San Joaquin Valley
AIR POLLUTION CONTROL DISTRICT

HEALTHY AIR LIVING™

July 1, 2021

Manuel Silva
Silva Dairy Farms #3
1499 Edminster Rd
Stevinson, CA 95374

**Re: Notice of Preliminary Decision - Authority to Construct**
**Facility Number: N-6120**
**Project Number: N-1204881**

Dear Mr. Silva:

Enclosed for your review and comment is the District's analysis of Silva Dairy Farms #3's application for an Authority to Construct for a 768 horsepower Tier 2 certified diesel engine to provide emergency power in the event of an electrical outage, at 1499 Edminster Rd in Stevinson, CA.

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

Thank you for your cooperation in this matter. If you have any questions regarding this matter, please contact Mr. Dakota Ballard of Permit Services at (559) 230-5865.

Sincerely,

Brian Clements
Director of Permit Services

BC:dhb

Enclosures

cc: Courtney Graham, CARB (w/ enclosure) via email
Ryan Sundstrom, Reddy Power Services

**Samir Sheikh**
Executive Director/Air Pollution Control Officer

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www.valleyair.org www.healthyairliving.com

# San Joaquin Valley Air Pollution Control District
## Authority to Construct
## Application Review
Agricultural Diesel-Fired Emergency Standby IC Engine

| | | | |
|---|---|---|---|
| Facility Name: | Silva Dairy Farms #3 | Date: | July 1, 2021 |
| Mailing Address: | 1499 Edminsiter Rd<br>Stevinson, CA 95322 | Engineer: | Dakota Ballard |
| | | Lead Engineer: | Jerry Sandhu |
| Contact Person: | Manuel Silva | | |
| Telephone: | 209-652-6582 | | |
| Application #: | N-6120-12-0 | | |
| Project #: | N-1204881 | | |
| Complete: | February 5, 2021 | | |

### I. Proposal

Silva Dairy Farms #3 is proposing to install a 768 bhp (intermittent) diesel-fired emergency standby internal combustion (IC) engine powering an electrical generator.

### II. Applicable Rules

Rule 2201 New and Modified Stationary Source Review Rule (8/15/19)
Rule 2410 Prevention of Significant Deterioration (6/16/11)
Rule 2520 Federally Mandated Operating Permits (8/15/19)
Rule 4001 New Source Performance Standards (4/14/99)
Rule 4002 National Emission Standards for Hazardous Air Pollutants (5/20/04)
Rule 4101 Visible Emissions (2/17/05)
Rule 4102 Nuisance (12/17/92)
Rule 4201 Particulate Matter Concentration (12/17/92)
Rule 4701 Internal Combustion Engines - Phase 1 (8/21/03)
Rule 4702 Internal Combustion Engines (11/14/13)
Rule 4801 Sulfur Compounds (12/17/92)
CH&SC 41700 Health Risk Assessment
CH&SC 42301.6 School Notice
Title 17 CCR, Section 93115 - Airborne Toxic Control Measure (ATCM) for Stationary Compression-Ignition (CI) Engines
Public Resources Code 21000-21177: California Environmental Quality Act (CEQA)
California Code of Regulations, Title 14, Division 6, Chapter 3, Sections 15000-15387: CEQA Guidelines

## III. Project Location

The equipment will be located at 1499 Edminsiter Rd in Stevinson, CA.

The District has verified that 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 emergency standby engine powers an electrical generator which will be used for the growing of crops and/or animals. Other than emergency standby operation, the engine may be operated up to 100 hours per year for maintenance and testing purposes.

## V. Equipment Listing

**N-6120-12-0:** 768 BHP (INTERMITTENT) VOLVO PENTA MODEL TAD1641GE TIER 2 CERTIFIED DIESEL-FIRED EMERGENCY STANDBY IC ENGINE POWERING AN ELECTRICAL GENERATOR

## VI. Emission Control Technology Evaluation

The applicant has proposed to install a Tier 2 certified diesel-fired IC engine that is fired on very low-sulfur diesel fuel.

The proposed engine meets the latest Tier Certification requirements; therefore, the engine meets the latest ARB/EPA emissions standards for diesel particulate matter, hydrocarbons, nitrogen oxides, and carbon monoxide (see Appendix C for a copy of the emissions data sheet).

The use of very low-sulfur diesel fuel (0.0015% by weight sulfur maximum) reduces $SO_X$ emissions by over 99% from standard diesel fuel.

## VII. General Calculations

### A. Assumptions

| | |
|---|---|
| Emergency operating schedule: | 24 hours/day |
| Non-emergency operating schedule: | 100 hours/year |
| Density of diesel fuel: | 7.1 lb/gal |
| EPA F-factor (adjusted to 60 °F): | 9,051 dscf/MMBtu |
| Fuel heating value: | 137,000 Btu/gal |
| BHP to Btu/hr conversion: | 2,542.5 Btu/bhp-hr |
| Thermal efficiency of engine: | commonly ≈ 35% |
| $PM_{10}$ fraction of diesel exhaust: | 0.96 (CARB, 1988) |
| Conversion factor: | 1.341 bhp/kw |

To streamline emission calculations, PM2.5 emissions are assumed to be equal to PM10 emissions.

## B. Emission Factors

| Emission Factors | | | |
|---|---|---|---|
| **Pollutant** | **Emission Factor (g/bhp-hr)** | **Emission Factor (g/kW-hr)** | **Source** |
| $NO_X$ | 3.87 | 5.19 | Engine Manufacturer |
| $SO_X$ | 0.0051 | 0.0068 | Mass Balance Equation Below |
| $PM_{10}$ | 0.084 | 0.112 | Engine Manufacturer |
| CO | 0.51 | 0.69 | Engine Manufacturer |
| VOC | 0.12 | 0.16 | Engine Manufacturer |

$$\frac{0.000015\ lb-S}{lb-fuel}\times\frac{7.1\ lb-fuel}{gallon}\times\frac{2\ lb-SO_2}{1\ lb-S}\times\frac{1\ gal}{137{,}000\ Btu}\times\frac{1\ bhp\ input}{0.35\ bhp\ out}\times\frac{2{,}542.5\ Btu}{bhp-hr}\times\frac{453.6\ g}{lb}=\ 0.0051\ \frac{g-SO_x}{bhp-hr}$$

## C. Calculations

### 1. Pre-Project Potential to Emit (PE1)

Since this is a new emissions unit, PE1 = 0.

### 2. Post-Project Potential to Emit (PE2)

The daily and annual PE are calculated as follows:

Daily PE2 (lb-pollutant/day) = EF (g-pollutant/bhp-hr) x rating (bhp) x operation (hr/day) / 453.6 g/lb

Annual PE2 (lb-pollutant/yr) = EF (g-pollutant/bhp-hr) x rating (bhp) x operation (hr/yr) / 453.6 g/lb

| Post Project Emissions (PE2) | | | | | | |
|---|---|---|---|---|---|---|
| **Pollutant** | **Emissions Factor (g/bhp-hr)** | **Rating (bhp)** | **Daily Hours of Operation (hrs/day)** | **Annual Hours of Operation (hrs/year)** | **Daily PE2 (lb/day)** | **Annual PE2 (lb/yr)** |
| $NO_X$ | 3.87 | 768 | 24 | 100 | **157.3** | **655** |
| $SO_X$ | 0.0051 | 768 | 24 | 100 | **0.2** | **1** |
| $PM_{10}$ | 0.084 | 768 | 24 | 100 | **3.4** | **14** |
| CO | 0.51 | 768 | 24 | 100 | **20.7** | **86** |
| VOC | 0.12 | 768 | 24 | 100 | **4.9** | **20** |

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

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

SSPE1 is summarized in the following table. See Appendix F for detailed SSPE calculations.

| SSPE1 | | | | | | | |
|---|---|---|---|---|---|---|---|
| | $NO_X$ (lb/yr) | $SO_X$ (lb/yr) | $PM_{10}$ (lb/yr) | CO (lb/yr) | VOC (lb/yr) | NH3 (lb/yr) | H2S (lb/yr) |
| **SSPE1 Total** | **124** | **0** | **40,435** | **11** | **103,354** | **113,582** | **1,041** |

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

Pursuant to District Rule 2201, the SSPE2 is the PE from all units with valid ATCs or PTOs at the Stationary Source and the quantity of ERCs which have been banked since September 19, 1991 for AER that have occurred at the source, and which have not been used on-site.

For this project the change in emissions for the facility is due to the installation of the new emergency standby IC engine. Thus:

| SSPE2 | | | | | | | |
|---|---|---|---|---|---|---|---|
| Permit Unit | $NO_X$ (lb/yr) | $SO_X$ (lb/yr) | $PM_{10}$ (lb/yr) | CO (lb/yr) | VOC (lb/yr) | NH3 (lb/yr) | H2S (lb/yr) |
| SSPE1 | 124 | 0 | 40,435 | 11 | 103,354 | 113,582 | 1,041 |
| N-6120-12-0 | 655 | 1 | 14 | 86 | 20 | 0 | 0 |
| **SSPE2 Total** | **779** | **1** | **40,449** | **97** | **103,374** | **113,582** | **1,041** |

## 5. Major Source Determination

**Rule 2201 Major Source Determination:**

Pursuant to District Rule 2201, a Major Source is a stationary source with a SSPE2 equal to or exceeding one or more of the following threshold values. For the purposes of determining major source status the following shall not be included:

- any ERCs associated with the stationary source

- Emissions from non-road IC engines (i.e. IC engines at a particular site at the facility for less than 12 months)
- Fugitive emissions, except for the specific source categories specified in 40 CFR 51.165

Since agricultural operations do not fall under any of the specific source categories specified in 40 CFR 51.165, fugitive emissions are not counted when determining if an agricultural operation is a major source.

Since emissions at this facility 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. All fugitive emissions are excluded from the Major Source determination.

SSPE calculations including fugitive and non-fugitive emissions from this facility are shown in Appendix F.

**Rule 2201 Major Source Determination**
**(lb/year)**

| | $NO_X$ | $SO_X$ | $PM_{10}$ | $PM_{2.5}$ | CO | VOC |
|---|---|---|---|---|---|---|
| SSPE1 (Non-Fugitive) | 124 | 0 | 3 | 3 | 11 | 4,074 |
| SSPE2 (Non-Fugitive) | 779 | 1 | 17 | 17 | 97 | 4,094 |
| Major Source Threshold | 20,000 | 140,000 | 140,000 | 140,000 | 200,000 | 20,000 |
| Major Source? | No | No | No | No | No | No |

Note: PM2.5 assumed to be equal to PM10

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

**Rule 2410 Major Source Determination:**

The facility is not an existing major source for PSD for at least one pollutant. Therefore the facility is not an existing major source for PSD.

### 6. Baseline Emissions (BE)

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 District Rule 2201.

Since this is a new emissions unit, BE = PE1 = 0 for all criteria pollutants.

### 7. SB 288 Major Modification

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

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

### 8. Federal Major Modification / New Major Source

**Federal Major Modification**

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

As defined in 40 CFR 51.165, Section (a)(1)(v) and part D of Title I of the CAA, a Federal Major Modification is 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. The significant net emission increase threshold for each criteria pollutant is included in Rule 2201.

Since this facility is not a Major Source for any pollutants, this project does not constitute a Federal Major Modification and no further discussion is required.

**New Major Source**

As demonstrated above, this facility is not becoming a Major Source as a result of this project, therefore, this facility is not a New Major Source pursuant to 40 CFR 51.165 a(1)(iv)(A)(3).

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

The project potential to emit, by itself, will not exceed any PSD major source thresholds. Therefore Rule 2410 is not applicable and no further discussion is required.

**10. Quarterly Net Emissions Change (QNEC)**

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

## 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 ATC 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 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.

As discussed in Section I, the facility is proposing to install a new emergency standby IC engine. Additionally, as determined in Sections VII.C.7 and VII.C.8, this project does not result in an SB288 Major Modification or a Federal Major Modification, respectively. Therefore, BACT can only be triggered if the daily emissions exceed 2.0 lb/day for any pollutant.

The daily emissions from the new engine are compared to the BACT threshold levels in the following table:

| New Emissions Unit BACT Applicability | | | | |
|---|---|---|---|---|
| Pollutant | Daily Emissions (lb/day) | BACT Threshold (lb/day) | SSPE2 (lb/yr) | BACT Triggered? |
| $NO_X$ | 157.3 | > 2.0 | n/a | Yes |
| $SO_X$ | 0.2 | > 2.0 | n/a | No |
| $PM_{10}$ | 3.4 | > 2.0 | n/a | Yes |
| CO | 20.7 | > 2.0 and SSPE2 ≥ 200,000 lb/yr | 97 | No |
| VOC | 4.9 | > 2.0 | n/a | Yes |

As shown above, BACT will be triggered for $NO_X$, $PM_{10}$, and VOC emissions from the engine for this project.

### 2. BACT Guideline

BACT Guideline 3.1.1, which appears in Appendix B of this report, covers diesel-fired emergency IC engines.

### 3. Top Down BACT Analysis

Per District Policy APR 1305, Section IX, "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 for source categories or classes covered in the BACT Clearinghouse, relevant information under each of the following steps may be simply cited from the Clearinghouse without further analysis."

Pursuant to the attached Top-Down BACT Analysis, which appears in Appendix B of this report, BACT is satisfied with:

$NO_X$: Latest Available Tier Certification level for applicable horsepower*
VOC: Latest Available Tier Certification level for applicable horsepower*
$PM_{10}$: 0.15 g/bhp-hr

The facility has proposed to install a 768 bhp Tier 2 certified IC engine (with a PM10 emissions rate of 0.084 g/bhp-hr). Therefore, BACT is satisfied for NOx, VOC, and PM10

## B. Offsets

Since emergency IC engines are exempt from the offset requirements of Rule 2201, per Section 4.6.2, offsets are not required for this engine, and no offset calculations are required.

However, even when there is an applicable exemption, the SSPE2 values are compared to the offset threshold to determine if offsets are triggered. In its PAS database, the District keeps track of facilities where offsets are triggered but an exemption applies. The SSPE2 values are compared to the offset trigger thresholds in the following table:

| Offset Determination (lb/year) | | | | | |
|---|---|---|---|---|---|
| | **NOx** | **SOx** | **$PM_{10}$** | **CO** | **VOC** |
| SSPE2 | 779 | 1 | 40,449 | 97 | 103,374 |
| Offset Thresholds | 20,000 | 54,750 | 29,200 | 200,000 | 20,000 |
| Offsets Triggered? | No | No | Yes | No | Yes |

### Quantity of Offsets Required

As shown in the table above, offsets are triggered for PM10 and VOC emissions since the PM10 and VOC SSPE2 exceeds the offset trigger threshold; however,

as previously discussed, the offset exemption from Section 4.6.2 of District Rule 2201 is applicable to this project; therefore, offset calculations are not necessary and offsets are not required.

## C. Public Notification

### 1. Applicability

Public noticing is required for:

a. New Major Sources, SB288 Major Modifications, and Federal Major Modifications

As shown in Sections VII.C.5, VII.C.7, and VII.C.8, this facility is not a new Major Source, not an SB 288 Major Modification, and not a Federal Major Modification, respectively.

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

As calculated in Section VII.C.2, daily emissions for $NO_X$ are greater than 100 lb/day.

c. Any project which results in the offset thresholds being surpassed

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

| Offset Thresholds | | | | |
|---|---|---|---|---|
| **Pollutant** | **SSPE1 (lb/year)** | **SSPE2 (lb/year)** | **Offset Threshold** | **Public Notice Required?** |
| $NO_X$ | 124 | 779 | 20,000 lb/year | No |
| $SO_X$ | 0 | 1 | 54,750 lb/year | No |
| $PM_{10}$ | 40,435 | 40,449 | 29,200 lb/year | No |
| CO | 11 | 97 | 200,000 lb/year | No |
| VOC | 103,354 | 103,374 | 20,000 lb/year | No |

While VOC and PM10 emissions already exceed the offset threshold, no offset thresholds are being surpassed as a result of this project.

d. Any project with a Stationary Source Project Increase in Permitted Emissions (SSIPE) greater than 20,000 lb/year for any pollutant.

For this project, the proposed engine is the only emissions source that will generate an increase in Potential to Emit. Since the proposed engine emissions are well below 20,000 lb/year for all pollutants (See Section VII.C.2), the SSIPE for this project will be below the public notice threshold.

e. Title V Significant Modification

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

**2. Public Notice Action**

As demonstrated above, this project will require public noticing. Therefore, public notice documents will be submitted to the California Air Resources Board (CARB) and a public notice will be published on the District's website prior to the issuance of the ATC for this equipment.

## D. Daily Emissions Limits

Daily Emissions Limitations (DELs) and other enforceable conditions are required by Rule 2201 to restrict a unit's maximum daily emissions, to a level at or below the emissions associated with the maximum design capacity. The DEL must be contained in the latest ATC and contained in or enforced by the latest PTO and enforceable, in a practicable manner, on a daily basis. Therefore, the following conditions will be listed on the ATC to ensure compliance:

- {4771} Emissions from this IC engine shall not exceed any of the following limits: 3.87 g-NOx/bhp-hr, 0.51 g-CO/bhp-hr, or 0.12 g-VOC/bhp-hr. [District Rule 2201 and 17 CCR 93115]

- {4772} Emissions from this IC engine shall not exceed 0.084 g-PM10/bhp-hr based on USEPA certification using ISO 8178 test procedure. [District Rules 2201 and 4102, and 17 CCR 93115]

- {4258} Only CARB certified diesel fuel containing not more than 0.0015% sulfur by weight is to be used. [District Rules 2201 and 4801, and 17 CCR 93115]

## E. Compliance Assurance

### 1. Source Testing

Pursuant to District Policy APR 1705, source testing is not required for emergency standby IC engines to demonstrate compliance with Rule 2201.

### 2. Monitoring

No monitoring is required to demonstrate compliance with Rule 2201.

### 3. Recordkeeping

Recordkeeping requirements, in accordance with District Rule 4702, will be discussed in Section VIII, *District Rule 4702*, of this evaluation.

### 4. Reporting

No reporting is required to ensure compliance with Rule 2201.

## F. Ambient Air Quality Analysis (AAQA)

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

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

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

## Rule 2410 Prevention of Significant Deterioration

This project does not result in a new PSD major source or PSD major modification. No further discussion is required.

## Rule 2520 Federally Mandated Operating Permits

Since this facility's potential to emit does not exceed any major source thresholds of Rule 2201, this facility is not a Major Source, and Rule 2520 does not apply.

**Rule 4001 New Source Performance Standards (NSPS)**

**40 CFR 60 Subpart IIII - Standards of Performance for Stationary Compression Ignition Internal Combustion Engines**

The District has not been delegated the authority to implement Subpart IIII requirements for non-Major Sources; therefore, no requirements shall be included on the permit.

**Rule 4002 National Emission Standards for Hazardous Air Pollutants**

**40 CFR 63 Subpart ZZZZ - National Emission Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Emissions (RICE)**

The District has not been delegated the authority to implement NESHAP regulations for Area Source requirements for non-Major Sources; therefore, no requirements shall be included on the permit.

**Rule 4101 Visible Emissions**

Rule 4101 states that no air contaminant shall be discharged into the atmosphere for a period or periods aggregating more than three minutes in any one hour which is as dark as, or darker than, Ringelmann 1 or 20% opacity. Therefore, the following condition will be listed on the ATC to ensure compliance:

- {15} No air contaminant shall be discharged into the atmosphere for a period or periods aggregating more than three minutes in any one hour which is as dark as, or darker than, Ringelmann 1 or 20% opacity. [District Rule 4101]

**Rule 4102 Nuisance**

Rule 4102 states that no air contaminant shall be released into the atmosphere which causes a public nuisance. Public nuisance conditions are not expected as a result of these operations, provided the equipment is well maintained. Therefore, the following condition will be listed on the ATC to ensure compliance:

- {98} No air contaminant shall be released into the atmosphere which causes a public nuisance. [District Rule 4102]

**California Health & Safety Code 41700 (Health Risk Assessment)**

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

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

| **RMR Results** | | | | |
|---|---|---|---|---|
| Unit | Acute Hazard Index | Chronic Hazard Index | Cancer Risk | T-BACT Required? |
| N-6120-12-0 | N/A[1] | N/A[2] | 3.98 in a million | Yes |

Notes:
1. Prioritization for this unit was not conducted since the District determinded that all diesel-fired IC engines will result in a prioritization score greater than 1.0.
2. Acute Hazard Index was not calculated for Unit 12-0 since there is no risk factor or the risk factor is so low that it has been determined to be insignificant for this type of unit.

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 $PM_{10}$. T-BACT is satisfied with BACT (see Appendix B), which is:

$PM_{10}$: 0.15 g/bhp-hr

Therefore, compliance with the District's Risk Management Policy is expected.

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

The following conditions will be listed on the ATC to ensure compliance with the RMR:

- {1898} The exhaust stack shall vent vertically upward. The vertical exhaust flow shall not be impeded by a rain cap (flapper ok), roof overhang, or any other obstruction. [District Rule 4102]

- {4772} Emissions from this IC engine shall not exceed 0.084 g-PM10/bhp-hr based on USEPA certification using ISO 8178 test procedure. [District Rules 2201 and 4102, and 17 CCR 93115]

- {4920} This engine shall be operated only for testing and maintenance of the engine, required regulatory purposes, and during emergency situations. Operation

of the engine for maintenance, testing, and required regulatory purposes shall not exceed 100 hours per calendar year. [District Rules 2201, 4102, and 4702, and 17 CCR 93115]

**Rule 4201 Particulate Matter Concentration**

Rule 4201 limits particulate matter emissions from any single source operation to 0.1 g/dscf, which, as calculated below, is equivalent to a $PM_{10}$ emission factor of 0.4 g-$PM_{10}$/bhp-hr.

$$0.1 \quad \frac{grain-PM}{dscf} \times \frac{g}{15.43 grain} \times \frac{1\,Btu_{in}}{0.35\,Btu_{out}} \times \frac{9{,}051 dscf}{10^6\,Btu} \times \frac{2{,}542.5\,Btu}{1 bhp-hr} \times \frac{0.96 g-PM_{10}}{1g-PM} = 0.4 \frac{g-PM_{10}}{bhp-hr}$$

The new engine has a $PM_{10}$ emission factor less than 0.4 g/bhp-hr. Therefore, compliance is expected and the following condition will be listed on the ATC:

- {14} Particulate matter emissions shall not exceed 0.1 grains/dscf in concentration. [District Rule 4201]

**Rule 4701 Internal Combustion Engines - Phase 1**

The purpose of this rule is to limit the emissions of nitrogen oxides (NOx), carbon monoxide (CO), and volatile organic compounds (VOC) from internal combustion engines. Except as provided in Section 4.0, the provisions of this rule apply to any internal combustion engine, rated greater than 50 bhp, that requires a PTO.

Section 4.1 of the rule specifically exempts IC engines in agricultural operations used for the growing of crops or raising of fowl or animals. Since the engine is used for the growing of crops or raising of fowl or animals, it is exempt from the requirements of this rule. Therefore, the following condition will be listed on the ATC to ensure compliance.

- {4002} This IC engine shall only be used for the growing and harvesting of crops or the raising of fowl or animals for the primary purpose of making a profit, providing a livelihood, or conducting agricultural research or instruction by an educational institution. [District Rule 4701 and 4702, and 17 CCR 93115]

**Rule 4702 Internal Combustion Engines**

The following summarizes District Rule 4702 requirements for emergency standby IC engines:

1. Operation of emergency standby engines is limited to 100 hours or less per calendar year for non-emergency purposes. The following condition will be included on the permit:

- {4775} This engine shall be operated only for testing and maintenance of the engine, required regulatory purposes, and during emergency situations. Operation of the engine for maintenance, testing, and required regulatory purposes shall not exceed 100 hours per calendar year. [District Rules 2201 and 4702]

2. Properly operate and maintain each engine as recommended by the engine manufacturer or emission control system supplier. The following condition will be included on the permit:

   - {4261} This engine shall be operated and maintained in proper operating condition as recommended by the engine manufacturer or emissions control system supplier. [District Rule 4702]

3. Monitor the operational characteristics of each engine as recommended by the engine manufacturer or emission control system supplier. The following condition will be included on the permit:

   - {3478} During periods of operation for maintenance, testing, and required regulatory purposes, the permittee shall monitor the operational characteristics of the engine as recommended by the manufacturer or emission control system supplier (for example: check engine fluid levels, battery, cables and connections; change engine oil and filters; replace engine coolant; and/or other operational characteristics as recommended by the manufacturer or supplier). [District Rule 4702]

4. Install and operate a nonresettable elapsed time meter. In lieu of installing a nonresettable elapsed time meter, the operator may use an alternative device, method, or technique, in determining operating time provided that the alternative is approved by the APCO and EPA and is allowed by Permit-to-Operate condition. The operator shall properly maintain and operate the nonresettable elapsed time meter or alternative device in accordance with the manufacturer's instructions.

   The following condition shall be used:

   - {4749} This engine shall be equipped with a non-resettable hour meter with a minimum display capability of 9,999 hours, unless the District determines that a non-resettable hour meter with a different minimum display capability is appropriate in consideration of the historical use of the engine and the owner or operator's compliance history. [District Rule 4702 and 17 CCR 93115]

5. Emergency standby engines cannot be used to reduce the demand for electrical power when normal electrical power line service has not failed, or to produce power for the electrical distribution system, or in conjunction with a voluntary utility demand reduction program or interruptible power contract. The following conditions will be included on the permit:

- {3807} An emergency situation is an unscheduled electrical power outage caused by sudden and reasonably unforeseen natural disasters or sudden and reasonably unforeseen events beyond the control of the permittee. [District Rule 4702]

- {3808} This engine shall not be used to produce power for the electrical distribution system, as part of a voluntary utility demand reduction program, or for an interruptible power contract. [District Rule 4702]

6. Records of the total hours of operation, type of fuel used, purpose for operating the engine, all hours of non-emergency and emergency operation, and other support documentation must be maintained. All records shall be retained for a period of at least five years, shall be readily available, and be made available to the APCO upon request. The following conditions will be included on the permit:

   - {3496} The permittee shall maintain monthly records of emergency and non-emergency operation. Records shall include the number of hours of emergency operation, the date and number of hours of all testing and maintenance operations, the purpose of the operation (for example: load testing, weekly testing, rolling blackout, general area power outage, etc.) and records of operational characteristics monitoring. For units with automated testing systems, the operator may, as an alternative to keeping records of actual operation for testing purposes, maintain a readily accessible written record of the automated testing schedule. [District Rule 4702 and 17 CCR 93115]

   - {4263} The permittee shall maintain monthly records of the type of fuel purchased. [District Rule 4702 and 17 CCR 93115]

   - {3475} All records shall be maintained and retained on-site for a minimum of five (5) years, and shall be made available for District inspection upon request. [District Rule 4702 and 17 CCR 93115]

**Rule 4801 Sulfur Compounds**

Rule 4801 requires that sulfur compound emissions (as $SO_2$) shall not exceed 0.2% by volume. Using the ideal gas equation, the sulfur compound emissions are calculated as follows:

Volume $SO_2$ = (n x R x T) ÷ P
n = moles $SO_2$
T (standard temperature) = 60 °F or 520 °R
R (universal gas constant) = $\frac{10.73\,\text{psi}\cdot\text{ft}^3}{\text{lb}\cdot\text{mol}\cdot{}^\circ\text{R}}$

$$\frac{0.000015\ lb-S}{lb-fuel}\times\frac{7.1\,\text{lb}}{\text{gal}}\times\frac{64\,\text{lb}-SO_2}{32\,\text{lb}-S}\times\frac{1\,\text{MMBtu}}{9{,}051\,\text{scf}}\times\frac{1\,\text{gal}}{0.137\,\text{MMBtu}}\times\frac{\text{lb}-\text{mol}}{64\,\text{lb}-SO_2}\times\frac{10.73\,\text{psi}-\text{ft}^3}{\text{lb}-\text{mol}-{}^\circ\text{R}}\times\frac{520{}^\circ\text{R}}{14.7\,\text{psi}}\times 1{,}000{,}000 = \quad 1.0\ \text{ppmv}$$

Since 1.0 ppmv is ≤ 2,000 ppmv, this engine is expected to comply with Rule 4801. Therefore, the following condition will be listed on the ATC to ensure compliance:

- {4258} Only CARB certified diesel fuel containing not more than 0.0015% sulfur by weight is to be used. [District Rules 2201 and 4801, and 17 CCR 93115]

**California Health & Safety Code 42301.6 (School Notice)**

The District has verified that this engine 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.

**Title 17 California Code of Regulations (CCR), Section 93115 - Airborne Toxic Control Measure (ATCM) for Stationary Compression-Ignition (CI) Engines**

The following requirements apply to new engines (those installed after 1/1/05):

| Title 17 CCR Section 93115 Requirements for New Emergency IC Engines Powering Electrical Generators | Proposed Method of Compliance with Title 17 CCR Section 93115 Requirements |
|---|---|
| The requirements in Sections 93115.6, 93115.7, and 93115.10(a) do not apply to new stationary diesel-fueled CI engines used in agricultural operations. | The following condition will be added to the permit:<br>• {4002} This IC engine shall only be used for the growing and harvesting of crops or the raising of fowl or animals for the primary purpose of making a profit, providing a livelihood, or conducting agricultural research or instruction by an educational institution. [District Rules 4701, 4702 and 17 CCR 93115] |
| Emergency engines must be fired on CARB diesel fuel, or an approved alternative diesel fuel. | The applicant has proposed the use of CARB certified diesel fuel. The proposed permit condition, requiring the use of CARB certified diesel fuel, was included earlier in this evaluation. |
| The engines must meet Table 6 of the ATCM, which requires the Off-road engine certification standard for the specific power rating of the proposed engine on the date of acquisition (purchase date) or permit application submittal to the District, whichever is earliest. | For emergency engines, the Off-road engine certification standards are identified in Table 1 of the ATCM[1]. The applicant has proposed the use of an emergency engine that meets the Table 1 emission standards (Off-road engine certification standards) for the applicable horsepower range). |
| | The following condition will be included on the permit: |

[1] Although Section 93115.8 of the ATCM states that new IC engines used in agricultural operations must meet the emissions limits in Table 6, the ATCM Staff Report clarifies that all new emergency standby IC engines must meet the emissions limits specified in Table 1 of the ATCM. This eliminates the requirement that new agricultural emergency standby IC engines would otherwise have to meet the after-treatment based Tier 4 standards specified in Table 6.

| | |
|---|---|
| A non-resettable hour meter with a minimum display capability of 9,999 hours shall be installed upon engine installation, or by no later than January 1, 2005, on all engines subject to all or part of the requirements of sections 93115.6, 93115.7, or 93115.8(a) unless the District determines on a case-by-case basis that a non-resettable hour meter with a different minimum display capability is appropriate in consideration of the historical use of the engine and the owner or operator's compliance history. | • {4749} This engine shall be equipped with a non-resettable hour meter with a minimum display capability of 9,999 hours, unless the District determines that a non-resettable hour meter with a different minimum display capability is appropriate in consideration of the historical use of the engine and the owner or operator's compliance history. [District Rule 4702 and 17 CCR 93115] |
| An owner or operator shall maintain monthly records of the following: emergency use hours of operation; maintenance and testing hours of operation; hours of operation for emission testing; initial start-up testing hours; hours of operation for all other uses; and the type of fuel used. All records shall be retained for a minimum of 36 months. | Permit conditions enforcing these requirements were shown earlier in the evaluation. |

**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 District performed an Engineering Evaluation (this document) for the proposed project and determined that the project qualifies for ministerial approval under the

District's Guideline for Expedited Application Review (GEAR). Section 21080 of the Public Resources Code exempts from the application of CEQA those projects over which a public agency exercises only ministerial approval. Therefore, the District finds that this project is exempt from the provisions of CEQA.

**Indemnification Agreement/Letter of Credit Determination**

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

As described above, the project requires only ministerial approval, and is exempt from the provisions of CEQA. As such, an Indemnification Agreement or a Letter of Credit will not be required for this project in the absence of expressed public concern.

To ensure that issuance of this permit does not conflict with any conditions imposed by any local agency permit process, the following permit condition will be listed on the ATC:

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

## IX. Recommendation

Pending a successful NSR Public Noticing period, issue Authority to Construct N-6120-12-0 subject to the permit conditions on the attached draft Authority to Construct in Appendix A.

## X. Billing Information

| Billing Schedule | | | |
|---|---|---|---|
| **Permit Number** | **Fee Schedule** | **Fee Description** | **Fee Amount** |
| N-6120-12-0 | 3020-10-D | 768 bhp IC engine | $577 |

## Appendixes

A. Draft ATC
B. BACT Guideline and BACT Analysis
C. Emissions Data Sheet
D. RMR Summary and AAQA
E. QNEC Calculations
F. SSPE Calculations
G. Dairy Calculations

# Appendix A
# Draft ATC

San Joaquin Valley
Air Pollution Control District

# AUTHORITY TO CONSTRUCT



**PERMIT NO:** N-6120-12-0 **ISSUANCE DATE:** DRAFT

**LEGAL OWNER OR OPERATOR:** SILVA DAIRY FARMS #3
**MAILING ADDRESS:** 1499 EDMINSTER RD
STEVINSON, CA 95374

**LOCATION:** 1499 EDMINSTER RD
STEVINSON, CA 95374

**EQUIPMENT DESCRIPTION:**
768 BHP (INTERMITTENT) VOLVO PENTA MODEL TAD1641GE TIER 2 CERTIFIED DIESEL-FIRED EMERGENCY STANDBY IC ENGINE POWERING AN ELECTRICAL GENERATOR

## CONDITIONS

1. {3215} Upon presentation of appropriate credentials, a permittee shall allow an authorized representative of the District to enter the permittee's premises where a permitted source is located or emissions related activity is conducted, or where records must be kept under condition of the permit. [District Rule 1070]
2. {3216} Upon presentation of appropriate credentials, a permittee shall allow an authorized representative of the District to have access to and copy, at reasonable times, any records that must be kept under the conditions of the permit. [District Rule 1070]
3. {3658} This permit does not authorize the violation of any conditions established for this facility in the Conditional Use Permit (CUP), Special Use Permit (SUP), Site Approval, Site Plan Review (SPR), or other approval documents issued by a local, state, or federal agency. [Public Resources Code 21000-21177: California Environmental Quality Act]
4. {98} No air contaminant shall be released into the atmosphere which causes a public nuisance. [District Rule 4102]
5. {15} No air contaminant shall be discharged into the atmosphere for a period or periods aggregating more than three minutes in any one hour which is as dark as, or darker than, Ringelmann 1 or 20% opacity. [District Rule 4101]
6. {14} Particulate matter emissions shall not exceed 0.1 grains/dscf in concentration. [District Rule 4201]

CONDITIONS CONTINUE ON NEXT PAGE

**YOU MUST NOTIFY THE DISTRICT COMPLIANCE DIVISION AT (209) 557-6400 WHEN CONSTRUCTION IS COMPLETED AND PRIOR TO OPERATING THE EQUIPMENT OR MODIFICATIONS AUTHORIZED BY THIS AUTHORITY TO CONSTRUCT.** This is NOT a PERMIT TO OPERATE. Approval or denial of a PERMIT TO OPERATE will be made after an inspection to verify that the equipment has been constructed in accordance with the approved plans, specifications and conditions of this Authority to Construct, and to determine if the equipment can be operated in compliance with all Rules and Regulations of the San Joaquin Valley Unified Air Pollution Control District. Unless construction has commenced pursuant to Rule 2050, this Authority to Construct shall expire and application shall be cancelled two years from the date of issuance. The applicant is responsible for complying with all laws, ordinances and regulations of all other governmental agencies which may pertain to the above equipment.

Samir Sheikh, Executive Director / APCO



Brian Clements, Director of Permit Services
N-6120-12-0 : Jul 1 2021 11:31AM -- BALLARDD : Joint Inspection NOT Required

7. {4002} This IC engine shall only be used for the growing and harvesting of crops or the raising of fowl or animals for the primary purpose of making a profit, providing a livelihood, or conducting agricultural research or instruction by an educational institution. [District Rules 4701 and 4702, and 17 CCR 93115]

8. {1898} The exhaust stack shall vent vertically upward. The vertical exhaust flow shall not be impeded by a rain cap (flapper ok), roof overhang, or any other obstruction. [District Rule 4102]

9. {4749} This engine shall be equipped with a non-resettable hour meter with a minimum display capability of 9,999 hours, unless the District determines that a non-resettable hour meter with a different minimum display capability is appropriate in consideration of the historical use of the engine and the owner or operator's compliance history. [District Rule 4702 and 17 CCR 93115]

10. {4258} Only CARB certified diesel fuel containing not more than 0.0015% sulfur by weight is to be used. [District Rules 2201 and 4801, and 17 CCR 93115]

11. Emissions from this IC engine shall not exceed any of the following limits: 3.87 g-NOx/bhp-hr, 0.51 g-CO/bhp-hr, or 0.12 g-VOC/bhp-hr. [District Rule 2201 and 17 CCR 93115]

12. Emissions from this IC engine shall not exceed 0.084 g-PM10/bhp-hr based on USEPA certification using ISO 8178 test procedure. [District Rules 2201 and 4102, and 17 CCR 93115]

13. {4261} This engine shall be operated and maintained in proper operating condition as recommended by the engine manufacturer or emissions control system supplier. [District Rule 4702]

14. {3478} During periods of operation for maintenance, testing, and required regulatory purposes, the permittee shall monitor the operational characteristics of the engine as recommended by the manufacturer or emission control system supplier (for example: check engine fluid levels, battery, cables and connections; change engine oil and filters; replace engine coolant; and/or other operational characteristics as recommended by the manufacturer or supplier). [District Rule 4702]

15. {3807} An emergency situation is an unscheduled electrical power outage caused by sudden and reasonably unforeseen natural disasters or sudden and reasonably unforeseen events beyond the control of the permittee. [District Rule 4702 and 17 CCR 93115]

16. {3808} This engine shall not be used to produce power for the electrical distribution system, as part of a voluntary utility demand reduction program, or for an interruptible power contract. [District Rule 4702 and 17 CCR 93115]

17. {4775} This engine shall be operated only for testing and maintenance of the engine, required regulatory purposes, and during emergency situations. Operation of the engine for maintenance, testing, and required regulatory purposes shall not exceed 100 hours per calendar year. [District Rules 2201 and 4702]

18. {3496} The permittee shall maintain monthly records of emergency and non-emergency operation. Records shall include the number of hours of emergency operation, the date and number of hours of all testing and maintenance operations, the purpose of the operation (for example: load testing, weekly testing, rolling blackout, general area power outage, etc.) and records of operational characteristics monitoring. For units with automated testing systems, the operator may, as an alternative to keeping records of actual operation for testing purposes, maintain a readily accessible written record of the automated testing schedule. [District Rule 4702 and 17 CCR 93115]

19. {4263} The permittee shall maintain monthly records of the type of fuel purchased. [District Rule 4702 and 17 CCR 93115]

20. {3475} All records shall be maintained and retained on-site for a minimum of five (5) years, and shall be made available for District inspection upon request. [District Rule 4702 and 17 CCR 93115]

# Appendix B
# BACT Guideline and BACT Analysis

San Joaquin Valley
Unified Air Pollution Control District

# Best Available Control Technology (BACT) Guideline 3.1.1*

Last Update: 6/13/2019

## Emergency Diesel-Fired IC Engine

| Pollutant | Achieved in Practice or contained in the SIP | Technologically Feasible | Alternate Basic Equipment |
|---|---|---|---|
| VOC | Latest EPA Tier Certification level for applicable horsepower range | | |
| SOx | Very low sulfur diesel fuel (15 ppmw sulfur or less) | | |
| PM10 | 0.15 g/bhp-hr or the latest EPA Tier Certification level for applicable horsepower range, whichever is more stringent (ATCM) | | |
| NOx | Latest EPA Tier Certification level for applicable horsepower range | | |
| CO | Latest EPA Tier Certification level for applicable horsepower range | | |

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

***This is a Summary Page for this Class of Source**

## Top Down BACT Analysis for the Emergency IC Engine(s)

BACT Guideline 3.1.1 (June 13, 2019) applies to emergency diesel IC engines. In accordance with the District BACT policy, information from that guideline will be utilized without further analysis.

### 1. BACT Analysis for $NO_X$ and VOC Emissions:

#### a. Step 1 - Identify all control technologies

BACT Guideline 3.1.1 identifies only the following option:

- *Latest EPA Tier Certification level for applicable horsepower range**

To determine the latest applicable Tier level, the following steps were taken:

- Conduct a survey of all the emergency IC engines permitted in the District to determine the latest EPA Tier certification level that has been permitted for the proposed engine size

- Conduct a survey of the major IC engine manufacturers/genset vendors to determine the latest EPA Tier certification level that is readily available for the proposed engine size and use

- Review Title 17 CCR, Section 93115 - Airborne Toxic Control Measure (ATCM) for Stationary Compression-Ignition (CI) Engines to determine the latest Tier certification level required in California for the proposed engine size

Survey of Permitted Units:
The proposed emergency IC engine is rated at 768 bhp. Based on the latest survey of all permitted emergency IC engines powering electrical generators in the horsepower range of 750-1,000 bhp, the District found that three Tier 4F and numerous Tier 2 certified engines have been permitted.

Survey of IC Engine Manufacturers/Genset Vendors:
The applicant has contacted three engine distributers to inquire about the avilablity of Tier 4F certified engines in the power range needed for this project. The three distributers contacted were Generac, Kohler, and Blue Star Power Systems Inc. Kohler and Blue Star Power Systems Inc. have no Tier 4F certified engines in the needed power range while the District has confirmed that Generac has been unresponsive concerning this request. Considering the lack of Tier 4F certified engines from these three distributers, the District finds that Tier 4F certified engines are not considered readily available in generator configurations needed for this dairy project.

Stationary ATCM:
The CARB Stationary Air Toxic Control Measure (ATCM) for stationary emergency standby diesel-fired IC engines requires new nonroad compression-ignition engines to meet emission standards as listed in Table 1 as well as the emission standards specified in Table 1 of 40 CFR, PART 60, Subpart IIII - Standards of Performance for Stationary Compression Ignition Internal Combustion Engines. Subpart IIII requires generator sets manufactured in 2008 or later and between 750 bhp and 1200 bhp to have emissions standards of no more than 0.15 g-PM10/bhp-hr, 4.8 g-NMHC+NOx/bhp-hr, and 2.6 g-CO/bhp-hr. The applicant has proposed a 768 bhp Tier 2 certified engine with emissions factors of 0.084 g-PM10/bhp-hr, 3.87 g-NOx/bhp-hr, 0.12 g-VOC/bhp-hr, and 0.51 g-CO/bhp hr. Therefore, the proposed certified engine meets the emissions standards set by the ATCM and 40 CFR, PART 60, Subpart IIII.

Summary:
The proposed emergency IC engine is rated at 768 bhp. The District has permitted three different emergency diesel-fired IC engines rated greater than 750 bhp with a Tier 4F certification level. However, the engine distributors and genset vendors contacted for this project either did not respond to the applicant's and District's requests regarding the availability of a Tier 4F engine, or stated a Tier 4F engine was not readily available. Therefore, the District does not conclude that Tier 4F is "achieved in practice" for an engine of the proposed size. Moreover, the ATCM does not require a tier certification level higher than Tier 2 for engines greater than 750 bhp.

Based on the above analysis, the District finds that a Tier 4F emergency IC engine/generator with a rating of approximately 768 bhp is not readily available.

Consequently, the District considers a Tier 2 certification level to be the latest available Tier certification level for the proposed engine size. Furthermore, a Tier 2 certification level satisfies the stationary ATCM requirement for emergency standby IC engines rated greater than 750 bhp.

**b. Step 2 - Eliminate technologically infeasible options**

The control option listed in Step 1 is not technologically infeasible.

**c. Step 3 - Rank remaining options by control effectiveness**

No ranking needs to be done because there is only one control option listed in Step 1.

**d. Step 4 - Cost Effectiveness Analysis**

The applicant has proposed the only control option remaining under consideration. Therefore, a cost effectiveness analysis is not required.

**e. Step 5 - Select BACT**

BACT for NOx and VOC will be the use of an EPA Tier 2 certified engine. The applicant is proposing such a unit. Therefore, BACT will be satisfied.

**2. BACT Analysis for $PM_{10}$ Emissions:**

**a. Step 1 - Identify all control technologies**

BACT Guideline 3.1.1 identifies only the following option:

- *0.15 g/bhp-hr or the Latest EPA Tier Certification level for applicable horsepower range, whichever is more stringent. (ATCM)*

The latest EPA Tier Certification level for an engine of the proposed model year and horsepower rating is Tier 2. Refer to the Top-Down BACT analysis for $NO_X$ and VOC for a discussion regarding the determination of the EPA Tier level to be considered.

Please note the proposed Tier 2 certified IC engine has a PM emission factor of 0.084 g/bhp-hr. Additionally, the ATCM requires a PM emission standard of 0.15 g/bhp-hr for all new emergency standby diesel IC engines.

Therefore, the proposed $PM/PM_{10}$ emission factor of 0.084 g/bhp-hr meets BACT requirements and also satisfies the stationary ATCM requirement for new emergency standby diesel IC engines.

**b. Step 2 - Eliminate technologically infeasible options**

The control option listed in Step 1 is not technologically infeasible.

**c. Step 3 - Rank remaining options by control effectiveness**

No ranking needs to be done because there is only one control option listed in Step 1.

**d. Step 4 - Cost Effectiveness Analysis**

The applicant has proposed the only control option remaining under consideration. Therefore, a cost effectiveness analysis is not required.

**e. Step 5 - Select BACT**

BACT for PM10 is emissions of 0.15 g/hp-hr or less. The applicant is proposing an engine that meets this requirement. Therefore, BACT will be satisfied.

# Appendix C
# Emissions Data Sheet

VOLVO PENTA

**NO: 164005**

# EXHAUST EMISSION DECLARATION

The emission data in this declaration are measured according to the test procedures specified below and on one member engine of the engine type. Emission data may vary among production engines.

**TECHNICAL SPECIFICATION**

| | |
|---|---|
| Engine type: | TAD1641GE |
| Specification: | 869252 / 869253 |
| Module No: | 138052004 |
| Rated crankshaft power *): | 565 kW |
| Rated speed: | 1800 rpm |

*) The engine performance corresponds to ISO 3046, BS 5514 and DIN 6271.

**TEST INFORMATION**

| | |
|---|---|
| Test conditions | 40 CFR part 89 |
| Test indentification | 27001877 |
| Test date | May 19, 2004 |
| Test cycle | 5-mode US constant speed test cycle |

**EXHAUST EMISSIONS (weighted cycle)**

| | |
|---|---|
| CO (g/kWh) | 0,69 |
| HC (g/kWh) | 0,16 |
| NOx (g/kWh) | 5,19 |
| PM (g/kWh) | 0,112 |

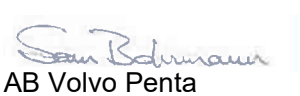
**EXHAUST EMISSIONS (per cycle mode)**

| Mode | # | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|---|
| Power | (kW) | 570,1 | 427,5 | 285 | 142,6 | 57,2 | | | |
| NOx | (g/h) | 2957 | 2165 | 1481 | 749 | 408 | | | |
| HC | (g/h) | 35 | 37 | 46 | 46 | 55 | | | |
| CO | (g/h) | 1084 | 232 | 84 | 107 | 177 | | | |
| PM | (g/h) | 80,7 | 29,5 | 20,5 | 18,9 | 27 | | | |
| $CO_2$ | (g/h) | 395353 | 284484 | 189290 | 104803 | 57109 | | | |
| NOx | (ppm) | 649 | 547 | 493 | 360 | 247 | | | |
| HC | (ppm) | 22 | 27 | 45 | 64 | 100 | | | |
| CO | (ppm) | 366 | 90 | 43 | 79 | 165 | | | |
| $CO_2$ | (%) | 8,38 | 6,94 | 6,07 | 4,85 | 3,34 | | | |
| $O_2$ | (%) | 9,19 | 11,14 | 12,32 | 14 | 16,08 | | | |
| NOx | ($mg/Nm^3$) | 1802 | 1820 | 1860 | 1683 | 1648 | | | |
| HC | ($mg/Nm^3$) | 17 | 25 | 48 | 85 | 188 | | | |
| CO | ($mg/Nm^3$) | 620 | 183 | 99 | 225 | 671 | | | |
| $CO_2$ | ($mg/Nm^3$) | - - | - - | - - | - - | - - | | | |
| Soot | ($mg/Nm^3$) | 27 | 11 | 8 | 13 | 25 | | | |

**SMOKE**

Opacity (%): Acc: n.a., Lug: n.a., Peak: n.a.

Gothenburg 2005-07-07



AB Volvo Penta
Product Liability
40508 Gothenburg

# Appendix D
# HRA Summary and AAQA

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

| | |
|---|---|
| To: | Rupi Gill – Permit Services |
| From: | Keanu Morin – Technical Services |
| Date: | February 11, 2021 |
| Facility Name: | Silva Dairy Farms #3 |
| Location: | 1499 Edminster Rd., Stevinson CA |
| Application #(s): | N-6120-12-0 |
| Project #: | N-1204881 |

## 1. Summary

### 1.1 RMR

| Units | Prioritization Score | Acute Hazard Index | Chronic Hazard Index | Maximum Individual Cancer Risk | T-BACT Required | Special Permit Requirements |
|---|---|---|---|---|---|---|
| 12-0 | N/A[1] | N/A[2] | 0.00 | 3.98E-06 | Yes | Yes |
| **Project Totals** | N/A[1] | N/A[2] | 0.00 | 3.98E-06 | | |
| **Facility Totals** | >1 | 0.00 | 0.00 | 3.98e-06 | | |

Notes:
1 Prioritization for this unit was not conducted since the District determinded that all diesel-fired IC engines will result in a prioritization score greater than 1.0.
2 Acute Hazard Index was not calculated for Unit 12-0 since there is no risk factor or the risk factor is so low that it has been determined to be insignificant for this type of unit.

### 1.2 AAQA

| Pollutant | Air Quality Standard (State/Federal) | | | | |
|---|---|---|---|---|---|
| | 1 Hour | 3 Hours | 8 Hours | 24 Hours | Annual |
| **CO** | NA[2] | | NA[2] | | |
| **$NO_x$** | NA[2] | | | | Pass |
| **$SO_x$** | NA[2] | NA[2] | | NA[2] | Pass |
| **PM10** | | | | NA[2] | Pass |
| **PM2.5** | | | | NA[2] | Pass |
| **Ozone** | NA[2] | | NA[2] | | |

Notes:
1. Results were taken from the attached AAQA Report.
2. The project is an intermittent source as defined in APR-1920. In accordance with APR-1920, compliance with short-term (i.e., 1-hour, 3-hour,8-hour and 24-hour) standards is not required.
3. [2]The criteria pollutants are below EPA's level of significance as found in 40 CFR Part 51.165 (b)(2) unless otherwise noted.
4. Modeled PM10 concentrations were below the District SIL for non-fugitive sources of 1 $\mu g/m^3$ for the annual concentration.
5. Modeled PM2.5 concentrations were below the District SIL for non-fugitive sources of 0.2 $\mu g/m^3$ for the annual concentration.

### 1.3 Proposed Permit Requirements

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

Unit # 12-0

1. The $PM_{10}$ emissions rate shall not exceed 0.084 g/bhp-hr based on US EPA certification using ISO 8178 test procedure.
2. The exhaust stack shall vent vertically upward. The vertical exhaust flow shall not be impeded by a rain cap (flapper ok), roof overhang, or any other obstruction.
3. This engine shall be operated only for testing and maintenance of the engine, required regulatory purposes, and during emergency situations. Operation of the engine for maintenance, testing, and required regulatory purposes shall not exceed 100 hours per calendar year.

**T-BACT is required for this unit because of emissions of Diesel Particulate Matter which is a PM10.**

## 2. Project Description

Technical Services received a request on February 5, 2021 to perform a Risk Management Review (RMR) and Ambient Air Quality Analysis (AAQA) for the following:

- Unit -12-0: 768 BHP VOLVO MODEL TAD1641GE DIESEL-FIRED EMERGENCY ENGINE (TIER 2 CERTIFIED) POWERING AN ELECTRICAL GENERATOR

## 3. RMR Report

### 3.1 Analysis

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

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

Then, generally no further analysis is required.

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

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

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

- Toxic emissions for the proposed engine were calculated and provided by the processing engineer.

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

The AERMOD model was used, with the parameters outlined below and meteorological data for 2004-2008 from Los Banos (rural dispersion coefficient selected) to determine the dispersion factors (i.e., the predicted concentration or X divided by the normalized source strength or Q) for a receptor grid. These dispersion factors were input into the SHARP Program, which then used the Air Dispersion Modeling and Risk Tool (ADMRT) of the Hot Spots Analysis and Reporting Program Version 2 (HARP 2) to calculate the chronic and acute hazard indices and the carcinogenic risk for the project.

The following parameters were used for the review:

| Source Process Rates | | | | | |
|---|---|---|---|---|---|
| **Unit ID** | **Process ID** | **Process Material** | **Process Units** | **Hourly Process Rate** | **Annual Process Rate** |
| 12-0 | 1 | Diesel PM | Lbs. | 0.14 | 14 |

| Point Source Parameters | | | | | | |
|---|---|---|---|---|---|---|
| **Unit ID** | **Unit Description** | **Release Height (m)** | **Temp. (°K)** | **Exit Velocity (m/sec)** | **Stack Diameter (m)** | **Vertical/ Horizontal/ Capped** |
| 12-0 | 768 BHP Diesel IC Engine | 3.05 | 751 | 56.74 | 0.20 | Vertical |

## 4. AAQA Report

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

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

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

| Monitoring Stations | | | | |
|---|---|---|---|---|
| **Pollutant** | **Station Name** | **County** | **City** | **Measurement Year** |
| CO | Modesto-14th Street | Stanislaus | Modesto | 2018 |
| NOx | Turlock | Stanislaus | Turlock | 2018 |
| PM10 | Turlock | Stanislaus | Turlock | 2018 |
| PM2.5 | Turlock | Stanislaus | Turlock | 2018 |
| SOx | Fresno - Garland | Fresno | Fresno | 2018 |

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

| Emission Rates (lbs/hour) | | | | | | |
|---|---|---|---|---|---|---|
| **Unit ID** | **Process** | **NOx** | **SOx** | **CO** | **PM10** | **PM2.5** |
| 12-0 | 1 | N/A[1] | N/A[1] | N/A[1] | N/A[1] | N/A[1] |

Notes:

1. The project is an intermittent source as defined in APR-1920. In accordance with APR-1920, compliance with short-term (i.e., 1-hour, 3-hour,8-hour and 24-hour) standards is not required.

| Emission Rates (lbs/year) | | | | | | |
|---|---|---|---|---|---|---|
| **Unit ID** | **Process** | **NOx** | **SOx** | **CO** | **PM10** | **PM2.5** |
| 12-0 | 1 | 657.00 | 1.00 | 88.00 | 14.00 | 14.00 |

The AERMOD model was used to determine if emissions from the project would cause or contribute to an exceedance of any state of federal air quality standard. The parameters outlined below and meteorological data for 2004-2008 from Los Banos (rural dispersion coefficient selected) were used for the analysis:

The following parameters were used for the review:

| Point Source Parameters | | | | | | |
|---|---|---|---|---|---|---|
| **Unit ID** | **Unit Description** | **Release Height (m)** | **Temp. (°K)** | **Exit Velocity (m/sec)** | **Stack Diameter (m)** | **Vertical/ Horizontal/ Capped** |
| 12-0 | 768 BHP Diesel IC Engine | 3.05 | 751 | 56.74 | 0.20 | Vertical |

## 5. Conclusion

### 5.1 RMR

The cumulative acute and chronic indices for this facility, including this project, are below 1.0; and the cumulative cancer risk for this facility, including this project, is less than 20 in a million. However, the cancer risk for one or more units in this project is greater than 1.0 in a million. **In accordance with the District's Risk Management Policy, the project is approved with Toxic Best Available Control Technology (T-BACT).**

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

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

### 5.2 AAQA

The emissions from the proposed equipment will not cause or contribute significantly to a violation of the State and National AAQS.

## 6. Attachments

A. Modeling request from the project engineer

B. Additional information from the applicant/project engineer

C. Facility Summary

D. AAQA results

# Appendix E
# QNEC Calculations

## Quarterly Net Emissions Change (QNEC)

The Quarterly Net Emissions Change is used to complete the emission profile screen for the District's PAS database. The QNEC shall be calculated as follows:

QNEC = PE2 - PE1, where:

QNEC = Quarterly Net Emissions Change for each emissions unit, lb/qtr
PE2 = Post-Project Potential to Emit for each emissions unit, lb/qtr
PE1 = Pre-Project Potential to Emit for each emissions unit, lb/qtr

Since this is a new unit, PE1 = 0 for all pollutants. Thus, QNEC = PE2 (lb/qtr).

Using the PE2 (lb/yr) values calculated in Section VII.C.2, Quarterly PE2 is calculated as follows:

$PE2_{quarterly}$ = PE2 (lb/yr) ÷ 4 quarters/year = QNEC

| QNEC | | |
|---|---|---|
| Pollutant | PE2 Total (lb/yr) | Quarterly PE2 (lb/qtr) |
| $NO_X$ | 655 | 163.8 |
| $SO_X$ | 1 | 0.3 |
| $PM_{10}$ | 14 | 3.5 |
| CO | 86 | 21.5 |
| VOC | 20 | 5.0 |

# Appendix F
# SSPE Calculations

## SSPE1 Total and Non-Fugitive Calculations

**PTOs N-6120-1-1, -2-0, -3-1, -4-0, -5-0, -7-0, -8-0, -9-0, -10-0, and -11-0**
**Dairy Operations:**

The following SSPE1 emission values for the dairy operations at this facility were taken from the District's Dairy Calculator. These results are shown in Appendix G. ATC -2-1 is valid and has lower emissions than PTO -2-0. However, ATC -2-1 has not been implemented yet; therefore, PTO -2-0's PE values will be used for the SSPE1 calculations.

The individual permit emissions and total PE are shown below:

| PE (Dairy Operations) | | | | | | | |
|---|---|---|---|---|---|---|---|
| Permit Unit | $NO_X$ | $SO_X$ | $PM_{10}$ | CO | VOC | $NH_3$ | H2S |
| N-6120-1-1 (Milking Parlor) | 0 | 0 | 0 | 0 | 568 | 194 | 0 |
| N-6120-2-0 (Cows Housing) | 0 | 0 | 22,697 | 0 | 20,805 | 43,688 | 0 |
| N-6120-3-1 (Liquid Manure Handling) | 0 | 0 | 0 | 0 | 5,076 | 14,203 | 222 |
| N-6120-4-0 (Solid Manure Handling) | 0 | 0 | 0 | 0 | 986 | 5,315 | 0 |
| N-6120-5-0 (Feed Storage) | 0 | 0 | 0 | 0 | 31,488 | 0 | 0 |
| N-6120-7-0 (Milking Parlor) | 0 | 0 | 0 | 0 | 400 | 137 | 0 |
| N-6120-8-0 (Cow Housing) | 0 | 0 | 17,735 | 0 | 15,915 | 29,138 | 0 |
| N-6120-9-0 (Liquid Manure) | 0 | 0 | 0 | 0 | 3,590 | 16,996 | 819 |
| N-6120-10-0 (Solid Manure) | 0 | 0 | 0 | 0 | 744 | 3,911 | 0 |
| N-6120-11-0 (Feed Storage) | 0 | 0 | 0 | 0 | 23,780 | 0 | 0 |
| **Total PE** | **0** | **0** | **40,432** | **0** | **103,352** | **113,582** | **1,041** |

**N-6120-6-0**
**190 bhp Diesel-Fired Emergency IC Engine:**

### Assumptions

| | |
|---|---|
| Emergency operating schedule: | 24 hours/day |
| Non-emergency operating schedule: | 50 hours/year |
| Density of diesel fuel: | 7.1 lb/gal |
| EPA F-factor (adjusted to 60 °F): | 9,051 dscf/MMBtu |
| Fuel heating value: | 137,000 Btu/gal |
| BHP to Btu/hr conversion: | 2,542.5 Btu/bhp-hr |
| Thermal efficiency of engine: | commonly ≈ 35% |

$PM_{10}$ fraction of diesel exhaust: 0.96 (CARB, 1988)
Conversion factor: 1.34 bhp/kw

**Emissions factors**

| Diesel-fired IC Engine Emission Factors | | |
|---|---|---|
| | g/bhp·hr* | Source |
| $NO_X$ | 5.9 | Engineering Evaluation (Project N-1104249) |
| $SO_X$ | 0.0051 | Mass Balance Equation Below |
| $PM_{10}$ | 0.12 | Engineering Evaluation (Project N-1104249) |
| CO | 0.53 | Engineering Evaluation (Project N-1104249) |
| VOC | 0.08 | Engineering Evaluation (Project N-1104249) |

*g/bhp·hr is calculated using the lb/bhp·hr value multiplied by 453.6 g/lb.

$$\frac{0.0015}{\%S} \times \frac{7.1\,lb\cdot fuel}{gallon} \times \frac{2\,lb\cdot SO_2}{1\,lb\cdot S} \times \frac{1\,gal}{137{,}000\,Btu} \times \frac{1\,hp\,input}{0.35\,hp\,out} \times \frac{2{,}542.5\,Btu}{hp\cdot hr} \times \frac{453.6\,g}{lb} = \frac{0.005}{1} \frac{g\cdot SO_x}{hp\cdot hr}$$

**PE Calculations**

Annual PE (lb-pollutant/yr) = EF (g-pollutant/bhp-hr) x rating (bhp)
x operation (hr/yr) / 453.6 g/lb

| Annual PE | | | | |
|---|---|---|---|---|
| **Pollutant** | **Emissions Factor (g/bhp-hr)** | **Rating (bhp)** | **Annual Hours of Operation (hrs/year)** | **Annual PE2 (lb/yr)** |
| $NO_x$ | 5.9 | 190 | 50 | **124** |
| $SO_x$ | 0.0051 | 190 | 50 | **0** |
| $PM_{10}$ | 0.12 | 190 | 50 | **3** |
| CO | 0.53 | 190 | 50 | **11** |
| VOC | 0.08 | 190 | 50 | **2** |

## SSPE1 Calculations

| SSPE1 | | | | | | | |
|---|---|---|---|---|---|---|---|
| Permit Unit | $NO_X$ | $SO_X$ | $PM_{10}$ | CO | VOC | $NH_3$ | H2S |
| Total PE (Dairy Operations) | 0 | 0 | 40,432 | 0 | 103,352 | 113,582 | 1,041 |
| N-6120-6-0 (Diesel-Fired IC Engine) | 124 | 0 | 3 | 11 | 2 | 0 | 0 |
| **Total** | **124** | **0** | **40,435** | **11** | **103,354** | **113,582** | **1,041** |

## Non-Fugitive SSPE1

As discussed in Section VII.C.5 of the engineering evaluation, fugitive emissions are not included in a facility's emission totals when determining if it is a major source. For dairy operations, only a portion of the liquid manure handling operation emissions and each of the IC engine emissions are not considered fugitive emissions. SSPE1 results of the non-fugitive calculations are shown below:

| Non-Fugitive SSPE1 (lb/year) | | | | | | |
|---|---|---|---|---|---|---|
| | $NO_X$ | $SO_X$ | $PM_{10}$ | $PM_{2.5}$ | CO | VOC |
| N-6120-3-1 (liquid manure handling – lagoon(s)/storage pond(s)) | 0 | 0 | 0 | 0 | 0 | 2,442 |
| N-6120-6-0 (emergency IC engine) | 124 | 0 | 3 | 3 | 11 | 2 |
| N-6120-9-0 (liquid manure handling – lagoon(s)/storage pond(s)) | 0 | 0 | 0 | 0 | 0 | 1,630 |
| **Non-Fugitive SSPE1** | **124** | **0** | **3** | **3** | **11** | **4,074** |

To streamline emission calculations, PM2.5 emissions are assumed to be equal to PM10 emissions.

## Non-Fugitive SSPE2

Non-fugitive SSPE2 calculations are determined by including the proposed ATC unit's emissions values with that of the currently permitted units. Permit Unit N-6120-8-0 emission values found in Section VII.C.2 of the engineering evaluation are added to the total Non-Fugitive SSPE1 emissions values to determine Non-Fugitive SSPE2 values shown below:

| Non-Fugitive SSPE2 (lb/year) | | | | | | |
|---|---|---|---|---|---|---|
| | $NO_X$ | $SO_X$ | $PM_{10}$ | $PM_{2.5}$ | CO | VOC |
| Non-Fugitive SSPE1 | 124 | 0 | 3 | 3 | 11 | 4,074 |
| N-6120-12-0(emergency IC engine) | 655 | 1 | 14 | 14 | 86 | 20 |
| **Non-Fugitive SSPE2** | **779** | **1** | **17** | **17** | **97** | **4,094** |

To streamline emission calculations, PM2.5 emissions are assumed to be equal to PM10 emissions.

# Appendix G
# Dairy Calculations

Rev. January 6, 2020

# Pre-Project Facility Information

1. Does this facility house Holstein or Jersey cows? Holstein
   Most facilities house Holstein cows unless explicitly stated on the PTO or application.
2. Does the facility have an anaerobic treatment lagoon? no
3. Does the facility land apply liquid manure? yes
   Answering "yes" assumes worst case.
4. Does the facility land apply solid manure? yes
   Answering "yes" assumes worst case.
5. Is any scraped manure sent to a lagoon/storage pond? yes
   Answering "yes" assumes worst case.

**Pre-Project Herd Size**

| Herd | Flushed Freestalls | Scraped Freestalls | Flushed Corrals | Scraped Corrals | Total # of Animals |
|---|---|---|---|---|---|
| Milk Cows | 1,420 | | | | 1,420 |
| Dry Cows | 225 | | | | 225 |
| Support Stock (Heifers, Calves, and Bulls) | 1,300 | | | | 1,300 |
| Large Heifers | | | | | 0 |
| Medium Heifers | | | | | 0 |
| Small Heifers | | | | | 0 |
| Bulls | | | | | 0 |

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

**Total Herd Summary**

| | |
|---|---|
| Total Milk Cows | 1,420 |
| Total Mature Cows | 1,645 |
| Support Stock (Heifers, Calves, and Bulls) | 1,300 |
| Total Calves | 0 |
| Total Dairy Head | 2,945 |

**Pre-Project Silage Information**

| Feed Type | Max # Open Piles | Max Height (ft) | Max Width (ft) |
|---|---|---|---|
| Corn | 1 | 20 | 100 |
| Alfalfa | | | |
| Wheat | 1 | 20 | 100 |

# Post-Project Facility Information

1. Does this facility house Holstein or Jersey cows? Holstein
   Most facilities house Holstein cows unless explicitly stated on the PTO or application.
2. Does the facility have an anaerobic treatment lagoon? no
3. Does the facility land apply liquid manure? yes
   Answering "yes" assumes worst case.
4. Does the facility land apply solid manure? yes
   Answering "yes" assumes worst case.
5. Is any scraped manure sent to a lagoon/storage pond? yes
   Answering "yes" assumes worst case.
6. Does this project result in an increase or relocation of uncovered surface area for any lagoon/storage pond? no

**Post-Project Herd Size**

| Herd | Flushed Freestalls | Scraped Freestalls | Flushed Corrals | Scraped Corrals | Total # of Animals |
|---|---|---|---|---|---|
| Milk Cows | 1,420 | | | | 1,420 |
| Dry Cows | 225 | | | | 225 |
| Support Stock (Heifers, Calves, and Bulls) | 1,300 | | | | 1,300 |
| Large Heifers | | | | | 0 |
| Medium Heifers | | | | | 0 |
| Small Heifers | | | | | 0 |
| Bulls | | | | | 0 |

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

**Total Herd Summary**

| | |
|---|---|
| Total Milk Cows | 1,420 |
| Total Mature Cows | 1,645 |
| Support Stock (Heifers, Calves, and Bulls) | 1,300 |
| Total Calves | 0 |
| Total Dairy Head | 2,945 |

**Post-Project Silage Information**

| Feed Type | Max # Open Piles | Max Height (ft) | Max Width (ft) |
|---|---|---|---|
| Corn | 1 | 20 | 100 |
| Alfalfa | | | |
| Wheat | 1 | 20 | 100 |

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

# VOC Mitigation Measures and Control Efficiencies

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

| Cow Housing | | | | |
|---|---|---|---|---|
| Measure Proposed? | | Mitigation Measure(s) per Emissions Point | VOC Control Efficiency (%) | |
| Pre-Project | Post-Project | | Pre-Project | Post-Project |
| | | **Enteric Emissions Mitigations** | | |
| ☑ | ☑ | Feed according to NRC guidelines | 10% | 10% |
| | | **Total Control Efficiency** | 10% | 10% |
| | | **Corrals/Pens Mitigations** | | |
| ☑ | ☑ | Feed according to NRC guidelines | 10% | 10% |
| ☑ | ☑ | Inspect water pipes and troughs and repair leaks at least once every seven days. Note: If selected for dairies > 999 milk cows, CE is already included in EF. | 0% | 0% |
| ☑ | ☑ | **Dairies:** Clean manure from corrals at least four times per year with at least 60 days between cleaning, or clean corrals at least once between April and July and at least once between September and December. Note: If selected for dairies > 999 milk cows, CE is already included in EF. Note: No additional control given for increased cleaning frequency (e.g. BACT requirement). **Heifer/Calf Ranches:** Scrape corrals twice a year with at least 90 days between cleanings, excluding in-corral mounds. Note: No additional control given for increased cleaning frequency (e.g. BACT requirement). | 0% | 0% |
| ☑ | ☑ | Scrape, vacuum, or flush concrete lanes in corrals at least once every day for mature cows and every seven days for support stock, or clean concrete lanes such that the depth of manure does not exceed 12 inches at any point or time. Note: No additional control given for increased cleaning frequency (e.g. BACT requirement). | 10% | 10% |
| ☑ | ☑ | Implement one of the following: 1) slope the surface of the corrals at least 3% where the available space for each animal is 400 sq ft or less and slope the surface of the corrals at least 1.5% where the available space for each animal is more than 400 sq ft; 2) maintain corrals to ensure proper drainage preventing water from standing more than 48 hrs; 3) harrow, rake, or scrape pens sufficiently to maintain a dry surface. Note: If selected for dairies > 999 milk cows, CE already included in EF. | 0% | 0% |
| ☑ | ☑ | Install shade structures such that they are constructed with a light permeable roofing material. Note: If selected for dairies > 999 milk cows, the control efficiency will be 5% since the EF used includes a partial control for this measure. | 5% | 5% |
| ☑ | ☑ | Install all shade structures uphill of any slope in the corral. Note: If selected for dairies > 999 milk cows, the control efficiency will be 5% since the EF used includes a partial control for this measure. | | |
| ☐ | ☐ | Clean manure from under corral shades at least once every 14 days, when weather permits access into corral. Note: If selected for dairies > 999 milk cows, the control efficiency will be 5% since the EF used includes a partial control for this measure. | | |
| ☐ | ☐ | Install shade structure so that the structure has a North/South orientation. Note: If selected for dairies > 999 milk cows, the control efficiency will be 5% since the EF used includes a partial control for this measure. | | |
| ☑ | ☑ | Manage corrals such that the manure depth in the corral does not exceed 12 inches at any time or point, except for in-corral mounding. Manure depth may exceed 12 inches when corrals become inaccessible due to rain events. The manure facility must resume management of the manure depth of 12 inches or lower immediately upon the corral becoming accessible. Note: If selected for dairies > 999 milk cows, control efficiency is already included in EF. | 0% | 0% |
| ☐ | ☐ | Knockdown fence line manure build-up prior to it exceeding a height of 12 inches at any time or point. Manure depth may exceed 12 inches when corrals become inaccessible due to rain events. The facility must resume management of the manure depth of 12 inches or lower immediately upon the corral becoming accessible. | 0% | 0% |
| ☐ | ☐ | Use lime or a similar absorbent material in the corral according to the manufacturer's recommendation to minimize moisture in the corrals. | 0% | 0% |
| ☐ | ☐ | Apply thymol to the corral soil in accordance with the manufacturer's recommendation. | 0% | 0% |
| | | **Total Control Efficiency** | 23.05% | 23.05% |
| | | **Bedding Mitigations** | | |
| ☑ | ☑ | Feed according to NRC guidelines | 10% | 10% |
| ☐ | ☐ | Use non-manure-based bedding and non-separated solids based bedding for at least 90% of the bedding material, by weight, for freestalls (e.g. rubber mats, almond shells, sand, or waterbeds). | 0% | 0% |

| | | | | |
|---|---|---|---|---|
| ☑ | ☑ | For a large dairy (1,000 milk cows or larger) or a heifer/calf ranch - Remove manure that is not dry from individual cow freestall beds or rake, harrow, scrape, or grade freestall bedding at least once every 7 days. | 10% | 10% |
| ☐ | ☐ | **(D)** For a medium dairy only (500 to 999 milk cows) - Remove manure that is not dry from individual cow freestall beds or rake, harrow, scrape, or grade freestall bedding at least once every 14 days. | 0% | 0% |
| | | **Total Control Efficiency** | 19.00% | 19.00% |
| | | **Lanes Mitigations** | | |
| ☑ | ☑ | Feed according to NRC guidelines | 10% | 10% |
| ☑ | ☑ | Pave feedlanes, where present, for a width of at least 8 feet along the corral side of the feedlane fence for milk and dry cows and at least 6 feet along the corral side of the feedlane for heifers. Note: No control efficiency at this time. | 0% | 0% |
| ☑ | ☑ | **Dairies**: Flush, scrape, or vacuum freestall flush lanes immediately prior to or after, or during each milking; or flush or scrape freestall flush lanes at least 3 times per day. **Heifer/Calf Ranches**: Vacuum, scrape, or flush freestalls at least once every seven days. | 10% | 10% |
| ☐ | ☐ | **(D)** Have no animals in exercise pens or corrals at any time. | 0% | 0% |
| | | **Total Control Efficiency** | 19.00% | 19.00% |

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

| **Solid Manure Handling** | | | | |
|---|---|---|---|---|
| **Measure Proposed?** | | **Mitigation Measure(s) per Emissions Point** | **VOC Control Efficiency (%)** | |
| Pre-Project | Post-Project | | Pre-Project | Post-Project |
| | | **Solid Manure Storage Mitigations** | | |
| ☑ | ☑ | Feed according to NRC guidelines | 10% | 10% |
| ☑ | ☑ | **LARGE CAFO ONLY**: Within 72 hours of removal from housing, either a) remove dry manure from the facility, or b) cover dry manure outside the housing with a weatherproof covering from October through May, except for times when wind events remove the covering, not to exceed 24 hours per event. | 10% | 10% |
| | | **Total Control Efficiency** | 19.00% | 19.00% |
| | | **Separated Solids Piles Mitigations** | | |
| ☑ | ☑ | Feed according to NRC guidelines | 10% | 10% |
| ☐ | ☐ | **LARGE CAFO ONLY**: Within 72 hours of removal from the drying process, either a) remove separated solids from the facility, or b) cover separated solids outside the housing with a weatherproof covering from October through May, except for times when wind events remove the covering, not to exceed 24 hours per event. | 0% | 0% |
| | | **Total Control Efficiency** | 10.00% | 10.00% |
| | | **Solid Manure Land Application Mitigations** | | |
| ☑ | ☑ | Feed according to NRC guidelines | 10% | 10% |
| ☑ | ☑ | Incorporate all solid manure within 72 hours of land application. Note: If selected for dairies > 999 milk cows, control efficiency is already included in EF. Note: No additional control given for rapid manure incorporation (e.g. BACT requirement). | 0% | 0% |
| ☐ | ☐ | Only apply solid manure that has been treated with an anaerobic treatment lagoon, aerobic lagoon or digester system. | 0% | 0% |
| ☐ | ☐ | Apply no solid manure with a moisture content of more than 50% | 0% | 0% |
| | | **Total Control Efficiency** | 10.00% | 10.00% |

| **Silage and TMR** | | | | |
|---|---|---|---|---|
| **Measure Proposed?** | | **Mitigation Measure(s) per Emissions Point** | **VOC Control Efficiency (%)** | |
| Pre-Project | Post-Project | | Pre-Project | Post-Project |
| | | **Corn/Alfalfa/Wheat Silage Mitigations** | | |
| | | 1. Utilize a sealed feed storage system (e.g. Ag-Bag) for bagged silage, or | | |

| | | | | |
|---|---|---|---|---|
| ☑ | ☑ | 2. Cover the surface of silage piles, except for the area where feed is being removed from the pile, with a plastic tarp that is at least 5 mils thick (0.005 inches), multiple plastic tarps with a cumulative thickness of at least 5 mils (0.005 inches), or an oxygen barrier film covered with a UV resistant material within 72 hours of last delivery of material to the pile, and implement one of the following:<br><br>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,<br><br>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,<br><br>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.<br><br>For dairies - implement two of the following:<br>For heifer/calf ranches - implement one of the following:<br><br>Manage Exposed Silage. a) manage silage piles such that only one silage pile has an uncovered face and the uncovered face has a total exposed surface area of less than 2,150 sq. ft., or b) manage multiple uncovered silage piles such that the total exposed surface area of all silage piles is less than 4,300 sq ft.<br><br>Maintain Silage Working Face. a) use a shaver/facer to remove silage from the silage pile, or b) maintain a smooth vertical surface on the working face of the silage pile<br><br>Silage Additive: a) inoculate silage with homolactic acid bacteria in accordance with manufacturer recommendations to achieve a concentration of at least 100,000 colony forming units per gram of wet forage or apply proprionic acid, benzoic acid, sorbic acid, sodium benzoate, or potassium sorbate at a rate specified by the manufacturer to reduce yeast counts when forming silage pile; or b) apply other additives at specified rates that have been demonstrated to reduce alcohol concentrations in silage and/or VOC emissions from silage and have been approved by the District and EPA. | 39.0% | 39.0% |
| | | **Total Control Efficiency*** | 39.00% | 39.00% |

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

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

# Ammonia Mitigation Measures and Control Efficiencies

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

| Cow Housing | | | | |
|---|---|---|---|---|
| Measure Proposed? | | Mitigation Measure(s) per Emissions Point | NH3 Control Efficiency (%) | |
| Pre-Project | Post-Project | | Pre-Project | Post-Project |
| | | **Corrals/Pens Mitigations** | | |
| ☑ | ☑ | Feed according to NRC guidelines | 28% | 28% |
| ☑ | ☑ | Clean manure from corrals at least four times per year with at least 60 days between cleaning, or clean corrals at least once between April and July and at least once between September and December. **OR** Use lime or a similar absorbent material in the corral according to the manufacturer's recommendation to minimize moisture in the corrals. **OR** Apply thymol to the corral soil in accordance with the manufacturer's recommendation. | 50% | 50% |
| | | **Total Control Efficiency** | 64% | 64% |
| | | **Bedding Mitigations** | | |
| ☑ | ☑ | Feed according to NRC guidelines | 28% | 28% |
| ☐ | ☐ | Use non-manure-based bedding and non-separated solids based bedding for at least 90% of the bedding material, by weight, for freestalls (e.g. rubber mats, almond shells, sand, or waterbeds). **OR** For a large dairy only (1,000 milk cows or larger) - Remove manure that is not dry from individual cow freestall beds or rake, harrow, scrape, or grade freestall bedding at least once every 7 days. **OR** For a medium dairy only (500 to 999 milk cows) - Remove manure that is not dry from individual cow freestall beds or rake, harrow, scrape, or grade freestall bedding at least once every 14 days. | 0.0% | 0.0% |
| | | **Total Control Efficiency** | 28.00% | 28.00% |
| | | **Lanes Mitigations** | | |
| ☑ | ☑ | Feed according to NRC guidelines | 28% | 28% |
| | | **Total Control Efficiency** | 28% | 28% |

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

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

# Dairy Emission Factors

| lb/hd-yr Dairy Emissions Factors for Holstein Cows | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Milk Cows | | | | Dry Cows | | | | Large Heifers (15 to 24 months) | | | | Medium Heifers (7 to 14 months) | | | | Small Heifers (3 to 6 months) | | | | Calves (0 - 3 months) | | | | Bulls | | | |
| | | | Uncontrolled | | Controlled | | Uncontrolled | | Controlled | | Uncontrolled | | Controlled | | Uncontrolled | | Controlled | | Uncontrolled | | Controlled | | Uncontrolled | | Controlled | | Uncontrolled | | Controlled | |
| | | | <1000 milk cows | ≥1000 milk cows | EF1 | EF2 | <1000 milk cows | ≥1000 milk cows | EF1 | EF2 | <1000 milk cows | ≥1000 milk cows | EF1 | EF2 | <1000 milk cows | ≥1000 milk cows | EF1 | EF2 | <1000 milk cows | ≥1000 milk cows | EF1 | EF2 | <1000 milk cows | ≥1000 milk cows | EF1 | EF2 | <1000 milk cows | ≥1000 milk cows | EF1 | EF2 |
| **Milking Parlor** | **VOC** | Enteric Emissions in Milking Parlors | 0.43 | 0.41 | 0.37 | 0.37 | - | - | - | - | - | - | - | - | - | - | - | - | | - | - | - | | - | - | - | | - | - | - |
| | | Milking Parlor Floor | 0.04 | 0.03 | 0.03 | 0.03 | - | - | - | - | - | - | - | - | - | - | - | - | | - | - | - | | - | - | - | | - | - | - |
| | | **Total** | **0.47** | **0.44** | **0.40** | **0.40** | - | - | - | - | - | - | - | - | - | - | - | - | | - | - | - | | - | - | - | | - | - | - |
| | **NH3** | **Total** | **0.19** | **0.19** | **0.14** | **0.14** | - | - | - | - | - | - | - | - | - | - | - | - | | - | - | - | | - | - | - | | - | - | - |
| **Cow Housing** | **VOC** | Enteric Emissions in Cow Housing | 3.89 | 3.69 | 3.32 | 3.32 | 2.33 | 2.23 | 2.01 | 2.01 | 1.81 | 1.71 | 1.54 | 1.54 | 1.23 | 1.17 | 1.05 | 1.05 | 0.69 | 0.65 | 0.58 | 0.58 | 0.32 | 0.31 | 0.28 | 0.28 | 1.10 | 1.04 | 0.94 | 0.94 |
| | | Corrals/Pens | 10.00 | 6.60 | 5.08 | 5.08 | 5.40 | 3.59 | 2.76 | 2.76 | 4.20 | 2.76 | 2.12 | 2.12 | 2.85 | 1.88 | 1.45 | 1.45 | 1.60 | 1.04 | 0.80 | 0.80 | 0.75 | 0.50 | 0.39 | 0.39 | 2.55 | 1.67 | 1.29 | 1.29 |
| | | Bedding | 1.05 | 1.00 | 0.81 | 0.81 | 0.57 | 0.54 | 0.44 | 0.44 | 0.44 | 0.42 | 0.34 | 0.34 | 0.30 | 0.28 | 0.23 | 0.23 | 0.17 | 0.16 | 0.13 | 0.13 | 0.08 | 0.08 | 0.06 | 0.06 | 0.27 | 0.25 | 0.20 | 0.20 |
| | | Lanes | 0.84 | 0.80 | 0.65 | 0.65 | 0.45 | 0.44 | 0.35 | 0.35 | 0.35 | 0.33 | 0.27 | 0.27 | 0.24 | 0.23 | 0.18 | 0.18 | 0.13 | 0.13 | 0.10 | 0.10 | 0.06 | 0.06 | 0.05 | 0.05 | 0.21 | 0.20 | 0.16 | 0.16 |
| | | **Total** | **15.78** | **12.09** | **9.86** | **9.86** | **8.75** | **6.80** | **5.57** | **5.57** | **6.81** | **5.22** | **4.27** | **4.27** | **4.62** | **3.56** | **2.91** | **2.91** | **2.59** | **1.98** | **1.62** | **1.62** | **1.22** | **0.95** | **0.78** | **0.78** | **4.13** | **3.16** | **2.59** | **2.59** |
| | **NH3** | Enteric Emissions in Cow Housing | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | | Corrals/Pens | 41.90 | 41.90 | 15.08 | 15.08 | 21.20 | 21.20 | 7.63 | 7.63 | 11.00 | 11.00 | 3.96 | 3.96 | 7.90 | 7.90 | 2.84 | 2.84 | 6.00 | 6.00 | 2.16 | 2.16 | 1.80 | 1.80 | 0.65 | 0.65 | 15.30 | 15.30 | 5.51 | 5.51 |
| | | Bedding | 6.30 | 6.30 | 4.54 | 4.54 | 3.20 | 3.20 | 2.30 | 2.30 | 1.70 | 1.70 | 1.22 | 1.22 | 1.20 | 1.20 | 0.86 | 0.86 | 0.90 | 0.90 | 0.65 | 0.65 | 0.30 | 0.30 | 0.22 | 0.22 | 2.30 | 2.30 | 1.66 | 1.66 |
| | | Lanes | 5.10 | 5.10 | 3.67 | 3.67 | 2.60 | 2.60 | 1.87 | 1.87 | 1.30 | 1.30 | 0.94 | 0.94 | 1.00 | 1.00 | 0.72 | 0.72 | 0.70 | 0.70 | 0.50 | 0.50 | 0.20 | 0.20 | 0.14 | 0.14 | 1.90 | 1.90 | 1.37 | 1.37 |
| | | **Total** | **53.30** | **53.30** | **23.29** | **23.29** | **27.00** | **27.00** | **11.81** | **11.81** | **14.00** | **14.00** | **6.12** | **6.12** | **10.10** | **10.10** | **4.43** | **4.43** | **7.60** | **7.60** | **3.31** | **3.31** | **2.30** | **2.30** | **1.01** | **1.01** | **19.50** | **19.50** | **8.53** | **8.53** |
| **Liquid Manure Handling** | **VOC** | Lagoons/Storage Ponds | 1.52 | 1.30 | 1.17 | 1.17 | 0.82 | 0.71 | 0.64 | 0.64 | 0.64 | 0.54 | 0.49 | 0.49 | 0.43 | 0.37 | 0.33 | 0.33 | 0.24 | 0.21 | 0.19 | 0.19 | 0.11 | 0.10 | 0.09 | 0.09 | 0.40 | 0.33 | 0.30 | 0.30 |
| | | Liquid Manure Land Application | 1.64 | 1.40 | 1.26 | 1.26 | 0.89 | 0.76 | 0.69 | 0.69 | 0.69 | 0.58 | 0.53 | 0.53 | 0.47 | 0.40 | 0.36 | 0.36 | 0.26 | 0.22 | 0.20 | 0.20 | 0.12 | 0.11 | 0.10 | 0.10 | 0.42 | 0.35 | 0.32 | 0.32 |
| | | **Total** | **3.16** | **2.70** | **2.43** | **2.43** | **1.71** | **1.47** | **1.33** | **1.33** | **1.33** | **1.13** | **1.02** | **1.02** | **0.90** | **0.77** | **0.69** | **0.69** | **0.51** | **0.43** | **0.38** | **0.38** | **0.24** | **0.21** | **0.18** | **0.18** | **0.82** | **0.68** | **0.61** | **0.61** |
| | **NH3** | Lagoons/Storage Ponds | 8.20 | 8.20 | 1.18 | 1.18 | 4.20 | 4.20 | 0.60 | 0.60 | 2.20 | 2.20 | 0.32 | 0.32 | 1.50 | 1.50 | 0.22 | 0.22 | 1.20 | 1.20 | 0.17 | 0.17 | 0.35 | 0.35 | 0.05 | 0.05 | 3.00 | 3.00 | 0.43 | 0.43 |
| | | Liquid Manure Land Application | 8.90 | 8.90 | 6.41 | 6.41 | 4.50 | 4.50 | 3.24 | 3.24 | 2.30 | 2.30 | 1.66 | 1.66 | 1.70 | 1.70 | 1.22 | 1.22 | 1.30 | 1.30 | 0.94 | 0.94 | 0.37 | 0.37 | 0.27 | 0.27 | 3.23 | 3.23 | 2.33 | 2.33 |
| | | **Total** | **17.10** | **17.10** | **7.59** | **7.59** | **8.70** | **8.70** | **3.84** | **3.84** | **4.50** | **4.50** | **1.97** | **1.97** | **3.20** | **3.20** | **1.44** | **1.44** | **2.50** | **2.50** | **1.11** | **1.11** | **0.72** | **0.72** | **0.32** | **0.32** | **6.23** | **6.23** | **2.76** | **2.76** |
| **Solid Manure Handling** | **VOC** | Solid Manure Storage | 0.16 | 0.15 | 0.12 | 0.12 | 0.09 | 0.08 | 0.07 | 0.07 | 0.07 | 0.06 | 0.05 | 0.05 | 0.05 | 0.04 | 0.03 | 0.03 | 0.03 | 0.02 | 0.02 | 0.02 | 0.01 | 0.01 | 0.01 | 0.01 | 0.04 | 0.04 | 0.03 | 0.03 |
| | | Separated Solids Piles | 0.06 | 0.06 | 0.05 | 0.05 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.02 | 0.02 | 0.02 | 0.02 |
| | | Solid Manure Land Application | 0.39 | 0.33 | 0.30 | 0.30 | 0.21 | 0.18 | 0.16 | 0.16 | 0.16 | 0.14 | 0.12 | 0.12 | 0.11 | 0.09 | 0.08 | 0.08 | 0.06 | 0.05 | 0.05 | 0.05 | 0.03 | 0.03 | 0.02 | 0.02 | 0.10 | 0.08 | 0.07 | 0.07 |
| | | **Total** | **0.61** | **0.54** | **0.47** | **0.47** | **0.33** | **0.29** | **0.26** | **0.26** | **0.26** | **0.23** | **0.20** | **0.20** | **0.17** | **0.15** | **0.13** | **0.13** | **0.10** | **0.09** | **0.07** | **0.07** | **0.05** | **0.04** | **0.04** | **0.04** | **0.16** | **0.14** | **0.12** | **0.12** |
| | **NH3** | Solid Manure Storage | 0.95 | 0.95 | 0.95 | 0.95 | 0.48 | 0.48 | 0.48 | 0.48 | 0.25 | 0.25 | 0.25 | 0.25 | 0.18 | 0.18 | 0.18 | 0.18 | 0.13 | 0.13 | 0.13 | 0.13 | 0.04 | 0.04 | 0.04 | 0.04 | 0.35 | 0.35 | 0.35 | 0.35 |
| | | Separated Solids Piles | 0.38 | 0.38 | 0.38 | 0.38 | 0.19 | 0.19 | 0.19 | 0.19 | 0.10 | 0.10 | 0.10 | 0.10 | 0.07 | 0.07 | 0.07 | 0.07 | 0.05 | 0.05 | 0.05 | 0.05 | 0.02 | 0.02 | 0.02 | 0.02 | 0.14 | 0.14 | 0.14 | 0.14 |
| | | Solid Manure Land Application | 2.09 | 2.09 | 1.50 | 1.50 | 1.06 | 1.06 | 0.76 | 0.76 | 0.55 | 0.55 | 0.40 | 0.40 | 0.39 | 0.39 | 0.28 | 0.28 | 0.30 | 0.30 | 0.22 | 0.22 | 0.09 | 0.09 | 0.06 | 0.06 | 0.76 | 0.76 | 0.55 | 0.55 |
| | | **Total** | **3.42** | **3.42** | **2.83** | **2.83** | **1.73** | **1.73** | **1.43** | **1.43** | **0.90** | **0.90** | **0.75** | **0.75** | **0.64** | **0.64** | **0.53** | **0.53** | **0.48** | **0.48** | **0.40** | **0.40** | **0.15** | **0.15** | **0.12** | **0.12** | **1.25** | **1.25** | **1.04** | **1.04** |

| Silage and TMR (Total Mixed Ration) Emissions (µg/m^2-min) | | | | | |
|---|---|---|---|---|---|
| | | Silage Type | Uncontrolled | EF1 | EF2 |
| **Feed Storage and Handling** | **VOC** | Corn Silage | 34,681 | 21,155 | 21,155 |
| | | Alfalfa Silage | 17,458 | 10,649 | 10,649 |
| | | Wheat Silage | 43,844 | 26,745 | 26,745 |
| | | TMR | 13,056 | 10,575 | 10,575 |

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

| $PM_{10}$ Emission Factors (lb/hd-yr) | | |
|---|---|---|
| **Type of Cow** | **Dairy EF** | **Source** |
| Cows in Freestalls | 1.37 | Based on a Summer 2003 study by Texas A&M ASAE at a West Texas Dairy |
| Milk/Dry in Loafing Barns | 2.73 | SJVAPCD |
| Heifers/Bulls in Loafing Barns | 5.28 | SJVAPCD |
| Calves in Loafing Barns | 0.69 | SJVAPCD |
| Milk/Dry in Corrals | 5.46 | Based on a Summer 2003 study by Texas A&M ASAE at a West Texas Dairy |
| Support Stock (Heifers/Bulls) in Open Corrals | 10.55 | Based on a USDA/UC Davis report quantifying dairy and feedlot emissions in Tulare & Kern Counties (April '01) |
| Large Heifers in Open Corrals | 8.01 | SJVAPCD |
| Calf (under 3 mo.) open corrals | 1.37 | SJVAPCD |
| Calf on-ground hutches | 0.343 | SJVAPCD |
| Calf above-ground flushed | 0.069 | SJVAPCD |
| Calf above-ground scraped | 0.206 | SJVAPCD |

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

## PM10 Mitigation Measures and Control Efficiencies

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

# Pre-Project PM10 Mitigation Measures

**Pre-Project PM10 Mitigation Measures**

| | Housing Name(s) or #(s) | Type of Housing | Type of cow | Total # of cows in Each Housing Structure(s) | Maximum Design Capacity of Each Structure | # of Combined Housing Structures in row | Shaded Corrals | Downwind Shelterbelts | Upwind Shelterbelts | No exercise pens, non-manure bedding | No exercise pens, manure bedding | Fibrous layer | Bi-weekly scraping Corrals/Pens | Sprinkling Corrals/Pens | Feed Young Stock Near Dusk |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | milk | open corral | milk cows | 1420 | 1420 | 1 | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 2 | dry | open corral | dry cows | 225 | 225 | 1 | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 3 | support | open corral | support stock | 1300 | 1300 | 1 | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| | | | **Pre-Project Total # of Cows** | 2,945 | | | | | | | | | | | |

| Pre-Project PM10 Control Efficiencies and Emission Factors | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Housing Name(s) or #(s) | Type of Housing | Type of cow | Total # of cows in Each Housing Structure(s) | Maximum Design Capacity of Each Structure | Uncontrolled EF (lb/hd-yr) | Shaded Corrals | Downwind Shelterbelts | Upwind Shelterbelts | No exercise pens, non-manure bedding | No exercise pens, manure bedding | Fibrous layer | Bi-weekly scraping Corrals/Pens | Sprinkling Corrals/Pens | Feed Young Stock Near Dusk | Controlled EF (lb/hd-yr) |
| 1 | milk | open corral | milk cows | 1420 | 1420 | 5.460 | | | | | | | | | | 5.46 |
| 2 | dry | open corral | dry cows | 225 | 225 | 5.460 | | | | | | | | | | 5.46 |
| 3 | support | open corral | support stock | 1300 | 1300 | 10.550 | | | | | | | | | | 10.55 |
| | | | **Pre-Project Total # of Cows** | 2,945 | | | | | | | | | | | | |

# Post-Project PM10 Mitigation Measures

**Post-Project PM10 Mitigation Measures**

| | Housing Name(s) or #(s) | Type of Housing | Type of cow | Total # of cows in Each Housing Structure(s) | Maximum Design Capacity of Each Structure | # of Combined Housing Structures in row | Shaded Corrals | Downwind Shelterbelts | Upwind Shelterbelts | No exercise pens, non-manure bedding | No exercise pens, manure bedding | Fibrous layer | Bi-weekly scraping Corrals/Pens | Sprinkling Corrals/Pens | Feed Young Stock Near Dusk |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | milk | open corral | milk cows | 1420 | 1420 | 1 | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 2 | dry | open corral | dry cows | 225 | 225 | 1 | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 3 | support | open corral | support stock | 1300 | 1300 | 1 | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| | | | **Post-Project Total # of Cows** | 2,945 | | | | | | | | | | | |

**Post-Project PM10 Control Efficiencies and Emission Factors**

| | Housing Name(s) or #(s) | Type of Housing | Type of cow | Total # of cows in Each Housing Structure(s) | Maximum Design Capacity of Each Structure | Uncontrolled EF (lb/hd-yr) | Shaded Corrals | Downwind Shelterbelts | Upwind Shelterbelts | No exercise pens, non-manure bedding | No exercise pens, manure bedding | Fibrous layer | Bi-weekly scraping Corrals/Pens | Sprinkling Corrals/Pens | Feed Young Stock Near Dusk | Controlled EF (lb/hd-yr) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | milk | open corral | milk cows | 1420 | 1420 | 5.460 | | | | | | | | | | 5.46 |
| 2 | dry | open corral | dry cows | 225 | 225 | 5.460 | | | | | | | | | | 5.46 |
| 3 | support | open corral | support stock | 1300 | 1300 | 10.550 | | | | | | | | | | 10.55 |

## Pre-Project Potential to Emit - Cow Housing

| | Pre-Project Potential to Emit - Cow Housing | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Housing Name(s) or #(s) | Type of Cow | # of Cows | Controlled VOC EF (lb/hd-yr) | Controlled NH3 EF (lb/hd-yr) | Controlled PM10 EF (lb/hd-yr) | VOC (lb/day) | VOC (lb/yr) | NH3 (lb/day) | NH3 (lb/yr) | PM10 (lb/day) | PM10 (lb/yr) |
| 1 | milk | milk cows | 1,420 | 9.86 | 23.29 | 5.46 | 38.4 | 14,001 | 90.6 | 33,075 | 21.2 | 7,753 |
| 2 | dry | dry cows | 225 | 5.57 | 11.81 | 5.46 | 3.4 | 1,253 | 7.3 | 2,657 | 3.4 | 1,229 |
| 3 | support | support stock | 1,300 | 4.27 | 6.12 | 10.55 | 15.2 | 5,551 | 21.8 | 7,956 | 37.6 | 13,715 |
| | **Pre-Project Total # of Cows** | | **2,945** | | | | **57.0** | **20,805** | **119.7** | **43,688** | **62.2** | **22,697** |

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

| Pre-Project Totals | | | | | | |
|---|---|---|---|---|---|---|
| Total # of Cows | VOC (lb/day) | VOC (lb/yr) | NH3 (lb/day) | NH3 (lb/yr) | PM10 (lb/day) | PM10 (lb/yr) |
| **2,945** | **57.0** | **20,805** | **119.7** | **43,688** | **62.2** | **22,697** |

Calculations:

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

## Post-Project Potential to Emit - Cow Housing

| | Post-Project Potential to Emit - Cow Housing | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Housing Name(s) or #(s) | Type of Cow | # of Cows | Controlled VOC EF (lb/hd-yr) | Controlled NH3 EF (lb/hd-yr) | Controlled PM10 EF (lb/hd-yr) | VOC (lb/day) | VOC (lb/yr) | NH3 (lb/day) | NH3 (lb/yr) | PM10 (lb/day) | PM10 (lb/yr) |
| 1 | milk | milk cows | 1,420 | 9.86 | 23.29 | 5.46 | 38.4 | 14,001 | 90.6 | 33,075 | 21.2 | 7,753 |
| 2 | dry | dry cows | 225 | 5.57 | 11.81 | 5.46 | 3.4 | 1,253 | 7.3 | 2,657 | 3.4 | 1,229 |
| 3 | support | support stock | 1,300 | 4.27 | 6.12 | 10.55 | 15.2 | 5,551 | 21.8 | 7,956 | 37.6 | 13,715 |
| | **Post-Project # of Cows (non-expansion)** | | **2,945** | | | | **57.0** | **20,805** | **119.7** | **43,688** | **62.2** | **22,697** |

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

| Post-Project Totals | | | | | | |
|---|---|---|---|---|---|---|
| Total # of Cows | VOC (lb/day) | VOC (lb/yr) | NH3 (lb/day) | NH3 (lb/yr) | PM10 (lb/day) | PM10 (lb/yr) |
| **2,945** | **57.0** | **20,805** | **119.7** | **43,688** | **62.2** | **22,697** |

Calculations:

Annual PE 2 for each pollutant (lb/yr) = Controlled EF (lb/hd-yr) x # of cows (hd)
Daily PE2 for each pollutant (lb/day) = [Controlled EF (lb/hd-yr) x # of cows (hd)] ÷ 365 (day/yr)

## Pre-Project Worst Case BACT Calculations - Cow Housing

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

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

| | Housing Name(s) or #(s) | Type of Cow | Capacity per housing unit | Controlled VOC EF (lb/hd-yr) | Controlled NH3 EF (lb/hd-yr) | Controlled PM10 EF (lb/hd-yr) | VOC (lb/day) | VOC (lb/yr) | NH3 (lb/day) | NH3 (lb/yr) | PM10 (lb/day) | PM10 (lb/yr) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | milk | milk cows | 1420 | 9.86 | 23.29 | 10.55 | 38.4 | 14,001 | 90.6 | 33,075 | 41.0 | 14,981 |
| 2 | dry | dry cows | 225 | 9.86 | 23.29 | 10.55 | 6.1 | 2,219 | 14.4 | 5,241 | 6.5 | 2,374 |
| 3 | support | support stock | 1300 | 9.86 | 23.29 | 10.55 | 35.1 | 12,818 | 83.0 | 30,280 | 37.6 | 13,715 |
| | | | | | | | **79.6** | **29,038** | **188.0** | **68,596** | **85.1** | **31,070** |

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

**Pre-Project Totals**

| VOC (lb/day) | VOC (lb/yr) | NH3 (lb/day) | NH3 (lb/yr) | PM10 (lb/day) | PM10 (lb/yr) |
|---|---|---|---|---|---|
| **79.6** | **29,038** | **188.0** | **68,596** | **85.1** | **31,070** |

Calculations:

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

## Post-Project Worst Case BACT Calculations - Existing Cow Housing

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

**Post-Project Worst Case BACT Calculations - Existing Cow Housing**

| | Housing Name(s) or #(s) | Type of Cow | Capacity per housing unit | Controlled VOC EF (lb/hd-yr) | Controlled NH3 EF (lb/hd-yr) | Controlled PM10 EF (lb/hd-yr) | VOC (lb/day) | VOC (lb/yr) | NH3 (lb/day) | NH3 (lb/yr) | PM10 (lb/day) | PM10 (lb/yr) | VOC AIPE | NH3 AIPE | PM10 AIPE | BACT Triggered for VOC? | BACT Triggered for NH3? | BACT Triggered for PM10? |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | milk | milk cows | 1420 | 9.86 | 23.29 | 10.55 | 38.4 | 14,001 | 90.6 | 33,075 | 41.0 | 14,981 | 0.0 | 0.0 | 0.0 | No | No | No |
| 2 | dry | dry cows | 225 | 9.86 | 23.29 | 10.55 | 6.1 | 2,219 | 14.4 | 5,241 | 6.5 | 2,374 | 0.0 | 0.0 | 0.0 | No | No | No |
| 3 | support | support stock | 1300 | 9.86 | 23.29 | 10.55 | 35.1 | 12,818 | 83.0 | 30,280 | 37.6 | 13,715 | 0.0 | 0.0 | 0.0 | No | No | No |
| | | | | | | | **79.6** | **29,038** | **188.0** | **68,596** | **85.1** | **31,070** | | | | | | |

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

Calculations:

Annual PE 2 for each pollutant (lb/yr) = Controlled EF (lb/hd-yr) x # of cows (hd)
Daily PE2 for each pollutant (lb/day) = [Controlled EF (lb/hd-yr) x # of cows (hd)] ÷ 365 (day/yr)

**Post-Project Totals**

| VOC (lb/day) | VOC (lb/yr) | NH3 (lb/day) | NH3 (lb/yr) | PM10 (lb/day) | PM10 (lb/yr) |
|---|---|---|---|---|---|
| **79.6** | **29,038** | **188.0** | **68,596** | **85.1** | **31,070** |

Calculations:

Annual PE 2 for each pollutant (lb/yr) = Controlled EF (lb/hd-yr) x # of cows (hd)
Daily PE2 for each pollutant (lb/day) = [Controlled EF (lb/hd-yr) x # of cows (hd)] ÷ 365 (day/yr)

**BACT Applicability**

## Milking Parlor

**VOC Emissions**

| | PE2 (lb/day) | PE1 (lb/day) | EF2 | EF1 | AIPE (lb/day) |
|---|---|---|---|---|---|
| Milk Cows | 1.6 | 1.6 | 0.40 | 0.40 | 0.0 |
| | | | | **Total** | **0.0** |

**NH3 Emissions**

| | PE2 (lb/day) | PE1 (lb/day) | EF2 | EF1 | AIPE (lb/day) |
|---|---|---|---|---|---|
| Milk Cows | 0.5 | 0.5 | 0.14 | 0.14 | 0.0 |
| | | | | **Total** | **0.0** |

## Cow Housing

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

## Liquid Manure Handling

**VOC Emissions - Lagoon/Storage Pond(s)**

| | PE2 (lb/day) | PE1 (lb/day) | EF2 | EF1 | AIPE (lb/day) |
|---|---|---|---|---|---|
| Milk Cows | 4.6 | 4.6 | 1.17 | 1.17 | 0.0 |
| Dry Cows | 0.4 | 0.4 | 0.64 | 0.64 | 0.0 |
| Support Stock (Heifers, Calves, and Bulls) | 1.7 | 1.7 | 0.49 | 0.49 | 0.0 |
| Large Heifers | 0.0 | 0.0 | 0.49 | 0.49 | 0.0 |
| Medium Hefiers | 0.0 | 0.0 | 0.33 | 0.33 | 0.0 |
| Small Heifers | 0.0 | 0.0 | 0.19 | 0.19 | 0.0 |
| Calves | 0.0 | 0.0 | 0.09 | 0.09 | 0.0 |
| Bulls | 0.0 | 0.0 | 0.30 | 0.30 | 0.0 |
| | | | | **Total** | **0.0** |

**VOC Emissions - Land Application**

| | PE2 (lb/day) | PE1 (lb/day) | EF2 | EF1 | AIPE (lb/day) |
|---|---|---|---|---|---|
| Milk Cows | 4.9 | 4.9 | 1.26 | 1.26 | 0.0 |
| Dry Cows | 0.4 | 0.4 | 0.69 | 0.69 | 0.0 |
| Support Stock (Heifers, Calves, and Bulls) | 1.9 | 1.9 | 0.53 | 0.53 | 0.0 |
| Large Heifers | 0.0 | 0.0 | 0.53 | 0.53 | 0.0 |
| Medium Hefiers | 0.0 | 0.0 | 0.36 | 0.36 | 0.0 |
| Small Heifers | 0.0 | 0.0 | 0.20 | 0.20 | 0.0 |
| Calves | 0.0 | 0.0 | 0.10 | 0.10 | 0.0 |
| Bulls | 0.0 | 0.0 | 0.32 | 0.32 | 0.0 |
| | | | | **Total** | **0.0** |

**NH3 Emissions - Lagoon/Storage Pond(s)**

| | PE2 (lb/day) | PE1 (lb/day) | EF2 | EF1 | AIPE (lb/day) |
|---|---|---|---|---|---|
| Milk Cows | 4.6 | 4.6 | 1.18 | 1.18 | 0.0 |
| Dry Cows | 0.4 | 0.4 | 0.60 | 0.60 | 0.0 |
| Support Stock (Heifers, Calves, and Bulls) | 1.1 | 1.1 | 0.32 | 0.32 | 0.0 |
| Large Heifers | 0.0 | 0.0 | 0.32 | 0.32 | 0.0 |
| Medium Hefiers | 0.0 | 0.0 | 0.22 | 0.22 | 0.0 |
| Small Heifers | 0.0 | 0.0 | 0.17 | 0.17 | 0.0 |
| Calves | 0.0 | 0.0 | 0.05 | 0.05 | 0.0 |
| Bulls | 0.0 | 0.0 | 0.43 | 0.43 | 0.0 |
| | | | | **Total** | **0.0** |

**NH3 Emissions - Land Application**

| | PE2 (lb/day) | PE1 (lb/day) | EF2 | EF1 | AIPE (lb/day) |
|---|---|---|---|---|---|
| Milk Cows | 24.9 | 24.9 | 6.41 | 6.41 | 0.0 |
| Dry Cows | 2.0 | 2.0 | 3.24 | 3.24 | 0.0 |
| Support Stock (Heifers, Calves, and Bulls) | 5.9 | 5.9 | 1.66 | 1.66 | 0.0 |
| Large Heifers | 0.0 | 0.0 | 1.66 | 1.66 | 0.0 |
| Medium Hefiers | 0.0 | 0.0 | 1.22 | 1.22 | 0.0 |
| Small Heifers | 0.0 | 0.0 | 0.94 | 0.94 | 0.0 |
| Calves | 0.0 | 0.0 | 0.27 | 0.27 | 0.0 |
| Bulls | 0.0 | 0.0 | 2.33 | 2.33 | 0.0 |
| | | | | **Total** | **0.0** |

**H2S Emissions - Lagoon/Storage Pond(s)**

| | PE2 (lb/day) | PE1 (lb/day) | EF2 | EF1 | AIPE (lb/day) |
|---|---|---|---|---|---|
| Milk Cows | 0.5 | 0.5 | 0.12 | 0.12 | 0.0 |
| Dry Cows | 0.0 | 0.0 | 0.06 | 0.06 | 0.0 |
| Support Stock (Heifers, Calves, and Bulls) | 0.1 | 0.1 | 0.03 | 0.03 | 0.0 |
| Large Heifers | 0.0 | 0.0 | 0.03 | 0.03 | 0.0 |
| Medium Hefiers | 0.0 | 0.0 | 0.02 | 0.02 | 0.0 |
| Small Heifers | 0.0 | 0.0 | 0.02 | 0.02 | 0.0 |
| Calves | 0.0 | 0.0 | 0.01 | 0.01 | 0.0 |
| Bulls | 0.0 | 0.0 | 0.04 | 0.04 | 0.0 |
| | | | | **Total** | **0.0** |

## Solid Manure Handling

**VOC Emissions - Solid Manure Storage/Separated Solids Piles**

| | PE2 (lb/day) | PE1 (lb/day) | EF2 | EF1 | AIPE (lb/day) |
|---|---|---|---|---|---|
| Milk Cows | 0.7 | 0.7 | 0.18 | 0.18 | 0.0 |
| Dry Cows | 0.1 | 0.1 | 0.10 | 0.10 | 0.0 |
| Support Stock (Heifers, Calves, and Bulls) | 0.3 | 0.3 | 0.10 | 0.07 | 0.0 |
| Large Heifers | 0.0 | 0.0 | 0.07 | 0.07 | 0.0 |
| Medium Hefiers | 0.0 | 0.0 | 0.05 | 0.05 | 0.0 |
| Small Heifers | 0.0 | 0.0 | 0.03 | 0.03 | 0.0 |
| Calves | 0.0 | 0.0 | 0.01 | 0.01 | 0.0 |
| Bulls | 0.0 | 0.0 | 0.05 | 0.05 | 0.0 |
| | | | | **Total** | **0.0** |

**VOC Emissions - Land Application**

| | PE2 (lb/day) | PE1 (lb/day) | EF2 | EF1 | AIPE (lb/day) |
|---|---|---|---|---|---|
| Milk Cows | 1.2 | 1.2 | 0.30 | 0.30 | 0.0 |
| Dry Cows | 0.1 | 0.1 | 0.16 | 0.16 | 0.0 |
| Support Stock (Heifers, Calves, and Bulls) | 0.4 | 0.4 | 0.12 | 0.12 | 0.0 |
| Large Heifers | 0.0 | 0.0 | 0.12 | 0.12 | 0.0 |
| Medium Hefiers | 0.0 | 0.0 | 0.08 | 0.08 | 0.0 |
| Small Heifers | 0.0 | 0.0 | 0.05 | 0.05 | 0.0 |
| Calves | 0.0 | 0.0 | 0.02 | 0.02 | 0.0 |
| Bulls | 0.0 | 0.0 | 0.07 | 0.07 | 0.0 |
| | | | | **Total** | **0.0** |

**NH3 Emissions - Solid Manure Storage/Separated Solids Piles**

| | PE2 (lb/day) | PE1 (lb/day) | EF2 | EF1 | AIPE (lb/day) |
|---|---|---|---|---|---|
| Milk Cows | 5.2 | 5.2 | 1.33 | 1.33 | 0.0 |
| Dry Cows | 0.4 | 0.4 | 0.67 | 0.67 | 0.0 |
| Support Stock (Heifers, Calves, and Bulls) | 1.2 | 1.2 | 0.35 | 0.35 | 0.0 |
| Large Heifers | 0.0 | 0.0 | 0.35 | 0.35 | 0.0 |
| Medium Hefiers | 0.0 | 0.0 | 0.25 | 0.25 | 0.0 |
| Small Heifers | 0.0 | 0.0 | 0.18 | 0.18 | 0.0 |
| Calves | 0.0 | 0.0 | 0.06 | 0.06 | 0.0 |
| Bulls | 0.0 | 0.0 | 0.49 | 0.49 | 0.0 |
| | | | | **Total** | **0.0** |

**NH3 Emissions - Land Application**

| | PE2 (lb/day) | PE1 (lb/day) | EF2 | EF1 | AIPE (lb/day) |
|---|---|---|---|---|---|
| Milk Cows | 5.9 | 5.9 | 1.50 | 1.50 | 0.0 |
| Dry Cows | 0.5 | 0.5 | 0.76 | 0.76 | 0.0 |
| Support Stock (Heifers, Calves, and Bulls) | 1.4 | 1.4 | 0.40 | 0.40 | 0.0 |
| Large Heifers | 0.0 | 0.0 | 0.40 | 0.40 | 0.0 |
| Medium Hefiers | 0.0 | 0.0 | 0.28 | 0.28 | 0.0 |
| Small Heifers | 0.0 | 0.0 | 0.22 | 0.22 | 0.0 |
| Calves | 0.0 | 0.0 | 0.06 | 0.06 | 0.0 |
| Bulls | 0.0 | 0.0 | 0.55 | 0.55 | 0.0 |
| | | | | **Total** | **0.0** |

## Feed Storage and Handling

**VOC Emissions - Silage**

| | PE2 (lb/day) | PE1 (lb/day) | EF2 | EF1 | AIPE (lb/day) |
|---|---|---|---|---|---|
| Corn Silage | 9.4 | 9.4 | 21,155 | 21,155 | 0.0 |
| Alfalfa Silage | 0.0 | 0.0 | 10,649 | 10,649 | 0.0 |
| Wheat Silage | 11.9 | 11.9 | 26,745 | 26,745 | 0.0 |
| | | | | **Total** | 0.0 |

**VOC Emissions - TMR**

| | PE2 (lb/day) | PE1 (lb/day) | EF2 | EF1 | AIPE (lb/day) |
|---|---|---|---|---|---|
| TMR | 64.9 | 64.9 | 10,575 | 10,575 | 0.0 |
| | | | | **Total** | **0.0** |

# Pre-Project Potential to Emit (PE1)

**Pre-Project Herd Size**

| Herd | Flushed Freestalls | Scraped Freestalls | Flushed Corrals | Scraped Corrals | Total # of Animals |
|---|---|---|---|---|---|
| Milk Cows | 1,420 | 0 | 0 | 0 | 1,420 |
| Dry Cows | 225 | 0 | 0 | 0 | 225 |
| Support Stock (Heifers, Calves and Bulls) | 1,300 | 0 | 0 | 0 | 1,300 |
| Large Heifers | 0 | 0 | 0 | 0 | 0 |
| Medium Heifers | 0 | 0 | 0 | 0 | 0 |
| Small Heifers | 0 | 0 | 0 | 0 | 0 |
| Bulls | 0 | 0 | 0 | 0 | 0 |

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

**Silage Information**

| Feed Type | Maximum # Open Piles | Maximum Height (ft) | Maximum Width (ft) | Open Face Area (ft^2) |
|---|---|---|---|---|
| Corn | 1 | 20 | 100 | 1,514 |
| Alfalfa | 0 | 0 | 0 | |
| Wheat | 1 | 20 | 100 | 1,514 |

**Milking Parlor**

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

**Cow Housing**

| Cow | VOC | | NH3 | | PM10 | |
|---|---|---|---|---|---|---|
| | lb/day | lb/yr | lb/day | lb/yr | lb/day | lb/yr |
| **Total** | **57.0** | **20,805** | **119.7** | **43,688** | **62.2** | **22,697** |

**Liquid Manure Handling**

| Cow | VOC | | NH3 | | H2S* | |
|---|---|---|---|---|---|---|
| | lb/day | lb/yr | lb/day | lb/yr | lb/day | lb/yr |
| Milk Cows | 9.5 | 3,451 | 29.5 | 10,778 | 0.5 | 168 |
| Dry Cows | 0.8 | 299 | 2.4 | 864 | 0 | 14 |
| Support Stock (Heifers, Calves and Bulls) | 3.6 | 1,326 | 7.0 | 2,561 | 0.1 | 41 |
| Large Heifers | 0.0 | 0 | 0.0 | 0 | 0 | 0 |
| Medium Heifers | 0.0 | 0 | 0.0 | 0 | 0 | 0 |
| Small Heifers | 0.0 | 0 | 0.0 | 0 | 0 | 0 |
| Calves | 0.0 | 0 | 0.0 | 0 | 0 | 0 |
| Bulls | 0.0 | 0 | 0.0 | 0 | 0 | 0 |
| **Total** | **13.9** | **5,076** | **38.9** | **14,203** | **0.6** | **222** |

**Solid Manure Handling**

| Cow | VOC | | NH3 | |
|---|---|---|---|---|
| | lb/day | lb/yr | lb/day | lb/yr |
| Milk Cows | 1.8 | 667 | 11.0 | 4,019 |
| Dry Cows | 0.2 | 59 | 0.9 | 322 |
| Support Stock (Heifers, Calves and Bulls) | 0.7 | 260 | 2.7 | 975 |
| Large Heifers | 0.0 | 0 | 0.0 | 0 |
| Medium Heifers | 0.0 | 0 | 0.0 | 0 |
| Small Heifers | 0.0 | 0 | 0.0 | 0 |
| Calves | 0.0 | 0 | 0.0 | 0 |
| Bulls | 0.0 | 0 | 0.0 | 0 |
| **Total** | **2.7** | **986** | **14.6** | **5,315** |

**Feed Handling and Storage**

| | Daily PE (lb-VOC/day) | Annual PE (lb-VOC/yr) |
|---|---|---|
| Corn Emissions | 9.4 | 3,441 |
| Alfalfa Emissions | 0.0 | 0 |
| Wheat Emissions | 11.9 | 4,350 |
| TMR | 64.9 | 23,697 |
| **Total** | **86.2** | **31,488** |

Calculations for milking parlor:

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

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

Calculations for cow housing:

See detailed calculations under Cow Housing Calculations worksheet.

Calculations for liquid manure and solid manure handling:

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

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

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

Calculations for silage emissions:

Annual PE = (EF1) x (area $ft^2$) x (0.0929 $m^2/ft^2$) x (8,760 hr/yr) x (60 min/hr) x 2.20E-9 lb/µg

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

Calculation for TMR emissions:

Annual PE = (# cows) x (EF1) x (0.658 $m^2$) x (525,600 min/yr) x (2.20E-9 lb/µg)

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

Calves are not included in TMR calculation.

Notes

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

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

| Permit | NOx | SOx | PM10 | CO | VOC | NH3 | H2S |
|---|---|---|---|---|---|---|---|
| Milking Parlor | 0.0 | 0.0 | 0.0 | 0.0 | 1.6 | 0.5 | 0.0 |
| Cow Housing | 0.0 | 0.0 | 62.2 | 0.0 | 57.0 | 119.7 | 0.0 |
| Liquid Manure | 0.0 | 0.0 | 0.0 | 0.0 | 13.9 | 38.9 | 0.6 |
| Solid Manure | 0.0 | 0.0 | 0.0 | 0.0 | 2.7 | 14.6 | 0.0 |
| Feed Handling | 0.0 | 0.0 | 0.0 | 0.0 | 86.2 | 0.0 | 0.0 |
| **Total** | **0.0** | **0.0** | **62.2** | **0.0** | **161.4** | **173.7** | **0.6** |

**Major Source Emissions (lb/yr)**

| Permit | NOx | SOx | PM10 | CO | VOC |
|---|---|---|---|---|---|
| Milk Parlor | 0 | 0 | 0 | 0 | 0 |
| Cow Housing | 0 | 0 | 0 | 0 | 0 |
| Liquid Manure | 0 | 0 | 0 | 0 | 2,442 |
| Solid Manure | 0 | 0 | 0 | 0 | 0 |
| Feed Handling | 0 | 0 | 0 | 0 | 0 |
| **Total** | **0** | **0** | **0** | **0** | **2,442** |

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

| Permit | NOx | SOx | PM10 | CO | VOC | NH3 | H2S |
|---|---|---|---|---|---|---|---|
| Milking Parlor | 0 | 0 | 0 | 0 | 568 | 194 | 0 |
| Cow Housing | 0 | 0 | 22,697 | 0 | 20,805 | 43,688 | 0 |
| Liquid Manure | 0 | 0 | 0 | 0 | 5,076 | 14,203 | 222 |
| Solid Manure | 0 | 0 | 0 | 0 | 986 | 5,315 | 0 |
| Feed Handling | 0 | 0 | 0 | 0 | 31,488 | 0 | 0 |
| **Total** | **0** | **0** | **22,697** | **0** | **58,923** | **63,400** | **222** |

# Post-Project Potential to Emit (PE2)

| Post-Project Herd Size | | | | | |
|---|---|---|---|---|---|
| **Herd** | **Flushed Freestalls** | **Scraped Freestalls** | **Flushed Corrals** | **Scraped Corrals** | **Total # of Animals** |
| Milk Cows | 1,420 | 0 | 0 | 0 | 1,420 |
| Dry Cows | 225 | 0 | 0 | 0 | 225 |
| Support Stock (Heifers, Calves, and Bulls) | 1,300 | 0 | 0 | 0 | 1,300 |
| Large Heifers | 0 | 0 | 0 | 0 | 0 |
| Medium Heifers | 0 | 0 | 0 | 0 | 0 |
| Small Heifers | 0 | 0 | 0 | 0 | 0 |
| Bulls | 0 | 0 | 0 | 0 | 0 |

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

| Silage Information | | | | |
|---|---|---|---|---|
| Feed Type | Maximum # Open Piles | Maximum Height (ft) | Maximum Width (ft) | Open Face Area (ft^2) |
| Corn | 1 | 20 | 100 | 1,514 |
| Alfalfa | 0 | 0 | 0 | |
| Wheat | 1 | 20 | 100 | 1,514 |

| Milking Parlor | | | | |
|---|---|---|---|---|
| Cow | VOC | | NH3 | |
| Milk Cows | lb/day | lb/yr | lb/day | lb/yr |
| **Total** | **1.6** | **568** | **0.5** | **194** |

| Cow Housing | | | | | | |
|---|---|---|---|---|---|---|
| | VOC | | NH3 | | PM10 | |
| | lb/day | lb/yr | lb/day | lb/yr | lb/day | lb/yr |
| **Total** | **57.0** | **20,805** | **120** | **43,688** | **62** | **22,697** |

| Liquid Manure Handling | | | | | | |
|---|---|---|---|---|---|---|
| Cow | VOC | | NH3 | | H2S | |
| | lb/day | lb/yr | lb/day | lb/yr | lb/day | lb/yr |
| Milk Cows | 9.5 | 3,451 | 29.5 | 10,778 | 0.5 | 168 |
| Dry Cows | 0.8 | 299 | 2.4 | 864 | 0 | 14 |
| Support Stock (Heifers, Calves, and Bulls) | 3.6 | 1,326 | 7.0 | 2,561 | 0.1 | 41 |
| Large Heifers | 0.0 | 0 | 0.0 | 0 | 0 | 0 |
| Medium Heifers | 0.0 | 0 | 0.0 | 0 | 0 | 0 |
| Small Heifers | 0.0 | 0 | 0.0 | 0 | 0 | 0 |
| Calves | 0.0 | 0 | 0.0 | 0 | 0 | 0 |
| Bulls | 0.0 | 0 | 0.0 | 0 | 0 | 0 |
| **Total** | **13.9** | **5,076** | **38.9** | **14,203** | **0.6** | **222** |

| Solid Manure Handling | | | | |
|---|---|---|---|---|
| Cow | VOC | | NH3 | |
| | lb/day | lb/yr | lb/day | lb/yr |
| Milk Cows | 1.8 | 667 | 11.0 | 4,019 |
| Dry Cows | 0.2 | 59 | 0.9 | 322 |
| Support Stock (Heifers, Calves, and Bulls) | 0.7 | 260 | 2.7 | 975 |
| Large Heifers | 0.0 | 0 | 0.0 | 0 |
| Medium Heifers | 0.0 | 0 | 0.0 | 0 |
| Small Heifers | 0.0 | 0 | 0.0 | 0 |
| Calves | 0.0 | 0 | 0.0 | 0 |
| Bulls | 0.0 | 0 | 0.0 | 0 |
| **Total** | **2.7** | **986** | **14.6** | **5,315** |

| Feed Handling and Storage | | |
|---|---|---|
| | Daily PE (lb-VOC/day) | Annual PE (lb-VOC/yr) |
| Corn Emissions | 9.4 | 3,441 |
| Alfalfa Emissions | 0.0 | 0 |
| Wheat Emissions | 11.9 | 4,350 |
| TMR | 64.9 | 23,697 |
| **Total** | **86.2** | **31,488** |

Calculations for milking parlor:

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

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

Calculations for cow housing:

See detailed calculations under Cow Housing Calculations worksheet.

Calculations for liquid manure and solid manure handling:

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

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

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

Calculations for silage emissions:

Annual PE = (EF2) x (area $ft^2$) x (0.0929 $m^2/ft^2$) x (8,760 hr/yr) x (60 min/hr) x 2.20E-9 lb/µg

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

Calculation for TMR emissions:

Annual PE = (# cows) x (EF2) x (0.658 $m^2$) x (525,600 min/yr) x (2.20E-9 lb/µg)

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

Calves are not included in TMR calculation.

| Total Daily Post-Project Potential to Emit (lb/day) | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Permit** | **NOx** | **SOx** | **PM10** | **CO** | **VOC** | **NH3** | **H2S** |
| Milking Parlor | 0.0 | 0.0 | 0.0 | 0.0 | 1.6 | 0.5 | 0.0 |
| Cow Housing | 0.0 | 0.0 | 62.2 | 0.0 | 57.0 | 119.7 | 0.0 |
| Liquid Manure | 0.0 | 0.0 | 0.0 | 0.0 | 13.9 | 38.9 | 0.6 |
| Solid Manure | 0.0 | 0.0 | 0.0 | 0.0 | 2.7 | 14.6 | 0.0 |
| Feed Handling | 0.0 | 0.0 | 0.0 | 0.0 | 86.2 | 0.0 | 0.0 |
| **Total** | **0.0** | **0.0** | **62.2** | **0.0** | **161.4** | **173.7** | **0.6** |

| Major Source Emissions (lb/yr) | | | | | |
|---|---|---|---|---|---|
| **Permit** | **NOx** | **SOx** | **PM10** | **CO** | **VOC** |
| Milk Parlor | 0 | 0 | 0 | 0 | 0 |
| Cow Housing | 0 | 0 | 0 | 0 | 0 |
| Liquid Manure | 0 | 0 | 0 | 0 | 2,442 |
| Solid Manure | 0 | 0 | 0 | 0 | 0 |
| Feed Handling | 0 | 0 | 0 | 0 | 0 |
| **Total** | **0** | **0** | **0** | **0** | **2,442** |

| Total Annual Post-Project Potential to Emit (lb/yr) | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Permit** | **NOx** | **SOx** | **PM10** | **CO** | **VOC** | **NH3** | **H2S** |
| Milking Parlor | 0 | 0 | 0 | 0 | 568 | 194 | 0 |
| Cow Housing | 0 | 0 | 22,697 | 0 | 20,805 | 43,688 | 0 |
| Liquid Manure | 0 | 0 | 0 | 0 | 5,076 | 14,203 | 222 |
| Solid Manure | 0 | 0 | 0 | 0 | 986 | 5,315 | 0 |
| Feed Handling | 0 | 0 | 0 | 0 | 31,488 | 0 | 0 |
| **Total** | **0** | **0** | **22,697** | **0** | **58,923** | **63,400** | **222** |

# Increase in Emissions

| SSIPE (lb/yr) | | | | | | | |
|---|---|---|---|---|---|---|---|
| | NOx | SOx | PM10 | CO | VOC | NH3 | H2S |
| Milking Parlor | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cow Housing | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Liquid Manure | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Solid Manure | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Feed Handling | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Total** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |

| Total Daily Change in Emissions (lb/day) | | | | | | | |
|---|---|---|---|---|---|---|---|
| | NOx | SOx | PM10 | CO | VOC | NH3 | H2S |
| Milking Parlor | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Cow Housing | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Liquid Manure | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Solid Manure | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Feed Handling | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Total** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** |

| Total Annual Change in Non-Fugitive Emissions (Major Source Emissions) (lb/yr) | | | | | | | |
|---|---|---|---|---|---|---|---|
| | NOx | SOx | PM10 | CO | VOC | NH3 | H2S |
| Milking Parlor | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cow Housing | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Liquid Manure | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Solid Manure | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Feed Handling | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Total** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |

Rev. January 6, 2020

# Pre-Project Facility Information

1. Does this facility house Holstein or Jersey cows? Holstein
   Most facilities house Holstein cows unless explicitly stated on the PTO or application.
2. Does the facility have an anaerobic treatment lagoon? no
3. Does the facility land apply liquid manure? yes
   Answering "yes" assumes worst case.
4. Does the facility land apply solid manure? yes
   Answering "yes" assumes worst case.
5. Is any scraped manure sent to a lagoon/storage pond? yes
   Answering "yes" assumes worst case.

**Pre-Project Herd Size**

| Herd | Flushed Freestalls | Scraped Freestalls | Flushed Corrals | Scraped Corrals | Total # of Animals |
|---|---|---|---|---|---|
| Milk Cows | 1,000 | | | | 1,000 |
| Dry Cows | 200 | | | | 200 |
| Support Stock (Heifers, Calves, and Bulls) | 1,060 | | | | 1,060 |
| Large Heifers | | | | | 0 |
| Medium Heifers | | | | | 0 |
| Small Heifers | | | | | 0 |
| Bulls | | | | | 0 |

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

**Total Herd Summary**

| | |
|---|---|
| Total Milk Cows | 1,000 |
| Total Mature Cows | 1,200 |
| Support Stock (Heifers, Calves, and Bulls) | 1,060 |
| Total Calves | 0 |
| Total Dairy Head | 2,260 |

**Pre-Project Silage Information**

| Feed Type | Max # Open Piles | Max Height (ft) | Max Width (ft) |
|---|---|---|---|
| Corn | 1 | 15 | 100 |
| Alfalfa | | | |
| Wheat | 1 | 15 | 100 |

# Post-Project Facility Information

1. Does this facility house Holstein or Jersey cows? Holstein
   Most facilities house Holstein cows unless explicitly stated on the PTO or application.
2. Does the facility have an anaerobic treatment lagoon? no
3. Does the facility land apply liquid manure? yes
   Answering "yes" assumes worst case.
4. Does the facility land apply solid manure? yes
   Answering "yes" assumes worst case.
5. Is any scraped manure sent to a lagoon/storage pond? yes
   Answering "yes" assumes worst case.
6. Does this project result in an increase or relocation of uncovered surface area for any lagoon/storage pond? no

**Post-Project Herd Size**

| Herd | Flushed Freestalls | Scraped Freestalls | Flushed Corrals | Scraped Corrals | Total # of Animals |
|---|---|---|---|---|---|
| Milk Cows | 1,000 | | | | 1,000 |
| Dry Cows | 200 | | | | 200 |
| Support Stock (Heifers, Calves, and Bulls) | 1,060 | | | | 1,060 |
| Large Heifers | | | | | 0 |
| Medium Heifers | | | | | 0 |
| Small Heifers | | | | | 0 |
| Bulls | | | | | 0 |

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

**Total Herd Summary**

| | |
|---|---|
| Total Milk Cows | 1,000 |
| Total Mature Cows | 1,200 |
| Support Stock (Heifers, Calves, and Bulls) | 1,060 |
| Total Calves | 0 |
| Total Dairy Head | 2,260 |

**Post-Project Silage Information**

| Feed Type | Max # Open Piles | Max Height (ft) | Max Width (ft) |
|---|---|---|---|
| Corn | 1 | 15 | 100 |
| Alfalfa | | | |
| Wheat | 1 | 15 | 100 |

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

# VOC Mitigation Measures and Control Efficiencies

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

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

| | | | | |
|---|---|---|---|---|
| ☑ | ☑ | For a large dairy (1,000 milk cows or larger) or a heifer/calf ranch - Remove manure that is not dry from individual cow freestall beds or rake, harrow, scrape, or grade freestall bedding at least once every 7 days. | 10% | 10% |
| ☐ | ☐ | (D) For a medium dairy only (500 to 999 milk cows) - Remove manure that is not dry from individual cow freestall beds or rake, harrow, scrape, or grade freestall bedding at least once every 14 days. | 0% | 0% |
| | | **Total Control Efficiency** | 19.00% | 19.00% |
| | | **Lanes Mitigations** | | |
| ☑ | ☑ | Feed according to NRC guidelines | 10% | 10% |
| ☑ | ☑ | Pave feedlanes, where present, for a width of at least 8 feet along the corral side of the feedlane fence for milk and dry cows and at least 6 feet along the corral side of the feedlane for heifers. Note: No control efficiency at this time. | 0% | 0% |
| ☑ | ☑ | Dairies: Flush, scrape, or vacuum freestall flush lanes immediately prior to or after, or during each milking; or flush or scrape freestall flush lanes at least 3 times per day. Heifer/Calf Ranches: Vacuum, scrape, or flush freestalls at least once every seven days. | 10% | 10% |
| ☐ | ☐ | (D) Have no animals in exercise pens or corrals at any time. | 0% | 0% |
| | | **Total Control Efficiency** | 19.00% | 19.00% |

| **Liquid Manure Handling** | | | | |
|---|---|---|---|---|
| **Measure Proposed?** | | **Mitigation Measure(s) per Emissions Point** | **VOC Control Efficiency (%)** | |
| Pre-Project | Post-Project | | Pre-Project | Post-Project |
| | | **Lagoons/Storage Ponds Mitigations** | | |
| ☑ | ☑ | Feed according to NRC guidelines | 10% | 10% |
| ☐ | ☐ | Use phototropic lagoon | 0% | 0% |
| ☐ | ☐ | Use an anaerobic treatment lagoon designed according to NRCS Guideline No. 359, or aerobic treatment lagoon, or mechanically aerated lagoon, or covered lagoon digester vented to a control device with minimum 95% control | 0% | 0% |
| ☐ | ☐ | Remove solids from the waste system with a solid separator system, prior to the waste entering the lagoon. Note: If selected for dairies > 999 milk cows, control efficiency is already included in EF. | 0% | 0% |
| ☑ | ☑ | Maintain lagoon pH between 6.5 and 7.5 | 10% | 10% |
| | | **Total Control Efficiency** | 19.00% | 19.00% |
| | | **Liquid Manure Land Application Mitigations** | | |
| ☑ | ☑ | Feed according to NRC guidelines | 10% | 10% |
| ☐ | ☐ | Only apply liquid manure that has been treated with an anaerobic or aerobic treatment lagoon, aerobic lagoon, or digester system | 0% | 0% |
| ☑ | ☑ | Allow liquid manure to stand in the fields for no more than 24 hours after irrigation. Note: If selected for dairies > 999 milk cows, control efficiency is already included in EF. | 0% | 0% |
| ☐ | ☐ | Apply liquid/slurry manure via injection with drag hose or similar apparatus | 0% | 0% |
| | | **Total Control Efficiency** | 10.00% | 10.00% |

| **Solid Manure Handling** | | | | |
|---|---|---|---|---|
| **Measure Proposed?** | | **Mitigation Measure(s) per Emissions Point** | **VOC Control Efficiency (%)** | |
| Pre-Project | Post-Project | | Pre-Project | Post-Project |
| | | **Solid Manure Storage Mitigations** | | |
| ☑ | ☑ | Feed according to NRC guidelines | 10% | 10% |
| ☑ | ☑ | LARGE CAFO ONLY: Within 72 hours of removal from housing, either a) remove dry manure from the facility, or b) cover dry manure outside the housing with a weatherproof covering from October through May, except for times when wind events remove the covering, not to exceed 24 hours per event. | 10% | 10% |
| | | **Total Control Efficiency** | 19.00% | 19.00% |
| | | **Separated Solids Piles Mitigations** | | |
| ☐ | ☐ | Feed according to NRC guidelines | 0% | 0% |
| ☐ | ☐ | LARGE CAFO ONLY: Within 72 hours of removal from the drying process, either a) remove separated solids from the facility, or b) cover separated solids outside the housing with a weatherproof covering from October through May, except for times when wind events remove the covering, not to exceed 24 hours per event. | 0% | 0% |
| | | **Total Control Efficiency** | 0.00% | 0.00% |
| | | **Solid Manure Land Application Mitigations** | | |
| ☑ | ☑ | Feed according to NRC guidelines | 10% | 10% |
| ☑ | ☑ | Incorporate all solid manure within 72 hours of land application. Note: If selected for dairies > 999 milk cows, control efficiency is already included in EF. Note: No additional control given for rapid manure incorporation (e.g. BACT requirement). | 0% | 0% |
| ☐ | ☐ | Only apply solid manure that has been treated with an anaerobic treatment lagoon, aerobic lagoon or digester system. | 0% | 0% |
| ☐ | ☐ | Apply no solid manure with a moisture content of more than 50% | 0% | 0% |
| | | **Total Control Efficiency** | 10.00% | 10.00% |

| **Silage and TMR** | | | | |
|---|---|---|---|---|
| **Measure Proposed?** | | **Mitigation Measure(s) per Emissions Point** | **VOC Control Efficiency (%)** | |
| Pre-Project | Post-Project | | Pre-Project | Post-Project |
| | | **Corn/Alfalfa/Wheat Silage Mitigations** | | |
| | | 1. Utilize a sealed feed storage system (e.g. Ag-Bag) for bagged silage, or | | |

| | | | | |
|---|---|---|---|---|
| ☑ | ☑ | 2. Cover the surface of silage piles, except for the area where feed is being removed from the pile, with a plastic tarp that is at least 5 mils thick (0.005 inches), multiple plastic tarps with a cumulative thickness of at least 5 mils (0.005 inches), or an oxygen barrier film covered with a UV resistant material within 72 hours of last delivery of material to the pile, and implement one of the following:<br><br>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,<br><br>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,<br><br>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.<br><br>For dairies - implement two of the following:<br>For heifer/calf ranches - implement one of the following:<br><br>Manage Exposed Silage. a) manage silage piles such that only one silage pile has an uncovered face and the uncovered face has a total exposed surface area of less than 2,150 sq. ft., or b) manage multiple uncovered silage piles such that the total exposed surface area of all silage piles is less than 4,300 sq ft.<br><br>Maintain Silage Working Face. a) use a shaver/facer to remove silage from the silage pile, or b) maintain a smooth vertical surface on the working face of the silage pile<br><br>Silage Additive: a) inoculate silage with homolactic acid bacteria in accordance with manufacturer recommendations to achieve a concentration of at least 100,000 colony forming units per gram of wet forage or apply proprionic acid, benzoic acid, sorbic acid, sodium benzoate, or potassium sorbate at a rate specified by the manufacturer to reduce yeast counts when forming silage pile; or b) apply other additives at specified rates that have been demonstrated to reduce alcohol concentrations in silage and/or VOC emissions from silage and have been approved by the District and EPA. | 39.0% | 39.0% |
| | | **Total Control Efficiency*** | 39.00% | 39.00% |

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

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

# Ammonia Mitigation Measures and Control Efficiencies

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

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

| Liquid Manure Handling | | | | |
|---|---|---|---|---|
| Measure Proposed? | | Mitigation Measure(s) per Emissions Point | NH3 Control Efficiency (%) | |
| Pre-Project | Post-Project | | Pre-Project | Post-Project |
| | | **Lagoons/Storage Ponds Mitigations** | | |
| ☑ | ☑ | Feed according to NRC guidelines | 28% | 28% |
| ☐ | ☐ | Use phototropic lagoon **OR** Remove solids from the waste system with a solid separator system, prior to the waste entering the lagoon. | 0% | 0% |
| | | **Total Control Efficiency** | 28.0% | 28.0% |
| | | **Liquid Manure Land Application Mitigations** | | |
| ☑ | ☑ | Feed according to NRC guidelines | 28% | 28% |
| ☐ | ☐ | Only apply liquid manure that has been treated with an anaerobic treatment lagoon | 0% | 0% |
| | | **Total Control Efficiency** | 28.00% | 28.00% |

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

# Dairy Emission Factors

| lb/hd-yr Dairy Emissions Factors for Holstein Cows | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Milk Cows | | | | Dry Cows | | | | Large Heifers (15 to 24 months) | | | | Medium Heifers (7 to 14 months) | | | | Small Heifers (3 to 6 months) | | | | Calves (0 - 3 months) | | | | Bulls | | | |
| | | | Uncontrolled | | Controlled | | Uncontrolled | | Controlled | | Uncontrolled | | Controlled | | Uncontrolled | | Controlled | | Uncontrolled | | Controlled | | Uncontrolled | | Controlled | | Uncontrolled | | Controlled | |
| | | | <1000 milk cows | ≥1000 milk cows | EF1 | EF2 | <1000 milk cows | ≥1000 milk cows | EF1 | EF2 | <1000 milk cows | ≥1000 milk cows | EF1 | EF2 | <1000 milk cows | ≥1000 milk cows | EF1 | EF2 | <1000 milk cows | ≥1000 milk cows | EF1 | EF2 | <1000 milk cows | ≥1000 milk cows | EF1 | EF2 | <1000 milk cows | ≥1000 milk cows | EF1 | EF2 |
| **Milking Parlor** | **VOC** | Enteric Emissions in Milking Parlors | 0.43 | 0.41 | 0.37 | 0.37 | - | - | - | - | - | - | - | - | - | - | - | - | | - | - | - | | - | - | - | | - | - | - |
| | | Milking Parlor Floor | 0.04 | 0.03 | 0.03 | 0.03 | - | - | - | - | - | - | - | - | - | - | - | - | | - | - | - | | - | - | - | | - | - | - |
| | | **Total** | **0.47** | **0.44** | **0.40** | **0.40** | - | - | - | - | - | - | - | - | - | - | - | - | | - | - | - | | - | - | - | | - | - | - |
| | **NH3** | **Total** | **0.19** | **0.19** | **0.14** | **0.14** | - | - | - | - | - | - | - | - | - | - | - | - | | - | - | - | | - | - | - | | - | - | - |
| **Cow Housing** | **VOC** | Enteric Emissions in Cow Housing | 3.89 | 3.69 | 3.32 | 3.32 | 2.33 | 2.23 | 2.01 | 2.01 | 1.81 | 1.71 | 1.54 | 1.54 | 1.23 | 1.17 | 1.05 | 1.05 | 0.69 | 0.65 | 0.58 | 0.58 | 0.32 | 0.31 | 0.28 | 0.28 | 1.10 | 1.04 | 0.94 | 0.94 |
| | | Corrals/Pens | 10.00 | 6.60 | 5.35 | 5.35 | 5.40 | 3.59 | 2.91 | 2.91 | 4.20 | 2.76 | 2.23 | 2.23 | 2.85 | 1.88 | 1.52 | 1.52 | 1.60 | 1.04 | 0.85 | 0.85 | 0.75 | 0.50 | 0.41 | 0.41 | 2.55 | 1.67 | 1.35 | 1.35 |
| | | Bedding | 1.05 | 1.00 | 0.81 | 0.81 | 0.57 | 0.54 | 0.44 | 0.44 | 0.44 | 0.42 | 0.34 | 0.34 | 0.30 | 0.28 | 0.23 | 0.23 | 0.17 | 0.16 | 0.13 | 0.13 | 0.08 | 0.08 | 0.06 | 0.06 | 0.27 | 0.25 | 0.20 | 0.20 |
| | | Lanes | 0.84 | 0.80 | 0.65 | 0.65 | 0.45 | 0.44 | 0.35 | 0.35 | 0.35 | 0.33 | 0.27 | 0.27 | 0.24 | 0.23 | 0.18 | 0.18 | 0.13 | 0.13 | 0.10 | 0.10 | 0.06 | 0.06 | 0.05 | 0.05 | 0.21 | 0.20 | 0.16 | 0.16 |
| | | **Total** | **15.78** | **12.09** | **10.13** | **10.13** | **8.75** | **6.80** | **5.71** | **5.71** | **6.81** | **5.22** | **4.38** | **4.38** | **4.62** | **3.56** | **2.99** | **2.99** | **2.59** | **1.98** | **1.66** | **1.66** | **1.22** | **0.95** | **0.80** | **0.80** | **4.13** | **3.16** | **2.65** | **2.65** |
| | **NH3** | Enteric Emissions in Cow Housing | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | | Corrals/Pens | 41.90 | 41.90 | 15.08 | 15.08 | 21.20 | 21.20 | 7.63 | 7.63 | 11.00 | 11.00 | 3.96 | 3.96 | 7.90 | 7.90 | 2.84 | 2.84 | 6.00 | 6.00 | 2.16 | 2.16 | 1.80 | 1.80 | 0.65 | 0.65 | 15.30 | 15.30 | 5.51 | 5.51 |
| | | Bedding | 6.30 | 6.30 | 2.37 | 2.37 | 3.20 | 3.20 | 1.20 | 1.20 | 1.70 | 1.70 | 0.64 | 0.64 | 1.20 | 1.20 | 0.45 | 0.45 | 0.90 | 0.90 | 0.34 | 0.34 | 0.30 | 0.30 | 0.11 | 0.11 | 2.30 | 2.30 | 0.87 | 0.87 |
| | | Lanes | 5.10 | 5.10 | 3.67 | 3.67 | 2.60 | 2.60 | 1.87 | 1.87 | 1.30 | 1.30 | 0.94 | 0.94 | 1.00 | 1.00 | 0.72 | 0.72 | 0.70 | 0.70 | 0.50 | 0.50 | 0.20 | 0.20 | 0.14 | 0.14 | 1.90 | 1.90 | 1.37 | 1.37 |
| | | **Total** | **53.30** | **53.30** | **21.13** | **21.13** | **27.00** | **27.00** | **10.71** | **10.71** | **14.00** | **14.00** | **5.54** | **5.54** | **10.10** | **10.10** | **4.02** | **4.02** | **7.60** | **7.60** | **3.00** | **3.00** | **2.30** | **2.30** | **0.90** | **0.90** | **19.50** | **19.50** | **7.74** | **7.74** |
| **Liquid Manure Handling** | **VOC** | Lagoons/Storage Ponds | 1.52 | 1.30 | 1.05 | 1.05 | 0.82 | 0.71 | 0.57 | 0.57 | 0.64 | 0.54 | 0.44 | 0.44 | 0.43 | 0.37 | 0.30 | 0.30 | 0.24 | 0.21 | 0.17 | 0.17 | 0.11 | 0.10 | 0.08 | 0.08 | 0.40 | 0.33 | 0.27 | 0.27 |
| | | Liquid Manure Land Application | 1.64 | 1.40 | 1.26 | 1.26 | 0.89 | 0.76 | 0.69 | 0.69 | 0.69 | 0.58 | 0.53 | 0.53 | 0.47 | 0.40 | 0.36 | 0.36 | 0.26 | 0.22 | 0.20 | 0.20 | 0.12 | 0.11 | 0.10 | 0.10 | 0.42 | 0.35 | 0.32 | 0.32 |
| | | **Total** | **3.16** | **2.70** | **2.31** | **2.31** | **1.71** | **1.47** | **1.26** | **1.26** | **1.33** | **1.13** | **0.97** | **0.97** | **0.90** | **0.77** | **0.66** | **0.66** | **0.51** | **0.43** | **0.37** | **0.37** | **0.24** | **0.21** | **0.18** | **0.18** | **0.82** | **0.68** | **0.58** | **0.58** |
| | **NH3** | Lagoons/Storage Ponds | 8.20 | 8.20 | 5.90 | 5.90 | 4.20 | 4.20 | 3.02 | 3.02 | 2.20 | 2.20 | 1.58 | 1.58 | 1.50 | 1.50 | 1.08 | 1.08 | 1.20 | 1.20 | 0.86 | 0.86 | 0.35 | 0.35 | 0.25 | 0.25 | 3.00 | 3.00 | 2.16 | 2.16 |
| | | Liquid Manure Land Application | 8.90 | 8.90 | 6.41 | 6.41 | 4.50 | 4.50 | 3.24 | 3.24 | 2.30 | 2.30 | 1.66 | 1.66 | 1.70 | 1.70 | 1.22 | 1.22 | 1.30 | 1.30 | 0.94 | 0.94 | 0.37 | 0.37 | 0.27 | 0.27 | 3.23 | 3.23 | 2.33 | 2.33 |
| | | **Total** | **17.10** | **17.10** | **12.31** | **12.31** | **8.70** | **8.70** | **6.26** | **6.26** | **4.50** | **4.50** | **3.24** | **3.24** | **3.20** | **3.20** | **2.30** | **2.30** | **2.50** | **2.50** | **1.80** | **1.80** | **0.72** | **0.72** | **0.52** | **0.52** | **6.23** | **6.23** | **4.49** | **4.49** |
| **Solid Manure Handling** | **VOC** | Solid Manure Storage | 0.16 | 0.15 | 0.12 | 0.12 | 0.09 | 0.08 | 0.07 | 0.07 | 0.07 | 0.06 | 0.05 | 0.05 | 0.05 | 0.04 | 0.03 | 0.03 | 0.03 | 0.02 | 0.02 | 0.02 | 0.01 | 0.01 | 0.01 | 0.01 | 0.04 | 0.04 | 0.03 | 0.03 |
| | | Separated Solids Piles | 0.06 | 0.06 | 0.06 | 0.06 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.02 | 0.02 | 0.02 | 0.02 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.02 | 0.02 | 0.02 | 0.02 |
| | | Solid Manure Land Application | 0.39 | 0.33 | 0.30 | 0.30 | 0.21 | 0.18 | 0.16 | 0.16 | 0.16 | 0.14 | 0.12 | 0.12 | 0.11 | 0.09 | 0.08 | 0.08 | 0.06 | 0.05 | 0.05 | 0.05 | 0.03 | 0.03 | 0.02 | 0.02 | 0.10 | 0.08 | 0.07 | 0.07 |
| | | **Total** | **0.61** | **0.54** | **0.48** | **0.48** | **0.33** | **0.29** | **0.26** | **0.26** | **0.26** | **0.23** | **0.20** | **0.20** | **0.17** | **0.15** | **0.14** | **0.14** | **0.10** | **0.09** | **0.08** | **0.08** | **0.05** | **0.04** | **0.04** | **0.04** | **0.16** | **0.14** | **0.12** | **0.12** |
| | **NH3** | Solid Manure Storage | 0.95 | 0.95 | 0.95 | 0.95 | 0.48 | 0.48 | 0.48 | 0.48 | 0.25 | 0.25 | 0.25 | 0.25 | 0.18 | 0.18 | 0.18 | 0.18 | 0.13 | 0.13 | 0.13 | 0.13 | 0.04 | 0.04 | 0.04 | 0.04 | 0.35 | 0.35 | 0.35 | 0.35 |
| | | Separated Solids Piles | 0.38 | 0.38 | 0.38 | 0.38 | 0.19 | 0.19 | 0.19 | 0.19 | 0.10 | 0.10 | 0.10 | 0.10 | 0.07 | 0.07 | 0.07 | 0.07 | 0.05 | 0.05 | 0.05 | 0.05 | 0.02 | 0.02 | 0.02 | 0.02 | 0.14 | 0.14 | 0.14 | 0.14 |
| | | Solid Manure Land Application | 2.09 | 2.09 | 1.50 | 1.50 | 1.06 | 1.06 | 0.76 | 0.76 | 0.55 | 0.55 | 0.40 | 0.40 | 0.39 | 0.39 | 0.28 | 0.28 | 0.30 | 0.30 | 0.22 | 0.22 | 0.09 | 0.09 | 0.06 | 0.06 | 0.76 | 0.76 | 0.55 | 0.55 |
| | | **Total** | **3.42** | **3.42** | **2.83** | **2.83** | **1.73** | **1.73** | **1.43** | **1.43** | **0.90** | **0.90** | **0.75** | **0.75** | **0.64** | **0.64** | **0.53** | **0.53** | **0.48** | **0.48** | **0.40** | **0.40** | **0.15** | **0.15** | **0.12** | **0.12** | **1.25** | **1.25** | **1.04** | **1.04** |

| Silage and TMR (Total Mixed Ration) Emissions (µg/m^2-min) | | | | | |
|---|---|---|---|---|---|
| | | Silage Type | Uncontrolled | EF1 | EF2 |
| **Feed Storage and Handling** | **VOC** | Corn Silage | 34,681 | 21,155 | 21,155 |
| | | Alfalfa Silage | 17,458 | 10,649 | 10,649 |
| | | Wheat Silage | 43,844 | 26,745 | 26,745 |
| | | TMR | 13,056 | 10,575 | 10,575 |

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

| $PM_{10}$ Emission Factors (lb/hd-yr) | | |
|---|---|---|
| **Type of Cow** | **Dairy EF** | **Source** |
| Cows in Freestalls | 1.37 | Based on a Summer 2003 study by Texas A&M ASAE at a West Texas Dairy |
| Milk/Dry in Loafing Barns | 2.73 | SJVAPCD |
| Heifers/Bulls in Loafing Barns | 5.28 | SJVAPCD |
| Calves in Loafing Barns | 0.69 | SJVAPCD |
| Milk/Dry in Corrals | 5.46 | Based on a Summer 2003 study by Texas A&M ASAE at a West Texas Dairy |
| Support Stock (Heifers/Bulls) in Open Corrals | 10.55 | Based on a USDA/UC Davis report quantifying dairy and feedlot emissions in Tulare & Kern Counties (April '01) |
| Large Heifers in Open Corrals | 8.01 | SJVAPCD |
| Calf (under 3 mo.) open corrals | 1.37 | SJVAPCD |
| Calf on-ground hutches | 0.343 | SJVAPCD |
| Calf above-ground flushed | 0.069 | SJVAPCD |
| Calf above-ground scraped | 0.206 | SJVAPCD |

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

## PM10 Mitigation Measures and Control Efficiencies

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

# Pre-Project PM10 Mitigation Measures

**Pre-Project PM10 Mitigation Measures**

| | Housing Name(s) or #(s) | Type of Housing | Type of cow | Total # of cows in Each Housing Structure(s) | Maximum Design Capacity of Each Structure | # of Combined Housing Structures in row | Shaded Corrals | Downwind Shelterbelts | Upwind Shelterbelts | No exercise pens, non-manure bedding | No exercise pens, manure bedding | Fibrous layer | Bi-weekly scraping Corrals/Pens | Sprinkling Corrals/Pens | Feed Young Stock Near Dusk |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | milk | open corral | milk cows | 1000 | 1000 | 1 | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 2 | dry | open corral | dry cows | 200 | 200 | 1 | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 3 | support | open corral | support stock | 1060 | 1060 | 1 | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| | | | **Pre-Project Total # of Cows** | 2,260 | | | | | | | | | | | |

| Pre-Project PM10 Control Efficiencies and Emission Factors | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Housing Name(s) or #(s) | Type of Housing | Type of cow | Total # of cows in Each Housing Structure(s) | Maximum Design Capacity of Each Structure | Uncontrolled EF (lb/hd-yr) | Shaded Corrals | Downwind Shelterbelts | Upwind Shelterbelts | No exercise pens, non-manure bedding | No exercise pens, manure bedding | Fibrous layer | Bi-weekly scraping Corrals/Pens | Sprinkling Corrals/Pens | Feed Young Stock Near Dusk | Controlled EF (lb/hd-yr) |
| 1 | milk | open corral | milk cows | 1000 | 1000 | 5.460 | | | | | | | | | | 5.46 |
| 2 | dry | open corral | dry cows | 200 | 200 | 5.460 | | | | | | | | | | 5.46 |
| 3 | support | open corral | support stock | 1060 | 1060 | 10.550 | | | | | | | | | | 10.55 |
| | | | **Pre-Project Total # of Cows** | 2,260 | | | | | | | | | | | | |

# Post-Project PM10 Mitigation Measures

**Post-Project PM10 Mitigation Measures**

| | Housing Name(s) or #(s) | Type of Housing | Type of cow | Total # of cows in Each Housing Structure(s) | Maximum Design Capacity of Each Structure | # of Combined Housing Structures in row | Shaded Corrals | Downwind Shelterbelts | Upwind Shelterbelts | No exercise pens, non-manure bedding | No exercise pens, manure bedding | Fibrous layer | Bi-weekly scraping Corrals/Pens | Sprinkling Corrals/Pens | Feed Young Stock Near Dusk |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | milk | open corral | milk cows | 1000 | 1000 | 1 | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 2 | dry | open corral | dry cows | 200 | 200 | 1 | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 3 | support | open corral | support stock | 1060 | 1060 | 1 | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| | | | Post-Project Total # of Cows | 2,260 | | | | | | | | | | | |

**Post-Project PM10 Control Efficiencies and Emission Factors**

| | Housing Name(s) or #(s) | Type of Housing | Type of cow | Total # of cows in Each Housing Structure(s) | Maximum Design Capacity of Each Structure | Uncontrolled EF (lb/hd-yr) | Shaded Corrals | Downwind Shelterbelts | Upwind Shelterbelts | No exercise pens, non-manure bedding | No exercise pens, manure bedding | Fibrous layer | Bi-weekly scraping Corrals/Pens | Sprinkling Corrals/Pens | Feed Young Stock Near Dusk | Controlled EF (lb/hd-yr) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | milk | open corral | milk cows | 1000 | 1000 | 5.460 | | | | | | | | | | 5.46 |
| 2 | dry | open corral | dry cows | 200 | 200 | 5.460 | | | | | | | | | | 5.46 |
| 3 | support | open corral | support stock | 1060 | 1060 | 10.550 | | | | | | | | | | 10.55 |

# Pre-Project Potential to Emit - Cow Housing

| | Pre-Project Potential to Emit - Cow Housing | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Housing Name(s) or #(s) | Type of Cow | # of Cows | Controlled VOC EF (lb/hd-yr) | Controlled NH3 EF (lb/hd-yr) | Controlled PM10 EF (lb/hd-yr) | VOC (lb/day) | VOC (lb/yr) | NH3 (lb/day) | NH3 (lb/yr) | PM10 (lb/day) | PM10 (lb/yr) |
| 1 | milk | milk cows | 1,000 | 10.13 | 21.13 | 5.46 | 27.8 | 10,130 | 57.9 | 21,128 | 15.0 | 5,460 |
| 2 | dry | dry cows | 200 | 5.71 | 10.71 | 5.46 | 3.1 | 1,142 | 5.9 | 2,142 | 3.0 | 1,092 |
| 3 | support | support stock | 1,060 | 4.38 | 5.54 | 10.55 | 12.7 | 4,643 | 16.1 | 5,868 | 30.6 | 11,183 |
| | **Pre-Project Total # of Cows** | | **2,260** | | | | **43.6** | **15,915** | **79.9** | **29,138** | **48.6** | **17,735** |

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

| Pre-Project Totals | | | | | | |
|---|---|---|---|---|---|---|
| Total # of Cows | VOC (lb/day) | VOC (lb/yr) | NH3 (lb/day) | NH3 (lb/yr) | PM10 (lb/day) | PM10 (lb/yr) |
| **2,260** | **43.6** | **15,915** | **79.9** | **29,138** | **48.6** | **17,735** |

Calculations:

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

# Post-Project Potential to Emit - Cow Housing

| | Post-Project Potential to Emit - Cow Housing | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Housing Name(s) or #(s) | Type of Cow | # of Cows | Controlled VOC EF (lb/hd-yr) | Controlled NH3 EF (lb/hd-yr) | Controlled PM10 EF (lb/hd-yr) | VOC (lb/day) | VOC (lb/yr) | NH3 (lb/day) | NH3 (lb/yr) | PM10 (lb/day) | PM10 (lb/yr) |
| 1 | milk | milk cows | 1,000 | 10.13 | 21.13 | 5.46 | 27.8 | 10,130 | 57.9 | 21,128 | 15.0 | 5,460 |
| 2 | dry | dry cows | 200 | 5.71 | 10.71 | 5.46 | 3.1 | 1,142 | 5.9 | 2,142 | 3.0 | 1,092 |
| 3 | support | support stock | 1,060 | 4.38 | 5.54 | 10.55 | 12.7 | 4,643 | 16.1 | 5,868 | 30.6 | 11,183 |
| | **Post-Project # of Cows (non-expansion)** | | **2,260** | | | | **43.6** | **15,915** | **79.9** | **29,138** | **48.6** | **17,735** |

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

| Post-Project Totals | | | | | | |
|---|---|---|---|---|---|---|
| Total # of Cows | VOC (lb/day) | VOC (lb/yr) | NH3 (lb/day) | NH3 (lb/yr) | PM10 (lb/day) | PM10 (lb/yr) |
| **2,260** | **43.6** | **15,915** | **79.9** | **29,138** | **48.6** | **17,735** |

Calculations:

Annual PE 2 for each pollutant (lb/yr) = Controlled EF (lb/hd-yr) x # of cows (hd)
Daily PE2 for each pollutant (lb/day) = [Controlled EF (lb/hd-yr) x # of cows (hd)] ÷ 365 (day/yr)

## Pre-Project Worst Case BACT Calculations - Cow Housing

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

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

| | Housing Name(s) or #(s) | Type of Cow | Capacity per housing unit | Controlled VOC EF (lb/hd-yr) | Controlled NH3 EF (lb/hd-yr) | Controlled PM10 EF (lb/hd-yr) | VOC (lb/day) | VOC (lb/yr) | NH3 (lb/day) | NH3 (lb/yr) | PM10 (lb/day) | PM10 (lb/yr) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | milk | milk cows | 1000 | 10.13 | 21.13 | 10.55 | 27.8 | 10,130 | 57.9 | 21,128 | 28.9 | 10,550 |
| 2 | dry | dry cows | 200 | 10.13 | 21.13 | 10.55 | 5.6 | 2,026 | 11.6 | 4,226 | 5.8 | 2,110 |
| 3 | support | support stock | 1060 | 10.13 | 21.13 | 10.55 | 29.4 | 10,738 | 61.4 | 22,396 | 30.6 | 11,183 |
| | | | | | | | **62.8** | **22,894** | **130.9** | **47,750** | **65.3** | **23,843** |

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

**Pre-Project Totals**

| VOC (lb/day) | VOC (lb/yr) | NH3 (lb/day) | NH3 (lb/yr) | PM10 (lb/day) | PM10 (lb/yr) |
|---|---|---|---|---|---|
| **62.8** | **22,894** | **130.9** | **47,750** | **65.3** | **23,843** |

Calculations:

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

## Post-Project Worst Case BACT Calculations - Existing Cow Housing

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

**Post-Project Worst Case BACT Calculations - Existing Cow Housing**

| | Housing Name(s) or #(s) | Type of Cow | Capacity per housing unit | Controlled VOC EF (lb/hd-yr) | Controlled NH3 EF (lb/hd-yr) | Controlled PM10 EF (lb/hd-yr) | VOC (lb/day) | VOC (lb/yr) | NH3 (lb/day) | NH3 (lb/yr) | PM10 (lb/day) | PM10 (lb/yr) | VOC AIPE | NH3 AIPE | PM10 AIPE | BACT Triggered for VOC? | BACT Triggered for NH3? | BACT Triggered for PM10? |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | milk | milk cows | 1000 | 10.13 | 21.13 | 10.55 | 27.8 | 10,130 | 57.9 | 21,128 | 28.9 | 10,550 | 0.0 | 0.0 | 0.0 | No | No | No |
| 2 | dry | dry cows | 200 | 10.13 | 21.13 | 10.55 | 5.6 | 2,026 | 11.6 | 4,226 | 5.8 | 2,110 | 0.0 | 0.0 | 0.0 | No | No | No |
| 3 | support | support stock | 1060 | 10.13 | 21.13 | 10.55 | 29.4 | 10,738 | 61.4 | 22,396 | 30.6 | 11,183 | 0.0 | 0.0 | 0.0 | No | No | No |
| | | | | | | | **62.8** | **22,894** | **130.9** | **47,750** | **65.3** | **23,843** | | | | | | |

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

Calculations:

Annual PE 2 for each pollutant (lb/yr) = Controlled EF (lb/hd-yr) x # of cows (hd)
Daily PE2 for each pollutant (lb/day) = [Controlled EF (lb/hd-yr) x # of cows (hd)] ÷ 365 (day/yr)

**Post-Project Totals**

| VOC (lb/day) | VOC (lb/yr) | NH3 (lb/day) | NH3 (lb/yr) | PM10 (lb/day) | PM10 (lb/yr) |
|---|---|---|---|---|---|
| **62.8** | **22,894** | **130.9** | **47,750** | **65.3** | **23,843** |

Calculations:

Annual PE 2 for each pollutant (lb/yr) = Controlled EF (lb/hd-yr) x # of cows (hd)
Daily PE2 for each pollutant (lb/day) = [Controlled EF (lb/hd-yr) x # of cows (hd)] ÷ 365 (day/yr)

**BACT Applicability**

## Milking Parlor

**VOC Emissions**

| | PE2 (lb/day) | PE1 (lb/day) | EF2 | EF1 | AIPE (lb/day) |
|---|---|---|---|---|---|
| Milk Cows | 1.1 | 1.1 | 0.40 | 0.40 | 0.0 |
| | | | | **Total** | **0.0** |

**NH3 Emissions**

| | PE2 (lb/day) | PE1 (lb/day) | EF2 | EF1 | AIPE (lb/day) |
|---|---|---|---|---|---|
| Milk Cows | 0.4 | 0.4 | 0.14 | 0.14 | 0.0 |
| | | | | **Total** | **0.0** |

## Cow Housing

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

## Liquid Manure Handling

**VOC Emissions - Lagoon/Storage Pond(s)**

| | PE2 (lb/day) | PE1 (lb/day) | EF2 | EF1 | AIPE (lb/day) |
|---|---|---|---|---|---|
| Milk Cows | 2.9 | 2.9 | 1.05 | 1.05 | 0.0 |
| Dry Cows | 0.3 | 0.3 | 0.57 | 0.57 | 0.0 |
| Support Stock (Heifers, Calves, and Bulls) | 1.3 | 1.3 | 0.44 | 0.44 | 0.0 |
| Large Heifers | 0.0 | 0.0 | 0.44 | 0.44 | 0.0 |
| Medium Hefiers | 0.0 | 0.0 | 0.30 | 0.30 | 0.0 |
| Small Heifers | 0.0 | 0.0 | 0.17 | 0.17 | 0.0 |
| Calves | 0.0 | 0.0 | 0.08 | 0.08 | 0.0 |
| Bulls | 0.0 | 0.0 | 0.27 | 0.27 | 0.0 |
| | | | | **Total** | **0.0** |

**VOC Emissions - Land Application**

| | PE2 (lb/day) | PE1 (lb/day) | EF2 | EF1 | AIPE (lb/day) |
|---|---|---|---|---|---|
| Milk Cows | 3.5 | 3.5 | 1.26 | 1.26 | 0.0 |
| Dry Cows | 0.4 | 0.4 | 0.69 | 0.69 | 0.0 |
| Support Stock (Heifers, Calves, and Bulls) | 1.5 | 1.5 | 0.53 | 0.53 | 0.0 |
| Large Heifers | 0.0 | 0.0 | 0.53 | 0.53 | 0.0 |
| Medium Hefiers | 0.0 | 0.0 | 0.36 | 0.36 | 0.0 |
| Small Heifers | 0.0 | 0.0 | 0.20 | 0.20 | 0.0 |
| Calves | 0.0 | 0.0 | 0.10 | 0.10 | 0.0 |
| Bulls | 0.0 | 0.0 | 0.32 | 0.32 | 0.0 |
| | | | | **Total** | **0.0** |

**NH3 Emissions - Lagoon/Storage Pond(s)**

| | PE2 (lb/day) | PE1 (lb/day) | EF2 | EF1 | AIPE (lb/day) |
|---|---|---|---|---|---|
| Milk Cows | 16.2 | 16.2 | 5.90 | 5.90 | 0.0 |
| Dry Cows | 1.7 | 1.7 | 3.02 | 3.02 | 0.0 |
| Support Stock (Heifers, Calves, and Bulls) | 4.6 | 4.6 | 1.58 | 1.58 | 0.0 |
| Large Heifers | 0.0 | 0.0 | 1.58 | 1.58 | 0.0 |
| Medium Hefiers | 0.0 | 0.0 | 1.08 | 1.08 | 0.0 |
| Small Heifers | 0.0 | 0.0 | 0.86 | 0.86 | 0.0 |
| Calves | 0.0 | 0.0 | 0.25 | 0.25 | 0.0 |
| Bulls | 0.0 | 0.0 | 2.16 | 2.16 | 0.0 |
| | | | | **Total** | **0.0** |

**NH3 Emissions - Land Application**

| | PE2 (lb/day) | PE1 (lb/day) | EF2 | EF1 | AIPE (lb/day) |
|---|---|---|---|---|---|
| Milk Cows | 17.6 | 17.6 | 6.41 | 6.41 | 0.0 |
| Dry Cows | 1.8 | 1.8 | 3.24 | 3.24 | 0.0 |
| Support Stock (Heifers, Calves, and Bulls) | 4.8 | 4.8 | 1.66 | 1.66 | 0.0 |
| Large Heifers | 0.0 | 0.0 | 1.66 | 1.66 | 0.0 |
| Medium Hefiers | 0.0 | 0.0 | 1.22 | 1.22 | 0.0 |
| Small Heifers | 0.0 | 0.0 | 0.94 | 0.94 | 0.0 |
| Calves | 0.0 | 0.0 | 0.27 | 0.27 | 0.0 |
| Bulls | 0.0 | 0.0 | 2.33 | 2.33 | 0.0 |
| | | | | **Total** | **0.0** |

**H2S Emissions - Lagoon/Storage Pond(s)**

| | PE2 (lb/day) | PE1 (lb/day) | EF2 | EF1 | AIPE (lb/day) |
|---|---|---|---|---|---|
| Milk Cows | 1.6 | 1.6 | 0.59 | 0.59 | 0.0 |
| Dry Cows | 0.2 | 0.2 | 0.30 | 0.30 | 0.0 |
| Support Stock (Heifers, Calves, and Bulls) | 0.5 | 0.5 | 0.16 | 0.16 | 0.0 |
| Large Heifers | 0.0 | 0.0 | 0.16 | 0.16 | 0.0 |
| Medium Hefiers | 0.0 | 0.0 | 0.11 | 0.11 | 0.0 |
| Small Heifers | 0.0 | 0.0 | 0.09 | 0.09 | 0.0 |
| Calves | 0.0 | 0.0 | 0.03 | 0.03 | 0.0 |
| Bulls | 0.0 | 0.0 | 0.22 | 0.22 | 0.0 |
| | | | | **Total** | **0.0** |

## Solid Manure Handling

**VOC Emissions - Solid Manure Storage/Separated Solids Piles**

| | PE2 (lb/day) | PE1 (lb/day) | EF2 | EF1 | AIPE (lb/day) |
|---|---|---|---|---|---|
| Milk Cows | 0.5 | 0.5 | 0.18 | 0.18 | 0.0 |
| Dry Cows | 0.1 | 0.1 | 0.10 | 0.10 | 0.0 |
| Support Stock (Heifers, Calves, and Bulls) | 0.2 | 0.2 | 0.10 | 0.08 | 0.0 |
| Large Heifers | 0.0 | 0.0 | 0.08 | 0.08 | 0.0 |
| Medium Hefiers | 0.0 | 0.0 | 0.05 | 0.05 | 0.0 |
| Small Heifers | 0.0 | 0.0 | 0.03 | 0.03 | 0.0 |
| Calves | 0.0 | 0.0 | 0.01 | 0.01 | 0.0 |
| Bulls | 0.0 | 0.0 | 0.05 | 0.05 | 0.0 |
| | | | | **Total** | **0.0** |

**VOC Emissions - Land Application**

| | PE2 (lb/day) | PE1 (lb/day) | EF2 | EF1 | AIPE (lb/day) |
|---|---|---|---|---|---|
| Milk Cows | 0.8 | 0.8 | 0.30 | 0.30 | 0.0 |
| Dry Cows | 0.1 | 0.1 | 0.16 | 0.16 | 0.0 |
| Support Stock (Heifers, Calves, and Bulls) | 0.4 | 0.4 | 0.12 | 0.12 | 0.0 |
| Large Heifers | 0.0 | 0.0 | 0.12 | 0.12 | 0.0 |
| Medium Hefiers | 0.0 | 0.0 | 0.08 | 0.08 | 0.0 |
| Small Heifers | 0.0 | 0.0 | 0.05 | 0.05 | 0.0 |
| Calves | 0.0 | 0.0 | 0.02 | 0.02 | 0.0 |
| Bulls | 0.0 | 0.0 | 0.07 | 0.07 | 0.0 |
| | | | | **Total** | **0.0** |

**NH3 Emissions - Solid Manure Storage/Separated Solids Piles**

| | PE2 (lb/day) | PE1 (lb/day) | EF2 | EF1 | AIPE (lb/day) |
|---|---|---|---|---|---|
| Milk Cows | 3.6 | 3.6 | 1.33 | 1.33 | 0.0 |
| Dry Cows | 0.4 | 0.4 | 0.67 | 0.67 | 0.0 |
| Support Stock (Heifers, Calves, and Bulls) | 1.0 | 1.0 | 0.35 | 0.35 | 0.0 |
| Large Heifers | 0.0 | 0.0 | 0.35 | 0.35 | 0.0 |
| Medium Hefiers | 0.0 | 0.0 | 0.25 | 0.25 | 0.0 |
| Small Heifers | 0.0 | 0.0 | 0.18 | 0.18 | 0.0 |
| Calves | 0.0 | 0.0 | 0.06 | 0.06 | 0.0 |
| Bulls | 0.0 | 0.0 | 0.49 | 0.49 | 0.0 |
| | | | | **Total** | **0.0** |

**NH3 Emissions - Land Application**

| | PE2 (lb/day) | PE1 (lb/day) | EF2 | EF1 | AIPE (lb/day) |
|---|---|---|---|---|---|
| Milk Cows | 4.1 | 4.1 | 1.50 | 1.50 | 0.0 |
| Dry Cows | 0.4 | 0.4 | 0.76 | 0.76 | 0.0 |
| Support Stock (Heifers, Calves, and Bulls) | 1.2 | 1.2 | 0.40 | 0.40 | 0.0 |
| Large Heifers | 0.0 | 0.0 | 0.40 | 0.40 | 0.0 |
| Medium Hefiers | 0.0 | 0.0 | 0.28 | 0.28 | 0.0 |
| Small Heifers | 0.0 | 0.0 | 0.22 | 0.22 | 0.0 |
| Calves | 0.0 | 0.0 | 0.06 | 0.06 | 0.0 |
| Bulls | 0.0 | 0.0 | 0.55 | 0.55 | 0.0 |
| | | | | **Total** | **0.0** |

## Feed Storage and Handling

**VOC Emissions - Silage**

| | PE2 (lb/day) | PE1 (lb/day) | EF2 | EF1 | AIPE (lb/day) |
|---|---|---|---|---|---|
| Corn Silage | 6.8 | 6.8 | 21,155 | 21,155 | 0.0 |
| Alfalfa Silage | 0.0 | 0.0 | 10,649 | 10,649 | 0.0 |
| Wheat Silage | 8.6 | 8.6 | 26,745 | 26,745 | 0.0 |
| | | | | **Total** | 0.0 |

**VOC Emissions - TMR**

| | PE2 (lb/day) | PE1 (lb/day) | EF2 | EF1 | AIPE (lb/day) |
|---|---|---|---|---|---|
| TMR | 49.8 | 49.8 | 10,575 | 10,575 | 0.0 |
| | | | | **Total** | **0.0** |

# Pre-Project Potential to Emit (PE1)

| Pre-Project Herd Size | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Herd** | **Flushed Freestalls** | **Scraped Freestalls** | **Flushed Corrals** | **Scraped Corrals** | **Total # of Animals** | | |
| Milk Cows | 1,000 | 0 | 0 | 0 | 1,000 | | |
| Dry Cows | 200 | 0 | 0 | 0 | 200 | | |
| Support Stock (Heifers, Calves and Bulls) | 1,060 | 0 | 0 | 0 | 1,060 | | |
| Large Heifers | 0 | 0 | 0 | 0 | 0 | | |
| Medium Heifers | 0 | 0 | 0 | 0 | 0 | | |
| Small Heifers | 0 | 0 | 0 | 0 | 0 | | |
| Bulls | 0 | 0 | 0 | 0 | 0 | | |
| | **Calf Hutches** | | | | **Calf Corrals** | | |
| | **Aboveground Flushed** | **Aboveground Scraped** | **On-Ground Flushed** | **On-Ground Scraped** | **Flushed** | **Scraped** | **Total # of Calves** |
| Calves | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| Silage Information | | | | |
|---|---|---|---|---|
| Feed Type | Maximum # Open Piles | Maximum Height (ft) | Maximum Width (ft) | Open Face Area (ft^2) |
| Corn | 1 | 15 | 100 | 1,087 |
| Alfalfa | 0 | 0 | 0 | |
| Wheat | 1 | 15 | 100 | 1,087 |

| Milking Parlor | | | | |
|---|---|---|---|---|
| Cow | VOC | | NH3 | |
| Milk Cows | lb/day | lb/yr | lb/day | lb/yr |
| | **1.1** | **400** | **0.4** | **137** |

| Cow Housing | | | | | | |
|---|---|---|---|---|---|---|
| Cow | VOC | | NH3 | | PM10 | |
| | lb/day | lb/yr | lb/day | lb/yr | lb/day | lb/yr |
| **Total** | **43.6** | **15,915** | **79.9** | **29,138** | **48.6** | **17,735** |

| Liquid Manure Handling | | | | | | |
|---|---|---|---|---|---|---|
| Cow | VOC | | NH3 | | H2S* | |
| | lb/day | lb/yr | lb/day | lb/yr | lb/day | lb/yr |
| Milk Cows | 6.3 | 2,310 | 33.7 | 12,310 | 1.6 | 590 |
| Dry Cows | 0.7 | 252 | 3.4 | 1,252 | 0.2 | 60 |
| Support Stock (Heifers, Calves and Bulls) | 2.8 | 1,028 | 9.4 | 3,434 | 0.5 | 168 |
| Large Heifers | 0.0 | 0 | 0.0 | 0 | 0 | 0 |
| Medium Heifers | 0.0 | 0 | 0.0 | 0 | 0 | 0 |
| Small Heifers | 0.0 | 0 | 0.0 | 0 | 0 | 0 |
| Calves | 0.0 | 0 | 0.0 | 0 | 0 | 0 |
| Bulls | 0.0 | 0 | 0.0 | 0 | 0 | 0 |
| **Total** | **9.8** | **3,590** | **46.5** | **16,996** | **2.3** | **819** |

| Solid Manure Handling | | | | |
|---|---|---|---|---|
| Cow | VOC | | NH3 | |
| | lb/day | lb/yr | lb/day | lb/yr |
| Milk Cows | 1.3 | 480 | 7.8 | 2,830 |
| Dry Cows | 0.1 | 52 | 0.8 | 286 |
| Support Stock (Heifers, Calves and Bulls) | 0.6 | 212 | 2.2 | 795 |
| Large Heifers | 0.0 | 0 | 0.0 | 0 |
| Medium Heifers | 0.0 | 0 | 0.0 | 0 |
| Small Heifers | 0.0 | 0 | 0.0 | 0 |
| Calves | 0.0 | 0 | 0.0 | 0 |
| Bulls | 0.0 | 0 | 0.0 | 0 |
| **Total** | **2.0** | **744** | **10.8** | **3,911** |

| Feed Handling and Storage | | |
|---|---|---|
| | Daily PE (lb-VOC/day) | Annual PE (lb-VOC/yr) |
| Corn Emissions | 6.8 | 2,471 |
| Alfalfa Emissions | 0.0 | 0 |
| Wheat Emissions | 8.6 | 3,124 |
| TMR | 49.8 | 18,185 |
| **Total** | **65.2** | **23,780** |

Calculations for milking parlor:

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

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

Calculations for cow housing:

See detailed calculations under Cow Housing Calculations worksheet.

Calculations for liquid manure and solid manure handling:

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

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

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

Calculations for silage emissions:

Annual PE = (EF1) x (area ft$^2$) x (0.0929 m$^2$/ft$^2$) x (8,760 hr/yr) x (60 min/hr) x 2.20E-9 lb/µg

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

Calculation for TMR emissions:

Annual PE = (# cows) x (EF1) x (0.658 m$^2$) x (525,600 min/yr) x (2.20E-9 lb/µg)

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

Calves are not included in TMR calculation.

Notes

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

| Total Daily Pre-Project Potential to Emit (lb/day) | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Permit** | **NOx** | **SOx** | **PM10** | **CO** | **VOC** | **NH3** | **H2S** |
| Milking Parlor | 0.0 | 0.0 | 0.0 | 0.0 | 1.1 | 0.4 | 0.0 |
| Cow Housing | 0.0 | 0.0 | 48.6 | 0.0 | 43.6 | 79.9 | 0.0 |
| Liquid Manure | 0.0 | 0.0 | 0.0 | 0.0 | 9.8 | 46.5 | 2.3 |
| Solid Manure | 0.0 | 0.0 | 0.0 | 0.0 | 2.0 | 10.8 | 0.0 |
| Feed Handling | 0.0 | 0.0 | 0.0 | 0.0 | 65.2 | 0.0 | 0.0 |
| **Total** | **0.0** | **0.0** | **48.6** | **0.0** | **121.7** | **137.6** | **2.3** |

| Major Source Emissions (lb/yr) | | | | | |
|---|---|---|---|---|---|
| **Permit** | **NOx** | **SOx** | **PM10** | **CO** | **VOC** |
| Milk Parlor | 0 | 0 | 0 | 0 | 0 |
| Cow Housing | 0 | 0 | 0 | 0 | 0 |
| Liquid Manure | 0 | 0 | 0 | 0 | 1,630 |
| Solid Manure | 0 | 0 | 0 | 0 | 0 |
| Feed Handling | 0 | 0 | 0 | 0 | 0 |
| **Total** | **0** | **0** | **0** | **0** | **1,630** |

| Total Annual Pre-Project Potential to Emit (lb/yr) | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Permit** | **NOx** | **SOx** | **PM10** | **CO** | **VOC** | **NH3** | **H2S** |
| Milking Parlor | 0 | 0 | 0 | 0 | 400 | 137 | 0 |
| Cow Housing | 0 | 0 | 17,735 | 0 | 15,915 | 29,138 | 0 |
| Liquid Manure | 0 | 0 | 0 | 0 | 3,590 | 16,996 | 819 |
| Solid Manure | 0 | 0 | 0 | 0 | 744 | 3,911 | 0 |
| Feed Handling | 0 | 0 | 0 | 0 | 23,780 | 0 | 0 |
| **Total** | **0** | **0** | **17,735** | **0** | **44,430** | **50,182** | **819** |

# Post-Project Potential to Emit (PE2)

| Post-Project Herd Size | | | | | |
|---|---|---|---|---|---|
| **Herd** | **Flushed Freestalls** | **Scraped Freestalls** | **Flushed Corrals** | **Scraped Corrals** | **Total # of Animals** |
| Milk Cows | 1,000 | 0 | 0 | 0 | 1,000 |
| Dry Cows | 200 | 0 | 0 | 0 | 200 |
| Support Stock (Heifers, Calves, and Bulls) | 1,060 | 0 | 0 | 0 | 1,060 |
| Large Heifers | 0 | 0 | 0 | 0 | 0 |
| Medium Heifers | 0 | 0 | 0 | 0 | 0 |
| Small Heifers | 0 | 0 | 0 | 0 | 0 |
| Bulls | 0 | 0 | 0 | 0 | 0 |

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

| Silage Information | | | | |
|---|---|---|---|---|
| Feed Type | Maximum # Open Piles | Maximum Height (ft) | Maximum Width (ft) | Open Face Area (ft^2) |
| Corn | 1 | 15 | 100 | 1,087 |
| Alfalfa | 0 | 0 | 0 | |
| Wheat | 1 | 15 | 100 | 1,087 |

| Milking Parlor | | | | |
|---|---|---|---|---|
| Cow | VOC | | NH3 | |
| Milk Cows | lb/day | lb/yr | lb/day | lb/yr |
| **Total** | **1.1** | **400** | **0.4** | **137** |

| Cow Housing | | | | | | |
|---|---|---|---|---|---|---|
| | VOC | | NH3 | | PM10 | |
| | lb/day | lb/yr | lb/day | lb/yr | lb/day | lb/yr |
| **Total** | **43.6** | **15,915** | **80** | **29,138** | **49** | **17,735** |

| Liquid Manure Handling | | | | | | |
|---|---|---|---|---|---|---|
| Cow | VOC | | NH3 | | H2S | |
| | lb/day | lb/yr | lb/day | lb/yr | lb/day | lb/yr |
| Milk Cows | 6.3 | 2,310 | 33.7 | 12,310 | 1.6 | 590 |
| Dry Cows | 0.7 | 252 | 3.4 | 1,252 | 0.2 | 60 |
| Support Stock (Heifers, Calves, and Bulls) | 2.8 | 1,028 | 9.4 | 3,434 | 0.5 | 168 |
| Large Heifers | 0.0 | 0 | 0.0 | 0 | 0 | 0 |
| Medium Heifers | 0.0 | 0 | 0.0 | 0 | 0 | 0 |
| Small Heifers | 0.0 | 0 | 0.0 | 0 | 0 | 0 |
| Calves | 0.0 | 0 | 0.0 | 0 | 0 | 0 |
| Bulls | 0.0 | 0 | 0.0 | 0 | 0 | 0 |
| **Total** | **9.8** | **3,590** | **46.5** | **16,996** | **2.3** | **819** |

| Solid Manure Handling | | | | |
|---|---|---|---|---|
| Cow | VOC | | NH3 | |
| | lb/day | lb/yr | lb/day | lb/yr |
| Milk Cows | 1.3 | 480 | 7.8 | 2,830 |
| Dry Cows | 0.1 | 52 | 0.8 | 286 |
| Support Stock (Heifers, Calves, and Bulls) | 0.6 | 212 | 2.2 | 795 |
| Large Heifers | 0.0 | 0 | 0.0 | 0 |
| Medium Heifers | 0.0 | 0 | 0.0 | 0 |
| Small Heifers | 0.0 | 0 | 0.0 | 0 |
| Calves | 0.0 | 0 | 0.0 | 0 |
| Bulls | 0.0 | 0 | 0.0 | 0 |
| **Total** | **2.0** | **744** | **10.8** | **3,911** |

| Feed Handling and Storage | | |
|---|---|---|
| | Daily PE (lb-VOC/day) | Annual PE (lb-VOC/yr) |
| Corn Emissions | 6.8 | 2,471 |
| Alfalfa Emissions | 0.0 | 0 |
| Wheat Emissions | 8.6 | 3,124 |
| TMR | 49.8 | 18,185 |
| **Total** | **65.2** | **23,780** |

Calculations for milking parlor:

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

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

Calculations for cow housing:

See detailed calculations under Cow Housing Calculations worksheet.

Calculations for liquid manure and solid manure handling:

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

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

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

Calculations for silage emissions:

Annual PE = (EF2) x (area $ft^2$) x (0.0929 $m^2/ft^2$) x (8,760 hr/yr) x (60 min/hr) x 2.20E-9 lb/µg

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

Calculation for TMR emissions:

Annual PE = (# cows) x (EF2) x (0.658 $m^2$) x (525,600 min/yr) x (2.20E-9 lb/µg)

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

Calves are not included in TMR calculation.

| Total Daily Post-Project Potential to Emit (lb/day) | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Permit** | **NOx** | **SOx** | **PM10** | **CO** | **VOC** | **NH3** | **H2S** |
| Milking Parlor | 0.0 | 0.0 | 0.0 | 0.0 | 1.1 | 0.4 | 0.0 |
| Cow Housing | 0.0 | 0.0 | 48.6 | 0.0 | 43.6 | 79.9 | 0.0 |
| Liquid Manure | 0.0 | 0.0 | 0.0 | 0.0 | 9.8 | 46.5 | 2.3 |
| Solid Manure | 0.0 | 0.0 | 0.0 | 0.0 | 2.0 | 10.8 | 0.0 |
| Feed Handling | 0.0 | 0.0 | 0.0 | 0.0 | 65.2 | 0.0 | 0.0 |
| **Total** | **0.0** | **0.0** | **48.6** | **0.0** | **121.7** | **137.6** | **2.3** |

| Major Source Emissions (lb/yr) | | | | | |
|---|---|---|---|---|---|
| **Permit** | **NOx** | **SOx** | **PM10** | **CO** | **VOC** |
| Milk Parlor | 0 | 0 | 0 | 0 | 0 |
| Cow Housing | 0 | 0 | 0 | 0 | 0 |
| Liquid Manure | 0 | 0 | 0 | 0 | 1,630 |
| Solid Manure | 0 | 0 | 0 | 0 | 0 |
| Feed Handling | 0 | 0 | 0 | 0 | 0 |
| **Total** | **0** | **0** | **0** | **0** | **1,630** |

| Total Annual Post-Project Potential to Emit (lb/yr) | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Permit** | **NOx** | **SOx** | **PM10** | **CO** | **VOC** | **NH3** | **H2S** |
| Milking Parlor | 0 | 0 | 0 | 0 | 400 | 137 | 0 |
| Cow Housing | 0 | 0 | 17,735 | 0 | 15,915 | 29,138 | 0 |
| Liquid Manure | 0 | 0 | 0 | 0 | 3,590 | 16,996 | 819 |
| Solid Manure | 0 | 0 | 0 | 0 | 744 | 3,911 | 0 |
| Feed Handling | 0 | 0 | 0 | 0 | 23,780 | 0 | 0 |
| **Total** | **0** | **0** | **17,735** | **0** | **44,430** | **50,182** | **819** |

# Increase in Emissions

| SSIPE (lb/yr) | | | | | | | |
|---|---|---|---|---|---|---|---|
| | NOx | SOx | PM10 | CO | VOC | NH3 | H2S |
| Milking Parlor | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cow Housing | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Liquid Manure | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Solid Manure | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Feed Handling | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Total** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |

| Total Daily Change in Emissions (lb/day) | | | | | | | |
|---|---|---|---|---|---|---|---|
| | NOx | SOx | PM10 | CO | VOC | NH3 | H2S |
| Milking Parlor | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Cow Housing | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Liquid Manure | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Solid Manure | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Feed Handling | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Total** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** |

| Total Annual Change in Non-Fugitive Emissions (Major Source Emissions) (lb/yr) | | | | | | | |
|---|---|---|---|---|---|---|---|
| | NOx | SOx | PM10 | CO | VOC | NH3 | H2S |
| Milking Parlor | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cow Housing | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Liquid Manure | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Solid Manure | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Feed Handling | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Total** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |