since these units are considered to be the only sources of non-fugitive emissions at dairies, as discussed in section VII.C.5.
- All 3,600 milk cows will be housed in freestalls with a flush system. The 535 dry cows, and 3,050 total support stock will be housed in open corrals with a flush system. The calves are housed in aboveground calf hutches with flush system.
- The applicant has proposed the following PM10 mitigation measures for the dairy:
  - Provide shade structures for all the dry cows and heifers in open corrals (16.7% control for dry cow and 8.3% for support stock).
  - Feed dry cows and heifers near dusk (10% control).
  - Scrape corrals on a weekly basis with a pull type scraper in the morning hours (15% control).
  - Install downwind windbreaks (12.5%) for all cows.

[3] Settlement Agreement. Western United Dairymen, Alliance of Western Milk Producers v. San Joaquin Valley Air Pollution Control District, settled in the Fresno Superior Court September 2004 (http://www.valleyair.org/busind/pto/dpag/settlement.pdf)

- The PM_{10} control efficiencies for the proposed practices and mitigation measures are based on the SJVAPCD memo – *Dairy and Feedlot PM_{10} Mitigation Practices and their Control Efficiencies.*
- All PM_{10} emissions from the dairy will be allocated to the cow housing permit units (S-6746-2).
- All H_2S emissions from the dairy will be allocated to the lagoon/storage of the liquid manure handling permit unit (S-6746-3).
- Because of the moisture content of the separated solids, PM_{10} emissions from solid manure handling are considered negligible.
- The PM_{10} emission factors for the dairy animals are based on a District document entitled "Dairy and Feedlot PM_{10} Emissions Factors", which compiled data from studies performed by Texas A & M ASAE and a USDA/UC Davis report quantifying dairy and feedlot emissions.
- The NH_3 emission factors for milk cows are based on an District 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 used in this evaluation are from the "APCO's Revision to the Dairy VOC Emission Factor", dated January 2010. These emission factors are controlled Emission Factors and contain mitigation measures from Rule 4570 (as adopted in 2010).
- For BACT analysis purposes, each permit unit at a dairy will also be treated as an emissions unit, except for the liquid manure handling permit unit. For BACT analysis purposes, the liquid manure handling permit unit will contain two emissions units: lagoons/storage ponds and liquid manure land application.
- Feeding animals in accordance with the National Research Council (NRC) guidelines is a feed formulation practice used to improve animal health and productivity. This typically limits the overfeeding of certain feed that have the potential of increasing emissions. This mitigation measure has the potential of reducing a significant amount of emissions, however, since there is not much data available, a conservative control efficiency of 5% will be applied to the overall dairy EF.
- Flushing or hosing down the milking parlor immediately prior to, immediately after, or during each milking has the potential of reducing a significant amount of emissions since many of the compounds emitted from the fresh manure, such as alcohols (ethanol and methanol) and many Volatile Fatty Acids (VFAs), are highly soluble in water and the fresh excreted manure is almost immediately flushed out of the milk barn. However, a conservative control efficiency estimate of 75% will be applied at this time. This control efficiency does not apply to the enteric emissions generated from the cows themselves. Taking that into account, the overall control efficiency for the milk barn is approximately 16.7%. (EF from milk barn is = 0.9 lbs/hd-yr. EF from fresh waste is equal to 0.2 lbs/hd-yr. 75% of 0.2 lbs/hd-yr = 0.15 lbs/hd-yr. 0.15 lbs/hd-yr/0.9 lbs/hd-yr = 16.7% control).
- Riverside Dairy will be flushing the feed lanes for all mature cows four times a day. Flushing the feed lanes four times per day is expected to reduce emissions since

manure degradation and decomposition in the feed lanes is reduced. Increasing the frequency of the flush will remove manure, which is a source of VOC emissions. Many of the compounds emitted from the fresh manure, such as alcohols (ethanol and methanol) and many Volatile Fatty Acids (VFAs), are highly soluble in water. Based on calculations in the Final Dairy Permitting Advisory Group's (DPAG) Report - "Recommendations to the San Joaquin Valley Air Pollution Control Officer Regarding Best Available Control Technology for Dairies in the San Joaquin Valley" dated January 31, 2006 (http://www.valleyair.org/busind/pto/dpag/dpag_idx.htm), a 47% control will be applied to flushing the corral lanes four times per day, until better data becomes available. This control efficiency only applies to the manure and does not apply to the enteric emissions generated from the cows themselves. However, in order to be conservative, a 10% control efficiency will be applied at this time.

- An anaerobic treatment lagoon designed in accordance with the NRCS Guideline (359) has the potential of reducing significant amount of emissions, since the system is designed to promote the conversion of Volatile Solids (VS) into methane by methanogenic bacteria. Although VOC emission reductions are expected to be high, to be conservative, a control efficiency of 40% will be applied to this mitigation measure for both the lagoon(s) and land application until better data becomes available.

- Many of the mitigation measures required will also have a reduction in ammonia emissions, however, due to limited data, these reductions will not be quantified in this evaluation.

B. Emission Factors

Pre-Project Emission Factor (EF1):

VOC:

Dairy EF1 (lb-VOC/hd-yr)				
		Milk Cow	**Dry Cow**	**Support Stock***
S-6746-1: **Milking Parlor**	Enteric Emissions in Milking Parlors	0.41	-	-
	Milking Parlor Floor	0.03	-	-
	Milking Parlor Total	**0.44**	-	-
S-6746-2: **Cow Housing**	Enteric Emissions in Cow Housing	3.69	2.23	1.71
	Corrals/Pens	6.6	3.59	2.76
	Bedding	1.0	0.54	0.42
	Lanes	0.8	0.44	0.33
	Cow Housing Total	**12.09**	**6.8**	**5.22**

Dairy EF1 (lb-VOC/hd-yr)				
		Milk Cow	Dry Cow	Support Stock*
S-6746-3: **Liquid Manure Handling**	Lagoons/Storage Ponds	1.3	0.71	0.54
	Liquid Manure Land Application	1.4	0.76	0.58
	Liquid Manure Handling Total	**2.7**	**1.47**	**1.12**
S-6746-4: **Solid Manure Handling**	Solid Manure Storage	0.15	0.08	0.06
	Separated Solids Piles	0.06	0.03	0.03
	Solid Manure Land Application	0.33	0.18	0.14
	Solid Manure Handling Total	**0.54**	**0.29**	**0.23**

Silage and TMR (Total Mixed Ration) EF1 (S-6746-5)		
Type of Silage	**VOC EF (µg/m^2-min)**	**Source**
Corn Silage[1]	34,681	SJVAPCD
Alfalfa Silage[1]	17,458	SJVAPCD
Wheat Silage[1]	43,844	SJVAPCD
TMR[2]	13,056	SJVAPCD

[1] Assuming pile is completely covered except for the front face
[2] Assuming rations are fed within 48 hours

PM_{10}:

Cow Housing PM_{10} EF1 (lbs-PM_{10}/hd-yr) (S-6746-2)			
Type of Cow	**Type of Housing**	**EF**	**Source**
Milk Cow	Freestalls	1.37	SJVAPCD
Dry Cow	Open Corral	5.46	SJVAPCD
Support Stock	Open Corrals/Individual Pens	10.55	CARB/SJVAPCD

NH_3:

Milking Parlor NH_3 EF1 (lbs-NH_3/hd-yr) (S-6746-1)			
Type of Cow	**Type of Housing**	**EF**	**Source**
Milk Cow	Freestalls	1.2	SJVAPCD

Cow Housing NH_3 EF1 (lbs-NH_3/hd-yr) (S-6746-2)			
Type of Cow	**Type of Housing**	**EF**	**Source**
Milk Cow	Freestalls	28	SJVAPCD
Dry Cow	Open Corral	20.6	SJVAPCD
Support Stock	Open Corrals/Individual Pens	14.4	CARB/SJVAPCD

Lagoon/Storage Pond NH_3 EF1 (lbs-NH_3/hd-yr) (S-6746-3)			
Type of Cow	**Type of Housing**	**EF**	**Source**
Milk Cow	Freestalls	15.7	SJVAPCD
Dry Cow	Open Corral	9.5	SJVAPCD
Support Stock	Open Corrals/Individual Pens	6.7	CARB/SJVAPCD

Land Application NH_3 EF1 (lbs-NH_3/hd-yr) (S-6746-3)			
Type of Cow	**Type of Housing**	**EF**	**Source**
Milk Cow	Freestalls	29.1	SJVAPCD
Dry Cow	Open Corral	15.3	SJVAPCD
Support Stock	Open Corrals/Individual Pens	10.7	CARB/SJVAPCD

Solid Manure NH_3 EF1 (lbs-NH_3/hd-yr) (S-6746-4)			
Type of Cow	**Type of Housing**	**EF**	**Source**
Milk Cow	Freestalls	3.4	SJVAPCD
Dry Cow	Open Corral	1.7	SJVAPCD
Support Stock	Open Corrals/Individual Pens	0.9	SJVAPCD

Post-Project Emission Factors (EF2):

VOC:

Where applicable, the VOC emission factors reflect the following mitigation measures which have been selected by the applicant:

Milking Parlor

Enteric Emissions Mitigations		
Apply	**Mitigation**	**CE (%)**
1	Feed according to National Research Council (NRC) guidelines.	10
	Total CE	10

Milking Parlor Floor Mitigations		
Apply	Mitigation	CE (%)
1	Feed according to National Research Council (NRC) guidelines.	5
1	Flush or hose milk parlor immediately prior to, immediately after, or during each milking NOTE: Control efficiency already included in EF2	0
	Total CE	5

Cow Housing

Enteric Emissions Mitigations		
Apply	Mitigation	CE (%)
1	Feed according to National Research Council (NRC) guidelines. NOTE: Control efficiency already partially included in EF2	5
	Total CE	5

Corrals/Pens Mitigations		
Apply	Mitigation	CE (%)
1	Feed according to National Research Council (NRC) guidelines.	5
1	BACT: Flush lanes four times per day for mature cows and two times per day for support stock (10%) Rule 4570 equivalent measure: Scrape, vacuum, or flush concrete lanes in corrals at least once every day for mature cows and every seven (7) days for support stock, or clean concrete lanes such that the depth of manure does not exceed twelve (12) inches at any point or time (10%).	10
1	Install shade structure such that they are constructed with a light permeable roofing material NOTE: If selected, for dairies greater than 999 milk cows, the control efficiency will be 5% since the EF used includes a partial control for this measure.	5
	Total CE	18.8

Bedding Mitigations		
Apply	**Mitigation**	**CE (%)**
1	Feed according to National Research Council (NRC) guidelines. NOTE: Control efficiency already partially included in EF2	5
1	For a large dairy only (1000 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 seven (7) days.	10
	Total CE	14.5

Lanes Mitigations		
Apply	**Mitigation**	**CE (%)**
1	Feed according to National Research Council (NRC) guidelines. NOTE: Control efficiency already partially included in EF2	5
1	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 three (3) times per day.	10
	Total CE	14.5

Liquid Manure Handling

Lagoons/Storage Ponds Mitigations		
Apply	**Mitigation**	**CE (%)**
1	Feed according to National Research Council (NRC) guidelines. NOTE: Control efficiency already partially included in EF2	5
1	Anaerobic treatment.	40
	Total CE	43

Liquid Manure Land Application Mitigations		
Apply	**Mitigation**	**CE (%)**
1	Feed according to National Research Council (NRC) guidelines. NOTE: Control efficiency already partially included in EF2	5
	Total CE	5

Solid Manure Handling

Solid Manure Storage Mitigations		
Apply	**Mitigation**	**CE (%)**
1	Feed according to National Research Council (NRC) guidelines. NOTE: Control efficiency already partially included in EF2	5
1	Within 72 hours of removal from housing, either a) remove dry manure from the facility, or b) cover dry manure outside the housing with a weatherproof covering from October through May, except for times when wind events remove the covering, not to exceed 24 hours per event.	10
	Total CE	14.5

Separated Solids Piles Mitigations		
Apply	**Mitigation**	**CE (%)**
1	Feed according to National Research Council (NRC) guidelines. NOTE: Control efficiency already partially included in EF2	5
	Total CE	5

Solid Manure Land Application Mitigations		
Apply	**Mitigation**	**CE (%)**
1	Feed according to National Research Council (NRC) guidelines. NOTE: Control efficiency already partially included in EF2	5
	Total CE	5

N-6746-5: Silage & TMR

Corn/Alfalfa/Wheat Silage Mitigations		
Apply	**Mitigation**	***CE (%)**
1	1. Utilize a sealed feed storage system (e.g. Ag-Bag) for bagged silage. < or >	39

Corn/Alfalfa/Wheat Silage Mitigations		
Apply	**Mitigation**	***CE (%)**
	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 Manage exposed silage Implement two 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	

Corn/Alfalfa/Wheat Silage Mitigations		
Apply	**Mitigation**	***CE (%)**
	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.	
	*Total CE	39

*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 (agbag)

TMR Mitigations		
Apply	**Mitigation**	**CE (%)**
1	Push feed so that it is within 3 feet of feedlane fence within 2 hours of putting out the feed or use a feed trough or other feeding structure designed to maintain feed within reach of the cows.	10
1	Feed stream-flaked, dry rolled, cracked or ground corn or other ground cereal grains	10
	Total CE	19

Emission Factors (lb-VOC/hd-yr)				
		Milk Cow	**Dry Cow**	**Support Stock***
Milking Parlor	Enteric Emissions in Milking Parlors	0.37	-	-
	Milking Parlor Floor	0.03	-	-
	Milking Parlor Total	**0.40**	-	-
Cow Housing	Enteric Emissions in Cow Housing	3.51	2.12	1.62
	Corrals/Pens	5.36	2.92	2.24
	Bedding	0.86	0.46	0.36
	Lanes	0.68	0.38	0.28
	Cow Housing Total	**10.41**	**5.88**	**4.50**

Emission Factors (lb-VOC/hd-yr)				
		Milk Cow	Dry Cow	Support Stock*
Liquid Manure Handling	Lagoons/Storage Ponds	0.74	0.40	0.31
	Liquid Manure Land Application	1.33	0.72	0.55
	Liquid Manure Handling Total	**2.07**	**1.12**	**0.86**

		Milk Cow	Dry Cow	Support Stock*
Solid Manure Handling	Solid Manure Storage	0.13	0.07	0.05
	Separated Solids Piles	0.06	0.03	0.03
	Solid Manure Land Application	0.31	0.17	0.13
	Solid Manure Handling Total	**0.50**	**0.27**	**0.21**

*In order to calculate worst case emissions, the emission factor for the large heifers will be used.

Silage and TMR (Total Mixed Ration) EF2		
Type of Silage	**VOC EF (μg/m^2-min)**	**Source**
Corn Silage[1]	21,155	SJVAPCD
Alfalfa Silage[1]	10,649	SJVAPCD
Wheat Silage[1]	26,745	SJVAPCD
TMR[2]	10,575	SJVAPCD

[1] Assuming pile is completely covered except for the front face
[2] Assuming rations are fed within 48 hours

PM_{10}:

PE_2 PM_{10} Emission Factors (EF2) (S-6746-2-0)				
Type of Cow	Uncontrolled EF ($lb\text{-}PM_{10}/hd\text{-}yr$)	Control(s)	Controlled EF Calculation	Controlled EF ($lb\text{-}PM_{10}/hd\text{-}yr$)
Milk Cows in Freestalls	1.37	Downwind Shelterbelts (12.5%) Weekly Scraping using Pull-Type Equipment in morning (15%)	1.37x(1-0.125)(1-0.15) =	**1.02**
Dry Cows in Open Corrals	5.46	Downwind Shelterbelts (12.5%) Weekly Scraping using Pull-Type Equipment in morning (15%) Shade Structures (16.7%)	5.46x(1-0.125)(1-0.15)(1-0.167) =	**3.38**

PE_2 PM_{10} Emission Factors (EF2) (S-6746-2-0)				
Type of Cow	Uncontrolled EF ($lb\text{-}PM_{10}/hd\text{-}yr$)	Control(s)	Controlled EF Calculation	Controlled EF ($lb\text{-}PM_{10}/hd\text{-}yr$)
Heifers in Open Corrals (15-24 months)	10.55	Downwind Shelterbelts (12.5%) Shade Structures (8.3%) Weekly Scraping using Pull-Type Equipment in morning (15%) Feeding Heifers Near Dusk (10%)	10.55 x (1-0.125)(1-0.083)(1-0.15)(1-0.10)=	**6.47**
Heifers in Open Corrals (7-14 months)	10.55	Downwind Shelterbelts (12.5%) Shade Structures (8.3%) Weekly Scraping using Pull-Type Equipment in morning (15%) Feeding Heifers Near Dusk (10%)	10.55 x (1-0.125)(1-0.083)(1-0.15)(1-0.10)=	**6.47**
Heifers in Open Corrals (4-6 months)	10.55	Downwind Shelterbelts (12.5%) Shade Structures (8.3%) Weekly Scraping using Pull-Type Equipment in morning (15%) Feeding Heifers Near Dusk (10%)	10.55 x (1-0.125)(1-0.083)(1-0.15)(1-0.10)=	**6.47**
Calves	1.37	Above-Ground Flushed Calf Hutches (95%) Downwind Shelterbelts (12.5%) Shade Structures (8.3%)	1.37 x (1-0.95)(1-0.083)(1-0.125)=	**0.05**

Ammonia:

The following emission factors will be used to calculate the emissions:

Milk Barn		
Category	Open Corral Housing	Freestall Housing
	($lb\text{-}NH_3/hd\text{-}yr$)	**($lb\text{-}NH_3/hd\text{-}yr$)**
Milk cows	1.3	1.2

Cow Housing		
Category	Open Corral Housing	Freestall Housing
	($lb\text{-}NH_3/cow\text{-}yr$)	**($lb\text{-}NH_3/cow\text{-}yr$)**
Milk cows	32.3	28
Dry cows	20.6	17.9
Heifers (15 - 24 mon)	14.4	12.6
Heifers (7 - 14 mon)	12.6	11.0
Heifers (3 - 6 mon)	11.4	9.9
Calves (0 - 3 mon)	10.7	9.3
Mature bulls	19.3	16.8

Cow Housing - PM_{10}		
Category	EF (lb/hd-yr)	Source
Mature cows and bulls in freestalls	1.37	Based on a Summer 2003 study by Texas A&M ASAE at a West Texas Dairy
Mature cows and bulls in open corrals	5.46	Based on a Summer 2003 study by Texas A&M ASAE at a West Texas Dairy
Heifers in open corrals	10.55	Based on a USDA/UC Davis report quantifying dairy and feedlot emissions in Tulare & Kern Counties (April '01)
Calves	1.37	SJVAPCD

Lagoon/Storage Pond		
Category	Open Corral Housing (lb-NH_3/cow-yr)	Freestall Housing (lb-NH_3/cow-yr)
Milk cows	15.5	15.7
Dry cows	9.5	9.6
Heifers (15 - 24 mon)	6.7	6.7
Heifers (7 - 14 mon)	5.8	5.9
Heifers (3 - 6 mon)	5.3	5.3
Calves (0 - 3 mon)	4.9	4.9
Mature bulls	8.9	9.0

Land Application of Liquid Manure		
Category	Open Corral Housing (lb-NH_3/cow-yr)	Freestall Housing (lb-NH_3/cow-yr)
Milk cows	24.9	29.1
Dry cows	15.3	17.9
Heifers (15 - 24 mon)	10.7	12.5
Heifers (7 - 14 mon)	9.3	10.9
Heifers (3 - 6 mon)	8.5	9.9
Calves (0 - 3 mon)	7.9	7.9
Mature bulls	14.3	16.8

C. Calculations

1. Pre-Project Potential to Emit (PE1)

Since this facility is a reconstructed source, PE1 = 0 for all pollutants.

2. Post Project Potential to Emit (PE2)

Post-Project Potential to Emit (PE2) for the dairy will be calculated below based on the maximum design capacity for each type of cow at the dairy and the controls required and proposed by the dairy.

Cow Milking Operation (S-6746-1-0):

VOC:

$PE2_{VOC}$ = 3,600 x 0.4 = **1,440 lb-VOC/yr**
$PE2_{VOC}$ = 1,440 lb-VOC/yr ÷ 365 days/yr = **3.9 lb-VOC/day**

NH_3:

$PE2_{NH3}$ = 3,600 x 1.2 = **4,320 lb-NH_3/yr**
$PE2_{NH3}$ = 4,320 lb-NH_3/yr ÷ 365 days/yr = **11.8 lb-NH_3/day**

Cow Housing (S-6746-2-0):

VOC:

$PE2_{VOC}$ = (3,600 x 10.41) + (535 x 5.88) + (3,050 x 4.5) = **54,347 lb-VOC/yr**
$PE2_{VOC}$ = 54,347 lb-VOC/yr ÷ 365 days/yr = **148.9 lb-VOC/day**

PM_{10}:

$PE2_{PM10}$ = (3,600 x 1.02) + (535 x 3.38) + (3,050 x 6.47) = **25,214 lb-PM_{10}/yr**
$PE2_{PM10}$ = 25,214 lb-PM_{10}/yr ÷ 365 days/yr = **69.1 lb-PM_{10}/day**

NH_3:

$PE2_{NH3}$ = (3,600 x 28) + (535 x 20.6) + (3,050 x 14.4) = **155,741 lb-NH_3/yr**
$PE2_{NH3}$ = 155,741 lb-NH_3/yr ÷ 365 days/yr = **426.7 lb-NH_3/day**

Liquid Manure Handling (S-6746-3-0):

Lagoon/Storage:

VOC:

$PE2_{VOC}$ = (3,600 x 0.74) + (535 x 0.40) + (3,050 x 0.31) = **3,824 lb-VOC/yr**
$PE2_{VOC}$ = 3,824 lb-VOC/yr ÷ 365 day/yr = **10.5 lb-VOC/day**

NH_3:

$PE2_{NH3}$ = (3,600 x 15.7) + (535 x 9.5) + (3,050 x 6.7) = **82,038 lb-NH_3/yr**
$PE2_{NH3}$ = 82,038 lb-NH_3/yr ÷ 365 days/yr = **224.8 lb-NH_3/day**

H_2S:

Annual H2S PE = 10% of the NH3 lagoon PE
= 10% x 82,038
= 8,204 lb/yr

Daily H2S PE = 5 times the average daily H2S emissions
= 5 x (8,204 lb/yr/365 days/yr)
= 112.4 lb/day

Land Application:

VOC:

$PE2_{VOC}$ = (3,600 x 1.33) + (535 x 0.72) + (3,050 x 0.55) = **6,851 lb-VOC/yr**
$PE2_{VOC}$ = 6,851 lb-VOC/yr ÷ 365 day/yr = **18.8 lb-VOC/day**

NH_3:

$PE2_{NH3}$ = (3,600 x 29.1) + (535 x 15.3) + (3,050 x 10.7) = **145,581 lb-NH_3/yr**
$PE2_{NH3}$ = 145,581 lb-NH_3/yr ÷ 365 days/yr = **398.9 lb-NH_3/day**

Liquid Manure Handling	VOC (lb/day	NH_3 (lb/day	VOC (lb/yr)	NH_3 (lb/yr)
Lagoon/Storage	10.5	224.8	3,824	82,038
Land Application	18.8	398.9	6,851	145,581
Total	**29.3**	**623.7**	**10,675**	**227,619**

Solid Manure Handling (S-6746-4-0):

VOC:

$PE2_{VOC}$ = (3,600 x 0.50) + (535 x 0.27) + (3,050 x 0.21) = **2,585 lb-VOC/yr**
$PE2_{VOC}$ = 2,585 lb-VOC/yr ÷ 365 day/yr = **7.1 lb-VOC/day**
NH_3:

$PE2_{NH3}$ = (3,600 x 3.4) + (535 x 1.7) + (3,050 x 0.9) = **15,895 lb-NH_3/yr**
$PE2_{NH3}$ = 15,895 lb-NH_3/yr ÷ 365 days/yr = **43.5 lb-NH_3/day**

Feed Storage and Handling (S-6746-5-0):

Open Face Area:

= [#open face piles] x [height] x
(([width] + ([width]/(0.1667 x ([width]/[height]) + 1.111)))/2)

Corn Area
= 1 x 30 ft x ((100 ft + (100 ft / (0.1667 x (100 ft /30 ft) + 1.111 ft)))/2)
= 2,400 ft^2

Wheat Area
= 1 x 30 ft x ((100 ft + (100 ft / (0.1667 x 100 ft /30 ft) + 1.111 ft))/2)
= 2400 ft^2

Silage Annual PE:

Corn Emissions
= emission factor x area x 0.0929 m^2/ft^2 x 8,760 hr/yr x 60 min/hr x 2.20E-9 lb/μg
= 21,155 x 2,400x 0.0929 x 8760 x 60 x 2.20E-9 lb/μg
= 5,454 lb-VOC/yr

Wheat Emissions
= emission factor x area x 0.0929 m^2/ft^2 x 8,760 hr/yr x 60 min/hr x 2.20E-9 lb/μg
= 26,745 x 2400 x 0.0929 x 8760 x 60 x 2.20E-9 lb/μg
= 6,895 lb-VOC/yr

TMR Annual PE:

TMR emissions should not include calves. However, the number of calves will be included in the total cow count as a worst-case scenario since the number of calves can vary.

= [# of cows] x [emission factor] x [area] x [min/yr] x [lb/μg]
= **7,185** x 10,575 μg/m^2-min x 0.658 m^2 x 525,600 min/yr x 2.20E-9 lb/μg
= 57,811 lb-VOC/yr

$PE2_{VOC}$ = 5,454 lb-VOC/yr + 6,895 lb-VOC/yr + 57,811 lb-VOC/yr = **70,160 lb-VOC/yr**
$PE2_{VOC}$ = 70,160 lb-VOC/yr ÷ 365 days/yr = **192.2 lb-VOC/day**

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

Pursuant to Section 4.9 of District Rule 2201, the Pre-Project Stationary Source Potential to Emit (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 that have occurred at the source, and which have not been used on-site.

Since this is a reconstructed source, SSPE1 = 0 for all pollutants.

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

Pursuant to Section 4.10 of District Rule 2201, the Post Project Stationary Source Potential to Emit (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 that have occurred at the source, and which have not been used on-site.

The SSPE2 is as summarized in the following table:

Post-Project Stationary Source Potential to Emit [SSPE2] (lb/year)							
	NO_X	SO_X	PM_{10}	CO	VOC	NH_3	H_2S
S-6746-1-0 (Milking operation)	0	0	0	0	1,440	4,320	0
S-6746-2-0 (Cow Housing)	0	0	25,214	0	54,347	155,741	0
S-6746-3-0 (Liquid manure)	0	0	0	0	10,675	227,619	8,809
S-6746-4-0 (Solid Manure)	0	0	0	0	2,585	15,895	0
S-6746-5-0 (Feed)	0	0	0	0	70,160	0	0
Post-Project SSPE (SSPE2)	**0**	**0**	**25,214**	**0**	**139,207**	**403,575**	**8,809**

5. Major Source Determination

Pursuant to Section 3.25 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 threshold values.
In determining whether a facility is a major source, fugitive emissions are not counted unless the facility belongs to certain specified source categories. 40 CFR 71.2 (Definitions, Major Source (2)) states the following:

(2) A major stationary source of air pollutants or any group of stationary sources as defined in section 302 of the Act, that directly emits, or has the potential to emit, 100 tpy or more of any air pollutant (including any major source of fugitive emissions of any such pollutant, as determined by rule by the Administrator). <u>The fugitive emissions of a stationary source shall not be considered in determining whether it is a major stationary source</u> for the purposes of section 302(j) of the Act, unless the source belongs to one of the following categories of stationary source: (i) Coal cleaning plants (with thermal dryers); (ii) Kraft pulp mills; (iii) Portland cement plants; (iv) Primary zinc smelters; (v) Iron and steel mills; (vi) Primary aluminum ore reduction plants; (vii) Primary copper smelters; (viii) Municipal incinerators capable of charging more than 250 tons of refuse per day; (ix) Hydrofluoric, sulfuric, or nitric acid plants; (x) Petroleum refineries; (xi) Lime plants; (xii) Phosphate rock processing plants; (xiii) Coke oven batteries; (xiv) Sulfur recovery plants; (xv) Carbon black plants (furnace process); (xvi) Primary lead smelters; (xvii) Fuel conversion plants; (xviii) Sintering plants; (xix) Secondary metal production plants; (xx) Chemical process plants; (xxi) Fossil-fuel boilers (or combination thereof) totaling more than 250 million British thermal units per hour heat input; (xxii) Petroleum storage and transfer units with a total storage capacity exceeding 300,000 barrels; (xxiii) Taconite ore processing plants; (xxiv) Glass fiber processing plants; (xxv) Charcoal production plants; (xxvi) Fossil-fuel-fired steam electric plants of more than 250 million British thermal units per hour heat input; or (xxvii) Any other stationary source category which, as of August 7, 1980, is being regulated under section 111 or 112 of the Act.

Because agricultural operations do not fall under any of the specific source categories listed above, fugitive emissions are not counted when determining if an agricultural operation is a major source. 40 CFR 71.2 defines fugitive emissions as "those emissions which could not reasonably pass through a stack, chimney, vent, or other functionally-equivalent opening."

Since emissions at the dairy 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 dairy farms. 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 dairies, *"... 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.

<u>Milking Center</u>
The mechanical system for the milking parlors can be utilized to capture the gases emitted from the milking parlors, however in order to capture all of the gases, and to keep an appropriate negative pressure throughout the system, the holding area would also need to be entirely enclosed. No facility currently encloses the holding area since cows are continuously going in and out of the barn throughout the day. The capital required to enclose this large area would also be significant. Since the holding area is primarily kept open, the District cannot reasonably demonstrate that emissions can pass through a stack, chimney, vent, or other functionally equivalent opening.

<u>Cow Housing</u>
Although there are smaller dairy farms that have 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 dry 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.

<u>Manure storage Areas</u>
Many dairies 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 many of these piles are covered, the emissions cannot easily 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 from 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 dairies. 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 dairies store the silage piles underneath a tarp or in an agbag. 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 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.

Therefore, the VOC emissions from these sources are considered fugitive. The District has determined that control technology to capture emissions from lagoons (biogas collection systems, for instance) is in use and these emissions can be reasonably collected and are not fugitive. Therefore, only emissions from the lagoons and storage ponds will be used to determine if this facility is a major source.

The post-project emissions from the lagoons/storage ponds at this dairy were calculated in Section VII.C.2 above. The following table shows the non-fugitive Post-Project Stationary Source Potential to Emit for the dairy.

Non-Fugitive Post-Project Stationary Source Potential to Emit [SSPE2] (lb/year)					
	NO_X	SO_X	PM_{10}	CO	VOC
S-6746-1-0 (Milking operation)	0	0	0	0	0
S-6746-2-0 (Cow housing)	0	0	0	0	0
S-6746-3-0 (Lagoons)	0	0	0	0	3,824
S-6746-4-0 (Solid Manure)	0	0	0	0	0
S-6746-5-0 (Feed)	0	0	0	0	0
Non Fugitive SSPE	**0**	**0**	**0**	**0**	**3,824**

Major Source Determination (lb/year)					
	NO_X	SO_X	PM_{10}	CO	VOC
Post Project SSPE (SSPE2)	0	0	0	0	3,824
Major Source Threshold	20,000	140,000	140,000	200,000	20,000
Major Source?	No	No	No	No	No

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

6. Baseline Emissions (BE)

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

Pursuant to Section 3.7 of District Rule 2201, BE = Pre-project Potential to Emit for:

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

otherwise,

BE = Historic Actual Emissions (HAE), calculated pursuant to Section 3.22 of District Rule 2201.

As shown in Section VII.C.5 above, the facility is not a major source for any pollutant. Therefore Baseline Emissions (BE) are equal to the Pre-Project Potential to Emit (PE1).

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 SB288 major modification.

8. Federal Major Modification

As shown above, this project does not constitute a Major Modification. Therefore, in accordance with District Rule 2201, Section 3.17, this project does not constitute a Federal Major Modification and no further discussion is required.

District Rule 2201, Section 3.17 states that Federal Major Modifications are the same as "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. Additionally, since the facility is not a major source for PM_{10} (140,000 lb/year), it is not a major source for PM2.5 (200,000 lb/year).

9. 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 B.

VIII. Compliance

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. Therefore, the following conditions will be listed on the 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 2201 New and Modified Stationary Source Review Rule

A. Best Available Control Technology (BACT)

1. BACT Applicability

BACT requirements are triggered on a pollutant-by-pollutant basis and on an emissions unit-by-emissions unit basis for the following*:

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 AIPE exceeding two pounds per day, and/or
d. Any new or modified emissions unit, in a stationary source project, which results in an SB288 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

All the emission units at the proposed dairy are to be considered new, pursuant to section 3.34 or Rule 2201 (reconstructed source). The following table is a summary of the daily emissions for each emissions unit:

Emissions unit	Daily Emissions (lb/day)						
	NOx	SOx	PM10	CO	VOC	NH3	H2S
N-6746-1: Milk Barn	0.0	0.0	0.0	0.0	3.9	11.8	0.0
N-6746-2: Cow Housing	0.0	0.0	69.1	0.0	148.9	426.7	0.0
N-6746-3: Liquid Manure – Lagoons	0.0	0.0	0.0	0.0	10.5	224.8	120.7
N-6746-3: Liquid Manure - Land Application	0.0	0.0	0.0	0.0	18.8	398.9	0.0
N-6746-4: Solid Manure	0.0	0.0	0.0	0.0	7.1	43.5	0.0
N-6746-5: Feed - Silage	0.0	0.0	0.0	0.0	33.8	0.0	0.0
N-6746-5: Feed - TMR	0.0	0.0	0.0	0.0	158.4	0.0	0.0

As shown in the table above, emissions exceed 2 lb/day and hence BACT is triggered for the following emission units:

- Milk Barn: VOC and NH3
- Cow Housing: PM10, VOC and NH3
- Lagoons: VOC, NH3 and H2S
- Land application: VOC and NH3
- Feed - Silage: VOC
- Feed - TMR: VOC

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 due to relocation of an emissions unit.

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

All the emission units at the proposed dairy are considered new, pursuant to section 3.34 or Rule 2201 (reconstructed source). BACT is therefore not triggered under this category.

d. SB 288/Federal Major Modification

As discussed in Section VII.C.7 above, this project does not constitute a SB 288 and/or Federal Major Modification for NO_X emissions; therefore BACT is not triggered for any pollutant.

2. Top-Down BACT Analysis

Per Permit Services Policies and Procedures for BACT, a Top-Down BACT analysis shall be performed as a part of the application review for each application subject to the BACT requirements pursuant to the District's NSR Rule.

Pursuant to the attached Top-Down BACT Analysis in Appendix D, BACT has been satisfied with the following:

Milk Barns:

VOC and NH_3: Flush/Spray down milking parlor after each group of cows is milked

Cow Housing and TMR:

VOC: 1) Feed lanes and walkways constructed of concrete.
2) Feed lanes and walkways flushed, scraped or vacuumed four times per day for milk and dry cows; and two times per day for bulls and heifers.
3) All animals fed in accordance with National Research Council (NRC) or other District-approved guidelines utilizing routine nutritional analysis for rations.
4) Refused feed refed or removed from feed lanes on a daily basis to prevent decomposition.
3) Weekly scraping and/or manure removal using pull type manure harvesting equipment, except during periods of rainy weather.
4) Dry lots sloped to facilitate runoff and drying in accordance with Title 3, Food and Agriculture, Division 2, Animal Industry of the California Code of Regulations, Section 646.1.
5) VOC mitigation measures required by District Rule 4570.

NH_3: 1) Concrete feed lanes and walkways.
2) Feed lanes and walkways flushed, scraped or vacuumed four times per day for milk and dry cows; and two times per day for bulls and heifers.
3) Weekly scraping and/or manure removal using pull type manure harvesting equipment, except during periods of rainy weather.
4) All animals fed in accordance with National Research Council (NRC) or other District-approved guidelines utilizing routine nutritional analysis for rations.
5) Dry lots sloped to facilitate runoff and drying in accordance with Title 3, Food and Agriculture, Division 2, Animal Industry of the California Code of Regulations, Section 646.1.

PM_{10}: 1) Concrete freestall and dry lot feed lanes and walkways.
2) Open corrals equipped with shade structures.
3) Heifers fed (at least one feeding) at or near (within one hour of) dusk.
4) Weekly scraping and/or manure removal using pull type manure harvesting equipment, except during periods of rainy weather.
4) Establishment of a downwind windbreak meeting NRCS guidelines.

Liquid Manure Handling System:

Lagoon/Storage Pond:

VOC: 1) Two-stage anaerobic treatment lagoon designed according to NRCS guidelines.
2) Installation of an anaerobic digester contingent upon the final dairy BACT guideline.

NH_3: 1) Two-stage anaerobic treatment lagoon designed according to NRCS guidelines.
2) Installation of an anaerobic digester contingent upon the final dairy BACT guideline.

H2S: 1) All animals fed in accordance with National Research Council (NRC) or other District-approved guidelines utilizing routine nutritional analysis for rations.

2) Separation of solids from liquid manure stream prior to treatment in the lagoons.

Land Application:

VOC: 1) Irrigation of crops using liquid and slurry manure from a holding/storage pond after an Anaerobic Treatment Lagoon.

NH_3: 1) Irrigation of crops using liquid and slurry manure from a holding/storage pond after an Anaerobic Treatment Lagoon.

Feed - Silage:

VOC: 1) Compliance with District Rule 4570 mitigation measures.

B. Offsets

Sources that are subject to federal NSR are required to offset the emissions they increase by providing emission reductions. This is generally done with emission reduction credits, or ERCs. There are strict federal requirements for ERCs that can be used to offset emissions increases under NSR. The emission reductions must be (1) real, (2) permanent, (3) quantifiable, (4) enforceable, and (5) surplus. Over time, EPA policies and court determinations have established fairly rigorous definitions and tests for each of these terms.

For certain agricultural operations, it is difficult to demonstrate that emission reductions are real, permanent, quantifiable, enforceable, and surplus – *as those terms are defined by EPA and case law.* Under SB 700, the air districts are prohibited from requiring offsets for sources for which the above demonstration cannot be made. These sources may include, for example, crop farm fugitive dust, agricultural burning, and non-equipment operations at CAFs. When it becomes possible to demonstrate that emissions (increases and reductions) are real, permanent, quantifiable, enforceable, and surplus, ERCs may be granted and offsets required. A program to allow this would have to include a regulation that is approved by EPA and incorporated into the State Implementation Plan (SIP). Such regulations specify appropriate quantification methodologies, and other provisions that ensure the reduction meet all the applicable tests, and the regulatory process allows for public review and comment.

To date, California air districts have not succeeded in gaining EPA approval to issue ERCs for agricultural activities. This has been the case even for reductions from on-the-farm equipment that is similar to traditional stationary sources. Therefore, ERCs will not be granted, nor will offsets be required for agricultural sources until the District has adopted the needed regulations, and EPA has approved those regulations and incorporated them into the SIP.

C. Public Notification

1. Applicability

Public noticing is required for:

a. Any new Major Source, which is a new facility that is also a Major Source,

b. Major Modifications,

c. Any new emissions unit with a Potential to Emit greater than 100 pounds during any one day for any one pollutant,

d. Any project which results in the offset thresholds being surpassed, and/or

e. Any project with an SSIPE of greater than 20,000 lb/year for any pollutant.

a. New Major Source

New Major Sources are new facilities which are also Major Sources. Since this facility is not a major source, public noticing for new major source purposes is not required.

b. Major modification

As demonstrated in VII.C.7, this project does not constitute a major modification. Public noticing for major modification purposes is therefore not required.

c. PE > 100 lb/day

Applications which include a new emissions unit with a Potential to Emit greater than 100 pounds during any one day for any pollutant will trigger public noticing requirements. The following table is a summary of daily emissions for each emissions unit:

Emissions unit	Daily Emissions (lb/day)						
	NOx	SOx	PM10	CO	VOC	NH3	H2S
N-6746-1: Milk Barn	0.0	0.0	0.0	0.0	3.9	11.8	0.0
N-6746-2: Cow Housing	0.0	0.0	69.1	0.0	148.9	426.7	0.0
N-6746-3: Liquid Manure - Lagoons	0.0	0.0	0.0	0.0	10.5	224.8	120.7
N-6746-3: Liquid Manure - Land Application	0.0	0.0	0.0	0.0	18.8	398.9	0.0
N-6746-4: Solid Manure	0.0	0.0	0.0	0.0	7.1	43.5	0.0
N-6746-5: Feed	0.0	0.0	0.0	0.0	192.2	0.0	0.0

As shown in the table above, the proposed project includes several emission units (cow housing, liquid manure, and feed) with potential emissions exceeding 100 lb/day. The project therefore triggers public notice requirements.

d. Offset Threshold

The following table compares the SSPE1 and the SSPE2 to the offsets thresholds in order to determine if any thresholds have been surpassed due to this project:

Offsets 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	25,214	29,200 lb/year	No
CO	0	0	200,000 lb/year	No
VOC	0	139,207	20,000 lb/year	Yes
NH3	0	403,575	N/A	No
H2S	0	8,809	N/A	No

As shown above, the VOC offsets threshold has been surpassed due to this project; therefore public noticing is required under this category.

e. SSIPE > 20,000 lb/year

Public notice is required for any permitting action that results in a Stationary Source Increase in Permitted Emissions (SSIPE) of more than 20,000 lb/year of any affected pollutant. According to District policy, the SSIPE is calculated as the Post Project Stationary Source Potential to Emit (SSPE2) minus the Pre-Project Stationary Source Potential to Emit (SSPE1), i.e. SSIPE = SSPE2 – SSPE1. The values for SSPE2 and SSPE1 are calculated according to Rule 2201, Sections 4.9 and 4.10, respectively.

The SSIPE is compared to the SSIPE Public Notice thresholds in the following table:

Stationary Source Increase in Permitted Emissions [SSIPE] – Public Notice					
Pollutant	SSPE2 (lb/yr)	SSPE1 (lb/yr)	SSIPE (lb/yr)	Public Notice Threshold (lb/yr)	Public Notice Required?
NO_x	0	0	0	20,000	No
SO_x	0	0	0	20,000	No
PM_{10}	25,214	0	25,214	20,000	Yes
CO	0	0	0	20,000	No
VOC	139,207	0	139,207	20,000	Yes
NH_3	403,575	0	403,575	20,000	Yes
H2S	8,809	0	8,809	20,000	No

As demonstrated in the preceding table, the SSIPE for VOC and NH_3 is greater than 20,000 lb/year. Public notice for SSIPE purposes is therefore required.

2. Public Notice Action

As discussed above, public notice is required for this project. 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 in Tulare County prior to the issuance of the ATCs for the project.

D. Daily Emission Limits (DELs)

Daily Emissions Limitations (DELs) and other enforceable conditions are required by Section 3.17 to restrict a unit's maximum daily emissions, to a level at or below the emissions associated with the maximum design capacity. Per Sections 3.17.1 and 3.17.2, the DEL must be contained in the latest ATC and contained in or enforced by the latest PTO and enforceable, in a practicable manner, on a daily basis. DELs are also required to enforce the applicability of BACT.

For dairies, the DEL is satisfied based on the number and types of cows at the dairy and the required controls and mitigation measures. The number and types of cows are listed in the permit equipment description for the Cow Housing (Permit S-6746-2-0).

Milking Parlor (S-6746-1-0)

For the milking parlor the DEL is satisfied by the number of cows listed in the permit description. Additionally, the following conditions will be placed on the ATC:

- The milking parlor shall be flushed or sprayed down immediately prior to, immediately after, or during the milking of each group of cows. [District Rules 2201 and 4570]

Cow Housing (S-6746-2-0)

The following condition will be added to limit the total number of cows housed at the dairy:

- The total number of cows housed at this dairy at any one time shall not exceed any of the following limits: 3,600 milk cows; 535 dry cows; 2,500 support stock (heifers and bulls); and 550 calves (under 3 months of age). [District Rule 2201]

Additionally, the following conditions will be placed on the ATC to ensure that the DEL requirements for PM_{10} are met:

- Open corrals shall be scraped weekly using a pull-type scraper in the morning hours, except when this is prevented by wet conditions. [District Rule 2201]

- Permittee shall establish a 2,440 foot windbreak along the dairy's east perimeter, starting at the Northeastern corner of the existing heifer corrals and going South along the Eastern border; and a 1,050 foot windbreak along the Southern perimeter, starting from the Southeastern corner of the dairy, going West along the Southern border. East windbreaks shall consist of the following two rows with the first row closest to the dairy:

first row shall consist of Arizona Cypress trees, planted 10 feet apart and the second row shall consist of Chinese Pistache trees, planted 14 feet apart. South windbreaks shall consist of the following two rows with the first row closest to the dairy: first row shall consist of Arizona Cypress trees, planted 10 feet apart and the second row shall consist of Interior Live Oak trees, planted 20 feet apart. Each row shall be offset from the adjacent row. Spacing between rows shall be sufficient to accommodate cultivation equipment. This spacing shall not exceed 24 feet. An alternative windbreak proposal must be approved by the District. [District Rule 2201]

- The open corrals shall be equipped with shade structures. [District Rule 2201]

- At least one of the feedings of the heifers at this dairy shall be near (within one hour of) dusk. [District Rule 2201]

The following conditions will be placed on the ATC to ensure that the DEL requirements for VOC are met:

- The concrete feed lanes and walkways for milk cows shall be flushed at least four times per day. [District Rules 2201 and 4570]

- The concrete feed lanes and walkways for all dry cows, heifers, and calves shall be flushed at least two times per day. [District Rules 2201 and 4570]

- Permittee shall maintain an operating plan that requires the feed lanes and walkways to be flushed at least four times per day for milk cows and at least two times per day for all other cows. [District Rules 2201 and 4570]

- All animals at this dairy shall be fed in accordance with the National Research Council (NRC) guidelines utilizing routine dairy nutritionist analyses of rations. [District Rule 2201]

<u>Liquid Manure Handling System (S-6746-3-0)</u>

Since emissions from the liquid manure handling system depend on the amount of manure handled, the following condition will be placed on the permit:

- The liquid manure handling system shall handle flush manure from no more than 3,600 milk cows; 535 dry cows; 2,500 support stock (heifers and bulls); and 550 calves (under 3 months of age). [District Rule 2201]

- The liquid manure handling system shall include an anaerobic treatment lagoon designed, constructed and operated according to NCRCS Guideline No. 359. [District Rule 2201]

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

Cow Housing (S-6746-2-0)

Based on guidelines from the University of Idaho in a document entitled "*Dairy Odor Management and Control Practices*"[4] and the requirements of District Rule 4570, the following conditions will be placed on the permit to ensure that emissions from the dairy are minimized:

- Inspection for potholes or other sources of emissions shall be performed on a monthly basis. [District Rule 2201]
- Firm, stable, and not easily eroded soils shall be used for the exercise pens. [District Rule 2201]
- A supply of fill soil shall be kept on site in order to fill areas where erosion and gouging occurs. This will help fill areas where puddles may form. This fill soil shall be covered with a tarp. [District Rule 2201]
- Clean rainfall runoff shall be diverted around exercise pens to reduce the amount of water that is potentially detained on the corral surface. [District Rule 2201]

3. Recordkeeping

Recordkeeping is required to demonstrate compliance with the public notification and daily emission limit requirements of Rule 2201. In general, recordkeeping for the Milking Parlor (S-6746-1), and the Liquid Manure Handling System (S-6746-3) are satisfied with the records that must be kept to demonstrate compliance with the numbers and types of cows listed in the permit equipment description for the Cow Housing (S-6746-2). The following conditions will be placed on the ATC permits:

Cow Housing (S-6746-2-0)

The following conditions will appear on the ATC for the Cow Housing Permit:

- Permittee shall maintain a record of the number of animals of each production group at the Facility and shall maintain quarterly records of any changes to this information. Such records may include DHIA monthly records, milk production invoices, ration sheets or periodic inventory records. [District Rules 2201 and 4570]

[4] http://courses.ag.uidaho.edu/bae/bae404/Dairy%20Odor%20Mgmt.pdf

- Permittee shall maintain records of: (1) the number of times feed lanes are flushed per day and (2) the frequency of scraping and manure removal from open corrals; and (3) a log of pothole inspections performed at the dairy. [District Rules 2201 and 4570]

Additional recordkeeping conditions are included under the Rule 4570 compliance section.

Liquid Manure Handling System (S-6746-3)

To ensure that the lagoon system is designed and operating properly, the following condition will be placed on the ATC for the Liquid Manure Handling System:

- Permittee shall maintain records of design specifications and calculations for the Anaerobic Treatment Lagoon system in order to demonstrate that the system has been designed and is operating in accordance with the applicable National Resource Conservation Service (NRCS) technical guide. [District Rules 2201 and 4570]

Additional recordkeeping conditions are included under the Rule 4570 compliance section.

4. Reporting

No reporting is required to demonstrate compliance with Rule 2201.

F. Ambient Air Quality Analysis

Section 4.14.1 of this Rule requires that an ambient air quality analysis (AAQA) be conducted for the purpose of determining whether a new or modified Stationary Source will cause or make worse a violation of an air quality standard. The Technical Services Division of the SJVAPCD conducted the required analysis. Refer to Appendix E of this document for the AAQA summary sheet.

The proposed location is in an attainment area for NOX, CO, and SOX. The proposed dairy expansion will not cause a violation of an air quality standard for NOX, CO, or SOX.

The proposed location is in a non-attainment area for PM10. Modeling results indicated that the calculated increase in the ambient PM_{10} concentration due to the proposed equipment will exceed the EPA significance level as given in 40 CFR Part 51.165 (b)(2).
Section 4.14.1 of District Rule 2201 states:

> Emissions from a new or modified Stationary Source shall not cause or make worse the violation of an Ambient Air Quality Standard. In making this determination, the APCO shall take into account the increases in minor and secondary source emissions as well as the mitigation of emissions through offsets obtained pursuant to this rule....

To mitigate potential adverse effects to Ambient Air Quality, the applicant has proposed to provide sufficient PM_{10} Emission Reduction Credits (ERCs) to reduce the project's impact below the significance threshold. A total of 11,499 lb/yr of ERCs will be surrendered in mitigation. This amount was calculated as the difference between the PE2 in section VII.C.2 (25,214 lb/yr) and the PE from the 1,300 heifers at the pre-existing heifer ranch operation (1,300 x 10.55 lb/hd-yr = 13,715 lb/yr).

The applicant has identified certificates # C-819-4 and # C-820-4 as the sources of the ERCs to be surrendered. Based on the sites of reductions listed on these certificates, the ERCs will be surrendered at a Distance Offset Ratio of 1.2, in accordance with District Rule 2201. Thus, the final quantity of offsets required is 13,799 lb/yr.

The following condition will be placed on the ATC for construction of the cow housing (S-6746-2-0) to ensure that adequate offsets are surrendered prior to operating the units approved in this project:

- Prior to operating equipment authorized under this Authority to Construct, the permittee shall surrender PM10 Emission Reduction Credits (ERC) for a total of 13,799 lb/yr. The ERC quantity stated includes a distance offset ratio of 1.2 as specified in Table 4-2 of Rule 2201. [District Rule 2201]

- ERC Certificates #C-819-4 and C-820-4 (or certificates split from these certificates) shall be used to supply the required offsets, unless a revised offsetting proposal is received and approved by the District, upon which this Authority to Construct shall be reissued administratively specifying the new offsetting proposal. Original public noticing requirements, if any, shall be duplicated prior to reissuance of this Authority to Construct. [District Rule 2201] N

The proposed location is in a non-attainment area for H_2S. Modeling results indicated that the calculated increase in the ambient H_2S concentration due to the proposed equipment will not exceed the state standard.

The following conditions will be added to the permit to ensure continued compliance with the AAQS:

- The average concentration of undissociated hydrogen sulfide (H2S) at the surface of the lagoon(s) and storage pond(s) shall not exceed 1.39 mg/L during the 1st calendar quarter (Jan – March), 1.93 mg/L during the 2nd calendar quarter (Apr – June), 1.80 mg/L during the 3rd calendar quarter (Jul – Sept), and 2.02 mg/L during the 4th calendar quarter (Oct – Dec). The concentration of undissociated H2S at the surface of each lagoon and storage pond shall be calculated using the monitored values for the total sulfide concentration, pH, and temperature. The fraction of total sulfide that is undissociated H2S shall calculated using the formula (10^-pH)/(10^-pH + Ka1), where Ka1 is the temperature-adjusted dissociation constant for H2S; or the procedures outlined in Standard Methods 4500-S2-H; or using other procedures approved by the District. [District Rules 2201 and 4102]

- The total sulfide concentration, pH, and temperature at the surface of each lagoon and storage pond shall be monitored and recorded at least once every calendar quarter and at other times requested by the District. If the average calculated undissociated H2S concentration from monitoring the lagoon(s) and pond(s) exceeds the maximum allowed concentration, the permittee shall monitor and record the total sulfide concentration, pH, and temperature at the surface of at least two other locations in each lagoon and pond as soon as possible, but no longer than 24 hours after results were available from the initial monitoring indicating a potential exceedance. The undissociated H2S concentration calculated from the initial monitoring locations and the secondary monitoring locations for the lagoons and ponds shall be averaged. If the calculated average concentration of undissociated H2S continues exceed the maximum allowed limit, then the total sulfide concentration, pH, and temperature at the surface of each lagoon and storage pond shall be monitored and recorded monthly until three consecutive months of monitoring show compliance, after which the monitoring frequency may return to quarterly. For each secondary storage pond that has a liquid depth of no greater than 5 feet during the monitoring period, the concentration of undissociated H2S may be considered negligible and monitoring shall not be required. Records of the results of monitoring of the sulfide concentration, pH, and temperature at the surface of each lagoon and storage pond and the maximum depth of storage ponds during periods that they are not monitored shall be maintained. The District may also approve alternative monitoring frequencies and/or parameters. [District Rules 2201 and 4102]

- Monitoring of the total sulfide concentration of lagoons and ponds shall be performed using a sulfide test kit, a sulfide meter, procedures of an accredited lab, Standard Methods 4500-S2; ASTM D4658; USGS Method I-3840; EPA Method 376.2; Marine Pollution Studies Laboratory (MPSL) Standard Operating Procedure for measurement of sulfide; or an alternative method approved by the District. [District Rules 2201 and 4102]

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 2550 Federally Mandated Preconstruction Review for Major Sources of Air Toxics

The provisions of this rule only apply to applications to construct or reconstruct a major air toxics source with Authority to Construct issued on or after June 28, 1998.

Under Rule 2550, newly constructed facilities or reconstructed units or sources[5] at existing facilities would be subject to preconstruction review requirements if they have the potential to emit hazardous air pollutants (air toxics) in "major" amounts (10 tons or more of an individual pollutant or 25 tons or more of a combination of pollutants) and the new units are not already subject to a standard promulgated under Section 112(d), 112(j), or 112(h) of the Clean Air Act." Facilities or sources subject to Rule 2550 would be subject to stringent air pollution control requirements, referred to Maximum Achievable Control Technology.

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[5] Reconstruction" is defined as a change that costs 50 percent of the cost of constructing a new unit or source like the one being rebuilt.

The federal Clean Air Act lists 189 substances as potential HAPs (Clean Air Act Section 112(b)(1)). Based on the current emission factor for dairies, the following table outlines the HAPs expected to be emitted at dairies. Since this dairy is complying with Best Available Control Technology (BACT) emissions control requirements, many of the pollutants listed below are expected to be reduced significantly; however, no control is being applied in the emissions estimates in order to calculate worst-case emissions. Please note that a conclusion that MACT requirements are triggered would necessarily involve consideration of controlled emissions levels. The following is a list of HAPs generated at dairies including the associated emission factor.

Hazardous Air Pollutant Emissions		
HAP	lbs-milk cow-yr	Source
Methanol	1.35	UC Davis - *VOC Emission from Dairy Cows and their Excreta*, 2005
Carbon disulfide	0.027	Dr. Schmidt - *Dairy Emissions using Flux Chambers (Phase I & II)*, 2005
Eythylbenzene	0.003	
o-Xylene	0.005	
1,2-Dibromo-3chloropropane	0.011	
1,2,4-Trichlorobenzene	0.025	
Napthalene	0.012	
Hexachlorobutadiene	0.012	
Formaldehyde	0.005	
Acetaldehyde	0.029	
Chloroform	0.017	California State University Fresno (CSUF) - *Monitoring and Modeling of ROG at California Dairies*, 2005
Styrene	0.01	
Vinyl acetate[6]	0.08	Dr. Schmidt - *Dairy Emissions using Flux Chambers (Phase I & II)* & California State University Fresno (CSUF) - *Monitoring and Modeling of ROG at California Dairies*, 2005
Toluene[7]	0.162	
Cadmium	0.009	Air Resources Board's Profile No. 423, Livestock Operations Dust
Hexavalent Chromium	0.004	
Nickel	0.026	
Arsenic	0.005	
Cobalt	0.003	
Lead	0.033	
Total	**1.828**	

Although some of the pollutants listed above may have been misidentified as HAPs due to similarities of many compounds consisting of very similar spikes (as measured through the gas Chromatograph Mass Spectroscopy - GCMS), all of these pollutants will be used in calculating the worst-case HAP emissions. Since this dairy is complying with all of the Best Available Control Technology (BACT) requirements and Rule 4570 mitigation measures, many of the

[6] 0.01 + 0.07 = 0.08 lbs/hd-yr
[7] 0.012 + 0.15 = 0.162 lbs/hd-yr

pollutants listed above are expected to be mitigated, however, no control is being applied to these factors at this time in order to calculate the worst-case emissions.

The emission calculations are shown in the following table:

HAP Emissions Dairy						
Category	**Number of cows**		**Emission Factor lbs/hd-yr[8]**		**lbs/yr**	**tons/yr**
Milking Cow	3,600	x	1.828	=	6,581	3.3
Dry Cow	535	x	1.123	=	601	0.3
Heifer (15-24 mo)	1,196	x	0.786	=	940	0.5
Heifer (7-14 mo)	952	x	0.686	=	653	0.3
Heifer (3-6 mo)	352	x	0.621	=	219	0.1
Calf (under 3 mo)	550	x	0.584	=	321	0.2
Bulls	0	x	1.123	=	0	0.0
Total				=	**9,315**	**4.7**

As shown above, each individual HAP is expected to be below 10 tons per year and total HAP emissions are expected to be below 25 tons per year. The largest individual HAP would be methanol, at 3.5 tons per year (4.7 tons x (1.35 lbs-methanol/1.828 lbs-HAPs)). Therefore, this facility will not be a major air toxics source and the provisions of Rule 2550 do not apply.

There are several recently completed and ongoing research studies that that will be considered in future revisions of the current emission factors for dairies, including the recent study conducted by Dr. Mitloehner in a study entitled "*Dairy Cow Measurements of Volatile Fatty Acids, Amine, Phenol, and Alcohol Emissions Using an Environmental Chamber*" completed in 2006. These studies have not been fully vetted or reviewed in the context of establishing standardized emission factors. For instance, although Dr. Mitloehner indicates a high methanol emissions rate from fresh manure in the cited study, in the same report he also indicates that the flushing of manure may significantly reduce alcohol emissions, including methanol.

Future review of these studies may indeed result in a change in the current emission factors and/or control efficiencies for various practices and controls, but until that scientific review process is complete and the District has had opportunity to consider public comment on any proposed changes, the premature, and therefore potentially flawed, use of such emissions data would be inconsistent with good governance and good science.

Rule 4101 Visible Emissions

Section 5.0 stipulates that no person shall discharge into the atmosphere emissions of any air contaminant aggregating more than 3 minutes in any hour, which is as dark as or darker than Ringelmann 1 (or 20% opacity).

[8] The emission factor has been adjusted for each type of cow based on the ratio of amount of manure generated for each cow.

Pursuant to Section 4.12, emissions subject to or specifically exempt from Regulation VIII (Fugitive PM10 Prohibitions) are considered to be exempt.

Pursuant to District Rule 8081, Section 4.1, on-field agricultural sources are exempt from the requirements of Regulation VIII. An on-field agricultural source is 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;

The units involved in this project are used solely for the raising of dairy animals. Therefore, these units are exempt from the provisions of this rule.

Rule 4102 Nuisance

Section 4.0 prohibits discharge of air contaminants which could cause injury, detriment, nuisance or annoyance to the public.

This project is proposing BACT and has proposed all mitigation measures required by Rule 4570. Therefore, this dairy is expected to comply with this rule.

California Health and 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 1.0. According to the Technical Services Memo for this project (**Appendix E**), the total facility prioritization score including this project was greater than 1.0. Therefore, a health risk assessment was required to determine the short-term acute and long-term chronic exposure from this project. The risk for this project is shown below:

RMR Summary					
Categories	**Milking Parlor (S-6746-1-0)**	**Cow Housing (S-6746-2-0)**	**Lagoon (S-6746-3-0)**	**Project Totals**	**Facility Totals**
Prioritization Score	0.01	0.4	0.4	0.8	0.8
Acute Hazard Index	0.0	0.3	0.6	0.9	0.9
Chronic Hazard Index	0.0	0.2	0.0	0.2	0.2
Maximum Individual Cancer Risk (10^{-6})	0.0	2.3	1.5	3.8	3.8
T-BACT Required?	**No**	**Yes**	**Yes**		
Special Permit Conditions?	**No**	**No**	**Yes**		

BACT for toxic emission control (T-BACT) is required if the cancer risk exceeds one in one million. As demonstrated above, T-BACT is required for this project because the HRA indicates that the risk is above the District's thresholds for triggering T-BACT requirements.
For this project T-BACT is triggered for PM_{10} and VOC. T-BACT is satisfied with BACT for PM_{10} and VOC, as discussed in Appendix D; therefore, compliance with the District's Risk Management Policy is expected.

District policy APR 1905 also specifies that the increase in emissions associated with a proposed new source or modification not have acute or chronic indices, or a cancer risk greater than the District's significance levels (i.e. acute and/or chronic indices greater than 1 and a cancer risk greater than 10 in a million). As outlined by the HRA Summary in Appendix E of this report, the emissions increases for this project was determined to be less than significant.

Rule 4550 Conservation Management Practices (CMP)

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

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.

The facility received District approval for its CMP plan on March 9, 2010. Continued compliance with the requirements of District Rule 4550 is expected. The applicant has proposed to comply with the same PM10 mitigation measures for the expansion as proposed for the existing facility.

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.

The applicant has submitted an application containing all the requirements above. Since public noticing is required for this project, a public notice will be published in a local newspaper of general circulation prior to the issuance of these ATC's.

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] N

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] N

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] N

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

The Dairy 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] N

- {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] N

Feed Mitigation Measures Required

Required

Feed according to National Research Council (NRC) guidelines.

- {4454} Permittee shall feed all animals according to National Research Council (NRC) guidelines. [District Rule 4570] N

- {4455} Permittee shall maintain records of feed content, formulation, and quantity of feed additive utilized, to demonstrate compliance with National Research Council (NRC) guidelines. Records such as feed company guaranteed analyses (feed tags), ration sheets, or feed purchase records may be used to meet this requirement. [District Rule 4570] N

Push feed so that it is within three (3) feet of feedlane fence within two hours of putting out the feed or use a feed trough or other feeding structure designed to maintain feed within reach of the animals.

- {4456} Permittee shall push feed so that it is within three feet of feedlane fence within two hours of putting out the feed or use a feed trough or other feeding structure designed to maintain feed within reach of the animals. [District Rule 4570] N

- {4457} Permittee shall maintain an operating plan/record that requires feed to be pushed within three feet of feedlane fence within two hours of putting out the feed, or use of a feed trough or other structure designed to maintain feed within reach of the animals. [District Rule 4570] N

Begin feeding total mixed rations within two (2) hours of grinding and mixing rations.

- {4458} Permittee shall begin feeding total mixed rations within two hours of grinding and mixing rations. [District Rule 4570] N

- {4459} Permittee shall maintain an operating plan/record of when feeding of total mixed rations began within two hours of grinding and mixing rations. [District Rule 4570] N

Store grain in a weatherproof storage structure or under a weatherproof covering from October through May.

- {4460} Permittee shall store grain in a weatherproof storage structure or under a weatherproof covering from October through May. [District Rule 4570] N

- {4461} Permittee shall maintain records demonstrating grain is/was stored in a weatherproof storage structure or under a weatherproof covering from October through May. [District Rule 4570] N

Optional

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

- {4464} Permittee shall remove uneaten wet feed from feed bunks within twenty-four (24) hours after the end of a rain event. [District Rule 4570] N

- {4465} 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] N

Silage

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

- {4468} For bagged silage/feedstuff, permittee shall utilize a sealed feed storage system (e.g., ag bag). [District Rule 4570] N

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.

- {4469} Permittee shall cover all silage piles, except for the area where feed is being removed from the pile, with a plastic tarp that is at least five (5) mils (0.005 inches) thick, multiple plastic tarps with a cumulative thickness of at least 5 mils (0.005 inches), or an oxygen barrier film covered with a UV resistant material. Silage piles shall be covered within seventy-two (72) hours of last delivery of material to the pile. Sheets of material used to cover silage shall overlap so that silage is not exposed where the sheets meet. [District Rule 4570] N

- {4470} Permittee shall maintain records of the thickness and type of cover used to cover each silage pile. Permittee shall also maintain records of the date of the last delivery of material to each silage pile and the date each pile is covered. [District Rule 4570] N

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

- {4471} 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] N

- {4472} For each silage pile that Option 1 (Measured Bulk Density) is chosen as a mitigation measure for building the pile, records of the measured bulk density shall be maintained. [District Rule 4570] N

- {4473} For each silage pile that Option 2 (Bulk Density Determined by Spreadsheet) is chosen as a mitigation measure for building the pile, records of the filling parameters entered into the District-approved spreadsheet to determine the bulk density shall be maintained. [District Rule 4570] N

- {4474} For each silage pile that Option 3 (Moisture, TLC, Roller Opening, & Material Delivery) is chosen as a mitigation measure for building the pile, the permittee shall harvest corn used for the pile at an average moisture content of at least 65% and harvest other silage crops for the pile at an average moisture content of at least 60%. [District Rule 4570] N
- {4475} For each silage pile that Option 3 (Moisture, TLC, Roller Opening, & Material Delivery) is chosen as a mitigation measure for building the pile, records of the average percent moisture of crops harvested for silage shall be maintained. [District Rule 4570] N

- {4476} For each silage pile that Option 3 (Moisture, TLC, Roller Opening, & Material Delivery) is chosen as a mitigation measure for building the pile, the permittee shall adjust setting of equipment used to harvest crops for the pile to incorporate the following parameters for Theoretical Length of Chop (TLC) and roller opening, as applicable: 1) Corn with no processing: TLC not exceeding 1/2 inch, 2) Processed Corn: TLC not exceeding 3/4 inch and roller opening of 1-4 mm, 3) Alfalfa/Grass: TLC not exceeding 1.0 inch, 4) Other silage crops: TLC not exceeding 1/2 inch. [District Rule 4570] N

- {4477} For each silage pile that Option 3 (Moisture, TLC, Roller Opening, & Material Delivery) is chosen as a mitigation measure for building the pile, records that equipment used to harvest crops for the pile was set to the required TLC and roller opening for the type of crop harvested shall be maintained. [District Rule 4570] N

- {4478} For each silage pile that Option 3 (Moisture, TLC, Roller Opening, & Material Delivery) is chosen as a mitigation measure for building the pile, the permittee shall manage silage material delivery such that the thickness of the layer of un-compacted material delivered on top of the pile is no more than six (6) inches. [District Rule 4570] N

- {4479} For each silage pile that Option 3 (Moisture, TLC, Roller Opening, & Material Delivery) is chosen as a mitigation measure for building the pile, the permittee shall maintain a plan that requires that the thickness of the layer of un-compacted material delivered on top of the pile is no more than six (6) inches. [District Rule 4570] N

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.

- {4480} Permittee shall select and implement at least two of the following mitigation measures for management of silage piles at the facility: Option 1) manage silage piles such that only one silage pile has an uncovered face and the total exposed surface area is less than 2,150 square feet, or manage multiple uncovered silage piles such that the total exposed surface area of all uncovered silage piles is less than 4,300 square feet; Option 2) use a shaver/facer to remove silage from the silage pile, or shall use another method to maintain a smooth vertical surface on the working face of the silage pile; or Option 3) inoculate silage with homolactic lactic acid bacteria in accordance with manufacturer recommendations to achieve a concentration of at least 100,000 colony forming units per gram of wet forage, apply propionic acid, benzoic acid, sorbic acid, sodium benzoate, or potassium sorbate at the rate specified by the manufacturer to reduce yeast counts when forming silage piles, or apply other additives at rates that have been demonstrated to reduce alcohol concentrations in silage and/or VOC emissions from silage and have been approved by the District and EPA. Records of the options chosen for managing each silage pile shall be maintained. [District Rule 4570] N

- {4481} If Option 1 (Limiting Exposed Area of Silage) is chosen as a mitigation measure for managing silage piles, the permittee shall calculate and record the maximum (largest part of pile) total exposed area of each silage pile. Records of the maximum calculated area shall be maintained. [District Rule 4570] N

- {4482} 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 Rule 4570] N

- {4483} 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 manufacturer's instructions for application of the additive. [District Rule 4570] N

Milking Parlor

Flush or hose milk parlor immediately prior to, immediately after, or during each milking.

- {4484} Permittee shall flush or hose milk parlor immediately prior to, immediately prior to, immediately after or during each milking. [District Rule 4570] N

- {4485} Permittee shall provide verification that milk parlors are flushed or hosed prior to, immediately after, or during each milking. [District Rule 4570] N

Freestall Barn

Required

Pave feed lanes, 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.

- {4486} Permittee shall pave feedlanes, where present, for a width of at least 8 feet along the corral side of the feedlane fence for milk and dry cows and at least 6 feet along the corral side of the feedlane for heifers. [District Rule 4570] N

Optional

Flush, scrape or vacuum freestall lanes immediately prior to, immediately after or during each milking.

- {4487} Permittee shall flush, scrape or vacuum freestall lanes immediately prior to, immediately after or during each milking. [District Rule 4570] N

- {4488} Permittee shall maintain records sufficient to demonstrate that freestall lanes are flushed, scraped or vacuumed immediately prior to, immediately after or during each milking. [District Rule 4570] N

For a LARGE dairy only (1000 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 seven (7) days.

- {4492} Permittee shall remove manure that is not dry from individual cow freestall beds or rake, harrow, scrape, or grade freestall bedding at least once every seven (7) days. [District Rule 4570] N

- {4493} Permittee shall record the date that manure that is not dry is removed from individual cow freestall beds or raked, harrowed, scraped, or freestall bedding is graded at least once every seven (7) days. [District Rule 4570] N

Corral

Required

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 feed along the corral side of the feedlane for heifers.

- {4486} Permittee shall pave feedlanes, where present, for a width of at least 8 feet along the corral side of the feedlane fence for milk and dry cows and at least 6 feet along the corral side of the feedlane for heifers. [District Rule 4570] N

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

- {4499} Permittee shall inspect water pipes and troughs and repair leaks at least once every seven (7) days. [District Rule 4570] N

- {4500} Permittee shall maintain records demonstrating that water pipes and troughs are inspected and leaks are repaired at least once every seven (7) days. [District Rule 4570] N

Clean manure from corrals at least four (4) times per year with at least sixty (60) days between cleaning, or clean corrals at least once between April and July and at least once between September and December.

- {4501} Permittee shall clean manure from corrals at least four (4) times per year with at least sixty (60) days between each cleaning, or permittee shall clean corrals at least once between April and July and at least once between September and December. [District Rule 4570] N

- {4502} Permittee shall record the date that animal waste is cleaned from corrals or demonstrate that manure from corrals are cleaned at least four (4) times per year with at least sixty (60) days between each cleaning. [District Rule 4570] N

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.

- {4554} Permittee shall implement at least one of the following corral mitigation measures: 1) slope the surface of the corrals at least 3% where the available space for each animal is 400 square feet or less and shall slope the surface of the corrals at least 1.5% where the available space for each animal is more than 400 square feet per animal; 2) maintain corrals to ensure proper drainage preventing water from standing more than forty-eight hours; or 3) harrow, rake, or scrape pens sufficiently to maintain a dry surface except during periods of rainy weather. [District Rule 4570] N

- {4555} Permittee shall either 1) maintain sufficient records to demonstrate that corrals are maintained to ensure proper drainage preventing water from standing for more than forty-eight hours or 2) maintain records of dates pens are groomed (i.e., harrowed, raked, or scraped, etc.). [District Rule 4570] N

Optional

Scrape, vacuum or flush concrete lanes in corrals at least once every day for mature cows and every seven (7) days for support stock.

- {4508} Permittee shall scrape, vacuum or flush concrete lanes in corrals at least once every day for mature cows and every seven (7) days for support stock. [District Rule 4570] N
- {4556} Permittee shall maintain records demonstrating that concrete lanes in corrals are scraped, vacuumed, or flushed at least once every day for mature cows and at least once every seven (7) days for support stock. [District Rule 4570] N

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

- {4513} Permittee shall install all shade structures uphill of any slope in the corral. [District Rule 4570] N

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.

- {4518} Permittee shall manage corrals such that the manure depth in the corral does not exceed twelve (12) inches at any time or point, except for in-corral mounding. Manure depth may exceed 12 inches when corrals become inaccessible due to rain events. However, permittee must resume management of the manure depth of 12 inches or lower immediately upon the corral becoming accessible. [District Rule 4570] N

{4519} Permittee shall measure and document the depth of manure in the corrals at least once every ninety (90) days. [District Rule 4570] N

<u>Solid Manure</u>

- Remove separated solids from the facility within seventy-two (72) hours of removal from the drying process. Within seventy two (72) hours of removal from the drying process, 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.

- {4529} Within seventy two (72) hours of removal of separated solids from the drying process, permittee shall either 1) remove separated solids from the dairy, or 2) 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 twenty-four (24) hours per event. [District Rule 4570] N

- {4530} Permittee shall keep records of dates when separated solids are removed from the dairy or permittee shall maintain records to demonstrate that separated solids piles outside the pens are covered with a weatherproof covering from October through May. [District Rule 4570] N

- {4531} Permittee shall maintain records, such as manufacturer warranties or other documentation, demonstrating that the weatherproof covering over separated solids are installed, used, and maintained in accordance with manufacturer recommendations and applicable standards listed in NRCS Field Office Technical Guide Code 313 or 367, or any other applicable standard approved by the APCO, ARB, and EPA. [District Rule 4570] N

Liquid Manure

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

- {4538} Permittee shall remove solids with a solid separator system, prior to the manure entering the lagoon. [District Rule 4570] N

Land Application

Solid

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

- {4541} Permittee shall incorporate all solid manure within seventy-two (72) hours of land application. [District Rule 4570] N

- {4542} Permittee shall maintain records to demonstrate that all solid manure has been incorporated within seventy-two (72) hours of land application. [District Rule 4570] N

Liquid

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

- {4550} Permittee shall not allow liquid manure to stand in the fields for more than twenty-four (24) hours after irrigation. [District Rule 4570] N

- {4551} Permittee shall maintain records to demonstrate liquid manure did not stand in the fields for more than twenty-four (24) hours after irrigation. [District Rule 4570] N

Therefore this facility is in compliance with this Rule.

California Health and Safety Code 42301.6 (School Notice)

The applicant states 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 Senate Bill 700 (SB 700)

Riverside Dairy is an agricultural operation that raises dairy cows for the production of milk for human consumption. Pursuant to Senate Bill (SB) 700, all agricultural operations, including Confined Animal Facilities (CAF), with emissions greater than ½ the major source emissions threshold levels (5 ton/year of NO_X or VOC), are required to obtain a District permit.

The emissions from the proposed dairy will exceed the 5 ton-VOC/year threshold and the dairy is classified as a large CAF by the California Air Resources Board (ARB). The facility is therefore subject to District Permit requirements and is complying by obtaining ATC permits. Continued compliance with the requirements of SB 700 is expected.

California Environmental Quality ACT (CEQA)

The California Environmental Quality Act (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 San Joaquin Valley Unified Air Pollution Control District (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.
- 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.

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. On April 30, 2004, the County certified the Environmental Impact Report (EIR) finding that emissions from the project would have a significant, unavoidable impact on air quality. The County approved the project and adopted a Statement of Overriding Consideration (SOC).

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 complies with CEQA by considering the Environmental Impact Report prepared by the Lead Agency, and by reaching its own conclusion on whether and how to approve the project (CEQA Guidelines §15096).

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 to levels below the District's thresholds of significance for criteria pollutants.

IX. Recommendation

Compliance with all applicable rules and regulations is expected. Pending a successful Public Noticing period, issue Authorities to Construct S-6746-1-0, -2-0, -3-0, -4-0, and -5-0 subject to the permit conditions on the attached draft Authorities to Construct in Appendix F.

X. Billing Information

Annual Permit Fees			
Permit Number	Fee Schedule	Fee Description	Annual Fee
S-6746-1-0	3020-06	Miscellaneous - Cow Milking	$105.00
S-6746-2-0	3020-06	Miscellaneous - Cow Housing	$105.00
S-6746-3-0	3020-06	Miscellaneous -Liquid Manure Handling	$105.00
S-6746-4-0	3020-06	Miscellaneous - Solid Manure Handling	$105.00
S-6746-5-0	3020-06	Miscellaneous - Feed Storage and Handling	$105.00

XI. Appendices

A: Anaerobic Treatment lagoon Design Check
B: Quarterly Net Emissions Change (QNEC)
C: Windbreaks Plan
D: BACT Analysis
E: Summary of Health Risk Assessment (HRA) and Ambient Air Quality Analysis (AAQA)
F: Draft ATCs (S-6746-1-0, -2-0, -3-0, -4-0, and -5-0)

APPENDIX A

Anaerobic Treatment 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	1000	ft
Width	180	ft
Depth	21	ft
Slope	1.1	ft

Primary Lagoon Volume	**3,222,523 ft3**

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	3,600	x	17	x	71%	x	(1 – 50%)	=	**21,726**
Dry Cow	535	x	9.2	x	71%	x	(1 – 50%)	=	**1,747**
Heifer (15 to 24 months)	1,196	x	7.1	x	48%	x	(1 – 50%)	=	**2,038**
Heifer (7 to 14 months)	952	x	4.9	x	48%	x	(1 – 50%)	=	**1,120**
Heifer (3 to 6 months)	352	x	2.7	x	48%	x	(1 – 50%)	=	**228**
Calf (under 3 months)	550	x	1.0	x	100%	x	(1 – 50%)	=	**275**
Bulls	0	x	9.2	x	48%	x	(1 – 50%)	=	**0**
Total for Dairy									**27,134**

[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	21,726	÷	0.011	=	**1,975,091**
Dry Cow	1,747	÷	0.011	=	**158,846**
Heifer (15 to 24 months)	2,038	÷	0.011	=	**185,271**
Heifer (7 to 14 months)	1,120	÷	0.011	=	**101,777**
Heifer (3 to 6 months)	228	÷	0.011	=	**20,736**
Calf (under 3 months)	275	÷	0.011	=	**25,000**
Bulls	0	÷	0.011	=	**0**
Total for Dairy					**2,466,722**

[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 =	3,222,523		2,466,722 =	755,801	(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	3,600	x	2.40	ft^3	=	8,640	ft^3/day
Dry Cows	535	x	1.30	ft^3	=	696	ft^3/day
Heifers (15-24 mo)	1,196	x	0.78	ft^3	=	933	ft^3/day
Heifers (7-14 mo)	952	x	0.78	ft^3	=	743	ft^3/day
Heifers (3-6 mo)	352	x	0.30	ft^3	=	106	ft^3/day
Calves	550	x	0.15	ft^3	=	83	ft^3/day
Bulls	0	x	1.30	ft^3	=	-	ft^3/day
Total	7,185					**11,199**	**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~~	3600 ~~milk cows~~	x	ft3	+	11,199	ft3
~~milk cow *~~ day			7.48 ~~gal~~			day
				=	35,263.2	ft3/day

Formula:

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

HRT:

2,466,722 ~~ft3~~	day	=	=	69.9517123	days
	35,263.2 ~~ft3~~				

APPENDIX B

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 - BE, where:

QNEC = Quarterly Net Emissions Change for each emissions unit, lb/qtr.
PE2 = Post Project Potential to Emit for each emissions unit, lb/qtr.
BE = Baseline Emissions (per Rule 2201) for each emissions unit, lb/qtr.

Using the values in Sections VII.C.2 and VII.C.6 in the evaluation above, quarterly PE2 and quarterly BE can be calculated as follows:

Milking Parlor (S-6746-1)

BE					
Pollutant	BE (lb/year)	÷	4 qtr/year	=	BE (lb/qtr)
NO_X	0	÷	4 qtr/year	=	0.0
SO_X	0	÷	4 qtr/year	=	0.0
PM_{10}	0	÷	4 qtr/year	=	0.0
CO	0	÷	4 qtr/year	=	0.0
VOC	0	÷	4 qtr/year	=	0.0
NH_3	0	÷	4 qtr/year	=	0.0

PE2 (lb/qtr)					
Pollutant	PE2 (lb/year)	÷	4 qtr/year	=	PE2 (lb/qtr)
NO_X	0	÷	4 qtr/year	=	0.0
SO_X	0	÷	4 qtr/year	=	0.0
PM_{10}	0	÷	4 qtr/year	=	0.0
CO	0	÷	4 qtr/year	=	0.0
VOC	1,440	÷	4 qtr/year	=	360.0
NH_3	4,320	÷	4 qtr/year	=	1,080.0

QNEC (lb/qtr)					
Pollutant	PE2 (lb/qtr)	-	BE (lb/qtr)	=	QNEC (lb/qtr)
NO_X	0.0	-	0.0	=	0.0
SO_X	0.0	-	0.0	=	0.0
PM_{10}	0.0	-	0.0	=	0.0
CO	0.0	-	0.0	=	0.0
VOC	360.0	-	0.0	=	360.0
NH_3	1,080.0	-	0.0	=	1,080.0

Cow Housing (S-6746-2)

BE (lb/qtr)					
Pollutant	BE (lb/year)	÷	4 qtr/year	=	BE (lb/qtr)
NO_X	0	÷	4 qtr/year	=	0.0
SO_X	0	÷	4 qtr/year	=	0.0
PM_{10}	0	÷	4 qtr/year	=	0.0
CO	0	÷	4 qtr/year	=	0.0
VOC	0	÷	4 qtr/year	=	0.0
NH_3	0	÷	4 qtr/year	=	0.0

PE2 (lb/qtr)					
Pollutant	PE2 (lb/year)	÷	4 qtr/year	=	PE2 (lb/qtr)
NO_X	0	÷	4 qtr/year	=	0.0
SO_X	0	÷	4 qtr/year	=	0.0
PM_{10}	25,214	÷	4 qtr/year	=	6,303.5
CO	0	÷	4 qtr/year	=	0.0
VOC	54,347	÷	4 qtr/year	=	13,586.75
NH_3	155,741	÷	4 qtr/year	=	38,935.25

QNEC (lb/qtr)					
Pollutant	PE2 (lb/qtr)	-	BE (lb/qtr)	=	QNEC (lb/qtr)
NO_X	0.0	-	0.0	=	0.0
SO_X	0.0	-	0.0	=	0.0
PM_{10}	6,303.5	-	0.0	=	6,303.5
CO	0.0	-	0.0	=	0.0
VOC	13,586.75	-	0.0	=	13,586.75
NH_3	38,935.25	-	0.0	=	38,935.25

Liquid Manure Handling System (S-6746-3)

BE (lb/qtr)					
Pollutant	BE (lb/year)	÷	4 qtr/year	=	BE (lb/qtr)
NO_X	0	÷	4 qtr/year	=	0.0
SO_X	0	÷	4 qtr/year	=	0.0
PM_{10}	0	÷	4 qtr/year	=	0.0
CO	0	÷	4 qtr/year	=	0.0
VOC	0	÷	4 qtr/year	=	0.0
NH_3	0	÷	4 qtr/year	=	0.0
H2S	0	÷	4 qtr/year	=	0.0

PE2 (lb/qtr)					
Pollutant	PE2 (lb/year)	÷	4 qtr/year	=	PE2 (lb/qtr)
NO_X	0	÷	4 qtr/year	=	0.0
SO_X	0	÷	4 qtr/year	=	0.0

PM_{10}	0	÷	4 qtr/year	=	0.0
CO	0	÷	4 qtr/year	=	0.0
VOC	10,675	÷	4 qtr/year	=	2,668.75
NH_3	227,619	÷	4 qtr/year	=	56,904.75
H2S	8,809	÷	4 qtr/year	=	2,202.25

QNEC (lb/qtr)					
Pollutant	PE2 (lb/qtr)	-	BE (lb/qtr)	=	QNEC (lb/qtr)
NO_X	0.0	-	0.0	=	0.0
SO_X	0.0	-	0.0	=	0.0
PM_{10}	0.0	-	0.0	=	0.0
CO	0.0	-	0.0	=	0.0
VOC	2,668.75	-	0.0	=	2,668.75
NH_3	56,904.75	-	0.0	=	56,904.75
H2S	2,202.25		0.0		2,202.25

Solid Manure Handling System (S-6746-4)

BE (lb/qtr)					
Pollutant	BE (lb/year)	÷	4 qtr/year	=	BE (lb/qtr)
NO_X	0	÷	4 qtr/year	=	0.0
SO_X	0	÷	4 qtr/year	=	0.0
PM_{10}	0	÷	4 qtr/year	=	0.0
CO	0	÷	4 qtr/year	=	0.0
VOC	0	÷	4 qtr/year	=	0.0
NH_3	0	÷	4 qtr/year	=	0.0

PE2 (lb/qtr)					
Pollutant	PE2 (lb/year)	÷	4 qtr/year	=	PE2 (lb/qtr)
NO_X	0	÷	4 qtr/year	=	0.0
SO_X	0	÷	4 qtr/year	=	0.0
PM_{10}	0	÷	4 qtr/year	=	0.0
CO	0	÷	4 qtr/year	=	0.0
VOC	2,585	÷	4 qtr/year	=	646.25
NH_3	15,895	÷	4 qtr/year	=	3,973.75

QNEC (lb/qtr)					
Pollutant	PE2 (lb/qtr)	-	BE (lb/qtr)	=	NEC (lb/qtr)
NO_X	0.0	-	0.0	=	0.0
SO_X	0.0	-	0.0	=	0.0
PM_{10}	0.0	-	0.0	=	0.0
CO	0.0	-	0.0	=	0.0
VOC	646.25	-	0.0	=	646.25
NH_3	3,973.75	-	0.0	=	3,973.75

Feed Handling and Storage (S-6746-5)

BE (lb/qtr)					
Pollutant	BE (lb/year)	÷	4 qtr/year	=	BE (lb/qtr)
NO_X	0	÷	4 qtr/year	=	0.0
SO_X	0	÷	4 qtr/year	=	0.0
PM_{10}	0	÷	4 qtr/year	=	0.0
CO	0	÷	4 qtr/year	=	0.0
VOC	0	÷	4 qtr/year	=	0.0
NH_3	0	÷	4 qtr/year	=	0.0

PE2 (lb/qtr)					
Pollutant	PE2 (lb/year)	÷	4 qtr/year	=	PE2 (lb/qtr)
NO_X	0	÷	4 qtr/year	=	0.0
SO_X	0	÷	4 qtr/year	=	0.0
PM_{10}	0	÷	4 qtr/year	=	0.0
CO	0	÷	4 qtr/year	=	0.0
VOC	70,160	÷	4 qtr/year	=	17,540.0
NH_3	0	÷	4 qtr/year	=	0.0

QNEC (lb/qtr)					
Pollutant	PE2 (lb/qtr)	-	BE (lb/qtr)	=	NEC (lb/qtr)
NO_X	0.0	-	0.0	=	0.0
SO_X	0.0	-	0.0	=	0.0
PM_{10}	0.0	-	0.0	=	0.0
CO	0.0	-	0.0	=	0.0
VOC	17,540.0	-	0.0	=	17,540.0
NH_3	0.0	-	0.0	=	0.0

APPENDIX C

Windbreaks Plan

Innovative Ag Services, LLC
1201 Lacey Blvd., Suite 5 Hanford, CA 93230
Office (559) 587-2800 Fax (559) 587-2801

May 19, 2011

Juscelino Siongco
SJVAPCD
1990 E. Gettysburg Avenue
Fresno CA 93726

Re: Riverside Dairy (S-6746)

Mr. Siongco,

On behalf of Mr. Willem De Boer, we request that the windbreak at this proposed facility be developed using a combination of Arizona Cypress trees, Chinese Pistache trees, and Interior Live Oak trees. We are proposing that wherever windbreaks are required along the east and south sides of the facility, they shall be developed using two rows of trees. The east perimeter shall be approximately 2,440 feet, starting by the northeast corner of the existing heifer corral going south along the eastern border. The south perimeter shall be approximately 1,050 feet, starting from the southeast corner of the facility, going west along the southern border.

The row closest to the dairy shall consist of Arizona Cypress trees planted 10 feet apart. The second row on the east side shall consist of Chinese Pistache trees planted 14 feet apart. The second row on the south side shall consist of Interior Live Oak trees planted 20 feet apart. Each row shall be offset from the adjacent row. Spacing between the rows shall be sufficient to accommodate cultivation equipment, not to exceed 24 feet.

If you have any questions or concerns contact me at 559.587.2800.

Sincerely

Jason Pausma

Jason Pausma

CC: Willem De Boer

APPENDIX D

BACT Analysis

Riverside Dairy (S-6746, Project # S-1055541)

TOP-DOWN BACT ANALYSIS

Pursuant to Section 5.2 of the Settlement Agreement between the District and the Western United Dairyman and the Alliance of Western Milk Producers Inc., signed September 20, 2004, "*... the District will not make any Achieved in Practice BACT determinations for individual dairy permits or for the dairy BACT guidance until the final BACT guidance has been adopted by the APCO....*".[9] Therefore, a cost effectiveness analysis will be performed for all the technologies, which have not been proposed by the applicant.

The U.S. Environmental Protection Agency (USEPA) RACT/BACT/LAER Clearinghouse, the California Air Pollution Control Officers Association (CAPCOA) BACT Clearinghouse, the San Joaquin Valley Unified Air Pollution Control District (SJVUAPCD) BACT Clearinghouse, the Bay Area Air Quality Management District (BAAQMD), and the South Coast Air Quality Management District (SCAQMD) BACT Guidelines were reviewed to determine potential control technologies for this class and category of operation. No BACT guidelines were found for this class and category of source.

I. Pollutants Emitted from Dairies

1. PM_{10} Emissions from Dairies

The National Ambient Air Quality Standards currently regulate concentrations of particulate matter with a mass median diameter of 10 micrometers or less (PM_{10}). Studies have shown that particles in the smaller size fractions contribute most to human health effects. A $PM_{2.5}$ standard was published in 1997, but has not been implemented pending the results of ongoing litigation.

All animal confinement facilities are sources of particulate matter emissions. However, the composition of these emissions will vary. Dust emissions from unpaved surfaces, dry manure storage sites, and land application sites are potential particulate matter emission sources. Sources of particulate matter emissions at a dairy include feed, bedding materials, dry manure, and unpaved soil surfaces such as corrals.

The mass of particulate matter emitted from totally or partially enclosed confinement facilities, as well as the particle size distribution, depend on type of ventilation and ventilation rate. Particulate matter emissions from naturally ventilated buildings will be lower than those from mechanically ventilated buildings.

2. VOC Formation and Emissions from Manure:

Volatile Organic Compounds (VOCs) result from ruminant digestive processes and are formed as intermediate metabolites when organic matter manure decomposes. Under

[9] Settlement Agreement. Western United Dairymen, Alliance of Western Milk Producers v. San Joaquin Valley Air Pollution Control District, settled in the Fresno Superior Court September 2004 (http://www.valleyair.org/busind/pto/dpaq/settlement.pdf

aerobic conditions, any VOCs formed in the manure are rapidly oxidized to carbon dioxide and water. Under anaerobic conditions, complex organic compounds are microbially decomposed to volatile organic acids and other volatile organic compounds, which in turn are mostly converted to methane and carbon dioxide by methanogenic bacteria. When the activity of the methanogenic bacteria is not inhibited, virtually all of the VOCs are metabolized to simpler compounds, and the potential for VOC emissions is minimized. However, the inhibition of methane formation results in a buildup of VOCs in the manure and ultimately to volatilization to the air. Inhibition of methane formation typically is caused by low temperatures or excessive loading rates, which both create an imbalance between the populations of microorganisms responsible for the formation of VOC and methane. VOC emissions will vary with temperature because the rate of VOC formation, reduction to methane, and volatilization and the solubility of individual compounds vary with temperature.[10] VOC emissions from manure and the associated field application site can be minimized by a properly designed and operated stabilization process (such as an anaerobic treatment lagoon). In contrast, VOC emissions will be higher from storage tanks, ponds, overloaded anaerobic lagoons, and the land application sites associated with these systems.

3. Ammonia Emissions from Dairies

When sulfur dioxide and nitrogen oxides are present, ammonia is a precursor for the secondary formation of $PM_{2.5}$ in the atmosphere. Ammonia reacts with sulfuric and nitric acids, which are produced from sulfur dioxide and nitrogen oxides in the ambient air, to form ammonium sulfate, ammonium nitrate, and other fine particulates.[11] Exposure to high levels of ammonia can cause irritation to the skin, throat, lungs, and eyes.

Ammonia volatilization is the result of the microbial decomposition of nitrogenous compounds in manure. The primary nitrogenous compound in dairy manure is urea, but nitrogenous compounds also occur in the form of undigested organic nitrogen in animal feces. Whenever urea comes in contact with the enzyme urease, which is excreted in animal feces, the urea will hydrolyze rapidly to form ammonia and this ammonia will be emitted soon after. The formation of ammonia will continue more slowly (over a period of months or years) with the microbial breakdown of organic nitrogen in the manure. Because ammonia is highly soluble in water, ammonia will accumulate in manure handled as liquids and semi-solids or slurries, but will volatize rapidly with drying from manure handled as solids.

The potential for ammonia volatilization exists wherever manure is present, and ammonia will be emitted from confinement buildings, open lots, stockpiles, anaerobic lagoons, and land application from both wet and dry handling systems. The rate of ammonia volatilization is influenced by a number of factors including the concentrations of nitrogenous compounds in the manure, temperature, air velocity, surface area, moisture, and pH. Because of its high solubility in water, the loss of ammonia to the atmosphere will be more rapid when drying of manure occurs. However, there may be little difference in total

[10] EPA Document "Emissions from Animal Feeding Operations" (Draft, August 15, 2001), pg. 2-10

[11] Workshop Review Draft for EPA Regional Priority AFO Science Question Synthesis Document - Air Emission Characterization and Management, pg. 2

ammonia emissions between solid and liquid manure handling systems if liquid manure is stored over extended periods of time prior to land application.[12]

4. Hydrogen Sulfide Emissions from Dairies

Hydrogen Sulfide (H2S) is produced from the decomposition of organic matter under anaerobic conditions. In the absence of oxygen, sulfur reducing bacteria in the manure lagoons reduce Sulfate ions in the manure into Sulfide. Aqueous sulfide exists in three different forms: molecular (un-dissociated) hydrogen sulfide (H2S) and the bisulfide (HS-) and sulfide (S2-) ions. In aqueous solutions molecular H2S exists in equilibrium with the bisulfide (HS-) and sulfide (S2-) ions but only molecular H2S, not the ionized forms, can be transferred across the gas-liquid interface and emitted to the atmosphere. The fractional amount of the form of sulfide present in solution is largely influenced by pH; with the molecular H2S form being favored in acidic conditions (pH <7) and ionic forms being favored in basic conditions (pH >7).

In a dairy, the conditions for the production of Hydrogen Sulfide exist in small amounts such as wet spots in corrals, manure piles and separated solids piles. However, the most significant source is the liquid manure lagoons and storage ponds.

II. Top Down BACT Analysis for the Milking Parlor (Permit S-6746-1-0)

1. BACT Analysis for VOC Emissions from the Milking Parlor:

a. Step 1 - Identify all control technologies

Since, specific VOC emissions control efficiencies have not been identified in the literature for dairy milking parlors, the control efficiencies listed are based on the control efficiencies of similar processes and engineering judgment.

1) Enclose, capture, and incineration (≈ 93%; 95% Capture, 98% Control)
2) Enclose, capture, and biofiltration (≈ 76%; 95% Capture, 80% Control)
3) Flush/spray down milking parlors after each group of cows is milked (≈ 16.5% of the total VOC emissions from the milking parlors; 75% of manure emissions)

Description of Control Technologies

1) Milking Parlor vented to an incinerator capable of achieving 98% control.

Milking parlors can be either naturally or mechanically ventilated. According to some dairy designers, mechanical ventilation is more reliable than natural ventilation. Mechanical ventilation can be easily applied to all areas of the milking parlors, except the holding area. The mechanical system for the milking parlors can be utilized to

[12] Emissions From Animal Feeding Operations – Draft, US EPA – Emissions Standards Division, August 15, 2001, pgs. 2-6 and 2-7

capture the gases emitted from the milking parlors, however in order to capture all of the gases, and to keep an appropriate negative pressure throughout the system, the holding area would also need to be entirely enclosed. No facility currently encloses the holding area since cows are continuously going in and out of the barn throughout the day. The capital required to enclose this large area would also be significant. Although the feasibility of such a technology is in question, it will be considered in this analysis. The captured VOC emissions could then be sent to an incinerator. Thermal incineration is a well-established VOC control technique. During combustion, gaseous hydrocarbons are oxidized to form CO_2 and water. It is assumed that 95% of the gasses emitted from the milking parlor will be captured by the mechanical ventilation system and that 98% of the captured VOCs will be eliminated by thermal incineration[13]; therefore the total control for VOCs from the milking parlor = 0.95 x 0.98 = 93.1%.

2) Milking Parlor vented to a biofilter capable of achieving 80% control

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 the pollutants are degraded by biological oxidation. In the biofiltration process, live bacteria biodegrade organic contaminants and ammonia into carbon dioxide, nitrogen 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.

Since biofilters rely on living organisms to function, the temperature, moisture content, and pH of the filter media should be monitored to ensure optimum operating conditions. The filter media also needs to be replaced periodically because of deterioration. It is assumed that 95% of the gasses emitted from the milking parlors will be captured by the mechanical ventilation system and that a properly functioning biofilter will eliminate 80% of the captured VOCs[14]; therefore, the total control for VOCs from the milking parlor = 0.95 x 0.80 = 76%.

3) Milking Parlor Flushed/Sprayed down after each Group of Cows is milked

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

[13] OAQPS Control Cost Manual, 4th Edition, EPA 450/3-90-006, January 1990, page 3-8.
[14] 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 NH_3."

manure and the dissolved volatile compounds to an anaerobic treatment lagoon or other manure stabilization process for treatment.

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

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) Enclose, capture, and incineration (≈ 93% of VOC emissions from the milking parlors)
2) Enclose, capture, and biofiltration (≈ 76% of VOC emissions from the milking parlors)
3) Flush/spray after each group of cows is milked (≈ 16.5% of VOC emissions from the milking parlors)

d. Step 4 - Cost Effectiveness Analysis

Thermal and Catalytic Incineration:

The following cost analysis demonstrates that the cost of natural gas alone, not including any capital costs, causes catalytic incineration to exceed the District VOC cost effective threshold. The temperature required for catalytic incineration is 600°F. The temperature required for thermal incineration is 1,400°F. Since the fuel requirements and fuel cost for thermal incineration are greater than catalytic incineration, the following analysis also demonstrates that thermal incineration would not be cost effective.

Air Flow Rate for Milking Parlor

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

As discussed in section I of this evaluation, the dairy is proposing to have 3,600 milk cows with two double 36 stall (72 stalls each) herringbone milking parlors. According to the drawings submitted, the two milking parlors each occupy an area approximately 112 ft long by 40 ft wide and is conservatively assumed to have a height of 20 feet. The total airflow rate is calculated as follows:

$$(112 \text{ ft} \times 40 \text{ ft} \times 20 \text{ ft}) \times 2 \text{ parlors} \times 35/\text{hr} = 6{,}272{,}000 \text{ ft}^3/\text{hr}$$

Fuel Requirement for Thermal Incineration:

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

Natural Gas Requirement = (flow)(Cp_{Air})(ΔT)(1-HEF)

Where:

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

Natural Gas Requirement = (6,272,000 scf/hr)(0.0194 Btu/scf)(600°F - 100°F)(1-0.7)
= **18,251,520 Btu/hr**

Fuel Cost for Thermal Incineration:

The cost for natural gas will be based upon the average spot market contract price (industrial) for August 2011 taken from the Energy Information Administration website (http://tonto.eia.doe.gov/dnav/ng/ng_sum_lsum_dcu_SCA_m.htm).

Average Cost for natural gas = $7.37/MMBtu

The oxidizer is assumed to operate 12 hours per day and 365 days per year.

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

18,251,520 Btu/hr x 1 MMBtu/10^6 Btu x 12 hr/day x 365 day/year x $7.37/MMBtu
= **$589,170/year**

VOC Emission Reductions for Thermal Incineration

[15] Environmental Control for Today's Milking Center, C.A. Gooch, http://www.ansci.cornell.edu/tmplobs/doc217.pdf

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

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

= (3,600 milk cows) x (0.4 lb-VOC/milk cow-year) x (0.95) x (0.98)
= **1,341 lb-VOC/year**

Cost of VOC Emission Reductions

Cost of reductions = ($589,170/year)/((1,341 lb-VOC/year)(1 ton/2000 lb))
= **$878,702/ton of VOC reduced**

As shown above, the natural gas cost alone for thermal or catalytic incineration would cause the cost of the VOC reductions to be greater than the $17,500/ton cost effectiveness threshold of the District BACT policy. The equipment is therefore not cost effective and is being removed from consideration at this time.

Biofiltration:

Biofiltration is a method of reducing pollutants in which exhaust air that contains contaminants is blown through a media (e.g., soil, compost, wood chips) that supports a microbial population. The microbes utilize the pollutants such as VOCs and ammonia as nutrients and oxidize the compounds as they pass through the filter.

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

Cost of Biofiltration

The cost estimate for a biofiltration system is taken from the United States EPA Report "Using Bioreactors to Control Air Pollution." The cost is largely dependent on the airflow rate that the filter must handle. According to University of Minnesota, Biofilters used to treat ventilating air exhausted from a livestock building should be sized to treat the maximum ventilation rate, which is typically the warm weather rate. The EPA report gives a range of $2.35–$37.06 per cfm for the initial construction of a biofilter. As stated above, the minimum ventilation rate required for milking parlor is 15 room exchanges per hour in the winter and 60 to 90 room exchanges per hour in the summer.[21] For more conservative calculations, a warm weather airflow rate of 35 room exchanges will be assumed for the milking parlor. According to the drawings submitted, the two proposed milking parlors are 112' long by 40' wide and is conservatively assumed to have a height of 20 feet. The total airflow rate is calculated as follows:

112' x 40' x 20' x 2 x 35/hr x 1/60 min = 104,533 cfm

Capital Cost

The cost estimate for the biofilter includes the costs of the fans, media, plenum, engineering, and labor but does not include installation of the required ductwork. As stated above, the United States EPA Report gives a capital cost range of between \$2.35 per cfm and \$37.06 per cfm. In general, the lower cost per cfm is associated with a higher flow rate. To be conservative, the lowest cost in the report of \$2.35 per cfm will be assumed in this cost analysis.

The capital cost of the biofilter is calculated as follows:

\$2.35 cfm x 104,533 cfm = \$245,653

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

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

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

$$A = [\$245,653 \times 0.1(1.1)^{10}]/[(1.1)^{10}-1]$$
$$= \mathbf{\$39,979/year}$$

VOC Emission Reductions for Biofiltration

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

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

= (3,600 milk cows) x (0.4 lb-VOC/milk cow-year) x (0.95) x (0.80)
= 1,094 lb-VOC/year

Cost of VOC Emission Reductions

Cost of reductions = (\$39,979/year)/((1,094 lb-VOC/year)(1 ton/2000 lb))
= **\$73,088/ton of VOC reduced**

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

Flushing/Spraying down Milking Parlor after each Group of Cows is Milked:

The applicant has proposed this option; therefore a cost-effective analysis is not required.

e. Step 5 - Select BACT

The facility is proposing to flush or spray down the milking parlor after each group of cows is milked, which satisfies the BACT requirements.

Additionally, District Rule 2201 defines BACT as including the most stringent emission limitation or control technique, including process and equipment changes, that has 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 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 applicant has selected to comply with Rule 4570 will also be required as part of BACT for VOC emissions from the milking parlor.

2. BACT Analysis for NH_3 Emissions from the Milking Parlor:

a. 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 in this project. However, for purposes of the Dairy BACT Guideline, the District will not deem any control options Achieved-in-Practice until after the final Dairy BACT Guideline has been established.

Flushing or spraying down the milk parlor after milking each group of cows has been identified as a possible control for the NH_3 emissions from the milking parlor. No other control technologies that meet the definition of Achieved-in-Practice have been identified for NH_3 emissions from the milking parlors.

1) Flush/spray after each group of cows is milked.

Description of Control Technology

1) Milking Parlor Flushed/Sprayed down after each Group of Cows is milked

Almost all dairy operations utilize some type of flush or spray system to wash out the manure that dairy cows deposit in the milking parlors. The primary purpose of the flush or spray system is to maintain the minimum level of sanitation required in the milking parlors. However, this system also serves as an emission control for reducing VOC and ammonia emissions. The manure deposited in the milking parlor, which is a source of NH_3 emissions, is removed from the milking parlor many times a day by flushing after each milking. Ammonia has a high affinity for water and is highly soluble in water. Therefore, a large proportion of ammonia will dissolve in the flush water and will not be emitted from the milking parlors.

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) Flush/spray down milking parlors after each group of cows is milked

d. Step 4 - Cost Effectiveness Analysis

The applicant has proposed the only option listed; therefore a cost analysis is not required.

e. Step 5 - Select BACT

The facility is proposing to flush or spray down the milking parlor after each group of cows is milked, which satisfies the BACT requirements.

Additionally, District Rule 2201 defines BACT as including the most stringent emission limitation or control technique, including process and equipment changes, that has 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 mitigation measures required by District Rule 4570 are technologically feasible for confined animal facilities and the applicant has proposed these options. Although District Rule 4570 is only intended to reduce VOC emissions, many of these measures also reduce ammonia emissions. Therefore, in addition to the BACT requirements determined in the Top-Down BACT Analysis above, implementation of the mitigation measures that the applicant has selected to comply with Rule 4570 will also be required as part of BACT for NH_3 emissions from the milk parlor.

III. Top Down BACT Analysis for the Cow Housing Permit Unit (S-6746-2)

1. BACT Analysis for PM_{10} Emissions from the Cow Housing Permit Unit:

a. Step 1 - Identify all control technologies

The following control options were identified for PM_{10} emissions from the new freestall barns and corrals.

1) Design and Management Practices
   - Weekly scraping of open corrals using a pull-type scraper in the morning hours except when prevented by wet conditions.
   - Concrete all feed lanes and walkways for all cows
   - Shade structures in open corrals
   - Feeding heifers near (within 1 hour of) dusk
   - Windbreaks/Shelterbelts
   - Above-ground calf hutches for baby calves under three months
   - Application of water (sprinklers) in heifer corrals

Description of Control Technologies

Weekly scraping of corrals
Dairy animals are typically housed in freestall barns or open corrals. In a freestall barn, the milk cows are grouped in large pens with free access to feed bunks, water, and stalls for resting, and exercise corral areas. An open corral is a large open area where cows are confined with unlimited access to feed and water. The corral surface 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}.

Concrete all feedlanes
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.

Shade Structures in 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.

Feeding heifers near (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.

Shelterbelts/Windbreaks

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 NRCS requires that a 3-row shelterbelt 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/shelterbelt will reduce the amount of particulate matter entrained into the atmosphere.

Above-ground Calf Hutches

Above-ground calf hutches will reduce PM_{10} emissions because the calves will be confined within the hutches, significantly limiting their movement. In addition, the calves will have no contact with the ground, resulting in additional emission reductions.

Water Application

A sprinkler system can be installed to reduce PM_{10} emissions. The sprinkler system reduces 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 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. For this reason, sprinkler systems are not used.

b. Step 2 - Eliminate technologically infeasible options

Application of Water in Corrals

Mastitis is a common and costly disease of dairy cattle. Mastitis is the inflammation of the mammary gland caused by microorganisms, usually bacteria that invade the udder, multiply, and produce toxins that are harmful to the mammary gland. Mastitis is commonly considered to be more prevalent in mature, lactating cows. However, investigations have identified significant problems with mastitis in unbred, and bred heifers[16]. Environmental Mastitis is contracted from bacteria that may breed in the environment of the cow. Bacteria breeds in the bedding depending on the available nutrients, amount of contamination, moisture and temperature. Water sprinkling systems can potentially cause excess moisture in bedding areas where the heifers lie down. The moist resting areas create a breeding ground for the environmental mastitis bacteria which infect the teats of the resting heifers. Due to concerns for animal health and welfare, this mitigation measure/control will be removed from consideration at this time.

[16] Heifer Mastitis, Fact Sheet, Sheila M. Andrew, Department of Animal Science, University of Connecticut

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) Design and Management Practices
   - Weekly scraping of open corrals using a pull-type scraper in the morning hours except when prevented by wet conditions.
   - Concrete all feed lanes and walkways for all cows
   - Shade structures in open corrals
   - Feeding heifers near (within 1 hour of) dusk
   - Windbreaks/Shelterbelts
   - Above-ground calf hutches for baby calves under three months

d. Step 4 - Cost Effectiveness Analysis

Design and Management Practices:

- Weekly scraping of open corrals using a pull-type scraper in the morning hours except when prevented by wet conditions.
- Concrete all feed lanes and walkways for all cows
- Shade structures in open corrals
- Feeding heifers near (within 1 hour of) dusk
- Windbreaks/Shelterbelts
- Above-ground calf hutches for baby calves under three months

The applicant has proposed these options; therefore a cost-effective analysis is not required.

e. Step 5 - Select BACT

The facility is proposing to scrape open corrals in the morning hours except when prevented by wet conditions; concrete all feed lanes and walkways; install shade structures in open corrals; feed heifers near dusk; install windbreaks; and house the calves in above-ground calf hutches, which satisfy the BACT requirements.

2. BACT Analysis for VOC Emissions from the Cow Housing and Feed (Total Mixed Ration):

Total Mixed Ration (TMR) refers to feed (silage, grains, oils, minerals, and other additives) that has been mixed per the applicable feeding guidelines and spread out in the feed bunks for consumption by the cattle. Because cattle are fed in the housing areas, BACT for TMR emissions must be considered joint with BACT for housing as it would not be practical to control emissions TMR separately.

a. 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 listed are based on the control efficiencies of similar processes and engineering judgment.

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

1) Enclosed freestalls vented to an incinerator - Entire herd (≈ 93%; 95% Capture, 98% Control of 100% of cow housing emissions)
2) Enclosed freestalls vented to an incinerator - Mature cows only (≈ 70% overall control of entire housing; 95% capture, 98% Control of 74.7% of cow housing emissions[17])
3) Enclosed freestalls vented to a biofilter - Entire herd (≈ 76%; 95% Capture, 80% Control of 100% of cow housing emissions)
4) Enclosed freestalls vented to a biofilter - Mature cows only (≈ 57% overall control of entire housing; 95% Capture, 80% Control of 74.7% of cow housing emissions[18])
5) Feed and Manure Management Practices (≈ 22%)
   - Concrete feed lanes and walkways for all cows
   - Freestall feed lanes and walkways for milk cows and dry cows flushed four times per day (≈ 18% for total emissions from cow housing; 47% for emissions from manure) and feed lanes and walkways in the corrals for the remaining animals flushed at least two times per day
   - All animals fed in accordance with National Research Council (NRC) or other District-approved guidelines utilizing routine nutritional analysis for rations. (5% of total emissions from dairy cows)
   - Uneaten feed re-fed to the animals or removed from feed lanes on a daily basis to prevent decomposition.
   - All open corrals adequately 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.
   - Weekly scraping of freestall exercise pens and open corrals using pull-type scraper in the morning hours except when prevented by wet conditions.
   - Rule 4570 mitigation measures.

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[17] Emissions from cow housing (S-6746-2-0) is equal to 54,347 lb/hd-yr for all cows, while emissions from mature cows is equal to 40,622 lbs/hd-yr. Therefore, mature cows represent 74.7% of the emissions from the cow housing (40,622 lb/hd-yr/54,347 lb/hd-yr). The overall control efficiency can then be calculated as follows: 95% Capture x 98% Control x 74.7% of emissions = 70% overall control efficiency from entire cow housing.

[18] The overall control efficiency can be calculated as follows: 95% Capture x 80% Control x 74.7% of emissions = 57% overall control efficiency.

Description of Control Technologies

1) Enclosed Freestall Barns vented to an incinerator capable of achieving 98% control

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 in turn keeps the cows cool. No enclosed freestall barns that were installed at a California dairy could be identified. However, partially enclosed freestall barns are available. These include tunnel-ventilated freestall barns, which are fairly common in the southern and eastern parts of the United States, and greenhouse barns. Greenhouse barns use a lightweight, galvanized steel tube frame to support one or two layers of a commercial-grade plastic film as covering. The most common use for these structures is as heated chambers for growing plants. Although the potential to enclose cows in a barn exist, the feasibility of reasonably collecting the biogas 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 will be even higher in the San Joaquin valley, where temperatures reach in excess of 110 degrees in the dry summer. Although the feasibility of such a technology is in question, it will be considered in this analysis. If the gases can be properly captured and sent to a control device, then those gases may be either incinerated or treated in a biofilter (see biofilter discussed in the option below). It is assumed that 95% of the gasses emitted from the freestall barns will be captured by the mechanical ventilation system and that 98% of the captured VOCs will be eliminated by thermal incineration[13]; therefore the total control for VOCs from the freestall barns = 0.95 x 0.98 = 93.1%.

2) Enclosed Freestall Barns vented to a biofilter capable of achieving 80% control

As stated above, the mechanical ventilation system of a completely enclosed freestall barn may be utilized to capture the gases emitted from the cow housing permit unit. The captured VOC emissions may then be sent to a biofilter. A biofilter is a device for removing contaminants from a gas in which the gas is passed through a media that supports microbial activity by which the pollutants are degraded by biological oxidation. In the biofiltration process, live bacteria biodegrade organic contaminants and ammonia into carbon dioxide, nitrogen 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.

Since biofilters rely on living organisms to function, the temperature, moisture content, and pH of the filter media should be monitored to ensure optimum operating conditions. The filter media also needs to be replaced periodically because of deterioration. It is assumed that 95% of the gasses emitted from the cow housing area will be captured by the mechanical ventilation system and that a properly functioning biofilter will eliminate 80% of the captured VOCs[14]; therefore, the total control for VOCs from the cow housing permit unit = 0.95 x 0.80 = 76%.

3) Feed and Manure Management Practices

Concrete Feed Lanes and Walkways

Dairy animals spend a large amount of time on the feed lanes and walkways. Constructing these areas of concrete will reduce particulate matter emissions by having the animals spend more time on a paved surface rather than dry dirt. The concrete lanes and walkways create an avenue for the flush system. 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 flush system, they do not individually reduce emissions of gaseous pollutants, therefore, no VOC control efficiency will be assigned for this practice.

Increased Flushing for feed lanes and walkways

Many dairy operations use a flush system to remove manure from the corral and freestall feed lanes and walkways. The flush system introduces a large volume of water 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. The freestall and corral lanes are for milk and dry cows are typically flushed twice per day, but the flushing frequency can vary between one to four times per day. The lanes for support stock are usually flushed once per day or less frequently.

In addition to cleaning the corral and freestall feed lanes and walkways, the flush system also serves as an emission control for reducing PM_{10}, VOC, and ammonia emissions. The manure deposited in the lanes, which is a source of VOC emissions, is removed from the cow housing area by the flush system. Many of the VOCs emitted from fresh cow manure, such as alcohols (ethanol and methanol) and many Volatile Fatty Acids (VFAs), are highly soluble in water. Therefore, a large percentage of these compounds will dissolve in the flush water and will not be emitted from the 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 flush system 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 feed lanes and walkways in the cow housing areas are typically flushed twice per day. Flushing the lanes four times per day will increase the frequency that manure is removed from the cow housing permit unit and should result in a higher percentage of soluble volatile compounds being dissolved in the flush. Based on calculations given in the final DPAG report[19], flushing the freestall lanes four times per day will be assumed to have a control efficiency of 47% for VOCs emitted from manure until better data becomes available. This control efficiency only applies to the manure and does not apply to the enteric emissions generated from the cows themselves. However, in order to be conservative, a 10% control efficiency will be applied at this time.

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.[20] This undigested protein also produces ammonia 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 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, ammonia, and hydrogen sulfide. 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% for both enteric VOC emissions from dairy animals and VOC emissions from manure.

Refused feed re-fed to the animals or removed from feed lanes on a daily basis to prevent decomposition.

Removing or re-feeding refused feed from the feed lanes on a daily basis will minimize gaseous emissions from decomposition. The feed that is removed must be properly disposed of to ensure that the emissions are not just relocated to another area of the dairy. Although this practice is expected to reduce emissions from the cow housing

[19] "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/dpaq/dpaq_idx.htm).

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

permit unit, there is not sufficient research to estimate the emissions reductions and no VOC control efficiency will be assigned for this practice.

Weekly 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 that promotes aerobic conditions on the corral surface, which will reduce gaseous pollutants from this area.

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 freestalls vented to an incinerator (≈ 93%; 95% Capture, 98% Control)
2) Enclosed freestalls vented to a biofilter (≈ 76%; 95% Capture, 80% Control)
3) Enclosed freestalls vented to an incinerator - Mature cows only (≈ 67% overall control of entire housing; 95% capture, 98% Control of 72% of cow housing emissions)
4) Enclosed freestalls vented to a biofilter - Mature cows only (≈ 55% overall control of entire housing; 95% Capture, 80% Control of 72% of cow housing emissions)
5) Feed and Manure Management Practices (≈ 22%)
   - Concrete feed lanes and walkways for all cows
   - Freestall feed lanes and walkways for milk cows and dry cows flushed four times per day (≈ 18% for total emissions from cow housing; 47% for emissions from manure) and feed lanes and walkways in the corrals for the remaining animals flushed at least two times per day
   - All animals fed in accordance with National Research Council (NRC) or other District-approved guidelines utilizing routine nutritional analysis for rations. (5% of total emissions from dairy cows)
   - Uneaten feed re-fed or removed from feed lanes on a daily basis to prevent decomposition.
   - All open corrals adequately 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.
   - Weekly scraping of freestall exercise pens and open corrals using pull-type scraper in the morning hours except when prevented by wet conditions.
   - Rule 4570 mitigation measures.

d. Step 4 - Cost Effectiveness Analysis

Thermal and Catalytic Incineration:

The following cost analysis demonstrates that the cost of natural gas alone, not including any capital costs, causes catalytic incineration to exceed the District VOC cost effective threshold. The temperature required for catalytic incineration is 600 °F. The temperature required for thermal incineration is 1,400 °F. Since the fuel requirements and fuel cost for thermal incineration are greater than catalytic incineration, the following analysis also demonstrates that thermal incineration would not be cost effective.

Required Airflow Rate of the Freestall Barns

In order to calculate the costs of this control option, the airflow rate required for the freestall barns must be determined. The University of Minnesota's publication "Improving Mechanical Ventilation in Dairy Barns", gives minimum ventilation rates for dairy cattle, which are listed in the table below.

Minimum Ventilation Rates for Dairy Cows (cfm/cow)			
Category	Winter	Mild Weather	Summer
Baby Calf	15	50	100
Heifer (2-12 months)	20	60	130
Heifer (12-24 months)	30	80	180
Mature Cow	50	170	500–1,000

The minimum summer ventilation rate listed for mature cows is 500 cfm per cow. However, according to the University of Minnesota publication and Cornell University's publication "Natural or Tunnel Ventilation of Freestall Structures: What is Right for Your Dairy Facility?", the required airflow rate in the summer increases to 1,000 cfm per cow if tunnel ventilation is used to provide additional cooling.[21]

The climate in the San Joaquin Valley is characterized by relatively mild winters and hot summers. Because of the warmer climate, it is expected that tunnel ventilation or a similar system would need to be employed in an enclosed freestall barn to prevent excessive heat stress. Additionally, tunnel ventilation systems, which operate with negative pressure inside the freestall barns, are more representative of the types of systems that would be required to capture and control emissions. Although the summer air requirement of 1,000 cfm per cow for tunnel ventilation is more representative of the airflow requirements in a completely enclosed freestall barn located in the San Joaquin Valley, for worst-case calculation purposes, the following average year round airflow requirement will be assumed: mature cows – 335 cfm/cow (average of 170 and 500 cfm per cow); large heifers – 130 cfm/cow (average of 80 and 180 cfm per cow); small and

[21] Improving Mechanical Ventilation in Dairy Barns, J.P. Chastain, http://www.bae.umn.edu/extens/aeu/aeu3.html and Natural or Tunnel Ventilation of Freestall Structures: What is Right for Your Dairy Facility?, C.A. Gooch, http://www.ansci.cornell.edu/tmplobs/doc225.pdf)

medium heifers – 95 cfm/cow (average of 60 and 130 cfm per cow); baby calves – 75 cfm (average of 50 and 100 cfm per cow).

<u>The analysis below is for the entire herd:</u>

As discussed in the evaluation, the expansion consists of the following: 3,600 Holstein milk cows; 535 dry cows; 1,196 heifers (15-24 months); 952 heifers (7-14 months); 352 heifers (3-6 months); and 550 calves (under 3 months). Enclosed freestalls will be evaluated as a housing alternative for all animals at this dairy.

The total required airflow rate for housing for these animals in freestalls is calculated as follows:

Category	# of cows	cfm/cow	min/hr	ft^3/hr
Milk cow	3,600	335	60	72,360,000
Dry cow	535	335	60	10,753,500
Heifer (15-24 mo)	1,196	130	60	9,328,800
Heifer (7-14 mo)	952	95	60	5,426,400
Heifer (3-6 mo)	352	95	60	2,006,400
Calves	550	75	60	2,475,000
Total				**102,350,100**

<u>Fuel Requirement for Thermal Incineration</u>

The gas leaving the freestall barns will be principally air, with a volumetric specific heat of 0.0194 Btu/scf-°F under standard conditions.

Natural Gas Requirement = (flow)(Cp_{Air})(ΔT)(1-HEF)

Where:

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

<u>Natural Gas Requirement for Thermal Incineration</u>

= (102,350,100 scf/hr)(0.0194 Btu/scf-°F)(600°F - 100°F)(1-0.7)
= **297,838,791 Btu/hr**

<u>Fuel Cost for Thermal Incineration:</u>

The cost for natural gas will be based upon the average spot market contract price (industrial) for August 2011 taken from the Energy Information Administration website (http://tonto.eia.doe.gov/dnav/ng/ng_sum_lsum_dcu_SCA_m.htm).

Average Cost for natural gas = $7.37/MMBtu

The oxidizer is assumed to operate 12 hours per day and 365 days per year.

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

297,838,791 Btu/hr x 1 MMBtu/10^6 Btu x 12 hr/day x 365 day/year x $7.37/MMBtu
= **$9,614,415/year**

VOC Emission Reductions for Thermal Incineration

The annual VOC Emission Reductions for housing all animals in enclosed freestall barns and venting the barns to an incinerator are calculated as follows:

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

Type of cow	# of cows	EF- lbs/hd-yr	CE	lbs-VOC/yr
Milk cow	3,600	9.92	93%	33,212
Dry cow	535	5.61	93%	2,791
Support stock	3,050	4.3	93%	12,197
TMR	7,185	8.046	93%	53,764
Total				**101,964**

Cost of VOC Emission Reductions

Cost of reductions = ($9,614,415/year)/((101,964 lb-VOC/year)(1 ton/2000 lb))
= **$188,585/ton of VOC reduced**

As shown above, the natural gas cost alone for thermal or catalytic incineration would cause the cost of the VOC reductions to be greater than the $17,500/ton cost effectiveness threshold of the District BACT policy. Additional costs such as the cost of constructing freestalls for all support stock, enclosing all freestalls, and the cost of installing and operating a cooling system for cow comfort would make it even less cost effective to install this technology. The equipment is therefore not cost effective and is being removed from consideration at this time.

The analysis below is for Mature Cows only:

As discussed in the evaluation, the expansion will consist of the following number of mature cows: 4,135 mature cows (3,600 Holstein milk cows and 535 dry cows). The milk cows are proposed to be housed in freestalls and dry cows housed in corrals with loafing barns. Enclosed freestalls will be evaluated as a housing alternative for the mature cows.

The total required airflow rate for housing for these animals in freestalls is calculated as follows:

Type of cow	# of cows	cfm/cow	min/hr	ft^3/hr
Milk cow	3,600	335	60	72,360,000
Dry cow	535	335	60	10,753,500
Total				**83,113,500**

Fuel Requirement for Thermal Incineration

The gas leaving the freestall barns will be principally air, with a volumetric specific heat of 0.0194 Btu/scf-°F under standard conditions.

Natural Gas Requirement = (flow)(Cp_{Air})(ΔT)(1-HEF)

Where:

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

Natural Gas Requirement for Thermal Incineration

= (83,113,500 scf/hr)(0.0194 Btu/scf - °F)(600 °F - 100 °F)(1-0.7)
= 241,860,285 Btu/hr

Fuel Cost for Thermal Incineration:

The cost for natural gas will be based upon the average spot market contract price (industrial) for August 2011 taken from the Energy Information Administration website (http://tonto.eia.doe.gov/dnav/ng/ng_sum_lsum_dcu_SCA_m.htm).

Average Cost for natural gas = $7.37/MMBtu

The oxidizer is assumed to operate 12 hours per day and 365 days per year.

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

241,860,285 Btu/hr x 1 MMBtu/10^6 Btu x 12 hr/day x 365 day/year x $7.37/MMBtu
= $7,807,395/year

VOC Emission Reductions for Thermal Incineration

The annual VOC Emission Reductions for housing all animals in enclosed freestall barns and venting the barns to an incinerator are calculated as follows:

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

Category	# of cows	EF- lbs/hd-yr	CE	lbs-VOC/yr
Milk cow	3,600	12.4	93%	41,515
Dry cow	535	8.2	93%	4,080
TMR	4,135	8.046	93%	30,941
Total				**76,536**

Cost of VOC Emission Reductions

Cost of reductions = ($7,807,395/year)/((76,536 lb-VOC/year)(1 ton/2000 lb))
= **$204,019/ton of VOC reduced**

As shown above, the natural gas cost alone for thermal or catalytic incineration would cause the cost of the VOC reductions to be greater than the $17,500/ton cost effectiveness threshold of the District BACT policy. Additional costs such as the cost of constructing freestalls for dry cows, enclosing all freestalls, and the cost of installing and operating a cooling system for cow comfort would make it even less cost effective to install this technology. The equipment is therefore not cost effective and is being removed from consideration at this time.

Biofiltration:

Biofiltration is a method of reducing pollutants in which exhaust air that contains contaminants is blown through a media (e.g., soil, compost, wood chips) that supports a microbial population. The microbes utilize the pollutants such as VOCs and ammonia as nutrients and oxidize the compounds as they pass through the filter.

The following cost analysis demonstrates that the cost of biofiltration exceeds the District cost effective threshold. Biofiltration can control both VOC and ammonia emissions. Although, this technology can control both pollutants, a cost effective threshold has not been established for ammonia. Therefore, only achieved-in-practice options will be considered for ammonia at this time and a multi-pollutant cost effective analysis for VOC and ammonia will not be performed.

Cost of Biofiltration

The cost estimate for a biofiltration system is taken from the United States EPA Report "Using Bioreactors to Control Air Pollution"[22]. The cost is largely dependent on the airflow rate that the filter must handle. According to University of Minnesota, Biofilters used to treat ventilating air exhausted from a livestock building should be sized to treat the maximum ventilation rate, which is typically the warm weather rate. The EPA report gives a range of $2.35 - $37.06 per cfm for the initial construction of a biofilter. As shown above in the thermal/catalytic incineration section, the following average year round airflow requirements will be assumed for worst-case purposes (based on the averages from the Minnesota's publication "Improving Mechanical Ventilation in Dairy Barns"[22]. See discussion on page 18 of this BACT analysis): mature cows – 335 cfm/cow (average of 170 and 500 cfm per cow); large heifers – 130 cfm/cow (average of

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

80 and 180 cfm per cow); small and medium heifers - 95 cfm/cow (average of 60 and 130 cfm per cow); baby calves – 75 cfm (average of 50 and 100 cfm per cow).

The analysis below is for the entire herd:

As discussed in the evaluation, the expansion consists of the following: 3,600 Holstein milk cows; 535 dry cows; 1,196 heifers (15-24 months); 952 heifers (7-14 months); 352 heifers (3-6 months); and 550 calves (under 3 months). Enclosed freestalls will be evaluated as a housing alternative for all animals at this dairy.

The total maximum airflow entering the biofilter from the enclosed freestalls for these animals is calculated as follows:

Category	# of cows	cfm/cow	cfm
Milk cow	3,600	335	1,206,000
Dry cow	535	335	179,225
Heifer (15-24 mo)	1,196	130	155,480
Heifer (7-14 mo)	952	95	90,440
Heifer (3-6 mo)	352	95	33,440
Calves	550	75	41,250
Total			**1,705,835**

Capital Cost

The cost estimate for the biofilter includes the costs of the fans, media, plenum, engineering, and labor but does not include installation of the required ductwork. As stated above, the United States EPA Report gives a capital cost range of between \$2.35 per cfm and \$37.06 per cfm. In general, the lower cost per cfm is associated with a higher flow rate. To be conservative, a median cost of \$19.71 per cfm will be assumed in this cost analysis.

The capital cost of the biofilter is calculated as follows:

\$19.71 cfm x 1,705,835 cfm = \$33,622,008

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

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

Where: A = Annual Cost
P = Present Value

I = Interest Rate (10%)
N = Equipment Life (10 years)

A = [$33,622,008 x 0.1(1.1)^{10}]/[(1.1)^{10}-1]
= **$5,471,823/year**

VOC Emission Reductions for Biofiltration

The annual VOC Emission Reductions for enclosed freestalls vented to a biofilter are calculated as follows:

[Number of cows] x [Uncontrolled Cow Housing VOC EF (lb/cow-year)] x [Overal Control Efficiency]

Category	# of cows	EF- lbs/hd-yr	CE	lbs-VOC/yr
Milk cow	3,600	12.4	76%	33,926
Dry cow	535	8.2	76%	3,334
Heifer (15-24 mo)	1,196	5.7	76%	5,181
Heifer (7-14 mo)	952	5	76%	3,618
Heifer (3-6 mo)	352	4.5	76%	1,204
Calves	550	4.3	76%	1,797
TMR	7185	8.046	76%	43,936
Total				**92,996**

Cost of VOC Emission Reductions

Cost of reductions = ($5,471,823/year)/((92,996 lb-VOC/year)(1 ton/2000 lb))
= **$117,679/ton of VOC reduced**

As shown above, the capital cost alone for a biofilter would cause the cost of the VOC reductions to be greater than the $17,500/ton cost effectiveness threshold of the District BACT policy. Additional costs such as the cost of constructing freestalls for all support stock, enclosing all freestalls, and the cost of installing and operating a cooling system for cow comfort would make it even less cost effective to install this technology. Therefore, this option is not cost effective and is being removed from consideration at this time.

The analysis below is for Mature Cows only:

As discussed in the evaluation, the expansion will consist of the following number of mature cows: 4,135 mature cows (3,600 Holstein milk cows and 535 dry cows). Enclosed freestalls will be evaluated as a housing alternative for the mature cows.

The total maximum airflow entering the biofilter from the enclosed freestalls is calculated as follows:

Type of cow	# of cows	cfm/cow	cfm
Milk cow	3,600	350	1,260,000
Dry cow	535	350	187,250
Total			**1,447,250**

Capital Cost

The cost estimate for the biofilter includes the costs of the fans, media, plenum, engineering, and labor but does not include installation of the required ductwork. As stated above, the United States EPA Report gives a capital cost range of between $2.35 per cfm and $37.06 per cfm. In general, the lower cost per cfm is associated with a higher flow rate. To be conservative, a median cost of $19.71 per cfm will be assumed in this cost analysis.

The capital cost of the biofilter is calculated as follows:

$19.71/cfm x 1,447,250 cfm = **$28,525,298**

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

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

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

$$A = [\$28,525,298 \times 0.1(1.1)^{10}]/[(1.1)^{10}-1]$$
$$= \mathbf{\$4,642,359/year}$$

VOC Emission Reductions for Biofiltration

The annual VOC Emission Reductions for enclosed freestalls vented to a biofilter are calculated as follows:

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

Category	# of cows	EF- lbs/hd-yr	CE	lbs-VOC/yr
Milk cow	3,600	12.4	76%	33,926
Dry cow	535	8.2	76%	3,334
TMR	4,135	8.046	76%	25,285
Total				**62,546**

Cost of VOC Emission Reductions

Cost of reductions = ($4,642,359/year)/((62,546 lb-VOC/year)(1 ton/2000 lb))
= **$148,446/ton of VOC reduced**

As shown above, the capital cost alone for a biofilter would cause the cost of the VOC reductions to be greater than the $17,500/ton cost effectiveness threshold of the District BACT policy. Additional costs such as the cost of constructing freestalls for dry cows, enclosing all freestalls, and the cost of installing and operating a cooling system for cow comfort would make it even less cost effective to install this technology. Therefore, this option is not cost effective and is being removed from consideration at this time.

Feed and Manure Management Practices:

- Concrete feed lanes and walkways for all cows
- Freestall feed lanes and walkways for milk cows and dry cows flushed four times per day and feed lanes and walkways in the corrals for the remaining animals flushed at least two times per day
- All animals fed in accordance with National Research Council (NRC) or other District-approved guidelines utilizing routine nutritional analysis for rations.
- Uneaten feed re-fed to animals or removed from feed lanes on a daily basis to prevent decomposition.
- All open corrals adequately 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.
- Weekly scraping of freestall exercise pens and open corrals using pull-type scraper in the morning hours except when prevented by wet conditions
- Rule 4570 mitigation measures.

The applicant has proposed this option; therefore a cost-effective analysis is not required.

e. Step 5 - Select BACT

The facility is proposing concrete feed lanes and walkways; to flush the freestall feed lanes and walkways for the milk and dry cows four times per day and to flush the corral feed lanes and walkways for the remaining animals two times per day; open corrals adequately sloped to promote drainage; to feed all animals in accordance with National Research Council (NRC) or other District-approved guidelines utilizing routine nutritional analysis for rations; to re-feed or remove refused feed from feed lanes on a daily basis to prevent decomposition; and to scrape open corrals and freestall exercise pens weekly with a pull-type scraper except during wet conditions, which satisfies the BACT requirements.

Additionally, District Rule 2201 defines BACT as including the most stringent emission limitation or control technique, including process and equipment changes, that has 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 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 applicant has selected to comply with Rule 4570 will also be required as part of BACT for VOC emissions from the cow housing permit.

3. BACT Analysis for NH_3 Emissions from the Cow Housing:

a. 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 in this project. However, for purposes of the Dairy BACT Guideline, the District will not deem any control options Achieved-in-Practice until after the final Dairy BACT Guideline has been established

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

1) Feed and Manure Management Practices
    - Concrete feed lanes and feed walkways for all cows
    - Feed lanes and walkways for milk cows and dry cows flushed four times per day and feed lanes and walkways in the corrals for the remaining animals flushed at least two times per day
    - All animals fed in accordance with National Research Council (NRC) or other District-approved guidelines utilizing routine nutritional analysis for rations.
    - All open corrals adequately 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.
    - Weekly scraping of freestall exercise pens and open corrals using pull-type scraper in the morning hours except when prevented by wet conditions

<u>Description of Control Technologies</u>

1) Feed and Manure Management Practices

<u>Concrete Feed Lanes and Walkways</u>
Dairy animals spend a large amount of time on the feed lanes and walkways. Constructing these areas of concrete will reduce particulate matter emissions by having the animals spend more time on a paved surface rather than dry dirt. The concrete lanes and walkways create an avenue for the flush system. The flush system will further reduce particulate matter emissions and will also reduce VOC and ammonia emissions (see below).

Increased Flushing for feed lanes and walkways
Many dairy operations use a flush system to remove manure from the corral and freestall feed lanes and walkways. The flush system introduces a large volume of water 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. The freestall and corral lanes for milk and dry cows are typically flushed twice per day, but the flushing frequency can vary between one to four times per day. The lanes for support stock are usually flushed once per day or less frequently.

In addition to cleaning the corral and freestall feed lanes and walkways, the flush system also serves as an emission control for reducing PM_{10}, VOC, and ammonia emissions. The manure deposited in the lanes, which is also a source of NH_3 emissions, is removed from the cow housing area by the flush system. Ammonia has a high affinity for water and is highly soluble in water. Therefore, 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.

Weekly 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 that promotes aerobic conditions on the corral surface, which will reduce gaseous pollutants from this area.

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) Feed and Manure Management Practices
   - Concrete feed lanes and feed walkways for all cows
   - Freestall feed lanes and walkways for milk cows and dry cows flushed four times per day and feed lanes and walkways in the corrals for the remaining animals flushed at least two times per day
   - All animals fed in accordance with National Research Council (NRC) or other District-approved guidelines utilizing routine nutritional analysis for rations.
   - All open corrals adequately 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.
   - Weekly scraping of freestall exercise pens and open corrals using pull-type scraper in the morning hours except when prevented by wet conditions

d. Step 4 - Cost Effectiveness Analysis

The applicant has proposed the only option listed; therefore a cost analysis is not required.

e. Step 5 - Select BACT

The facility is proposing concrete feed lanes and feed walkways; to flush the freestall feed lanes and walkways for the milk and dry cows four times per day and to flush the corral feed lanes and walkways for the remaining animals two times per day; open corrals adequately sloped to promote drainage; to feed all animals in accordance with National Research Council (NRC) or other District-approved guidelines utilizing routine nutritional analysis for rations; and to scrape open corrals and freestall exercise pens weekly with a pull-type scraper except during wet conditions, which satisfies the BACT requirements.

Additionally, District Rule 2201 defines BACT as including the most stringent emission limitation or control technique, including process and equipment changes, that has 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 mitigation measures required by District Rule 4570 are technologically feasible for confined animal facilities and the applicant has proposed these options. Although District Rule 4570 is only intended to reduce VOC emissions, many of these measures also reduce ammonia emissions. Therefore, in addition to the BACT requirements determined in the Top-Down BACT Analysis above, implementation of the mitigation measures that the applicant has selected to comply with Rule 4570 will also be required as part of BACT for NH_3 emissions from the cow housing permit.

IV. Top Down BACT Analysis for the Liquid Manure Handling System - Lagoon & Storage Ponds

1. BACT Analysis for VOC Emissions from the Lagoon & Storage Pond:

a. Step 1 - Identify all control technologies

Since, specific control efficiencies have not been identified in the literature for VOC emissions from dairy lagoons and storage ponds, the control efficiencies listed are based on the control efficiencies of similar processes and engineering judgment.

The following options were identified as possible controls for VOC emissions from the Lagoon and Storage Pond:

1) Aerobic Treatment Lagoon – mechanical aeration to achieve a dissolved oxygen concentration of 2.0 mg/L (≈ 95%; based information provided by Dr. Ruihong Zhang of UC Davis)

2) Covered Lagoon Anaerobic Digester with biogas collected and vented to a destruction device such as an internal combustion engine or flare, and treated waste discharged into a secondary lagoon or storage pond. (≈ 75%) (Note: not required unless required by the final Dairy BACT Guideline)

3) Anaerobic Treatment Lagoon designed to meet Natural Resources Conservation Service (NRCS) standards (≈ 40%)

<u>Description of Control Technologies</u>

1) Aerobic Treatment Lagoon – mechanical aeration to achieve a dissolved oxygen concentration of 2.0 mg/L

An aerobic treatment 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.

Sufficient oxygen must be provided to sustain the aerobic microorganisms in completely aerated lagoons. Lagoons can be considered completely aerobic if sufficient oxygen is provided to achieve a dissolved oxygen (DO) content of 2.0 mg/L or more. Oxygen is typically provided by mechanical aerators. These aerators 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) content of the liquid manure is 2.0 mg/L or more. A major disadvantage of completely aerated lagoons is the enormous cost of the energy required to run the aerators continuously. Because of this, it has been determined that completely aerated lagoons are not cost effective options for dairy facilities at the present time.

2) Covered Lagoon Anaerobic Digester

Pursuant to Section 5.3 of the Settlement Agreement (9/20/2004) between the District and the Western United Dairyman and the Alliance of Western Milk Producers Inc., installation of an anaerobic digester will only be required if this technology is proven effective in reducing emissions and is required by the final Dairy BACT Guideline.[3]

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 can be captured and then sent to a suitable combustion device. Combustion (thermal incineration) is a generally accepted, well-established VOC control technique. 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. The overall control efficiency is assumed to be 75% of the emissions that would have been emitted from the lagoon and storage pond.

3) Anaerobic Treatment Lagoon

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

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) Aerobic Treatment Lagoon – mechanical aeration to achieve a dissolved oxygen concentration of 2.0 mg/L (≈ 95%)
2) Covered Lagoon Anaerobic Digester with biogas collected and vented to a destruction device such as an internal combustion engine or flare, and treated waste discharged into a secondary lagoon or storage pond. (≈ 75%)
3) Anaerobic Treatment Lagoon designed to meet Natural Resources Conservation Service (NRCS) standards (≈ 40%)

d. Step 4 - Cost Effectiveness Analysis

Aerobic Treatment Lagoon:

The following cost analysis demonstrates that the energy costs alone, not including any capital costs, causes complete aeration to exceed the District VOC cost effective threshold.

Energy Requirement for Complete Aeration

In order to effectively calculate the costs of this control option, the energy requirement for complete aeration must be determined. 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).[23] It is generally accepted that at least

[23] An Assessment of Technologies for Management and Treatment of Dairy Manure in California's San Joaquin Valley, December 2005, page 34 (http://www.arb.ca.gov/ag/caf/dairypnl/dmtfaprprt.pdf)

twice the BOD should be provided for complete aeration[24]. According to Dr. Ruihong Zhang of the University of California, Davis, 2.4 lbs (1.1 kg) of oxygen (O_2) per cow must be provided each day for removal of BOD and an additional 3 lbs (1.4 kg) for oxidation of 70% of the nitrogen.[25] Based on the data gathered in a UC Davis study on aerator performance for wastewater lagoons, aeration efficiencies for mechanical aerators range from 0.10 to 0.68 kg of oxygen provided per kW-hr of energy utilized.[26] For this analysis it will be assumed that twice the BOD is required for complete aeration and that mechanical aerators will provide 1.0 kg of oxygen per kW-hr. This efficiency is very conservative since it is greater than the efficiency of the most efficient aerator tested in the UC Davis study (0.68 kg-O_2/kW-hr) and more than twice the efficiency of the most efficient aerator tested that had been installed in dairy lagoons (0.49 kg-O_2/kW-hr). Additionally, the efficiency tests were performed in clean water and lower aeration efficiencies are expected in liquid dairy manure that contains a significant amount of solids. The yearly energy requirement per cow is calculated as follows:

[2 x (1.1 kg/cow-day) x (365 day/year)] ÷ (1.0 kg/kW-hr) = 803 kW/cow-year

The total yearly energy requirement is calculated below. Based on animal units (AU), it is assumed that the BOD loading (and the energy requirement) for the dry cows will be 80% of that of the milk cows, the BOD loading from the large heifers will be 73% of milk cows, the BOD loading from the small and medium heifers will be 35% of milk cows, and the BOD loading from the baby calves will be 21% of milk cows.[27]

As discussed in the evaluation, after completion of the project, the dairy will house 3,600 Holstein milk cows; 535 dry cows; 1,196 heifers (15-24 months); 952 heifers (7-14 months), 352 heifers (3-6 months) and 550 calves (0-3 months). The amount of electricity required for complete aeration of the lagoon system is calculated as follows:

(3,600 milk cows x 803 kW/cow-year) + (535 dry cows x 0.8 x 803 kW/cow-year) + (1196 large heifers (15-24 mo.) x 0.73 x 803 kW/cow-year) + (952 medium heifers (7-14 mo) x 0.35 x 803 kW/cow-year) + (352 small heifers (3-6 mo.) x 0.35 x 803 kW/cow-year) + (550 calves x 0.21 x 803 kW/cow-year)

= 4,394,803 kW-hr/year

Cost of Electricity for Complete Aeration:

The cost for electricity is based upon on an average retail price of industrial electricity in California for the year 2009 taken from the Energy Information Administration (EIA) Website: http://www.eia.doe.gov/cneaf/electricity/epm/table5_6_b.html.

[24] See http://www.extension.org/faq/27574 and http://www.omafra.gov.on.ca/english/engineer/facts/04-033.htm

[25] An Assessment of Technologies for Management and Treatment of Dairy Manure in California's San Joaquin Valley, December 2005, page 35 (http://www.arb.ca.gov/aq/caf/dairypnl/dmtfaprprt.pdf)

[26] Aerator Performance for Wastewater Lagoon Application, September 2007, UC Davis, R.H. Zhang (http://asae.frymulti.com/abstract.asp?aid=23832&t=2)

[27] Animal Unit (AU) factors are taken from the California Regional Water Quality Control Board Central Valley Region Annual Report for Dairies Subject to Monitoring and Reporting (http://www.waterboards.ca.gov/centralvalley/available_documents/dairies/genorderwdrform.pdf)

Average Cost for electricity = $0.1056/kW-hr

The electricity costs for complete aeration are calculated as follows:
4,394,803 kW-hr/year x $0.1056/kW-hr
= $464,091/year

VOC Emission Reductions for Complete Aeration

In addition to controlling 95% of the emissions from the lagoon and storage pond, complete aeration will also control 95% of the emissions from liquid manure land application as well. Therefore, these emissions reductions will also be included in the analysis.

The annual VOC Emission Reductions for the lagoons, storage ponds, and liquid manure land application unit are calculated as follows:

{[Number of cows] x [Uncontrolled Lagoon/Storage Pond VOC EF (lb/cow-year)] x [Complete Aeration Control Efficiency for Lagoon/Storage Pond]} + {[Number of cows] x [Uncontrolled Land application VOC EF (lb/cow-year)] x [Complete Aeration Control Efficiency for Land Application]}

[(3,600 milk cows x 0.74 lb-VOC/cow-year) + (535 dry cows x 0.40 lb-VOC/cow-year) + (3,050 support stock x 0.31lb-VOC/cow-year)] x 0.95 + (3,600 milk cows x 1.33 lb-VOC/cow-year) + (535 dry cows x 0.72 lb-VOC/cow-year) + (3,050 support stock x 0.55 lb-VOC/cow-year)] x 0.95

=[3,824 lb-VOC/year x 0.95] + [6,851 lb-VOC/year x 0.95]
= **10,140 lb-VOC/year**

Cost of VOC Emission Reductions

Cost of reductions = ($464,091/year)/((10,140 lb-VOC/year)(1 ton/2000 lb))
= **$91,537/ton of VOC reduced**

As shown above, the electricity cost alone for complete aeration would cause the cost of the VOC reductions to be greater than the $17,500/ton cost effectiveness threshold of the District BACT policy. The equipment is therefore not cost effective and is being removed from consideration at this time.

Covered Lagoon Anaerobic Digester:

Pursuant to Section 5.3 of the Settlement Agreement (9/20/2004) between the District and the Western United Dairyman and the Alliance of Western Milk Producers Inc., installation of an anaerobic digester will only be required if this technology is proven effective in reducing emissions and is required by the final Dairy BACT Guideline.[3]

The applicant has proposed to install an anaerobic digester if this technology is proven effective in reducing emissions and is required by the final Dairy BACT Guideline. Since the applicant has proposed this option in accordance with the Settlement Agreement, a cost-effective analysis is not required. If an anaerobic digester is required in the final Dairy BACT Guideline, the applicant will be required to install the system in accordance with the timeframes and procedures established by the APCO in the final Dairy BACT Guideline.

Anaerobic Treatment Lagoon:

The applicant has proposed an anaerobic treatment lagoon, as described in full detail under section VI, Emission Control Technology Evaluation, of the main evaluation. The applicant's proposal therefore meets the BACT requirements under this category.

e. Step 5 - Select BACT

The facility is proposing a three-stage phototrophic treatment lagoon that is at least equivalent to an anaerobic treatment lagoon designed according to National Resource Conservation Service (NRCS) Guidelines. Additionally, the facility is proposing to install an anaerobic digester if determined to be an effective emissions control in the final Dairy BACT guideline. Therefore, the BACT requirements are satisfied.

Additionally, District Rule 2201 defines BACT as including the most stringent emission limitation or control technique, including process and equipment changes, that has 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 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 applicant has selected to comply with Rule 4570 will also be required as part of BACT for VOC emissions from the lagoons/storage ponds.

2. BACT Analysis for NH_3 Emissions from the Lagoon & Storage Pond

a. 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 considered for ammonia at this time. (Although these options must meet the District definition of Achieved-in-Practice, pursuant to the Settlement Agreement (9/20/2004) between the District and Western United Dairyman and Alliance of Western Milk Producers Inc3, the District will not deem any control options Achieved-in-Practice until after the Dairy BACT Guideline has been established.)

The following practice has been identified as a possible control option for the NH3 emissions from the lagoon and storage pond. No other control technologies that meet the definition of Achieved-in-Practice have been identified for the lagoon or storage pond:

1) Animals fed in accordance with National Research Council (NRC) or other District-approved guidelines utilizing routine nutritional analysis for rations.

Description of Control Technologies

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 the liquid manure in the lagoon and storage pond..

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) Animals fed in accordance with National Research Council (NRC) or other District-approved guidelines utilizing routine nutritional analysis for rations.

d. Step 4 - Cost Effectiveness Analysis

The applicant has proposed the only option listed; therefore a cost analysis is not required.

e. Step 5 - Select BACT

The facility is proposing to feed all animals in accordance with National Research Council (NRC) or other District-approved guidelines utilizing routine nutritional analysis for rations, which satisfies the BACT requirements.

Additionally, District Rule 2201 defines BACT as including the most stringent emission limitation or control technique, including process and equipment changes, that has 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 mitigation measures required by District Rule 4570 are technologically feasible for confined animal facilities and the applicant has proposed these options. Although District Rule 4570 is only intended to reduce VOC emissions, many of these measures also reduce ammonia emissions. Therefore, in addition to the BACT requirements determined in the Top-Down BACT Analysis above, implementation of the mitigation measures that the applicant has selected to comply with Rule 4570 will also be required as part of BACT for NH_3 emissions from the lagoons/storage ponds.

3. BACT Analysis for H_2S Emissions from the Lagoon & Storage Pond

A cost effectiveness threshold has not been established for H2S. Therefore, only options that meet the District's definition of Achieved-in-Practice controls will be considered for H at this time.

a. Step 1 - Identify all control technologies

The following options were identified as possible controls for H2S emissions from the Lagoon/Storage Pond:

a. Lagoon PH maintained at a minimum of 7.8, with monitoring and recordkeeping, and adjustment with lime (or similar base) as needed

b. Feeding per NRC Guidelines

c. Solids Separation

d. Reduce or Eliminate the Use of Copper Sulfate as a Footbath Disinfectants

<u>Description of Control Technologies</u>

1) Lagoon pH Maintained at a Minimum of 7.8

Hydrogen Sulfide in the lagoon exists in both aqueous and vapor phases. The aqueous phase is represented by hydrogen sulfide (HS^-) and sulfide (S^{2-}) ions, whereas the vapor phase is represented by Hydrogen Sulfide gas. The determining factor of the proportion of each phase is pH. If the pH is low enough, virtually all Hydrogen Sulfide while exist in the vapor phase, and Hydrogen Sulfide gas emissions from the surface of the lagoon will be maximized. On the other hand, if the pH is high enough, virtually all the Hydrogen Sulfide with exist in the aqueous phase, and Hydrogen Sulfide gas emissions will be virtually non-existent.

While a pH high enough to eliminate emissions completely is probably not feasible in a large body of liquid such as a dairy manure lagoon, emissions may still be significantly reduced by maintaining the pH of the lagoon in the basic range. Modeling results indicate that significant reductions can be achieved cost effectively at a minimum pH of 7.8. This pH will be achieved by the addition of lime (or similar salts) to the lagoon. Monitoring and record keeping will be required to ensure that the pH is maintained above the recommended value.

2) Feeding per NRC Guidelines

H_2S is produced as a result of the decomposition of sulfur compounds in the manure under anaerobic conditions. The presence of these Sulfur compounds in the manure is primarily due to excretion of excess Sulfur from the digestive tract, as well as other inorganic sources[28].

Because both organic Nitrogen and Sulfur compounds are primarily components of amino acids, they tend to occur in set ratios and strategies to reduce the excretion of undigested protein and Nitrogen will also reduce the amount of Sulfur in the manure. A diet that is formulated to feed proper amounts of ruminantly-degradable protein will result in improved protein utilization by the animal and corresponding reduction in sulfur content of the manure, which will reduce the potential for production of H_2S.

3) Solids Separation

Solids separation will reduce loading and the amount of organic Sulfur compounds that are stored under anaerobic conditions, thereby reducing the potential for production of H_2S.

Reducing the loading of lagoons also creates conditions that are more favorable to the growth of sulfur-reducing phototrophic bacteria. Phototrophic or red water treatment lagoons have a characteristic purple, pink, or rose color. Purple sulfur bacteria utilize hydrogen sulfide and volatile organic acids as an electron source for anoxygenic photosynthesis and utilize volatile organic acids and alcohols as a carbon source for 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.

In addition to mechanical separators, settling basins can also be used to remove solids; however, they must be frequently emptied so the removed solids do not remain in an anaerobic.

4) Reduce or Eliminate the Use of Copper Sulfate as a Footbath Disinfectant

Some researchers recommended reducing or eliminating the use of Copper Sulfate as a means of reducing H2S emissions from lagoons. This will reduce the amount of inorganic sulfur compounds that are stored under anaerobic conditions, thereby reducing the potential for production of H2S. Copper Sulfate can also be detrimental to

[28] http://www.epa.gov/ttnchie1/ap42/ch09/draft/draftanimalfeed.pdf

purple sulfur bacteria and other anaerobic microbes that reduce VOC and H2S[29].

Copper Sulfate is one of the main disinfectants used in dairy footbaths to prevent the occurrence and spread digital dermatitis (aka hairy foot warts) on the hooves of dairy cattle. Digital dermatitis is a health concern that can result in lameness in dairy cattle.

b. Step 2 - Eliminate technologically infeasible options

There are no technologically infeasible options to eliminate from step 1, but the following control options should not be considered further:

1) Lagoon pH Maintained at a Minimum of 7.8

This measure should not be considered because it would result in increased Ammonia emissions. Under pH conditions close to neutral or acidic (pH 7 or lower) Ammonia exists primarily as the soluble Ammonium ion, which is retained in the lagoon[30]. When the pH increases toward the basic range, the Ammonium ion is increasingly converted into the insoluble Ammonia phase and emitted into the atmosphere. Since under normal circumstances lagoon pH is close to neutral or is slightly acidic, it is reasonable to assume that the balance between H2S and NH3 emissions is somewhat optimal. Further, since NH3 is generally present in significantly larger quantities than H2S, leaving the pH in a natural range that may slightly favor H2S emission is more beneficial than influencing it into the basic range that will favor NH3 emissions.

2) Reduce or Eliminate the Use of Copper Sulfate as a Footbath Disinfectant

Copper Sulfate is one of the main disinfectants used in dairy footbaths to prevent the occurrence and spread digital dermatitis (aka hairy foot warts) on the hooves of dairy cattle. Digital dermatitis is a health concern that can result in lameness in dairy cattle. Further research is needed to better quantify the effect that the use of copper sulfate has on H2S emissions and to additional research is needed regarding the effectiveness and practicality of the use of alternative disinfectants for the prevention of digital dermatitis. Therefore, this practice will not be required at this time but may be revaluated later.

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) Feeding per NRC Guidelines

2) Solids Separation

[29] http://www.cals.uidaho.edu/edComm/pdf/CIS/CIS1148.pdf; http://courses.cals.uidaho.edu/bae/bae404/Dairy%20Odor%20Mgmt.pdf; and http://www.deq.idaho.gov/media/635665-58_0101_0502_scientific_basis_final.pdf

[30] http://pubs.ext.vt.edu/442/442-110/442-110.html

d. Step 4 - Cost Effectiveness Analysis

Since the remaining control measures are achieved in practice, a cost effectiveness analysis is not required.

e. Step 5 - Select BACT

The facility is proposing to feed all animals per NRC guidelines and separate solids from the manure stream prior to treatment in the lagoon. Therefore, the BACT requirements are satisfied.

V. Top Down BACT Analysis for the Liquid Manure Handling System – Liquid Manure Land Application

1. BACT Analysis for VOC Emissions from Liquid Manure Land Application:
a. Step 1 - Identify all control technologies

Since, specific control efficiencies have not been identified in the literature for VOC emissions from dairy lagoons and storage ponds, the control efficiencies listed are based on the control efficiencies of similar processes and engineering judgment.

The following options were identified as possible controls for VOC emissions from the Lagoon and Storage Pond:

1) Aerobic Treatment Lagoon – mechanical aeration to achieve a dissolved oxygen concentration of 2.0 mg/L (≈ 95%)
2) Anaerobic Treatment Lagoon designed to meet Natural Resources Conservation Service (NRCS) standards (≈ 40%)
3) Injection of Liquid and Slurry Manure (≈ 50%)

<u>Description of Control Technologies</u>

1) Aerobic Treatment Lagoon – mechanical aeration to achieve a dissolved oxygen concentration of 2.0 mg/L

An aerobic treatment 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, sulphates 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. Because these compounds would be removed from the liquid manure, emissions from liquid manure land application would also be eliminated.

Sufficient oxygen must be provided to sustain the aerobic microorganisms in completely aerated lagoons. Lagoons can be considered completely aerobic if sufficient oxygen is provided to achieve a dissolved oxygen (DO) content of 2.0 mg/L or more. Oxygen is typically provided by mechanical aerators. These aerators 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) content of the liquid manure is 2.0 mg/L or more. A major disadvantage of completely aerated lagoons is the enormous cost of the energy required to run the aerators continuously. Because of this, it has been determined that completely aerated lagoons are not cost effective options for dairy facilities at the present time.

2) Anaerobic Treatment Lagoon

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

3) 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.

b. Step 2 - Eliminate technologically infeasible options

Option 4 - 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.[31]

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.

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) Aerobic Treatment Lagoon – mechanical aeration to achieve a dissolved oxygen concentration of 2.0 mg/L (≈ 95%)

2) Anaerobic Treatment Lagoon designed to meet Natural Resources Conservation Service (NRCS) standards (≈ 40%)

d. Step 4 - Cost Effectiveness Analysis

Aerobic Treatment Lagoon:

The preceding cost analysis performed for the BACT analysis for VOC emissions from the lagoon and storage pond demonstrated that the energy costs alone, not including any capital costs, caused complete aeration to exceed the District VOC cost effective threshold. This analysis included VOC reductions from liquid manure land application as well as the lagoon and storage pond since complete aeration reduces emissions from

[31] 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)

both emissions units. Therefore, no further cost analysis is required for complete aeration.

Anaerobic Treatment Lagoon:

The applicant has proposed a control method that is at least equivalent to this option; therefore a cost-effectiveness analysis is not required.

e. Step 5 - Select BACT

The facility is proposing an anaerobic treatment lagoon that is at least equivalent to an anaerobic treatment lagoon designed according to National Resource Conservation Service (NRCS) Guidelines. Additionally, the facility is proposing to install an anaerobic digester if determined to be an effective emissions control in the final Dairy BACT guideline. Therefore, the BACT requirements are satisfied.

Additionally, District Rule 2201 defines BACT as including the most stringent emission limitation or control technique, including process and equipment changes, that has 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 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 applicant has selected to comply with Rule 4570 will also be required as part of BACT for VOC emissions from liquid manure land application.

2. BACT Analysis for NH_3 Emissions from the Liquid Manure Land Application

a. 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 considered for ammonia at this time. (Although these options must meet the District definition of Achieved-in-Practice, pursuant to the Settlement Agreement (9/20/2004) between the District and Western United Dairyman and Alliance of Western Milk Producers Inc[3], the District will not deem any control options Achieved-in-Practice until after the Dairy BACT Guideline has been established.)

The following practice has been identified as a possible control option for the NH_3 emissions from the liquid manure land application. No other control technologies that meet the definition of Achieved-in-Practice have been identified for liquid manure land application.

1) Animals fed in accordance with National Research Council (NRC) or other District-approved guidelines utilizing routine nutritional analysis for rations.

Description of Control Technologies

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

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

1) Animals fed in accordance with National Research Council (NRC) or other District-approved guidelines utilizing routine nutritional analysis for rations.

d. Step 4 - Cost Effectiveness Analysis

The applicant has proposed the only option listed; therefore a cost analysis is not required.

e. Step 5 - Select BACT

The facility is proposing to feed all animals in accordance with National Research Council (NRC) or other District-approved guidelines utilizing routine nutritional analysis for rations, which satisfies the BACT requirements.

Additionally, District Rule 2201 defines BACT as including the most stringent emission limitation or control technique, including process and equipment changes, that has 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 mitigation measures required by District Rule 4570 are technologically feasible for confined animal facilities and the applicant has proposed these options. Although District Rule 4570 is only intended to reduce VOC emissions, many of these measures also reduce ammonia emissions. Therefore, in addition to the BACT requirements determined in the Top-Down BACT Analysis above, implementation of the mitigation measures that the applicant has selected to comply with Rule 4570 will also be required as part of BACT for NH_3 emissions from liquid manure land application.

VI. Top Down BACT Analysis for the Solid Manure

1. BACT Analysis for VOC Emissions from Solid Manure:

a. Step 1 - Identify all control technologies

Since specific control efficiencies have not been identified in the literature for VOC emissions from solid manure handling, the control efficiencies listed are based on the control efficiencies of similar processes and engineering judgment.

The following options were identified as possible controls for VOC emissions from Solid Manure Handling and Land Application:

1) Open Windrow Composting
2) Open Aerated Static Pile (ASP) (≈ 23.2%)
3) Open Negatively Aerated Static Pile vented to biofilter ≥ 80% destruction efficiency for both active and curing phases (or a combination of controls) (≈ 84.6%)
4) Enclosed Negatively Aerated Static Pile (≈ 33.2%)
5) In-Vessel/Enclosed Negative Aerated Static Piles vented to biofilter ≥ 80% destruction efficiency for both active and curing phases (or a combination of controls) (≈ 86.6%)
6) Daily Land Application with Immediate Incorporation (≈ 43.5%)

<u>**Description of Control Technologies**</u>

1) Open Windrow Composting

Composting is the aerobic decomposition of manure or other organic materials in the thermophilic temperature range (104 –149 degrees F). It is the same process that decays leaves and other organic debris in nature. Composting controls the conditions so that the natural decomposition process occurs at a faster rate. Composting can be performed using windrows. A windrow process involves forming long piles (windrows as shown in the picture below) turned by specially designed machines. Typically the rows are 1 to 2 meters high and 2 to 5 meters at the base. The piles are turned periodically to mix and introduce and rebuild bed porosity. This helps to ensure that all the material is uniformly composted. However, studies have shown that VOC and ammonia emissions from open windrow composting are significant.

Composting is a three-stage process that begins as soon as appropriate materials are combined and piled together. The initial stage of the process is referred to as active composting followed by curing or finishing, and storage and/or processing of composted products.

The composted material is usually odorless, fine-textured, has low moisture, and can be bagged and sold for use in gardens, nurseries or used as fertilizer on cropland. Composting improves the handling characteristics of any organic residue by reducing its volume and weight. Composting also kills pathogens and weed seeds. Composting reduces material volume through natural biological action and produces a product that enhances soil structure and benefits new growth.

Active composting phase (Thermophilic stage):

Based on SCAQMD Rule 1133.2, titled "Emission Reductions from Co-Composting Operations" the active composting phase is the phase of the composting process that begins when organic materials are mixed together for composting purposes and lasts approximately 22 days. According to SCAQMD, 80% of VOC emissions and 50% of NH_3 emissions occur during the first 22 days of composting.[32] The active phase of composting is where the population of thermophilic microorganisms is usually the highest. This stage is characterized by high temperatures, high level of oxygen demand, and high evaporation rates due to temperature.

Curing phase (Mesophilic stage):

Conversely, the curing stage of the process is where the mesophilic microorganism population is the highest and the need for oxygen and evaporation rates decreases. The curing phase is defined in SCAQMD Rule 1133.2 as "a period that begins immediately after the active phase and lasts 40 days or until the compost exhibits a Solvita Maturity Index of 7, or the product respiration rate is below 10 milligrams of oxygen per gram of volatile solids per day as measured by direct respirometry". 20% of VOC emissions and 50% of NH_3 emissions are expected to occur during this phase.[33]

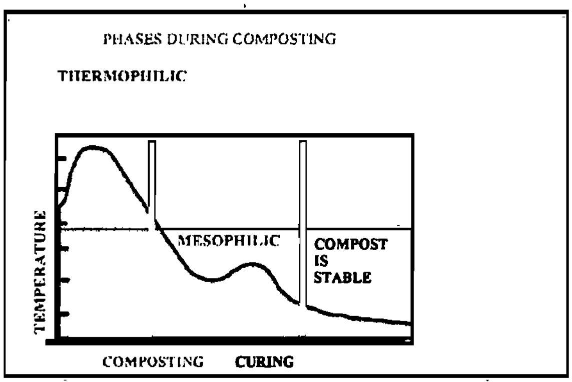
VOC emissions from composting:

VOC emissions primarily occur during the active and curing phases of the composting. To ensure consistent temperatures within the piles, a layer of finished compost can be

[32] Page 8 of SCAQMD Rule 1133 final staff report
[33] SCAQMD Rule 1133 Technology Assessment

placed on top of the active and curing phase piles. This helps minimize volatility of VOCs at the surface of the compost piles.

There is a linkage between the microbial activity and the VOC emissions profile from composting operations. Emissions are generally higher during thermophilic temperatures and lower during mesophilic temperatures. The figure below illustrates the oxygen demand and microbial profile of the various composting stages. This figure also illustrates the corresponding VOC emissions primarily occurring during active and curing phases of composting.[34]



This graphic was provided by Eliot Epstein, Ph.D. Chief Environmental Scientist Tetra Tech, Inc.
*VOC emissions are expected to follow the similar profile as oxygen demand.

During the composting process the volume of waste will be reduced anywhere from 40-50 percent. The rate at which manure will compost depends on the following[35]: moisture content; pH; temperature; amount of oxygen available; size of particles in the material; the carbon-to-nitrogen ratio - the weight of decomposable carbon to the weight of total nitrogen in an organic material

The bacterial breakdown of substrates in the material being composted produces various organic and inorganic gases that can contribute to several different air pollution problems. Source testing conducted by the SCAQMD District in 1994 and early 1995 indicated that outdoor windrow composting of dewatered sewage sludge releases significant levels of ammonia, methane and VOCs (SCAQMD, 1995).

Disadvantages of composting organic residues include loss of nitrogen and other nutrients, time for processing, cost for handling equipment, available land for composting, odors, marketing, and slow release of available nutrients. During a three year Nebraska study as much as 40 percent of total beef feedlot manure nitrogen and 60 percent of total carbon was lost to the atmosphere during composting.[36] Increasing the carbon-to-nitrogen ratio by incorporating high carbon materials (leaves, plant residue, paper, sawdust, etc.) can reduce nitrogen loss.

2) Negatively Aerated Static Pile (ASP)

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[34] Page 9-10, SCAQMD Final Staff Report for Proposed Rules 1133, 1133.1, and 1133.2.
[35] Proposed SCAQMD Rule 1133 (Pages 1-6)
[36] University of Nebraska-Lincoln

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 (non-aerated piles turned mechanically with front-end loaders or scarabs as discussed above).

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.

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.[37]

An odor and emissions study done at the City of Philadelphia biosolids co-composting facility by the Department of Water[38] 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.

3) Open negatively aerated static pile with exhaust vented to a biofilter > 80% control efficiency

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

[37] Technology Assessment for SCAQMD proposed Rule 1133 Page 3-2
[38] 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.

aeration.

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 harmless 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.[39]

4) Enclosed Aerated Static Pile

An enclosed aerated static pile uses the same forced aeration principle of an open ASP, except that the entire pile is fully enclosed. There are a few companies that are promoting this type of system. In this evaluation, the following two companies will be discussed: AgBag International Ltd and the Gore Cover. Both technologies are briefly described below:

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

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.

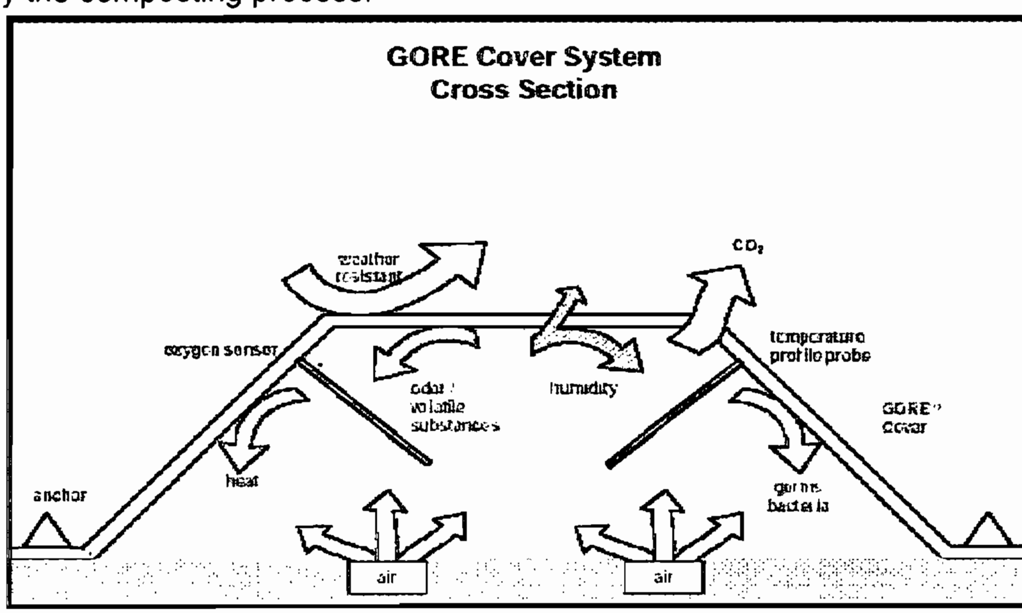
AgBag is working closely with SCAQMD and the Milk Producers Council to perform a pilot study to evaluate the efficiency of this technology. Until the study is completed, this technology will be conservatively assumed to control emissions by at least 10% more than open aerated static piles, with a minimum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

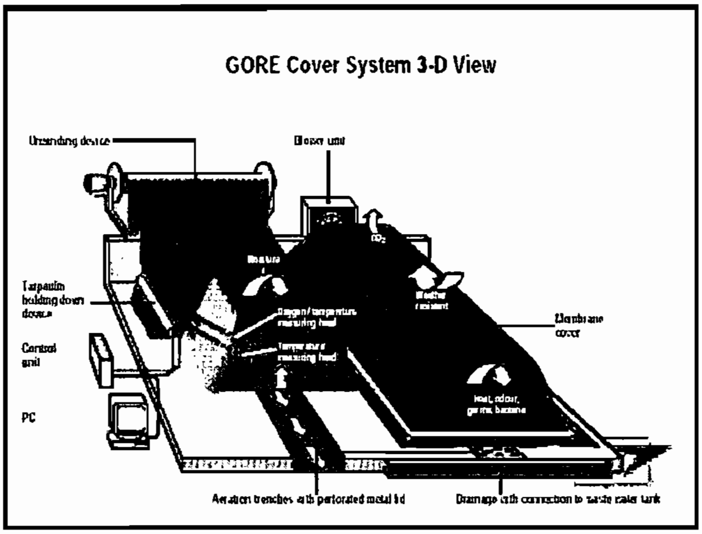
In addition to the membrane, which covers the organic material during composting, the system includes a concrete floor and wall, blowers for aeration, and a winder for efficient movement of the cover. The system also requires consistent management including preparation of materials to achieve a homogenous 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.



The Gore Cover technology is being implemented in over 140 facilities, mainly in Europe and the Mid East. This technology is capable of reducing anywhere from 90-97% of the odor created. However, not much is known regarding the control efficiencies for VOC and ammonia emissions. Oley Shermeta from Oley Shermeta Environmental has stated that this technology is superior to other in-vessel systems and has control efficiencies greater than 80% for both VOC and ammonia. However, at this point in time, there is no data to validate this. Mr. Shermeta has stated that he will gather all the information necessary to validate his claims and will provide this information to the District as soon as possible.

Until the data is presented, this technology will also be conservatively assumed to control emissions by at least 10% more than open aerated static piles, with a minimum control efficiency of 33.2% (similar to AgBag). Once the data is available, the District will be able to more accurately determine the control efficiency for this technology.

5) In-Vessel/Enclosed Negatively Aerated Static Piles with exhaust vented to biofilter > 80% control efficiency

An in-vessel system confines the composting material within a building or container and uses forced air and mechanical turning to speed up the composting process. The enclosed ASP systems discussed above (AgBag and the Gore Cover) are also considered in-vessel systems. In these types of systems, close to 100% capture efficiency can be achieved. The captured gases can be sent to a control device such as a biofilter.

The enclosed systems typically allow treatment to be completed in less time than the windrow or aerated pile by providing better control of composting conditions. Rapid treatment time is offset by the high initial cost of the composting reactor.

There are a few co-composting facilities that compost in a fully enclosed building. One of these facilities is located in Rockland County, New York. This facility began operations in February of 1999. However, this facility processes biosolids from five publicly owned treatment works (POTWs) and does not process any dairy manure. A brief explanation of system at this the facility is discussed below in order to show some of the intricacies and costs of this type of system.

The facility was designed to handle 110 wet tons/day. The facility had to go through a 12-week odor control acceptance test, which included performance testing of ammonia, reduced sulfur compounds, VOCs and hydrogen sulfide. The facility is located approximately 1,000 feet away from a residential development. New York state regulations required that the facility not cause any objectionable odor impacts, however the required removal rates could not be guaranteed with conventional open biofilter systems. Consequently, proposals for proprietary biofilter systems were evaluated where the required performance could be guaranteed. A system supplied by Envirogen with a guaranteed odor removal rate of 94% was selected. The Envirogen package cost $1,670,000 and included supply and construction/installation of the exhaust fans, dual pretreatment scrubbers with chemical feed system, enclosed biofilter, and discharge stack. In addition to odor concentration, removal rate guarantees were provided for ammonia, hydrogen sulfide, and methyl mercaptan. Ammonia removal of 99% was achieved. VOC concentrations in the inlet averaged in the 20-ppmv range with peaks exceeding 200 ppmv as propane. Based on the data collected, VOCs were reduced from an average 15 ppmv in the inlet to less than 0.5 ppmv in the outlet, or a removal rate greater than 95 percent.

There are also two in-vessel composting systems that are currently being operated in the South Coast AQMD. Both use control equipment for ammonia, VOCs, and odors as well. However, these operations are currently composting materials other than manure.

No dairy or heifer facilities could be identified that are currently utilizing these types of in-vessel composting systems at their facility. The in-vessel systems, although very efficient in controlling emissions, can be extremely costly and are not considered to be cost effective for confined animal facilities at this time.

6) Daily Incorporation of Solid Manure into cropland

Incorporation of solid manure into the soil immediately after removal from animal housing will reduce emissions by minimizing the amount of time that the solid waste is exposed to the atmosphere. Limiting the exposure of the solid manure to the atmosphere will reduce the rate of volatilization of gaseous pollutants, such as VOCs and ammonia, thereby reducing overall emissions. Once the solid manure has been incorporated into the soil, VOCs will be absorbed onto particles of soil providing the opportunity for the VOCs to be oxidized into carbon dioxide and water[40].

Based on estimates in 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", daily incorporation of solid manure removed from the cow housing will be assumed to have a 43% control efficiency for VOC emissions from solid manure handling and land application until data becomes available.

b. Step 2 - Eliminate technologically infeasible options

All technologies listed in step 1 are currently considered to be technologically feasible.

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) In-Vessel/Enclosed Negative Aerated Static Piles vented to biofilter ≥ 80% destruction efficiency for both active and curing phases (or a combination of controls) (≈ 86.6%)[41]
2) Open Negatively Aerated Static Pile vented to biofilter ≥ 80% destruction efficiency for both active and curing phases (or a combination of controls) (≈ 84.6%)[42]
3) Daily Land Application with Immediate Incorporation (≈ 43.5%)
4) Enclosed Negatively Aerated Static Pile (≈ 33.2%)[43]
5) Open Negatively Aerated Static Pile (ASP) (≈ 23.2%)[44]
6) Open Windrow Composting (0%)

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

[41] 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%) and the biofilter. (80%), calculated as follows: (0.332) + (1-0.332)*0.8 =86.6%

[42] The overall control efficiency of this technology is equal to the combined control efficiencies of the open aerated system (23.2%) and the biofilter. (80%), calculated as follows: (0.232) + (1-0.232)*0.8 =84.6%

[43] There is no control efficiency available at this time for enclosed aerated static piles, however vendors for this technology are claiming a high degree of control. 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 conducted, 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%.

[44] Control Efficiency is based on emissions capture efficiency of 25 to 33% from an open ASP multiplied by a conservative 80% control equipment efficiency from the Technology Assessment for Proposed Rule 1133 Table 3-2. The average control efficiency for open aerated static piles based on the Technology Assessment is 23.2%. Additional emission reduction potential from ASP cannot be quantified at this time.

d. Step 4 - Cost Effectiveness Analysis

<u>Option 1) In-Vessel/Enclosed Composting vented to a biofilter; Option 2) Open Aerated Static Pile (ASP) vented to a biofilter; Option 4) Enclosed ASP; and Option 5) Open ASP</u>

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.[45]

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.[46]

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.

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.

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

[46] 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)

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

Daily Land Application with Immediate Incorporation:

The applicant has proposed this option; therefore a cost-effective analysis is not required.

e. Step 5 - Select BACT

The facility is proposing to land apply and immediately incorporate the solid manure.

Additionally, District Rule 2201 defines BACT as including the most stringent emission limitation or control technique, including process and equipment changes, that has 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 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 applicant has selected to comply with Rule 4570 will also be required as part of BACT for VOC emissions from Solid Manure Handling and land Application.

2. BACT Analysis for NH_3 Emissions from Solid Manure Handling & Land Application:

a. 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 in this project. However, for purposes of the Dairy BACT Guideline, the District will not deem any control options Achieved-in-Practice until after the final Dairy BACT Guideline has been established.

The following practice has been identified as a possible control option for the increase of NH_3 emissions from solid manure handling and land application.

1) All animals fed in accordance with National Research Council (NRC) or other District-approved guidelines utilizing routine nutritional analysis for rations.

Description of Control Technologies

1) 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 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

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

1) All animals fed in accordance with National Research Council (NRC) or other District-approved guidelines utilizing routine nutritional analysis for rations.

d. Step 4 - Cost Effectiveness Analysis

The applicant has proposed the only option listed; therefore a cost analysis is not required.

e. Step 5 - Select BACT

The facility is proposing to feed all animals at the dairy in accordance with National Research Council (NRC) or other District-approved guidelines utilizing routine nutritional analysis for rations.

Additionally, District Rule 2201 defines BACT as including the most stringent emission limitation or control technique, including process and equipment changes, that has 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 mitigation measures required by District Rule 4570 are technologically feasible for confined animal facilities and the applicant has proposed these options. Although District Rule 4570 is only intended to reduce VOC emissions, many of these measures also reduce ammonia emissions. Therefore, in addition to the BACT requirements determined in the Top-Down BACT Analysis above, implementation of the mitigation measures that the applicant has selected to comply with Rule 4570 will also be required as part of BACT for NH_3 emissions from solid manure handling and land application.

VII. Top Down BACT Analysis for the Silage

1. BACT Analysis for VOC Emissions from Silage:

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) Management Practices

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 full in the preceding parts of this evaluation.

2) Management Practices

Various management measures can be used to minimize the release of VOC emissions from silage. These measures include building silage piles with higher bulk densities, using silage additives and inoculants, limiting the number of silage piles faces exposed for access purposes, using a silage shaver/facer to maintain a clean silage pile face, and covering the surfaces of the silage piles or using sealed silage bags. These management practices, which are included in full detail in the District Rule 4570 discussion section, either reduce the quantities of VOCs produced by the silage, or reduce the rate at which the VOCs already produced escape into the atmosphere.

b. Step 2 - Eliminate technologically infeasible options

Fully Enclosed Silage Vented to a Control Device cannot reasonably be considered to be technologically feasible at this point, as explained 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. 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 counter-intuitive 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) Management Practices

d. Step 4 - Cost Effectiveness Analysis

Since the remaining control option has been achieved in practice and/or proposed by the applicant, a cost effectiveness analysis is not required.

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

e. Step 5 - Select BACT

The facility is proposing to comply with the silage management practices included in District Rule 4570.

APPENDIX E

Summary of Health Risk Assessment (HRA) and Ambient Air Quality Analysis (AAQA)

San Joaquin Valley Air Pollution Control District
Risk Management Review

To:	Jonah Aiyabei – Permit Services
From:	Matthew Cegielski – Technical Services
Date:	November 10, 2011
Facility Name:	Riverside Dairy
Location:	Avenue 84 & Road 64, Pixley
Application #(s):	S-6746-1-0, -2-0, -3-0, -4-0 and 5-0
Project #:	S-1055541

A. RMR SUMMARY

RMR Summary							
Categories	**1-0 Milk Parlor**	**2-0 Cow Housing**	**3-0 Lagoons**	**4-0 Solid Manure**	**5-0 Feed Storage and Handling**	**Project Totals**	**Facility Totals**
Prioritization Score	0.01[2]	0.4[2]	0.4[2]	N/A[1]	N/A[1]	0.8	0.8
Acute Hazard Index	0.0	0.3	0.6[3]	N/A[1]	N/A[1]	0.9	0.9
Chronic Hazard Index	0.0	0.2	0.0	N/A[1]	N/A[1]	0.2	0.2
Maximum Individual Cancer Risk (10^{-6})	0.0	2.3	1.5	N/A[1]	N/A[1]	3.8	3.8
T-BACT Required?	**No**	**Yes**	**Yes**	**No**	**No**		
Special Permit Conditions?	**No**	**No**	**Yes**	**No**	**No**		

1. There are currently no toxic emission factors developed for solid manure handling or Feed Storage and Handling.
2. Original Prioritization was 0.5, 35, 32 respectfully when there was an onsite receptor.
3. Lagoon acute value is 0.07 based on VOCs and 0.52 (Receptor 2, 21.9/42) based on H_2S

Proposed Permit Conditions

To ensure that human health risks will not exceed District allowable levels; the following permit conditions must be included for:

Unit 1,2,4,5-0

1. No special conditions are required.

Unit 3-0

1. The average concentration of undissociated hydrogen sulfide (H2S) at the surface of the lagoon(s) and storage pond(s) shall not exceed 1.39 mg/L during the 1st calendar quarter (Jan - March), 1.93 mg/L during the 2nd calendar quarter (Apr - June), 1.80 mg/L during the 3rd calendar quarter (Jul - Sept), and 2.02 mg/L during the 4th calendar quarter (Oct - Dec). The concentration of undissociated H_2S at the surface of each

lagoon and storage pond shall be calculated using the monitored values for the total sulfide concentration, pH, and temperature. The fraction of total sulfide that is undissociated H_2S shall be calculated using the formula (10^-pH)/(10^-pH + Ka1), where Ka1 is the temperature-adjusted dissociation constant for H2S; or the procedures outlined in Standard Methods 4500-S2-H; or using other procedures approved by the District. [District Rules 2201 and 4102] N

2. Total surface area of all Lagoons, Storage Ponds, and Settling Basins cannot exceed 41,388 m^2 (2201).

B. RMR REPORT

I. Project Description

Technical Services performed an Ambient Air Quality Analysis and a Risk Management Review for an expansion of an existing dairy operation by 3,600 milk cows and a total new herd expansion of 5,885 total cows. While there is an onsite residence at the dairy, residents have waived their right to be included as sensitive receptors.

II. Analysis

Toxic emissions for the proposed dairy units were calculated using the Dairy Air Toxics Spreadsheet. In accordance with the District's *Risk Management Policy for Permitting New and Modified Sources* (APR 1905, March 2, 2001), risks from the proposed unit's toxic emissions were prioritized using the procedure in the 1990 CAPCOA Facility Prioritization Guidelines and incorporated in the District's HEARTs database.

Since this project is public notice, a refined health risk assessment was required. AERMOD was used, with the parameters outlined below and meteorological data for 2005 to 2009 from Porterville 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 risk assessment module of the Hot Spots Analysis and Reporting Program (HARP) to calculate the chronic and acute hazard indices and the carcinogenic risk for the project.

Technical Services performed modeling for PM_{10} and H_2S to determine if the federal or state Ambient Air Quality Standards (AAQS) would be violated or if the facility's emissions would contribute to a violation of the AAQS. The project's PM_{10} emissions were completely offset by the submission of ERCs. However, the PM_{10} emissions are still utilized for purposes of determining toxic releases and associated health risks.

The following parameters were used for the review:

Analysis Parameters S-6746 Project 1055541			
Total Cows		5,885	
Total NH3 Increase lb/yr	363,405	**Total NH3 Increase lb/hr**	1.3
Total PM10 Increase lb/yr	0 (11,499)	**Total PM10 Increase lb/hr**	1.3
Closest Receptor (m)	805	**Type of Receptor**	Business

Analysis Parameters Unit 1-0 Milk Parlor			
Source Type	Area	**Location Type**	Rural
Approx. Area (m^2)	4,287	**Release Height (m)**	1

Analysis Parameters Unit 2-0 Cow Housing			
Source Type	Area	**Location Type**	Rural
Approx. Area (m^2)	264,820	**Release Height (m)**	1

Analysis Parameters Unit 3-0 Liquid Manure Handling			
Source Type	Area	**Location Type**	Rural
Approx. Area (m^2)	41,388	**Release Height (m)**	0

The results from the Criteria Pollutant Modeling are as follows:

PM_{10} Pollutant Modeling Results*
Values are in μg/m³

Category	24 Hours
Proposed Dairy	23.2
Interim Significance Level	10.4[1]
Result	Fail[2]

[1]The District has decided on an interim basis to use a threshold for fugitive dust sources of 10.4 μg/m³ for the 24-hour average concentration.
[2]The PM10 concentration is below the District's interim threshold for fugitive dust sources.

The results from the H_2S pollutant modeling are less than the state standard of 42 Ug/m³ as long as the Special Permit conditions for unit 3-0 are maintained.

III. Conclusion

RMR
The acute and chronic indices are below 1.0 and the cancer risk factor associated with the dairy operation is greater than 1.0 in a million but less than 10 in a million.

The cancer risk factor for the Milk Parlor unit is less than 1.0 in a million. **In accordance with the District's Risk Management Policy, the Milk Parlor is approved without Toxic Best Available Control Technology (T-BACT).**

The cancer risk factor associated with the Cow Housing and Lagoons is greater than 1.0 in a million but less than 10 in a million. **In accordance with the District's Risk Management Policy, the Cow Housing and Lagoons are approved with Toxic Best Available Control Technology (T-BACT).**

To ensure that human health risks will not exceed District allowable levels; the permit conditions 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.

AAQA

The emissions from the proposed equipment will cause or contribute significantly to a violation of the State and National AAQS. However, the emissions were mitigated by the submittal of PM_{10} offsets.

Attachments:

A. RMR request from the project engineer
B. HARP output files
C. AERMOD dispersion maps
D. Prioritization score with toxic emissions summary
E. Dairy Spreadsheets

APPENDIX F

Draft ATCs

San Joaquin Valley
Air Pollution Control District

AUTHORITY TO CONSTRUCT

PERMIT NO: S-6746-1-0 **ISSUANCE DATE:** DRAFT

LEGAL OWNER OR OPERATOR: RIVERSIDE DAIRY
MAILING ADDRESS: 14976 AVENUE 168
TULARE, CA 93274-9518

LOCATION: AVENUE 84 AND ROAD 64, 8 MI WEST OF SR99
3 MI NORTHEAST OF ALPAUGH

EQUIPMENT DESCRIPTION:
3,600 COW MILKING OPERATION WITH ONE 80-STALL ROTARY MILKING PARLOR.

CONDITIONS

1. {3215} Upon presentation of appropriate credentials, a permittee shall allow an authorized representative of the District to enter the permittee's premises where a permitted source is located or emissions related activity is conducted, or where records must be kept under condition of the permit. [District Rule 1070]
2. {3216} Upon presentation of appropriate credentials, a permittee shall allow an authorized representative of the District to have access to and copy, at reasonable times, any records that must be kept under the conditions of the permit. [District Rule 1070]
3. {4035} If a licensed veterinarian, a certified nutritionist, the California Department of Food and Agriculture (CDFA), or the United States Department of Agriculture (USDA) determines that any VOC mitigation measure (with a Rule 4570 reference) is detrimental to animal health and needs to be suspended, the Permittee 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 2201 and Rule 4570]
4. Permittee shall flush or hose down milk parlor immediately prior to, immediately after, or during each milking. [District Rules 2201 and 4570]
5. {3538} Permittee shall provide verification that milk parlors are flushed or hosed prior to, immediately after, or during each milking. [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.

Seyed Sadredin, Executive Director / APCO

DAVID WARNER, Director of Permit Services

S-6746-1-0 : Nov 15 2011 12:24PM – AIYABEIJ : Joint Inspection NOT Required

6. {3657} All records shall be kept and maintained for a minimum of five (5) years and shall be made available to the APCO, ARB and EPA upon request. [District Rule 4570]

7. {3658} This permit does not authorize the violation of any conditions established for this facility in the Conditional Use Permit (CUP), Special Use Permit (SUP), Site Approval, Site Plan Review (SPR), or other approval documents issued by a local, state, or federal agency. [District Rules 2070 and 2080, and Public Resources Code 21000-21177: California Environmental Quality Act]

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San Joaquin Valley
Air Pollution Control District

AUTHORITY TO CONSTRUCT

PERMIT NO: S-6746-2-0 **ISSUANCE DATE:** DRAFT

LEGAL OWNER OR OPERATOR: RIVERSIDE DAIRY
MAILING ADDRESS: 14976 AVENUE 168
TULARE, CA 93274-9518

LOCATION: AVENUE 84 AND ROAD 64, 8 MI WEST OF SR99
3 MI NORTHEAST OF ALPAUGH

EQUIPMENT DESCRIPTION:
COW HOUSING - 3,600 MILK COWS NOT TO EXCEED A COMBINED TOTAL OF 4,135 MATURE COWS (MILK AND DRY), AND 3,050 TOTAL SUPPORT STOCK (HEIFERS AND CALVES); AND SEVEN FREESTALL BARNS WITH FLUSH/SCRAPE SYSTEM.

CONDITIONS

1. {3215} Upon presentation of appropriate credentials, a permittee shall allow an authorized representative of the District to enter the permittee's premises where a permitted source is located or emissions related activity is conducted, or where records must be kept under condition of the permit. [District Rule 1070]
2. {3216} Upon presentation of appropriate credentials, a permittee shall allow an authorized representative of the District to have access to and copy, at reasonable times, any records that must be kept under the conditions of the permit. [District Rule 1070]
3. {4035} If a licensed veterinarian, a certified nutritionist, the California Department of Food and Agriculture (CDFA), or the United States Department of Agriculture (USDA) determines that any VOC mitigation measure (with a Rule 4570 reference) is detrimental to animal health and needs to be suspended, the Permittee 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 2201 and Rule 4570]
4. The total number of cows housed at this dairy at any one time shall not exceed any of the following limits: 3,600 milk cows; 535 dry cows; 2,500 support stock (heifers and bulls); and 550 calves (under 3 months of age). [District Rule 2201]

CONDITIONS CONTINUE ON NEXT PAGE

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Seyed Sadredin, Executive Director / APCO

DRAFT

DAVID WARNER, Director of Permit Services

5. Open corrals shall be scraped weekly using a pull-type scraper in the morning hours, except when this is prevented by wet conditions. [District Rule 2201]
6. The open corrals shall be equipped with shade structures. Shade structures shall be installed uphill of any slopes in the corrals. [District Rules 2201 and 4570]
7. At least one of the feedings of the heifers at this dairy shall be near (within one hour of) dusk. [District Rule 2201]
8. {4486} Permittee shall pave feedlanes, where present, for a width of at least 8 feet along the corral side of the feedlane fence for milk and dry cows and at least 6 feet along the corral side of the feedlane for heifers. [District Rule 4570]
9. The concrete feed lanes and walkways for milk cows shall be flushed at least four times per day. [District Rule 2201 and 4570]
10. The concrete feed lanes and walkways for all dry cows, heifers, and calves shall be flushed at least two times per day. [District Rule 2201 and 4570]
11. Permittee shall maintain an operating plan that requires the feed lanes and walkways to be flushed at least four times per day for milk cows and at least two times per day for all other cows. [District Rule 2201 and 4570]
12. All animals at this dairy shall be fed in accordance with the National Research Council (NRC) guidelines utilizing routine dairy nutritionist analyses of rations. [District Rule 2201]
13. Inspection for potholes or other sources of emissions shall be performed on a monthly basis. [District Rule 2201]
14. Firm, stable, and not easily eroded soils shall be used for the exercise pens. [District Rule 2201]
15. A supply of fill soil shall be kept on site in order to fill areas where erosion and gouging occurs. This will help fill areas where puddles may form. This fill soil shall be covered with a tarp. [District Rule 2201]
16. Clean rainfall runoff shall be diverted around exercise pens to reduce the amount of water that is potentially detained on the corral surface. [District Rule 2201]
17. {4492} Permittee shall remove manure that is not dry from individual cow freestall beds or rake, harrow, scrape, or grade freestall bedding at least once every seven (7) days. [District Rule 4570]
18. {4493} Permittee shall record the date that manure that is not dry is removed from individual cow freestall beds or raked, harrowed, scraped, or freestall bedding is graded at least once every seven (7) days. [District Rule 4570]
19. {4499} Permittee shall inspect water pipes and troughs and repair leaks at least once every seven (7) days. [District Rule 4570]
20. {4500} Permittee shall maintain records demonstrating that water pipes and troughs are inspected and leaks are repaired at least once every seven (7) days. [District Rule 4570]
21. {4501} Permittee shall clean manure from corrals at least four (4) times per year with at least sixty (60) days between each cleaning, or permittee shall clean corrals at least once between April and July and at least once between September and December. [District Rule 4570]
22. {4502} Permittee shall record the date that animal waste is cleaned from corrals or demonstrate that manure from corrals are cleaned at least four (4) times per year with at least sixty (60) days between each cleaning. [District Rule 4570]
23. 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]
24. {4555} Permittee shall either 1) maintain sufficient records to demonstrate that corrals are maintained to ensure proper drainage preventing water from standing for more than forty-eight hours or 2) maintain records of dates pens are groomed (i.e., harrowed, raked, or scraped, etc.). [District Rule 4570]

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CONDITIONS CONTINUE ON NEXT PAGE

25. {4518} Permittee shall manage corrals such that the manure depth in the corral does not exceed twelve (12) inches at any time or point, except for in-corral mounding. Manure depth may exceed 12 inches when corrals become inaccessible due to rain events. However, permittee must resume management of the manure depth of 12 inches or lower immediately upon the corral becoming accessible. [District Rule 4570]

26. {4519} Permittee shall measure and document the depth of manure in the corrals at least once every ninety (90) days. [District Rule 4570]

27. Permittee shall establish a 2,440 foot windbreak along the dairy's east perimeter, starting at the Northeastern corner of the existing heifer corrals and going South along the Eastern border; and a 1,050 foot windbreak along the Southern perimeter, starting from the Southeastern corner of the dairy, going West along the Southern border. East windbreaks shall consist of the following two rows with the first row closest to the dairy: first row shall consist of Arizona Cypress trees, planted 10 feet apart and the second row shall consist of Chinese Pistache trees, planted 14 feet apart. South windbreaks shall consist of the following two rows with the first row closest to the dairy: first row shall consist of Arizona Cypress trees, planted 10 feet apart and the second row shall consist of Interior Live Oak trees, planted 20 feet apart. Each row shall be offset from the adjacent row. Spacing between rows shall be sufficient to accommodate cultivation equipment. This spacing shall not exceed 24 feet. An alternative windbreak proposal must be approved by the District. [District Rule 2201]

28. Permittee shall maintain records of: (1) the number of times concrete feed lanes and walkways are flushed per day and (2) the frequency of scraping and manure removal from open corrals; and (3) a log of pothole inspections performed at the dairy. [District Rules 2201 and 4570]

29. Permittee shall maintain a record of the number of animals of each production group at the facility and shall maintain quarterly records of any changes to this information. Such records may include DHIA monthly records, milk production invoices, ration sheets or periodic inventory records. [District Rules 2201 and 4570]

30. {3657} All records shall be kept and maintained for a minimum of five (5) years and shall be made available to the APCO, ARB and EPA upon request. [District Rule 4570]

31. Prior to operating equipment authorized under this Authority to Construct, the permittee shall surrender PM10 Emission Reduction Credits (ERC) for a total of 13,799 lb/yr. The ERC quantity stated includes a distance offset ratio of 1.2 as specified in Table 4-2 of Rule 2201. [District Rule 2201]

32. ERC Certificates #C-819-4 and C-820-4 (or certificates split from these certificates) shall be used to supply the required offsets, unless a revised offsetting proposal is received and approved by the District, upon which this Authority to Construct shall be reissued administratively specifying the new offsetting proposal. Original public noticing requirements, if any, shall be duplicated prior to reissuance of this Authority to Construct [District Rule 2201]

33. {3658} This permit does not authorize the violation of any conditions established for this facility in the Conditional Use Permit (CUP), Special Use Permit (SUP), Site Approval, Site Plan Review (SPR), or other approval documents issued by a local, state, or federal agency. [District Rules 2070 and 2080, and Public Resources Code 21000-21177: California Environmental Quality Act]

San Joaquin Valley
Air Pollution Control District

AUTHORITY TO CONSTRUCT

DRAFT

PERMIT NO: S-6746-3-0 **ISSUANCE DATE:** DRAFT

LEGAL OWNER OR OPERATOR: RIVERSIDE DAIRY
MAILING ADDRESS: 14976 AVENUE 168
TULARE, CA 93274-9518

LOCATION: AVENUE 84 AND ROAD 64, 8 MI WEST OF SR99
3 MI NORTHEAST OF ALPAUGH

EQUIPMENT DESCRIPTION:
LIQUID MANURE HANDLING SYSTEM CONSISTING OF ONE MECHANICAL SEPARATOR, ONE PROCESSING PIT, THREE SETTLING BASINS, ONE ANAEROBIC TREATMENT LAGOON (180'X1000'X21'), AND ONE STORAGE POND; MANURE LAND APPLIED THROUGH FURROW IRRIGATION.

CONDITIONS

1. {3215} Upon presentation of appropriate credentials, a permittee shall allow an authorized representative of the District to enter the permittee's premises where a permitted source is located or emissions related activity is conducted, or where records must be kept under condition of the permit. [District Rule 1070]
2. {3216} Upon presentation of appropriate credentials, a permittee shall allow an authorized representative of the District to have access to and copy, at reasonable times, any records that must be kept under the conditions of the permit. [District Rule 1070]
3. {4035} If a licensed veterinarian, a certified nutritionist, the California Department of Food and Agriculture (CDFA), or the United States Department of Agriculture (USDA) determines that any VOC mitigation measure (with a Rule 4570 reference) is detrimental to animal health and needs to be suspended, the Permittee 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 2201 and Rule 4570]
4. The liquid manure handling system shall handle flush manure from no more than 3,600 milk cows; 535 dry cows; 2,500 support stock (heifers and bulls); and 550 calves (under 3 months of age). [District Rule 2201]

CONDITIONS CONTINUE ON NEXT PAGE

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Seyed Sadredin, Executive Director / APCO

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DAVID WARNER, Director of Permit Services

5. The liquid manure handling system shall include an anaerobic treatment lagoon designed, constructed and operated according to NCRCS Guideline No. 359. [District Rules 2201 and 4570]

6. Permittee shall maintain 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. [Districts 2201 and Rule 4570]

7. {3622} 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]

8. The average concentration of undissociated hydrogen sulfide (H2S) at the surface of the lagoon(s) and storage pond(s) shall not exceed 1.39 mg/L during the 1st calendar quarter (Jan - March), 1.93 mg/L during the 2nd calendar quarter (Apr - June), 1.80 mg/L during the 3rd calendar quarter (Jul - Sept), and 2.02 mg/L during the 4th calendar quarter (Oct - Dec). The concentration of undissociated H2S at the surface of each lagoon and storage pond shall be calculated using the monitored values for the total sulfide concentration, pH, and temperature. The fraction of total sulfide that is undissociated H2S shall calculated using the formula (10^-pH)/(10^-pH + Ka1), where Ka1 is the temperature-adjusted dissociation constant for H2S; or the procedures outlined in Standard Methods 4500-S2-H; or using other procedures approved by the District. [District Rules 2201 and 4102]

9. The total sulfide concentration, pH, and temperature at the surface of each lagoon and storage pond shall be monitored and recorded at least once every calendar quarter and at other times requested by the District. If the average calculated undissociated H2S concentration from monitoring the lagoon(s) and pond(s) exceeds the maximum allowed concentration, the permittee shall monitor and record the total sulfide concentration, pH, and temperature at the surface of at least two other locations in each lagoon and pond as soon as possible, but no longer than 24 hours after results were available from the initial monitoring indicating a potential exceedance. The undissociated H2S concentration calculated from the initial monitoring locations and the secondary monitoring locations for the lagoons and ponds shall be averaged. If the calculated average concentration of undissociated H2S continues exceed the maximum allowed limit, then the total sulfide concentration, pH, and temperature at the surface of each lagoon and storage pond shall be monitored and recorded monthly until three consecutive months of monitoring show compliance, after which the monitoring frequency may return to quarterly. For each secondary storage pond that has a liquid depth of no greater than 5 feet during the monitoring period, the concentration of undissociated H2S may be considered negligible and monitoring shall not be required. Records of the results of monitoring of the sulfide concentration, pH, and temperature at the surface of each lagoon and storage pond and the maximum depth of storage ponds during periods that they are not monitored shall be maintained. The District may also approve alternative monitoring frequencies and/or parameters. [District Rules 2201 and 4102]

10. Monitoring of the total sulfide concentration of lagoons and ponds shall be performed using a sulfide test kit, a sulfide meter, procedures of an accredited lab, Standard Methods 4500-S2; ASTM D4658; USGS Method I-3840; EPA Method 376.2; Marine Pollution Studies Laboratory (MPSL) Standard Operating Procedure for measurement of sulfide; or an alternative method approved by the District. [District Rules 2201 and 4102]

11. The total surface area of all lagoons, storage ponds, and settling basins shall not exceed 41,388 square meters. [District Rules 2201 and 4102]

12. {3624} Permittee shall remove solids from the waste system with a solid separator system, prior to the waste entering the lagoon. [District Rule 4570]

13. {3643} Permittee shall not allow liquid animal waste to stand in the fields for more than twenty-four (24) hours after irrigation. [District Rule 4570]

14. {3644} Permittee shall maintain records to demonstrate liquid animal waste does not stand in the fields for more than twenty-four (24) hours after irrigation. [District Rule 4570]

15. {3657} All records shall be kept and maintained for a minimum of five (5) years and shall be made available to the APCO, ARB and EPA upon request. [District Rule 4570]

16. {3658} This permit does not authorize the violation of any conditions established for this facility in the Conditional Use Permit (CUP), Special Use Permit (SUP), Site Approval, Site Plan Review (SPR), or other approval documents issued by a local, state, or federal agency. [District Rules 2070 and 2080, and Public Resources Code 21000-21177: California Environmental Quality Act]

San Joaquin Valley
Air Pollution Control District

AUTHORITY TO CONSTRUCT

PERMIT NO: S-6746-4-0 **ISSUANCE DATE:** DRAFT

LEGAL OWNER OR OPERATOR: RIVERSIDE DAIRY
MAILING ADDRESS: 14976 AVENUE 168
TULARE, CA 93274-9518

LOCATION: AVENUE 84 AND ROAD 64, 8 MI WEST OF SR99
3 MI NORTHEAST OF ALPAUGH

EQUIPMENT DESCRIPTION:
SOLID MANURE HANDLING CONSISTING OF MANURE STOCK PILES, WINDROW COMPOSTING, SOLID MANURE APPLICATION TO LAND AND/OR OFFSITE HAULING.

CONDITIONS

1. {3215} Upon presentation of appropriate credentials, a permittee shall allow an authorized representative of the District to enter the permittee's premises where a permitted source is located or emissions related activity is conducted, or where records must be kept under condition of the permit. [District Rule 1070]
2. {3216} Upon presentation of appropriate credentials, a permittee shall allow an authorized representative of the District to have access to and copy, at reasonable times, any records that must be kept under the conditions of the permit. [District Rule 1070]
3. {4035} If a licensed veterinarian, a certified nutritionist, the California Department of Food and Agriculture (CDFA), or the United States Department of Agriculture (USDA) determines that any VOC mitigation measure (with a Rule 4570 reference) is detrimental to animal health and needs to be suspended, the Permittee 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 2201 and Rule 4570]
4. {4541} Permittee shall incorporate all solid manure within seventy-two (72) hours of land application. [District Rule 4570]
5. {4542} Permittee shall maintain records to demonstrate that all solid manure has been incorporated within seventy-two (72) hours of land application. [District Rule 4570]

CONDITIONS CONTINUE ON NEXT PAGE

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Seyed Sadredin, Executive Director / APCO

DRAFT

DAVID WARNER, Director of Permit Services

S-6746-4-0 : Nov 10 2011 3:25PM – AIYABEIJ : Joint Inspection NOT Required

6. {4529} Within seventy two (72) hours of removal of separated solids from the drying process, permittee shall either 1) remove separated solids from the dairy, or 2) 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 twenty-four (24) hours per event. [District Rule 4570]
7. {4530} Permittee shall keep records of dates when separated solids are removed from the dairy or permittee shall maintain records to demonstrate that separated solids piles outside the pens are covered with a weatherproof covering from October through May. [District Rule 4570]
8. {4531} Permittee shall maintain records, such as manufacturer warranties or other documentation, demonstrating that the weatherproof covering over separated solids are installed, used, and maintained in accordance with manufacturer recommendations and applicable standards listed in NRCS Field Office Technical Guide Code 313 or 367, or any other applicable standard approved by the APCO, ARB, and EPA. [District Rule 4570]
9. {3657} All records shall be kept and maintained for a minimum of five (5) years and shall be made available to the APCO, ARB and EPA upon request. [District Rule 4570]
10. {3658} This permit does not authorize the violation of any conditions established for this facility in the Conditional Use Permit (CUP), Special Use Permit (SUP), Site Approval, Site Plan Review (SPR), or other approval documents issued by a local, state, or federal agency. [District Rules 2070 and 2080, and Public Resources Code 21000-21177: California Environmental Quality Act]

San Joaquin Valley
Air Pollution Control District

AUTHORITY TO CONSTRUCT

DRAFT

PERMIT NO: S-6746-5-0 **ISSUANCE DATE:** DRAFT

LEGAL OWNER OR OPERATOR: RIVERSIDE DAIRY
MAILING ADDRESS: 14976 AVENUE 168
TULARE, CA 93274-9518

LOCATION: AVENUE 84 AND ROAD 64, 8 MI WEST OF SR99
3 MI NORTHEAST OF ALPAUGH

EQUIPMENT DESCRIPTION:
FEED STORAGE AND HANDLING CONSISTING OF COMMODITY BARNS AND SILAGE PILES.

CONDITIONS

1. {3215} Upon presentation of appropriate credentials, a permittee shall allow an authorized representative of the District to enter the permittee's premises where a permitted source is located or emissions related activity is conducted, or where records must be kept under condition of the permit. [District Rule 1070]
2. {3216} Upon presentation of appropriate credentials, a permittee shall allow an authorized representative of the District to have access to and copy, at reasonable times, any records that must be kept under the conditions of the permit. [District Rule 1070]
3. {4035} If a licensed veterinarian, a certified nutritionist, the California Department of Food and Agriculture (CDFA), or the United States Department of Agriculture (USDA) determines that any VOC mitigation measure (with a Rule 4570 reference) is detrimental to animal health and needs to be suspended, the Permittee 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 2201 and Rule 4570]
4. {4454} Permittee shall feed all animals according to National Research Council (NRC) guidelines. [District Rule 4570]
5. {4455} Permittee shall maintain records of feed content, formulation, and quantity of feed additive utilized, to demonstrate compliance with National Research Council (NRC) guidelines. Records such as feed company guaranteed analyses (feed tags), ration sheets, or feed purchase records may be used to meet this requirement. [District Rule 4570]

CONDITIONS CONTINUE ON NEXT PAGE

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Seyed Sadredin, Executive Director / APCO

DRAFT

DAVID WARNER, Director of Permit Services
S-6746-5-0 : Nov 10 2011 3:25PM -- AIYABEIJ : Joint Inspection NOT Required

6. {4456} Permittee shall push feed so that it is within three feet of feedlane fence within two hours of putting out the feed or use a feed trough or other feeding structure designed to maintain feed within reach of the animals. [District Rule 4570]

7. {4457} Permittee shall maintain an operating plan/record that requires feed to be pushed within three feet of feedlane fence within two hours of putting out the feed, or use of a feed trough or other structure designed to maintain feed within reach of the animals. [District Rule 4570]

8. {4458} Permittee shall begin feeding total mixed rations within two hours of grinding and mixing rations. [District Rule 4570]

9. {4459} Permittee shall maintain an operating plan/record of when feeding of total mixed rations began within two hours of grinding and mixing rations. [District Rule 4570]

10. {4460} Permittee shall store grain in a weatherproof storage structure or under a weatherproof covering from October through May. [District Rule 4570]

11. {4461} Permittee shall maintain records demonstrating grain is/was stored in a weatherproof storage structure or under a weatherproof covering from October through May. [District Rule 4570]

12. {4464} Permittee shall remove uneaten wet feed from feed bunks within twenty-four (24) hours after the end of a rain event. [District Rule 4570]

13. {4465} 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]

14. {4468} For bagged silage/feedstuff, permittee shall utilize a sealed feed storage system (e.g., ag bag). [District Rule 4570]

15. {4469} Permittee shall cover all silage piles, except for the area where feed is being removed from the pile, with a plastic tarp that is at least five (5) mils (0.005 inches) thick, multiple plastic tarps with a cumulative thickness of at least 5 mils (0.005 inches), or an oxygen barrier film covered with a UV resistant material. Silage piles shall be covered within seventy-two (72) hours of last delivery of material to the pile. Sheets of material used to cover silage shall overlap so that silage is not exposed where the sheets meet. [District Rule 4570]

16. {4470} Permittee shall maintain records of the thickness and type of cover used to cover each silage pile. Permittee shall also maintain records of the date of the last delivery of material to each silage pile and the date each pile is covered. [District Rule 4570]

17. {4471} 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]

18. {4472} For each silage pile that Option 1 (Measured Bulk Density) is chosen as a mitigation measure for building the pile, records of the measured bulk density shall be maintained. [District Rule 4570]

19. {4473} For each silage pile that Option 2 (Bulk Density Determined by Spreadsheet) is chosen as a mitigation measure for building the pile, records of the filling parameters entered into the District-approved spreadsheet to determine the bulk density shall be maintained. [District Rule 4570]

20. {4474} For each silage pile that Option 3 (Moisture, TLC, Roller Opening, & Material Delivery) is chosen as a mitigation measure for building the pile, the permittee shall harvest corn used for the pile at an average moisture content of at least 65% and harvest other silage crops for the pile at an average moisture content of at least 60%. [District Rule 4570]

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CONDITIONS CONTINUE ON NEXT PAGE

21. {4475} For each silage pile that Option 3 (Moisture, TLC, Roller Opening, & Material Delivery) is chosen as a mitigation measure for building the pile, records of the average percent moisture of crops harvested for silage shall be maintained. [District Rule 4570]

22. {4476} For each silage pile that Option 3 (Moisture, TLC, Roller Opening, & Material Delivery) is chosen as a mitigation measure for building the pile, the permittee shall adjust setting of equipment used to harvest crops for the pile to incorporate the following parameters for Theoretical Length of Chop (TLC) and roller opening, as applicable: 1) Corn with no processing: TLC not exceeding 1/2 inch, 2) Processed Corn: TLC not exceeding 3/4 inch and roller opening of 1-4 mm, 3) Alfalfa/Grass: TLC not exceeding 1.0 inch, 4) Other silage crops: TLC not exceeding 1/2 inch. [District Rule 4570]

23. {4477} For each silage pile that Option 3 (Moisture, TLC, Roller Opening, & Material Delivery) is chosen as a mitigation measure for building the pile, records that equipment used to harvest crops for the pile was set to the required TLC and roller opening for the type of crop harvested shall be maintained. [District Rule 4570]

24. {4478} For each silage pile that Option 3 (Moisture, TLC, Roller Opening, & Material Delivery) is chosen as a mitigation measure for building the pile, the permittee shall manage silage material delivery such that the thickness of the layer of un-compacted material delivered on top of the pile is no more than six (6) inches. [District Rule 4570]

25. {4479} For each silage pile that Option 3 (Moisture, TLC, Roller Opening, & Material Delivery) is chosen as a mitigation measure for building the pile, the permittee shall maintain a plan that requires that the thickness of the layer of un-compacted material delivered on top of the pile is no more than six (6) inches. [District Rule 4570]

26. {4480} Permittee shall select and implement at least two of the following mitigation measures for management of silage piles at the facility: Option 1) manage silage piles such that only one silage pile has an uncovered face and the total exposed surface area is less than 2,150 square feet, or manage multiple uncovered silage piles such that the total exposed surface area of all uncovered silage piles is less than 4,300 square feet; Option 2) use a shaver/facer to remove silage from the silage pile, or shall use another method to maintain a smooth vertical surface on the working face of the silage pile; or Option 3) inoculate silage with homolactic lactic acid bacteria in accordance with manufacturer recommendations to achieve a concentration of at least 100,000 colony forming units per gram of wet forage, apply propionic acid, benzoic acid, sorbic acid, sodium benzoate, or potassium sorbate at the rate specified by the manufacturer to reduce yeast counts when forming silage piles, or apply other additives at rates that have been demonstrated to reduce alcohol concentrations in silage and/or VOC emissions from silage and have been approved by the District and EPA. Records of the options chosen for managing each silage pile shall be maintained. [District Rule 4570]

27. {4481} If Option 1 (Limiting Exposed Area of Silage) is chosen as a mitigation measure for managing silage piles, the permittee shall calculate and record the maximum (largest part of pile) total exposed area of each silage pile. Records of the maximum calculated area shall be maintained. [District Rule 4570]

28. {4482} 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 Rule 4570]

29. {4483} 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 Rule 4570]

30. {3657} All records shall be kept and maintained for a minimum of five (5) years and shall be made available to the APCO, ARB and EPA upon request. [District Rule 4570]

31. {3658} This permit does not authorize the violation of any conditions established for this facility in the Conditional Use Permit (CUP), Special Use Permit (SUP), Site Approval, Site Plan Review (SPR), or other approval documents issued by a local, state, or federal agency. [District Rules 2070 and 2080, and Public Resources Code 21000-21177: California Environmental Quality Act]

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