Resource Management Agency

COUNTY OF TULARE
AGENDA ITEM

AGENDA DATE: May 3, 2022 – REVISED

Public Hearing Required	Yes	☐	N/A	☒
Scheduled Public Hearing w/Clerk	Yes	☐	N/A	☒
Published Notice Required	Yes	☐	N/A	☒
Advertised Published Notice	Yes	☒	N/A	☐
Meet & Confer Required	Yes	☐	N/A	☒
Electronic file(s) has been sent	Yes	☒	N/A	☐
Budget Transfer (Aud 308) attached	Yes	☐	N/A	☒
Personnel Resolution attached	Yes	☐	N/A	☒
Agreements are attached and signature line for Chairman is marked with tab(s)/flag(s)	Yes	☐	N/A	☒

CONTACT PERSON: Celeste Perez PHONE: (559) 624-7010

SUBJECT: 2021 Interim Report of Total Greenhouse Gas Emissions from Dairies and Feedlots for 2020

REQUEST(S):

That the Board of Supervisors:

1. Hold a public meeting to receive a presentation to consider the 2021 Interim Report of Total Greenhouse Gas Emissions from Dairies and Feedlots for 2020 ("2021 Interim Report") and provide an opportunity for public comment.

2. Approve the 2021 Interim Report and adopt a Categorical Exemption for that action, consistent with the California Environmental Quality Act ("CEQA") Title 14 California Code of Regulations, Section 15061(b)(3) Common Sense Exemption and Section 15306, Information Collection.

SUMMARY:

On August 2, 2019, a Stipulated Settlement ("Settlement") was made and became effective by and among all parties to Tulare County Superior Court Case No. 272380, namely the Sierra Club, Association of Irritated Residents, and Center for Biological Diversity (collectively "Petitioners" or "Plaintiffs") and the County of Tulare ("County"). Petitioners had challenged your Board's approval of an Animal Confinement Facilities Plan ("ACFP"), a Dairy Feedlot and Dairy Climate Action Plan ("CAP"), related General Plan Amendment, zoning change, and EIR in what became known as the "DairyCares" litigation.

The Settlement, under Section IV.B.2, requires the County to prepare an Interim Report of Total Greenhouse Gas ("GHG") Emissions from Dairies and Feedlots for 2020 (in lieu of an Annual Report) for 2021. The 2021 Interim Report (see

Attachment No. 1) is required to include:

1. Total number of permitted dairies and feedlots in the County, number and type of animal waste management systems, number of permitted cows provided on the ACFP list, total estimated dairy GHG emissions in 2020 and GHG reductions achieved since 2013.

   An Air Quality Consultant has prepared a GHG Emissions Reduction Report (see Exhibit "A" of Attachment No. 1).

2. Total estimated dairy GHG emissions reduced to date compared to the 1.05 million MT/yr. by 2023 Dairy and Feedlot CAP reduction goal, and the total dairy GHG emissions reduced to date compared to the maximum projected SB 1383 potential target.

   See Exhibit "A" of Attachment No. 1.

3. Summary of the State's GHG-reduction recommendations or required measures pursuant to SB 1383, including but not limited to, digester and Alternative Manure Management Plan ("AMMP") funding.

   Resource Management Agency (RMA) staff completed an AMMP Spreadsheet (Exhibit "B") with this information on March 3, 2022.

4. Staff recommendations regarding additional, different, or modified measures or programs ("adaptive management") to further reduce GHG emissions, especially if the data analyzed in Section IV.B.2.b of the Stipulated Settlement suggests the County is not in line to meet reduction target of 1.05 million metric tons/yr. by 2023 Dairy and Feedlot CAP or SB 1383 reduction targets.

   Regarding the Dairy and Feedlot CAP, so far Tulare County has reduced GHG emissions by 303,618 metric tons per year as a result of projects in operation in 2020, which is 28.916 percent of emissions reductions needed to achieve the Dairy CAP reduction target. To meet the target, County dairies and feedlots will need to reduce emissions by an additional 746,382 metric tons per year by 2023. At present, there are an additional 677,589 metric tons per year of upcoming emissions reductions from County solar, digester, and AMMP projects that have either started operating after 2020, are currently under construction, or are approved and funded for construction.

   To meet the Dairy CAP reduction target, another 68,793 metric tons per year of emissions reductions from yet-to-be identified solar, digester, AMMP, or enteric projects will need to be implemented by 2023. So, additional projects will be needed in order to reduce emissions by 6.552 percent to meet the Dairy CAP reduction target of 1.05 million metric tons/yr. by 2023. With the projects in operation in 2020, and the County solar, digester, and AMMP projects that have either started operating after 2020, are currently under construction, or are approved and funded for construction, the amount of emissions reductions for Tulare County will reach 93.448 percent of the the Dairy CAP reduction target. The average emissions reduction for the 53 digesters that are operating, under construction, or are approved and funded

for construction, is 172,723 metric tons over a period of ten (10) years. For annual reductions, the amount would be 1/10 of that, which is 17,272 metric tons per year. So, four (4) additional digester projects of average size would allow Tulare County to achieve the Dairy CAP reduction target of 1.05 million metric tons/yr. by 2023.

In addition, the last paragraph on Page 24 in Section 7.1 of Exhibit "A" of Attachment No. 1 states that "Figure 7-1 show the progress of the County dairies and feedlots toward meeting the SB 1383 target in graphical format. The third paragraph of Section 8 on Page 27 of Exhibit "A" of Attachment No. 1 states that "Figure 7-1 shows that, as of 2020, the County was ahead of schedule in it progress to meet the SB 1383 target of 40 percent below 2013 levels by 2030."

Based on the above information, the data analyzed is in line to meet the reduction target of 1.05 million metric tons/yr. by 2023 Dairy and Feedlot CAP or SB 1383 reduction targets; therefore, recommendations regarding additional, different, or modified measures or programs ("adaptive management") to further reduce GHG emissions are not necessary at this time.

5. Information required in the Interim Report not otherwise listed in this section.

   Updated Digester Project list for digesters within the County that lists: 1) the operation name, 2) project title, 3) total project cost, 4) California Department of Food and Agriculture ("CDFA") funding award, additional Federal or State public funding awards, 5) project description, 6) project construction state, 7) location, 8) GHG emission reductions over ten years, and 9) how captured methane is used. The report shall also include any reported problems with completed digesters within the County.

   RMA staff completed the Updated Digester Project List (Exhibit "C") with this information on February 22, 2022.

Pursuant to the Settlement, the Interim Report shall be completed by May 1, 2022, and be made available to the public (through the County website). The County shall hold a public meeting on the Interim Report and the County Board shall provide the Interim Report to the public not less than ten (10) calendar days prior to a duly noticed public meeting, where the Board shall consider the Interim Report following a staff report and opportunity for public comments.

The Interim Report was completed on April 4, 2022, and made available to the public (through the County Website) on April 20, 2022. Notice of the May 3, 2022, Board of Supervisors meeting was published on April 20, 2022. The Board of Supervisors provided the Interim Report to the public on April 20, 2022, and then will consider the Interim Report on May 3, 2022, following a staff report and opportunity for public comments. It should be noted that the County completed 48 Inspections in 2021 of Dairies and Feedlots, which exceeds the Settlement's requirement for the County to inspect fifteen (15) percent of the facilities each year on a rolling basis.

Environmental summary

Preparation of the 2021 Interim Report makes no physical change to the environment because it only involves gathering information to prepare a written report. As such, it is exempt from CEQA based on the Common-Sense Exemption consistent with CEQA and the State CEQA Guidelines pursuant to Title 14, Cal. Code Regulations Section 15061(b)(3) and Section 15306, Class 6, Information Collection.

Staff has prepared and will file a Notice of Exemption (see Attachment No. 2) in connection with and following the Board's approval of the Interim Report and adoption of the Notice of Exemption.

FISCAL IMPACT/FINANCING:

Funding of the implementation of the Stipulated Settlement, including the 2021 Interim Report, is through the previously approved RMA annual budget in association with the County Administrative Office.

LINKAGE TO THE COUNTY OF TULARE STRATEGIC BUSINESS PLAN:

The County's five-year strategic plan includes the "Economic Well Being Initiative - to promote economic development opportunities, effective growth management and a quality standard of living" and "Quality of Life Initiative – to promote public health and welfare, educational opportunities, natural resource management and continued improvement of environmental quality." The 2021 Interim Report will continue to support the agricultural economy while implementing the County General Plan. In doing so, it will promote sustainability, economic development, and prosperity by providing design flexibility, streamline approval process and aid in reducing environmental impacts within unincorporated Tulare County.

ADMINISTRATIVE SIGN-OFF:

Aaron R. Bock, MCRP, JD, LEED AP
Assistant Director, Economic Development & Planning

Michael Washam, ACE
Associate Director

Reed Schenke, P.E.
Director

SUBJECT: 2021 Interim Report of Total Greenhouse Gas Emissions from Dairies and Feedlots for 2020
DATE: May 3, 2022

cc: County Administrative Office

Attachment(s) Attachment No. 1: 2021 Interim Report
Exhibit “A”: 2020 GHG Emissions Reduction Report
Exhibit “B”: AMMP Spreadsheet
Exhibit “C”: Updated Digester Project List
Attachment No. 2: Notice of Exemption

BEFORE THE BOARD OF SUPERVISORS
COUNTY OF TULARE, STATE OF CALIFORNIA

IN THE MATTER OF 2021 INTERIM REPORT OF TOTAL GREENHOUSE GAS EMISSIONS FROM DAIRIES AND FEEDLOTS FOR 2020	))))	**Resolution No. _____**

UPON MOTION OF SUPERVISOR _____, SECONDED BY SUPERVISOR _____, THE FOLLOWING WAS ADOPTED BY THE BOARD OF SUPERVISORS, AT AN OFFICIAL MEETING HELD MAY 3, 2022, BY THE FOLLOWING VOTE:

AYES:
NOES:
ABSTAIN:
ABSENT:

ATTEST: JASON T. BRITT
COUNTY ADMINISTRATIVE OFFICER/
CLERK, BOARD OF SUPERVISORS

BY: _____
Deputy Clerk

* * * * * * * * * * * * * * * * * * *

1. Held a public meeting to receive a presentation to consider the 2021 Interim Report of Total Greenhouse Gas Emissions from Dairies and Feedlots for 2020 ("2021 Interim Report") and provide an opportunity for public comment.

2. Approved the 2021 Interim Report and adopted a Categorical Exemption for that action, consistent with the California Environmental Quality Act ("CEQA") Title 14 California Code of Regulations, Section 15061(b)(3) Common-Sense Exemption and Section 15306, Information Collection.

Attachment “1”

2021 Interim Report

TULARE COUNTY
RESOURCE MANAGEMENT AGENCY

5961 South Mooney Boulevard
Visalia, CA 93277

2021 INTERIM REPORT

OF TOTAL GREENHOUSE GAS EMISSIONS FROM
DAIRIES AND FEEDLOTS FOR 2020

April 4, 2022

Prepared by

Tulare County Resources Management Agency
Economic Development & Planning Branch

TABLE OF CONTENTS

I. INTRODUCTION

The 2021 Interim Report of total Greenhouse Gas ("GHG") emissions from dairies and feedlots for 2020 is a requirement of a Stipulated Settlement ("Settlement"). The Settlement became effective August 2, 2019, completely resolving Case No. 272380 - Petition for Writ of Mandate and Complaint for Declaratory and Injunctive Relief, Superior Court, State of California, County of Tulare, Visalia Division, challenging the certification by the County of Tulare of the 2017 Environmental Impact Report for the 2017 Animal Facilities Confinement Plan and related General Plan Amendments Zone Changes, and Dairy and Feedlot Climate Action Plan. The ACFP and Dairy CAP are components of the County's General Plan and are part of the Settlement by and between the Sierra Club, Association of Irritated Residents, and Center for Biological Diversity (collectively "Petitioners" or "Plaintiffs") and the County of Tulare, a political subdivision of the State of California and the Board of Supervisors of the County of Tulare (collectively "County").

A. BACKGROUND

On November 30, 2011, in accordance with the California Environmental Quality Act ("CEQA"), the County of Tulare filed a Notice of Preparation ("NOP") with the California State Clearinghouse in the Governor's Office of Planning and Research as notification that a Draft EIR would be prepared for the 2017 ACFP and 2017 Dairy CAP. The NOP was distributed to involved public agencies and other interested parties for a 30-day public review period. The purpose of the public review period was to solicit comments on the scope and content of the environmental analysis to be included in the EIR.

On February 3, 2016, a Notice of Completion for a Draft EIR for the 2017 ACFP and 2017 Dairy CAP was filed with the State Clearinghouse, together with the requisite number of copies of the Draft EIR to be mailed to affected public agencies and interested parties, indicating a 45-day review period commencing on February 4, 2016, and ending on March 21, 2016.

On February 4, 2016, a Notice of Availability of a Draft EIR was duly published in the Visalia Times-Delta, Porterville Recorder, and Dinuba Sentinel, which are newspapers of general circulation in Tulare County, as well as the Bakersfield Californian and Delano Record in Kern County.

On February 4, 2016, a Notice of Availability of a Draft EIR was posted in the office of the Tulare County Clerk for a 45-day public review period commencing on February 4, 2016, and ending on March 21, 2016.

On September 8, 2017, a copy of the written responses to the timely public comments on the Draft EIR was sent to the commenting public agencies and interested parties in a manner that public agencies and interested parties received it at least 10 days before the Board of Supervisors meeting where the Board was scheduled to act upon the Planning Commission's recommendation to certify the EIR.

On October 12, 2017, a Notice of Availability of a Draft EIR and Notice of Public Hearing was duly published in the Visalia Times-Delta, Porterville recorder, Dinuba Sentinel, Bakersfield Californian, and Delano Record, newspapers of general circulation, for a Planning Commission meeting set for October 25, 2017.

On October 25, 2017, the Planning Commission held a duly notice meeting where staff presented evidence regarding the Final EIR and the Project to the Planning Commission and answered Planning Commission questions, and the Commission held a duly notice public hearing where public testimony was received and recorded regarding the Project and Final EIR.

On October 25, 2017, the Planning Commission reviewed the Final EIR, Findings of Fact, Statement of Overriding Considerations, and Mitigation Monitoring and Reporting Program ("MMRP") for the Project and recommended by Resolution No. 8358 that the Board of Supervisors certify the Final EIR and adopt the Findings of Fact, Statement of Overriding Considerations, and MMRP.

On December 1, 2017, a Notice of Public Hearing was published in the Visalia Times-Delta for a public hearing before the Board at its regular meeting on December 12, 2017.

On December 12, 2017, public testimony was received and recorded at the Board of Supervisors hearing regarding the Project and Final EIR.

On December 12, 2017, after notice and hearing, the Board adopted the 2017 ACFP as the updated Chapter 12 of the Tulare County 2030 General Plan Update, approved and adopted the 2017 Dairy CAP, and approved and certified a Final Environmental Impact Report ("2017 FEIR") and adopted the CEQA Findings of Fact, Statement of Overriding Considerations, and Mitigation Monitoring and Reporting Program ("MMRP") pursuant to CEQA.

The 2017 FEIR formally evaluated the environmental impacts of the 2017 ACFP and 2017 Dairy CAP. The 2017 FEIR was prepared pursuant to CEQA. On December 12, 2017, after notice and hearing, the Board adopted the 2017 ACFP as the updated Chapter 12 of the Tulare County 2030 General Plan Update, approved and adopted the 2017 Dairy CAP, and approved and certified the 2017 FEIR and adopted the CEQA Findings of Fact, Statement of Overriding Considerations, and Mitigation Monitoring and Reporting Program ("MMRP") pursuant to CEQA.

On July 21, 2020, the Tulare County Board of Supervisors adopted Resolution No. 2020-0430 approving an Addendum to the 2017 FEIR for the 2017 ACFP and Dairy CAP, adopted Resolution No. 2020-0431 approving General Plan Amendment No. 20-009 amending the 2017 ACFP and Dairy CAP, and adopted Resolution No. 2020-0446 accepting the Tulare County Planning Commission's recommendation to approve an Addendum to the 2017 FEIR for the 2017 ACFP and Dairy CAP and accepted the Commission's recommendation to approve General Plan Amendment No. 20-009 amending the 2017 ACFP and Dairy CAP.

B. INTERIM REPORT SUMMARY

Section IV.B.2 of the Settlement requires the County of Tulare to prepare an Interim Report (in lieu of an Annual Report) for 2021. The 2021 Interim Report (see Attachment No. 1) is required to include:

1. Total number of permitted dairies and feedlots in the County, number and type of animal waste management system, number of permitted cows provided on the ACFP list, total estimated dairy GHG emissions in 2020 and GHG reductions achieved since 2013.

   The County's Air Quality Consultant has prepared a GHG Emissions Reduction Report (Exhibit "A") with this information. On February 2, 2022, the County's Air Quality Consultant began preparing an Interim Report of total dairy GHG emissions for 2020. The County's Air Quality consultant completed the Interim Report of total dairy GHG emissions for 2020 on March 31, 2022. The Interim Report of total dairy GHG emissions for 2021 presents the 2020 GHG emissions inventory for dairies and cattle feedlots in Tulare County. It also evaluates the voluntary GHG emission reduction projects implemented at dairies and feedlots since 2013 and quantifies the reductions.

2. Total estimated dairy GHG emissions reduced to date compared to the 1.05 million MT/yr. by 2023 Dairy and Feedlot CAP reduction goal, and the total dairy GHG emissions reduced to date compared to the maximum projected SB 1383 potential target.

   The County's Air Quality Consultant has prepared a GHG Emissions Reduction Report (Exhibit "A") with this information. On February 2, 2022, the County's Air Quality Consultant began preparing an Interim Report of total dairy GHG emissions for 2020. The County's Air Quality consultant completed the Interim Report of total dairy GHG emissions for 2020 on March 31, 2022. The Interim Report of total dairy GHG emissions for 2021 presents the 2020 GHG emissions inventory for dairies and cattle feedlots in Tulare County. It also evaluates the voluntary GHG emission reduction projects implemented at dairies and feedlots since 2013 and quantifies the reductions.

   Maas Energy Works and California Bioenergy indicated that bringing a digester project to full operation has taken longer than originally expected due to several reasons. One reason is that CDFA funding is partial, and it has taken time to secure additional funding. Another reason is that permitting is complex and can involve obtaining permits from up to six different agencies. Another reason is that the "hub and spoke" model, where several digesters feed digester gas into a central facility, is complex and components are not always built out simultaneously. Once digester installation is complete, start of operation may be delayed until downstream components are built out. Moreover, the COVID-19 pandemic has resulted in additional delays in the next inventory year, 2021, due to staffing shortages and regulatory agency delays.

   The Interim Report of total dairy GHG emissions for 2021 shows that there were approximately 677,598 additional metric tons per year of CO_2e reductions from solar, digester, and AMMP projects that are planned to become operational after 2020. The

complete dairy digester and AMMP project lists, with project descriptions, are included in Appendix B of the Interim Report of total dairy GHG emissions for 2020.

3. Report on the State's measures pursuant to SB 1383, including but not limited to digester funding and the Alternative Manure Management Program ("AMMP").

   RMA staff completed an AMMP Spreadsheet (Exhibit "B") with this information on March 3, 2022. The AMMP Spreadsheet contains fifteen (15) facilities and shows that the CDFA has awarded $9,301,486.00 in funding for improvements at dairies and feedlots in Tulare County. Ten (10) of those facilities are operational after completing improvements, three (3) facilities have improvements that are under construction, one (1) facility is breaking ground within the second quarter of 2022, and one (1) of the facilities has not started construction due to material acquisition complications. Once the fifteen (15) facilities are all operating for five (5) years after completing improvements, the Greenhouse Gas (GHG) reductions will total 183,630 $MTCO_2e$.

4. Staff recommendations regarding additional, different or modified measures or programs ("adaptive management") to further reduce GHG emissions, especially if the data analyzed in Section IV.B.2.b of the Stipulated Settlement suggests the County is not in line to meet reduction target of 1.05 million metric tons/yr. by 2023 Dairy and Feedlot CAP or SB 1383 reduction targets.

   Regarding the Dairy and Feedlot CAP, so far Tulare County has reduced GHG emissions by 303,618 metric tons per year as a result of projects in operation in 2020, which is 28.916 percent of emissions reductions needed to achieve the Dairy CAP reduction target. To meet the target, County dairies and feedlots will need to reduce emissions by an additional 746,382 metric tons per year by 2023. At present, there are an additional 677,589 metric tons per year of upcoming emissions reductions from County solar, digester, and AMMP projects that have either started operating after 2020, are currently under construction, or are approved and funded for construction.

   To meet the Dairy CAP reduction target, another 68,793 metric tons per year of emissions reductions from yet-to-be identified solar, digester, AMMP or enteric projects will need to be implemented by 2023. So, additional projects will be needed in order to reduce emissions by 6.552 percent to meet the Dairy CAP reduction target of 1.05 million metric tons/yr. by 2023. With the projects in operation in 2020, and the County solar, digester, and AMMP projects that have either started operating after 2020, are currently under construction, or are approved and funded for construction, the amount of emissions reductions for Tulare County will reach 93.448 percent of the meet the Dairy CAP reduction target. The average emissions reduction for the 53 digesters that are operating, under construction, or are approved and funded for construction is 172,723 metric tons over a period of ten (10) years. For annual reductions, the amount would be 1/10 of that, which is 17,272 metric tons per year. So, four (4) additional digester projects of average size would allow Tulare County to achieve the Dairy CAP reduction target of 1.05 million metric tons/yr. by 2023.

In addition, the last paragraph on Page 24 in Section 7.1 of Exhibit "A" states that "Figure 7-1 show the progress of the County dairies and feedlots toward meeting the SB 1383 target in graphical format. The third paragraph of Section 8 on Page 27 of Exhibit "A" states that "Figure 7-1 shows that, as of 2020, the County was ahead of schedule in it progress to meet the SB 1383 target of 40 percent below 2013 levels by 2030."

Based on the above information, the data analyzed is in line to meet the reduction target of 1.05 million metric tons/yr. by 2023 Dairy and Feedlot CAP or SB 1383 reduction targets; therefore, recommendations regarding additional, different or modified measures or programs ("adaptive management") to further reduce GHG emissions are not necessary.

5. Information required in the Interim Report not otherwise listed in this section.

   Updated Digester Project list for digesters within the County that lists: 1) the operation name, 2) project title, 3) total project cost, 4) CDFA funding award, additional Federal or State public funding awards, 5) project description, 6) project construction state, 7) location, 8) GHG emission reductions over ten years, and 9) how captured methane is used. The report shall also include any reported problems with completed digesters within the County.

   RMA staff completed the Updated Digester Project List (Exhibit "C") with this information on February 22, 2022. The Updated Digester Project List contains fifty-five (55) Digesters and shows that the CDFA has awarded $76,191,099 for Digesters at fifty (50) dairies in Tulare County. Three (3) Digesters that are currently operating did not receive CDFA funding. Thirty-nine (39) Digesters are operational, fourteen (14) Digesters are under construction, two (2) Digesters have not yet applied for Building Permits, and two (2) Digester Projects have been cancelled at the request of the grant recipient. Once the fifty-three (53) Digesters are all operating for ten (10) years, the Greenhouse Gas (GHG) reductions will total 9,154,359 $MTCO_2e$. The captured methane is used for RNG generation and pipeline injection for vehicle fuel use, RNG combustion in cogeneration turbines for bioethanol production, and electrical generation.

The Settlement requires Interim Report to be completed by May 1, 2022, and be made available to the public (through the County website). The County shall hold a public meeting on the Interim Report and the County Board shall provide the Interim Report to the public not less than ten (10) calendar days prior to a duly noticed public meeting, where the Board shall consider the Interim Report following a staff report and opportunity for public comments.

The Interim Report was completed on April 4, 2022, and made available to the public (through the County Website) on April 20, 2022. Notice of the May 3, 2022, Board of Supervisors meeting was published on April 20, 2022. The Board of Supervisors provided the Interim Report to the public on April 20, 2022, and then considered the Interim Report on May 3, 2022, following a staff report and opportunity for public comments. It should be noted that the County completed 48 Inspections in 2021 of Dairies and Feedlots, which exceeds the requirement to inspect fifteen (15) percent of the facilities each year on a rolling basis.

C. CEQA FRAMEWORK INTERIM REPORT

Common Sense Exemption consistent with CEQA and the Guidelines for Implementation of the California Environmental Quality Act ("CEQA Guidelines") pursuant to Title 14, Cal. Code Regulations Section 15061(b) (3). Section 15061(b) (3) states that a project is exempt from CEQA if "The activity is covered by the Common Sense exemption that CEQA applies only to projects which have the potential for causing a significant effect on the environment. Where it can be seen with certainty that there is no possibility that the activity in question may have a significant effect on the environment, the activity is not subject to CEQA." Preparing the 2021 Interim Report of total dairy GHG emissions from 2020 will not make any physical change to the environment because it only involves gathering information to prepare a written report concerning whether or not the County of Tulare is in compliance with the 2017 Animal Confinement Facilities Plan ("2017 ACFP") and the 2017 Dairy and Feedlot Climate Action Plan ("2017 Dairy CAP").

Categorical Exemption consistent with CEQA and the CEQA Guidelines pursuant to Title 14, Cal. Code Regulations Section 15306, Class 6, pertaining to basic data collection, research, experimental management, and resource evaluation activities which do not result in a serious or major disturbance to an environmental resource. The use of Section 15306 is applicable and appropriate because preparing the 2021 Interim Report of total dairy GHG emissions from 2020 will not make any physical change to the environment because it only involves gathering information to prepare a written report concerning whether or not the County of Tulare is in compliance with the 2017 ACFP and the 2017 Dairy CAP.

Exhibits: "A" 2021 Interim Report of total GHG emissions from Dairies and Feedlots for 2020

"B" Alternative Manure Management Program Spreadsheet

"C" Digester Project List Spreadsheet

Tulare County

Interim Report of Dairy and Feedlot GHG Emissions in 2020

Prepared by:

Castle Environmental Consulting, LLC
iLanco Environmental, LLC

March 31, 2022

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Appendices

List of Acronyms

ACFP	Animal Confinement Facilities Plan
ACFP DEIR	Draft Environmental Impact Report for the Animal Confinement Facilities Plan, And Dairy and Feedlot Climate Action Plan
ACR	Annual compliance report
AMMP	Alternative Manure Management Program
AR4	IPCC Fourth Assessment Report
BAU	Business-as-usual
CARB	California Air Resources Board
CCI	California Climate Investments
CDFA	California Department of Food and Agriculture
CEC	California Energy Commission
CEFM	Cattle Enteric Fermentation Model
CH_4	Methane
CO_2	Carbon dioxide
CO_2e	Carbon dioxide equivalent
County	County of Tulare
CPUC	California Public Utilities Commission
CSI	California Solar Initiative
Dairy CAP	Tulare County Dairy and Feedlot Climate Action Plan
DDRDP	Dairy Digester Research and Development Program
EIR	Environmental Impact Report
FDA	US Food and Drug Administration
FY	Fiscal year
GHG	Greenhouse gas
HFCs	Hydrofluorocarbons
IPCC	Intergovernmental Panel on Climate Change
SJVAPCD	San Joaquin Valley Air Pollution Control District
kW	Kilowatts
kWh/yr	Kilowatt-hours per year
MBtu/hr	Thousand British thermal units per hour
MT	Metric tons
N_2O	Nitrous oxide
NREL	National Renewable Energy Laboratory
RMA	County of Tulare Resource Management Agency
SB	Senate Bill
SLCP	Short-lived climate pollutants

Executive Summary

This report presents the greenhouse gas (GHG) emissions inventory for dairies and cattle feedlots in the County of Tulare (County) for calendar year 2020. It also evaluates the voluntary GHG emission reduction projects implemented at dairies and feedlots since 2013. The GHG inventory and evaluation of emission reductions were prepared pursuant to the 2019 Stipulated Settlement, entered into by the Sierra Club, Association of Irritated Residents, Center for Biological Diversity, and County of Tulare. This edition of the annual report is the "Interim Report" required by the Stipulated Settlement. As such, it includes additional information not contained in the previous annual reports.

In 2020, the overall operation of County dairies and feedlots and their support crops produced an estimated 6,226,151 metric tons of carbon dioxide equivalent (CO_2e) GHG emissions. This quantity is 17 percent less than the 2013 baseline year emissions and 1 percent less than the previous inventory year (2019) emissions. The reduction in emissions from 2019 to 2020 was primarily associated with a reduction in the dairy cow population and implementation of additional digester projects.

The voluntary emission reduction projects operating at County dairies and feedlots in 2020 included 71 solar panel projects, 11 solar thermal hot water systems, 16 digester projects, and 4 Alternative Manure Management Program (AMMP) projects. These projects provided 303,618 metric tons of CO_2e reductions in calendar year 2020. These reductions constituted 29 percent of the annual emission reductions needed to achieve the Dairy and Feedlot Climate Action Plan (Dairy CAP) target by 2023. The 2020 emission reductions were less than the Dairy CAP reference trajectory and therefore behind schedule. To meet the target, County dairies and feedlots will need to reduce emissions by an additional 746,382 metric tons per year by 2023. At the time of this study, the known additional projects scheduled for post-2020 start-up would provide further reductions of up to 677,589 metric tons of CO_2e per year when operational. This leaves another 68,793 metric tons per year of emission reductions needed from yet-to-be identified solar, digester, AMMP, or enteric projects by 2023. Table ES-1 summarizes the progress toward meeting the CAP target as of 2020.

In 2020, manure management operations at County dairies and feedlots produced an estimated 5,083,865 metric tons of methane CO_2e emissions. This emissions quantity was 12 percent below 2013 levels. The 2020 emissions were lower than the Senate Bill (SB) 1383 reference trajectory and therefore ahead of schedule. To meet the SB 1383 target, County dairies and feedlots will need to further reduce methane CO_2e emissions by an additional 1,613,865 metric tons per year by 2030. At the time of this study, the known additional projects scheduled for post-2020 start-up would provide further methane CO_2e reductions of up to 670,289 metric tons per year when operational. This leaves another 943,576 metric tons per year of methane CO_2e reductions needed from yet-to-be identified digester, AMMP, or enteric projects by 2030. Changes to the animal population would also affect the emissions. Table ES-1 summarizes the progress toward meeting the SB 1383 target as of 2020.

Although County dairies and feedlots have made significant progress in reducing their GHG emissions, additional reduction projects will be needed by 2023 and 2030 to meet the Dairy CAP and SB 1383 targets. The County will continue to track and regulate dairies and feedlots through its ACFP framework.

Continued State and federal incentive funding will be necessary to make additional emission reduction projects economically feasible for the dairy industry.

Table ES-1. Summary of Progress Toward the Dairy CAP and SB 1383 Targets

Policy	Pollutant	Target Year	Target	Progress as of 2020	Additional Needed after 2020 to Reach Target
Dairy CAP	GHGs from all emission categories (CO_2e)	2023	1,050,000 metric tons per year reduction	303,618 metric tons per year reduction	746,382 metric tons per year reduction
SB 1383	Methane from manure management	2030	40% below 2013 emissions	12% below 2013 emissions	1,613,865 metric tons per year reduction (as methane CO_2e)

1 Introduction

This report presents the GHG emissions inventory for dairies and cattle feedlots in the County of Tulare for calendar year 2020. This report also documents the voluntary GHG emission reduction projects initiated at dairies and feedlots since 2013 and quantifies the reductions. The estimated 2020 emission reductions are compared to 2013 base year emissions and emission reduction targets set by the Dairy and Feedlot Climate Action Plan (Dairy CAP) (County of Tulare, 2017a) and Senate Bill (SB) 1383 (Lara, 2016). This report was prepared pursuant to the 2019 Stipulated Settlement, entered into by the Sierra Club, Association of Irritated Residents, Center for Biological Diversity, and County of Tulare.

This edition of the annual report is the "Interim Report" required by the Stipulated Settlement.[1] As such, this report includes additional information not contained in the previous annual reports. The additional information included in this Interim Report is described in detail in Section 2.5.

Section 2 of this report provides background information on the Stipulated Settlement, Animal Confinement Facilities Plan (ACFP), Dairy CAP, and SB 1383. Section 3 provides information concerning the dairy and feedlot animal populations in the County. Section 4 presents the 2013 base year emissions, which provide the benchmark for measuring progress toward the emission reduction targets. Section 5 presents the 2020 business-as-usual (BAU) emissions, which represent what the dairy and feedlot emissions would have been without implementation of the GHG emission reduction projects. Section 6 identifies the voluntary GHG emission reduction projects and presents the estimated emission reductions achieved by those projects. Section 6 also evaluates the progress of the 2020 emission reductions toward meeting the 2023 target set by the Dairy CAP. Section 7 presents the actual 2020 GHG emissions, which result from applying the voluntary emission reductions to the BAU emissions. Section 7 also evaluates the progress of the actual emissions toward meeting the 2030 target set by SB 1383.

This report presents emissions for four GHGs: carbon dioxide (CO_2), methane, nitrous oxide (N_2O), and hydrofluorocarbons (HFCs). For the dairy and feedlot industry, CO_2 is a product of fuel combustion by

[1] The Stipulated Settlement refers to this Interim Report as the "Interim Report for 2021", although it quantifies calendar year 2020 emissions and is due May 1, 2022. It is based on the dairy and feedlot ACR reports for calendar year 2020, which were due in 2021.

on-road trucks and automobiles, off-road dairy and farming equipment, and power plants providing electricity to the dairies and related equipment (this report generally uses "dairy" to mean dairies and feedlots). Methane is primarily produced from anaerobic manure decomposition and enteric digestion (also called enteric fermentation). N_2O is primarily produced from manure decomposition and the use of nitrogen-based fertilizers, including manure, on dairy support crops. HFCs are used in milk refrigeration systems. They are potent GHGs emitted through normal system leakage.

The combined emissions of all four GHGs evaluated in this report are expressed as CO_2e emissions. CO_2e is a common metric used to compare emissions of various GHGs. CO_2e represents the amount of CO_2 that would result in an equivalent amount of global warming as another GHG. CO_2e is computed by multiplying the mass of each GHG by its global warming potential (GWP)[2] and summing the products over all GHGs. By definition, CO_2 has a GWP of 1. The GWPs of the remaining three GHGs were obtained from the Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report (AR4) (IPCC, 2007). Under AR4 guidance, the GWPs for methane, N_2O, and HFCs are 25, 298, and 14,800, respectively.[3] The use of AR4 GWPs is consistent with the CARB California 2000-2019 Greenhouse Gas Emission Inventory Program (CARB, 2021a). The GHG emissions in this report are reported in units of metric tons. One metric ton is equivalent to 1.1 U.S. (short) tons or 2,205 pounds.

2 Background

This section provides background information on the ACFP, Dairy CAP, SB 1383, California's actions related to SB 1383, and the Stipulated Settlement.

2.1 Animal Confinement Facilities Plan

The ACFP, included in the County's General Plan governing dairies and cattle feedlots, was originally adopted in 2001 and updated in 2017 (County of Tulare, 2017c). The 2017 ACFP serves as the guiding document to regulate the County's bovine facilities and projected growth through 2023 in response to statewide climate change regulations and reduction targets. Under the ACFP, the County tracks existing dairies and bovine facilities and defines permitted herd sizes. The ACFP's Conformance Checklist Review serves to streamline the CEQA process for expanding facilities that meet specific eligibility requirements. The ACFP also requires that dairies and feedlots submit Annual Compliance Reports (ACRs) and recommends voluntary, incentivized GHG reduction strategies.

2.2 Dairy CAP

When the County revised the General Plan in 2012 (2030 General Plan Update), it retained the ACFP but provided for a subsequent process to update the ACFP with its own CEQA review and Environmental Impact Report (EIR). Under the General Plan Update, the County directed the preparation of a separate

[2] GWP is a measurement of how much heat a GHG can trap in the atmosphere, over a specific amount of time, as compared to CO_2. CO_2 is used as a benchmark for this measurement, so its GWP is 1. All other gases are represented in comparison to this value.

[3] The GWP of 14,800 for HFCs used in this report corresponds to HFC-23. HFC-23 is one of several types of refrigerants used in industrial refrigeration equipment. HFC-23 was conservatively selected as the refrigerant for quantification purposes because of its high GWP.

climate action plan as part of the ACFP Update to specifically address dairies and feedlots. The Dairy CAP serves that purpose and is used to implement the ACFP Update and its application to new and expanding dairies and feedlots (County of Tulare, 2017a; County of Tulare, 2017c).

The Dairy CAP includes estimates of dairy and feedlot GHG emissions for the 2013 baseline year, approaches for reducing GHG emissions in accordance with statewide requirements and reduction targets, and projections through 2023. The CAP sets a reduction target of 1.05 million metric tons of GHG emissions per year by 2023. Section 6.4 tracks the progress of County dairy and feedlot GHG reductions achieved by year 2020 relative to the CAP target.

2.3 Senate Bill 1383

Short-lived climate pollutants (SLCPs) are powerful climate forcers that have relatively short atmospheric lifetimes. These pollutants include methane, HFCs, and anthropogenic black carbon. SB 1383 authorized the California Air Resources Board (CARB) to set goals for reducing SLCPs and specifically for adopting regulations to reduce methane emissions from dairy and livestock manure management operations by 40 percent below 2013 levels by 2030 (CLI, 2016). In adopting such regulations, CARB is directed to coordinate with the California Department of Food and Agriculture (CDFA), the California Public Utilities Commission (CPUC) and the California Energy Commission (CEC). Notably, any regulations to reduce dairy emissions cannot take effect sooner than January 1, 2024, and then only if CARB, in consultation with CDFA, determines the regulations to be technologically feasible, economically feasible, and cost-effective. CARB is also directed to consider livestock and dairy operation research on dairy methane emissions reduction projects, including, but not limited to, scrape manure management systems, solids separation systems, and enteric fermentation; and to consider developing and adopting methane emissions reduction protocols. Section 7.1 tracks the progress of County dairy and feedlot methane reductions achieved by year 2020 relative to the SB 1383 target.

2.4 California's Actions Pursuant to SB 1383

The Stipulated Settlement requires the County to report on the State's measures pursuant to SB 1383, including but not limited to digester funding and the AMMP. This section describes the State's regulatory framework adopted pursuant to SB 1383 as well as funding and incentive programs.

On March 24, 2017, CARB adopted the SLCP Reduction Strategy, outlining future steps for implementing SB 1383 and the need for cooperation between regulatory agencies (CARB, 2017). Of note is SB 1383 direction that CARB and CDFA are to evaluate the dairy sector's progress toward meeting the SLCP 2030 reduction target on a voluntary basis, and, if sufficient progress has not been attained due to insufficient funding or market or technical barriers, CARB may revise the SLCP Strategy's methane emission reduction target for dairies to a less stringent level.

In response to this significant contribution to the State's emissions and the requirement of Senate Bill 1383 to work with stakeholders to identify barriers to dairy and livestock GHG emissions reduction projects, CARB, CDFA, CEC, and CPUC convened a Dairy and Livestock GHG Emissions Working Group (Working Group). The Working Group held its first meeting in May 2017 and included participation from dairy industry representatives, environmental justice advocates, public utilities, academics, and other interested stakeholders. At the May 2017 meeting, the Working Group formed three subgroups to develop policy recommendations on the following topics:

- Subgroup #1: Fostering Markets for Non-Digester Projects
- Subgroup #2: Fostering Markets for Digester Projects
- Subgroup #3: Research Needs, Including Enteric Fermentation

The Working Group held additional meetings in January and December 2018. At the December meeting, representatives of the three subgroups presented their recommendations to advance methane emissions reductions at California dairy and livestock operations. These recommendations inform actions to reduce methane emissions from dairy and livestock operations, help prioritize incentive funding and research, and provide guidance for future policies (CARB, 2021b).

California established several incentive programs to help the dairy industry meet SLCP reduction targets. The centerpiece of these efforts is the following two state-funded incentive programs implemented by the CDFA:

- Dairy Digester Research and Development Program (DDRDP)
- Alternative Manure Management Program (AMMP)

Both programs are funded under the California Climate Investments (CCI) Program through Cap-and-Trade auction proceeds or the Greenhouse Gas Reduction Fund.

From 2015 through 2020, CDFA awarded $195 million to 117 dairy digester projects in California under the DDRDP, with $413.1 million provided in matching funds by grant awardees. The DDRDP projects have an anticipated cumulative statewide GHG reduction of 21.0 million metric tons of CO_2e over ten years, or approximately 2.1 million metric tons of CO_2e annually, and equate to a 21 percent reduction in methane emissions from manure management in California (CDFA, 2021a; CDFA, 2022c). Many of these manure methane reduction projects are also generating environmental credits through CARB's Cap-and-Trade Program, Low Carbon Fuel Standard Program, and the federal Renewable Fuel Standard Program (CARB, 2022d).

From 2016 through 2020, CDFA has awarded $67 million to 114 AMMP projects in California. Approximately $10 million has been provided in matching funds by awardees. The AMMP projects have an anticipated cumulative GHG reduction of approximately 1.1 million metric tons of CO_2e over five years, or approximately 0.22 million metric tons of CO_2e annually, and equate to a 2.1 percent reduction in methane emissions from manure management in California. Unlike digesters which capture methane, AMMP projects are designed to avoid methane production. CDFA's AMMP funds provide for a diverse range of manure management options to dairy and livestock operations where digesters may not be economically feasible (CDFA, 2021a; CDFA, 2022d).

SB 1383 has also generated considerable interest in reducing enteric methane emissions using cattle diet modification or feed additives. CARB has sponsored various studies to identify potential strategies for California (CARB, 2021b; CARB, 2021c). However, several technical and market barriers such as animal health, commercial availability, consumer acceptance, and cost-effectiveness must be overcome before safe and effective strategies can be widely implemented and tracked (CARB, 2020a). One potential feed additive, 3-Nitrooxypropanol (3-NOP), has shown an emissions reduction potential between 20 and 40 percent across multiple ruminant species under various testing conditions. It has undergone both laboratory-scale and on-farm testing for effectiveness in reducing methane emissions safely, and for potential impacts on animal health, reproduction, and productivity. It is currently

undergoing US Food and Drug Administration approval and may become available within the next few years (CARB, 2022d).

In March 2022, CARB published a final report titled *Analysis of Progress toward Achieving the 2030 Dairy and Livestock Sector Methane Emissions Target* (CARB, 2022d). The CARB report projected that, without any additional incentive funding after FY 2019-2020, the dairy and livestock sector would achieve just over half of the annual methane emissions reductions necessary to achieve the SB 1383 target by 2030. The projected reductions would come primarily through the assumption that the California dairy cow population would continue to decline at the recent historical rate as well as the digester and AMMP projects funded through FY 2019-2020. To meet the 2030 target, additional dairy digesters, AMMP projects, and enteric strategies will be needed. Challenging sector economics, insufficient availability of public funds, and underdeveloped markets for value-added manure products are persistent market barriers for these types of projects. (CARB, 2022d).

CARB estimated that if the remaining reductions needed to achieve the 2030 target are met through a mix of half dairy digesters and half AMMP projects, then at least 420 additional projects may be necessary. This approach would cost an amount between $0.8 and $3.7 billion, which could be supported by local, State, and federal funding, or other financial mechanisms, such as the pilot financial mechanism outlined in SB 1383. If, going forward, only digester projects were developed to achieve the target, approximately 230 additional digesters may be needed, at a cost between $0.7 and $3.9 billion depending on the types of technologies selected. Regardless of the project and technology mix used, the most important factors for achieving the 2030 target are ongoing capital funding for new methane emissions reduction projects, continued revenue streams that incentivize dairy biogas capture and beneficial use, and an available and accepted means of reducing enteric methane emissions. (CARB, 2022d).

Even with considerable progress toward achieving the target since its enactment, SB 1383 requires CARB to adopt a regulation to meet the 2030 target, provided that certain conditions are met. Further, CARB is only authorized to implement regulations to meet the target after January 1, 2024, provided that CARB, in consultation with CDFA, determine the regulations are technologically and economically feasible, cost-effective, include provisions to minimize and mitigate potential leakage (i.e., moving out of state), and include an evaluation of the achievements made by incentive-based programs. In designing a regulation for methane emission reductions, CARB staff will consider reasonable strategies to support the sector in meeting the 2030 target, which may include strategies that further support biogas capture and end-uses needed to advance the State's carbon neutrality efforts. (CARB, 2022d).

CARB's next steps will be to continue to monitor the dairy and livestock sector's methane emissions reductions progress and refine its understanding of emissions sources, emissions reduction potential, and the achievements of incentives. CARB will continue to research additional technology options and management practices that can achieve methane emissions reductions, as well as research the effectiveness of practices used today. To assist in this effort, CDFA plans to convene a working group to address market development barriers for facilitating value-added manure products. CARB will also consider potential options to improve quantification of methane emissions reductions from manure management projects as well as ways to refine GHG emissions accounting for the sector. Finally, CARB will consider regulation development to ensure that the 2030 target is achieved, assuming the conditions outlined in the statute are met. (CARB, 2022d).

2.5 Stipulated Settlement

On August 2, 2019, a Stipulated Settlement was entered into by the Sierra Club, Association of Irritated Residents, Center for Biological Diversity, and County of Tulare. The Stipulated Settlement completely resolved Case No. 272380 - Petition for Writ of Mandate and Complaint for Declaratory and Injunctive Relief, Superior Court, State of California, County of Tulare, Visalia Division, challenging the certification by the County of Tulare of the Environmental Impact Report for the ACFP and related General Plan Amendments Zone Changes, and Dairy CAP.

Section IV.B.1 of the Stipulated Settlement requires the County to prepare Annual Reports of total dairy GHG emissions from fiscal year (FY) 2019 to FY 2024. The Annual Reports are required to include:

1. The total estimated dairy GHG emissions reduced to date compared to the 1.05 million metric tons per year Dairy CAP reduction target set for 2023, and the total dairy GHG emissions reduced to date compared to the maximum projected SB 1383 potential target of 40 percent below 2013 methane levels by 2030.

   Sections 6.4 and 7.1 of this report satisfy Item 1.

2. A report on the State's measures pursuant to SB 1383, including but not limited to digester funding and the AMMP.

   County of Tulare RMA staff completed an AMMP List with this information on March 3, 2022. This list, together with Section 2.4 of this report, satisfies Item 2.

3. An updated digester project list for digesters within the County that lists: 1) the operation name, 2) project title, 3) total project cost, 4) CDFA funding award, additional federal or state public funding awards, 5) project description, 6) project construction state, 7) location, 8) GHG emission reductions over ten years, and 9) how captured methane is used. The report must also include any reported problems with completed digesters within the County.

   RMA staff completed the updated digester project list with this information on February 22, 2022. This list, together with Section 6.5 of this report, satisfies Item 3.

Furthermore, Section IV.B.2 of the Stipulated Settlement requires the County to prepare an Interim Report (in lieu of an Annual Report) for 2021. This edition of the Annual Report is the "Interim Report for 2021" required by the Stipulated Settlement (the Interim Report for 2021 quantifies calendar year 2020 emissions and is due May 1, 2022). In addition to Items 1-3 above, the Interim Report is required to include:

4. Total number of permitted dairies and feedlots in the County, number and type of animal waste management system, number of permitted cows provided on the ACFP list, total estimated dairy GHG emissions in 2020 and GHG reductions achieved since 2013.

   Section 3, Table 7-1, and Table 7-2 satisfy Item 4.

5. Total estimated dairy GHG emissions reduced to date compared to the 1.05 million metric tons/yr by 2023 Dairy CAP reduction target, and the total dairy GHG emissions reduced to date compared to the maximum projected SB 1383 potential target.

Sections 6.4 and 7.1 of this report satisfy Item 5.

6. Summary of the State's GHG-reduction recommendations or required measures pursuant to SB 1383 including but not limited to digester and AMMP funding.

   Section 2.4 satisfies Item 6.

7. Staff recommendations regarding additional, different, or modified measures or programs ("adaptive management") to further reduce GHG emissions, especially if the data analyzed in Item 5 suggests the County is not in line to meet reduction target of 1.05 million metric tons/yr by 2023 Dairy CAP or SB 1383 reduction targets.

   Section 8 satisfies Item 7.

3 Animal and Facility Statistics

At present, the County maintains ACFP permits for 297 dairies and 38 feedlots. Table 3-1 presents the maximum number of milking cows and total head permitted by the County at these facilities.

Table 3-1. Dairy and Feedlot County Permit Limits

Facility Type	Permitted Facilities[1]	Permitted Milking Cows	Permitted Total Head
Dairies	297	426,704[2]	735,792[3]
Feedlots	38	8,708	152,548
Total	**335**	**435,412**	**888,340**

Notes:

1. Source: County of Tulare RMA. ACFP List updated February 18, 2022.
2. Fifteen grandfathered dairies have no County limit on milking cows; therefore, the Regional Water Quality Control Board's permit limit for the number of mature cows was substituted.
3. Two grandfathered dairies have no County limit on total head; therefore, the San Joaquin Valley Air Pollution Control District's permit limit for total head was substituted.

Table 3-2 lists the various manure management practices used at the County dairies and feedlots as of 2020. The practices are presented in descending order of prevalence. The counts in Table 3-2 were obtained from San Joaquin Valley Air Pollution Control District (SJVAPCD) air permits for the facilities as well as the facilities' FY 2020 ACRs to the County (S. Roper, County of Tulare RMA, personal communication, February and March 2022). Manure management practice data were available for 283 facilities.

Table 3-2. Manure Management Practices used at County Dairies and Feedlots in 2020

Manure Management Practice[1]	Number of Facilities Using Practice[2]	Definition
Dry Lot	274	A paved or unpaved open confinement area without any significant vegetative cover where accumulating manure may be removed periodically.
Solid Storage/Stock Pile	264	The storage of manure, typically for a period of several months, in unconfined piles or stacks. Manure is able to be stacked due to the presence of a sufficient amount of bedding material or loss of moisture by evaporation.
Liquids Land Application	250	Application of nutrient-laden liquid manure to land as an agricultural fertilizer. Because separated liquids have fewer solids, they are easier to agitate and handle using pumping equipment, and can provide farmers with more options during land application.
Haul Solids Offsite	239	The practice of transporting solid manure offsite, often for subsequent land application.
Solids Land Application	226	The spreading of biosolids on the soil surface or incorporating or injecting biosolids into the soil.
D2: Total Mixed Rations Strategy[3]	173	Feeding strategy intended to maximize feed-to-milk production efficiency in lactating cows.
Settling Basin	173	Structures designed to separate solids from liquid manure by sedimentation.
Storage Pond	166	A structure used for impounding or storing manure, wastewater, and contaminated runoff. Manure is stored for a specified period of time, one year or less, and then the pond is emptied.
Flush System	160	A system that uses a shallow gutter that is flushed or drained periodically to remove waste from the building to a lagoon or storage basin.
Anaerobic Lagoon (uncovered)	149	Anaerobic lagoons combine liquid waste stabilization and storage. Anaerobic digestion is a series of biological processes in which microorganisms break down biodegradable material in the absence of oxygen. Animal excreta with or without straw are collected and anaerobically digested. The microbial reduction of complex organic compounds generates substantial quantities of methane emissions. These lagoons accumulate sludge over time, diminishing treatment capacity and must be cleaned out once every 5 to 15 years. Lagoon sludge is typically applied to agricultural lands. Lagoon water may be recycled as flush water or used to irrigate and fertilize fields.
D7: Increase Solids Separation[3]	124	Increasing separation of solids by settling or mechanical methods such as screening or pressing to divert manure from lagoons. Solids can be used as animal bedding, sold, or spread on the land as fertilizer.
D6: Scraping[3]	116	Manual systems designed to divert manure from lagoons to another part of the storage system, including composting for on-site or off-site use.
Composting	55	The process where naturally occurring microorganisms in manure, degrade organic matter, producing a humic substance. This humic substance contains vital nutrients for crops but has less volume, reduced odors, and reduced pathogen content.
Processing Pit	24	Enclosure which allows for collection of flushed manure to be conveyed through a solids separation system at the rate required for maximum separation.
D5: Anaerobic Digester (including covered lagoon)[3]	16	Dairy digesters prevent GHGs like methane formed in lagoons from reaching the atmosphere. Anaerobic digesters stop gases from escaping because the lagoon's surface is covered and the gases trapped inside. Once trapped, they can be used for a variety of purposes. For example, the gas can be burned for renewable electricity, but is more commonly used for vehicle fuel. The captured gases from digesters can be injected into natural gas pipelines to power renewable natural gas (RNG) vehicles (UC Davis, 2022).
Daily Spread	3	The process where manure is routinely removed from a confinement facility and is applied to cropland or pasture within 24 hours of excretion.
Solar Drying	3	The process of using solar energy to evaporate a portion of water in manure to reduce the manure volume.
D8: Pasture-Based Management[3]	2	The practice of growing forage grasses that ensure a lasting food source for livestock while at the same time maintaining and improving the ecological health of the soil.

Source: SJVAPCD air permit records (Public Records Request C-2022-2-70, March 18, 2022); County dairy/feedlot ACR data (County of Tulare RMA, personal communication with Sandy Roper, February 22, 2022).

Notes:

1. The following manure management practices were not used in 2020 and therefore are not shown in the table: Deep Pit, Liquid/Slurry, and Aerobic Treatment.
2. Most facilities use multiple manure management practices and therefore contribute to the counts in multiple table rows.
3. Manure management practices denoted by D2, D5, D6, D7, and D8 are GHG emission reduction strategies identified in the ACFP.

Actual cattle population data compiled by the County of Tulare RMA served as the basis for the GHG emission estimates for both the 2013 baseline year and the 2020 inventory year. The 2013 County data were used to generate the baseline year emissions in the Dairy CAP and were represented by 330 reporting facilities (County of Tulare, 2017a). RMA staff compiled the 2020 data from the FY 2020 ACRs prepared by the individual dairies and feedlots. The 2020 data were represented by 288 reporting facilities with non-zero cattle populations.

Table 3-3 presents the 2013 and 2020 actual cattle population data upon which this report is based. Data for the prior inventory years, 2018 and 2019, are also included for comparison. The table shows that the reported populations of dairy cows and dairy calves decreased in 2020 relative to both 2013 and 2019. The populations of dairy heifers (0-12 months), feedlot cattle, and total animals increased relative to both 2013 and 2019. The population of dairy heifers (12-24 months) increased relative to 2013 but slightly decreased relative to 2019.

County of Tulare RMA staff is presently working to identify facilities that did not submit ACRs and to fill in missing 2020 data. Any substantial revisions to the 2020 data made after release of this report will be noted in the subsequent year's GHG emission inventory report.

Table 3-3. Dairy and Feedlot Reported Animal Populations

Year	Dairy Cows[3]	Dairy Heifers 0-12 mos.	Dairy Heifers 12-24 mos.	Dairy Calves	Feedlot Cattle	Total Animals
2013 (baseline year)[1]	543,431	137,985	148,928	65,770	133,886	**1,030,000**
2018[2]	569,140	125,636	167,099	59,636	204,272	**1,125,783**
2019[2]	487,382	165,914	183,410	61,871	179,261	**1,077,838**
2020 (current inventory year)[2]	484,574	175,335	183,216	61,411	214,271	**1,118,807**

Legend: mos. = months of age.

Notes:

1. Source: Dairy CAP. Appendix A, Tables A-1 and A-3.
2. Source: County of Tulare RMA. ACRs.
3. Includes milk cows and dry cows.

4 Baseline Year (2013) Emissions

Table 4-1 presents the dairy and feedlot GHG emissions for the 2013 baseline year. The table matches Table 3.7-1 of the *Draft Environmental Impact Report for the Animal Confinement Facilities Plan, And Dairy and Feedlot Climate Action Plan* (ACFP DEIR) (County of Tulare, 2017b) and Table 3 of the Dairy CAP. The 2013 GHG emissions represent the baseline to which the actual 2020 emissions are compared in Section 7.

Table 4-1. Dairy and Feedlot 2013 Baseline GHG Emissions

Source Category	CO_2 (MT/yr)	CH_4 (MT/yr)	N_2O (MT/yr)	HFCs (MT/yr)	CO_2e (MT/yr)
Farm Equipment Exhaust	38,054	3	0	0.0	38,129
Farm Agricultural Soil	0	0	2,725	0.0	812,050
Farm Electricity Consumption	79,107	3	1	0.0	79,480
Dairy Equipment Exhaust	99,106	12	0	0.0	99,406
Truck Trips	23,137	0	0	0.0	23,137
Automobile Trips	14,882	3	3	0.0	15,851
Dairy Electricity Consumption	144,792	6	1	0.0	145,335
Dairy Refrigeration	0	0	0	4.3	63,640
Dairy Manure Decomposition	0	123,329	1,385	0.0	3,496,077
Dairy Enteric Digestion	0	98,523	0	0.0	2,463,071
Feedlot Manure Decomposition	0	388	67	0.0	29,598
Feedlot Enteric Digestion	0	9,083	0	0.0	227,068
Total Emissions	**399,078**	**231,350**	**4,182**	**4.3**	**7,492,843**

Legend: CO_2 = carbon dioxide; CH_4 = methane; N_2O = nitrous oxide; HFCs = hydrofluorocarbons; CO_2e = carbon dioxide equivalent; MT/yr = metric tons per year.

Source: ACFP DEIR, Table 3.7-1. Consistent with Table 3 of the Dairy CAP.

Table 4-2 presents the 2013 baseline emissions of methane from the manure management source categories (i.e., manure decomposition and enteric digestion). These emissions are a subset of the emissions in Table 4-1. They were used to determine the year 2030 SB 1383 target, which is defined as 40 percent below 2013 methane emissions by 2030. Therefore, the 2030 SB 1383 target for County dairies and feedlots is 3,470,000 metric tons per year of methane CO_2e from manure management (5,783,068 × 0.6, rounded to the nearest thousand).

Table 4-2. Dairy and Feedlot 2013 Baseline Methane Emissions from Manure Management

Source Category	CH_4 (MT/yr)	CO_2e (MT/yr)[1]
Dairy Manure Decomposition	123,329	3,083,219
Dairy Enteric Digestion	98,523	2,463,071
Feedlot Manure Decomposition	388	9,710
Feedlot Enteric Digestion	9,083	227,068
Total Emissions	**231,323**	**5,783,068**

Legend: CH_4 = methane; CO_2e = carbon dioxide equivalent; MT/yr = metric tons per year.

Source: ACFP DEIR, Table 3.7-1. Consistent with Table 3 of the Dairy CAP.

Note:

1. Methane emissions are expressed as CO_2e.

5 Business-As-Usual Emissions in 2020

The development of 2020 BAU emissions was the first step in estimating 2020 actual emissions. In this study, BAU represents a hypothetical operating condition consisting of 2020 animal populations coupled with the continuation of 2013 manure management practices. BAU emissions exclude the emission

reductions from the voluntary solar, digester, and AMMP projects implemented at the dairies and feedlots since 2013. Section 6 describes these voluntary projects and quantifies their emission reductions. Section 7 applies the voluntary emission reductions to the BAU emissions to produce the estimated 2020 actual emissions.

5.1 Quantification Methodology

For the 2020 BAU emissions, this report quantified the same emission source categories as the 2013 baseline categories shown in Table 4-1. Where applicable, the quantification of 2020 BAU emissions generally used the same methodologies and the most recent available equations and variables that CARB used for the California 2000-2019 Greenhouse Gas Emission Inventory Program (CARB, 2021a). The California Greenhouse Gas Emission Inventory Program used methodologies published by the IPCC and U.S. EPA (IPCC, 2006; USEPA, 2013). The BAU emission quantification methodologies are described below. Appendix A includes the detailed BAU calculation tables for all source categories.

5.1.1 Farm Equipment Exhaust

During farming operations for the dairy and feedlot support crops, diesel-powered equipment is used to perform routine tasks such as plowing and crop harvesting. Annual fuel use for the farm equipment was estimated using a factor of 25 gallons per year per acre, from CARB's *Analysis of California's Diesel Agricultural Equipment Inventory according to Fuel Use, Farm Size, and Equipment Horsepower* (CARB, 2018). The 2020 cultivated acreage for support crops was estimated by scaling the 2013 acreage by the relative number of animal units.[4] The 2013 acreage was obtained from Appendix E2 of the ACFP DEIR. Year 2020 emissions were calculated by multiplying the 2020 fuel use by CO_2, methane, and N_2O emission factors obtained from The Climate Registry (TCR, 2021).

5.1.2 Farm Agricultural Soil

Various agricultural soil management practices contribute to GHG emissions. The use of synthetic and organic fertilizers adds nitrogen to soils, thereby increasing natural emissions of N_2O. Emissions of N_2O from support crop agricultural soil were calculated using equations published by the IPCC (2019). The equations estimate N_2O emissions due to direct emissions from soils, indirect emissions from runoff, and indirect emissions from volatilization and subsequent conversion to N_2O. The emission calculations used the 2020 cultivated acreage described in Section 5.1.1.

5.1.3 Farm Electricity Consumption

The use of electricity by agricultural irrigation pumps for support crops generates indirect GHG emissions from regional power plants burning fossil fuels. Appendix E2 of the ACFP DEIR estimated an average electricity usage rate of 1.59 megawatt-hours per acre per year for agricultural irrigation pumps in the San Joaquin Valley. Year 2020 electricity usage was estimated by multiplying this factor by the 2020 cultivated acreage described in Section 5.1.1. Year 2020 GHG emissions were estimated using U.S. EPA Emissions & Generation Resources Integrated Database (eGRID) emission factors for the CAMX

[4] The County of Tulare defines an animal unit as a common animal denominator, based on feed consumption, where one mature Holstein milking cow (1,400 pounds) represents one animal unit.

subregion in year 2020 (USEPA, 2022). CAMX represents the California Western Electricity Coordinating Council (WECC) subregion.

5.1.4 Dairy Equipment Exhaust

During dairy and feedlot operations, diesel-powered mobile equipment is used to perform routine tasks such as distribution of cattle feed and corral scraping. Annual equipment usage for 2020 was scaled from the 2013 usage in proportion to the relative number of animal units, except for standby generator usage, which was scaled in proportion to the relative number of facilities. The 2013 equipment usage was obtained from Appendix E2 of the ACFP DEIR. Year 2020 emissions were calculated by converting the equipment usage (in horsepower-hours) to fuel use (in gallons) and multiplying by CO_2, methane, and N_2O emission factors obtained from The Climate Registry (TCR, 2021).

5.1.5 Truck and Automobile Trips

Operation of dairies and feedlots generates a variety of truck trips, including silage trucks, hay trucks, concentrated feed trucks, calf milk replacer trucks, and cattle trucks. The facilities also generate light-duty vehicle trips from employees and visitors (veterinarians, breeders, sales, and delivery). Trip counts in 2020 were scaled from 2013 in proportion to the number of animal units for trucks and the number of facilities for automobiles. The 2013 trip counts and trip lengths were obtained from Appendix E2 of the ACFP DEIR. Trip lengths were assumed to remain constant. The EMFAC2021 mobile source emission factor program was used to generate truck and automobile exhaust emission factors (CARB, 2022b). The emission factors include contributions from running exhaust, idle exhaust, and starting exhaust. Because EMFAC2021 estimated a small fraction of light-duty vehicle trips were made by electric and hybrid vehicles, the emission calculation also included regional power plant emissions using eGRID emission factors.

5.1.6 Dairy Electricity Consumption

Electricity is used at dairies for lighting, operation of the milking equipment, operation of electric pumps for water supply, and other uses. The use of electricity by dairy facilities generates indirect GHG emissions from regional power plants burning fossil fuels. Appendix E2 of the ACFP DEIR estimated an average electricity usage rate of 0.49 megawatt-hours per cow (dairy cows and heifers) per year for dairies in the San Joaquin Valley. Year 2020 electricity usage was estimated by multiplying this factor by the 2020 animal population of dairy cows and dairy heifers (0-12 months and 12-24 months) from Table 3-3. Year 2020 GHG emissions were estimated using eGRID emission factors.

5.1.7 Dairy Refrigeration

Dairies refrigerate milk prior to pick-up by milk trucks. HFC emissions are produced by normal refrigerant leakage from the refrigeration equipment. The Climate Registry (TCR, 2021) lists a default upper bound annual refrigerant loss rate of 25 percent for industrial refrigeration. The total 2020 refrigerant charge was scaled from 2013 in proportion to the number of dairy cows as shown in Table 3-3. The total 2013 refrigerant charge was obtained from Appendix E2 of the ACFP DEIR. The 2020 HFC emissions were estimated by multiplying the total refrigerant charge by the 25 percent loss rate. HFC-23 is one of several types of refrigerants used in industrial refrigeration equipment. HFC-23 was conservatively selected as the refrigerant for quantification purposes because of its high GWP of 14,800.

5.1.8 Manure Decomposition

Manure is primarily composed of organic material and water. Under anaerobic conditions, the organic material is decomposed by anaerobic bacteria. The primary end products of anaerobic decomposition are methane and stabilized organic material. N_2O is also produced during manure storage and treatment.

The key factors affecting methane production from livestock manure are the quantity of manure produced, manure characteristics (which in turn depend on the composition and digestibility of the animal diet), the manure management system, and climate. Production of N_2O during manure storage and treatment occurs via combined nitrification-denitrification of nitrogen contained in the manure. The amount of N_2O released depends on the manure management system, duration of waste management, nitrogen concentration, temperature, volatilization fraction, runoff fraction, biochemical oxygen demand, and other variables.

Emissions associated with manure decomposition were calculated using the methodology developed for the CARB statewide 2000-2019 GHG Emission Inventory, which also reflects the 2006 IPCC Guidelines for National Emission Inventories (CARB, 2021a; IPCC, 2006). The methodology takes into consideration the apportionment of manure to each type of manure management system and specifies the variables used in the emission calculations.

The calculation of 2020 BAU emissions assumed a distribution of manure to each type of manure management system that was consistent with year 2013 assumptions in the CARB Statewide GHG Emission Inventory. Use of the baseline 2013 distribution ensures that the BAU emissions do not inadvertently include any of the voluntary reduction projects implemented after 2013 and quantified in Section 6.

Methane emissions from manure decomposition were estimated using Equation 1.

Equation 1: $CH_{4,man} = V_{ex} \times B_0 \times MCF \times c_1$

$CH_{4,man}$ = methane emissions from manure [kg/yr]
V_{ex} = volatile solids excreted [kg VS/yr]
B_0 = maximum methane producing capacity [m^3/kg VS]
MCF = methane conversion factor [%]
c_1 = conversion factor representing density of methane at 25°C.

Volatile solids excreted were estimated using Equation 2.

Equation 2: $V_{ex} = VS \times (WMS \times N_{animals})$

VS = volatile solids excreted per animal [kg VS/animal/yr]
$(WMS \times N_{animals})$ = equivalent number of animals per waste management system

N_2O emissions from manure decomposition were estimated using Equation 3.

Equation 3: $N_2O = WMS \times N_{animals} \times N_{excreted} \times [D_{EF} + (V_{frac} \times V_{EF}) + (R_{frac} \times R_{EF})] \times 1.5711$

N_2O = nitrous oxide emissions from manure [kg N_2O/yr]
$N_{excreted}$ = nitrogen excreted per animal [kg N/animal/yr]

D_{EF} = direct nitrogen as N_2O-N [g N_2O-N/g N]
V_{frac} = volatilization fraction of N [fraction]
V_{EF} = indirect nitrogen as N_2O-N [g N_2O-N/g]
R_{frac} = runoff fraction of nitrogen [fraction]
R_{EF} = indirect nitrogen as N_2O-N for runoff N [g N_2O-N/g]

The following variables were obtained from CARB's GHG Emissions Inventory from the most recent emissions inventory year available, 2019: MCF, c_1, B_0, VS, $N_{excreted}$, D_{EF}, V_{frac}, V_{EF}, R_{frac}, R_{EF}.

5.1.9 Enteric Digestion

Enteric digestion (also referred to as enteric fermentation) is a natural part of the digestive process in ruminant animals such as cattle. Microbes in the digestive tract, or rumen, decompose and ferment food, producing methane as a by-product.

County methane emissions from enteric digestion were estimated by scaling the 2019 CARB statewide enteric methane emissions (2019 being the most recent statewide emissions year available) by the 2020 County animal counts (see Equation 4). Since CARB uses the IPCC methodology as implemented in the Cattle Enteric Fermentation Model (CEFM), it is appropriate to estimate emissions from enteric digestion by assuming that County emissions are proportional to the California emissions based on animal population.

Year 2019 statewide animal counts and enteric digestion methane emissions were obtained from the CARB 2000-2019 GHG Inventory (CARB, 2021a). County animal counts for 2020 were obtained the County's ACR reports (see Table 3-3).

Equation 4: $CH_4,ent = CH_{4,ent,CA} \times (Pop_{Tulare}/Pop_{CA})$

$CH_{4,ent}$ = 2020 County methane emissions from enteric digestion
$CH_{4,ent,CA}$ = Statewide 2019 methane emissions from enteric digestion
Pop_{Tulare} = County 2020 animal count
Pop_{CA} = Statewide 2019 animal count

5.2 Estimated 2020 BAU Emissions

Table 5-1 presents the dairy and feedlot BAU emissions for 2020. As discussed at the beginning of Section 5, the BAU emissions reflect 2020 animal populations but exclude the emission reductions from voluntary projects implemented at the dairies and feedlots since 2013. The BAU emissions were used in the development of the 2020 actual emissions presented in Section 7.

Table 5-1. Dairy and Feedlot 2020 Business-as-Usual GHG Emissions

Source Category	CO_2 (MT/yr)	CH_4 (MT/yr)	N_2O (MT/yr)	HFCs (MT/yr)	CO_2e (MT/yr)[1]
Farm Equipment Exhaust	39,425	1	2	0.0	40,016
Farm Agricultural Soil	0	0	938	0.0	279,407
Farm Electricity Consumption	57,203	4	0	0.0	57,425
Dairy Equipment Exhaust	112,885	3	5	0.0	114,576
Truck Trips	20,916	0	3	0.0	21,911
Automobile Trips	11,368	1	1	0.0	11,565
Dairy Electricity Consumption	96,228	6	1	0.0	96,601
Dairy Refrigeration	0	0	0	4.9	71,941
Dairy Manure Decomposition	0	110,374	1,466	0.0	3,196,139
Dairy Enteric Digestion	0	90,457	0	0.0	2,261,423
Feedlot Manure Decomposition	0	599	113	0.0	48,770
Feedlot Enteric Digestion	0	13,200	0	0.0	329,994
Total Emissions	**338,024**	**214,644**	**2,529**	**4.9**	**6,529,769**

Legend: CO_2 = carbon dioxide; CH_4 = methane; N_2O = nitrous oxide; HFCs = hydrofluorocarbons; CO_2e = carbon dioxide equivalent; MT/yr = metric tons per year.

Notes:

1. BAU emissions reflect 2020 dairy and feedlot cattle populations coupled with 2013 baseline year manure management practices. Emission calculations used methodologies consistent with the CARB California Greenhouse Gas Emission Inventory Program. BAU emissions exclude the voluntary GHG reduction projects implemented since the baseline year (see Table 6-1).

6 Emission Reductions Achieved in 2020

This section presents the GHG emission reductions associated with voluntary projects implemented at County dairies and feedlots from 2013 through 2020. The projects consist of solar panels, solar thermal hot water systems, dairy digesters, and AMMP projects.

6.1 Emission Reduction Projects

The County of Tulare RMA tracks the solar panel projects, solar thermal hot water systems, digester projects, and AMMP projects that were installed or planned to be installed at dairies and feedlots since 2013 (S. Roper, County of Tulare RMA, personal communication, February 2022). The following projects were operating as of 2020:

- 71 solar panel projects
- 11 solar thermal hot water systems
- 16 digester projects
- 4 AMMP projects

Solar panels reduce GHG emissions by reducing consumption of grid electrical power. Solar thermal hot water systems reduce GHG emissions by reducing the use of natural gas or electricity needed to heat water. Digester projects reduce GHG emissions by capturing methane produced through anaerobic manure decomposition and using the methane as fuel rather than releasing it directly to the atmosphere. AMMP projects reduce GHG emissions by diverting manure from higher-emitting

management practices to lower-emitting management practices. For example, converting from flushed feed lanes and anaerobic lagoons to scraped feed lanes and solar dried manure substantially reduces methane emissions.

The full lists of completed and planned solar, digester, and AMMP projects in the County are included in Appendix B.

6.2 Quantification Methodology

GHG emission reductions associated with the 71 solar panel projects were quantified using the California Air Resources Board's (CARB's) Benefits Calculator Tool for the Low-Income Weatherization Program (CARB, 2022a). Calculations were made for a single hypothetical 1000 kW project, and the corresponding emission reductions were scaled by actual project size for each of the dairy projects. One of the inputs required by the Benefits Calculator Tool is annual system output in kW-hours per year (kWh/yr). System output was quantified using the National Renewable Energy Laboratory (NREL) PVWatts Calculator (NREL, 2022). The inputs to the Benefits Calculator Tool and PVWatts Calculator were developed in consultation with County of Tulare RMA staff and CARB's Quantification Methodology document (CARB, 2019). The outputs from the Benefits Calculator Tool and PVWatts Calculator are included in Appendix B.

Emission reductions associated with the 11 solar thermal hot water systems were determined using California Solar Initiative (CSI) Thermal Program Data (CSI, 2022). This methodology provides an average annual GHG reduction rate of 3.985 metric tons of CO_2e per year per commercial system in California.

The 16 dairy digester projects and 4 AMMP projects that were operational in 2020 received grants from the CDFA (CDFA, 2022a; CDFA, 2022b). Therefore, emission reductions from these projects were estimated by the grant recipients using CARB's CCI Quantification, Benefits, and Reporting Materials (CARB, 2022c).

6.3 Estimated Emission Reductions

Table 6-1 summarizes the estimated 5-year, annual, and calendar year 2020 GHG emission reductions from the voluntary projects implemented at County dairies and feedlots since 2013. In the table, the annual reductions are greater than the CY 2020 reductions because the annual reductions reflect a theoretical full year of operation while the CY 2020 reductions account for the projects that started operating during 2020 and therefore had partial-year actual reductions. The estimated emission reductions by individual project are presented in Appendix B.

Table 6-1. Dairy and Feedlot GHG Emission Reductions from Voluntary Projects Operating in 2020

Project Type	5-Year CO_2e Reductions (MT/5-yrs)[1]	Annual CO_2e Reductions (MT/yr)	CY 2020 CO_2e Reductions (MT/yr)[2]
Solar Panels	-114,363	-22,873	-21,701
Solar Thermal Hot Water Systems	-219	-44	-44
Digesters	-1,520,858	-304,172	-267,122
Alternative Manure Management	-84,669	-16,934	-14,751
Total	**-1,720,108**	**-344,022**	**-303,618**

Legend: CO_2e = carbon dioxide equivalent; MT/5-yrs = metric tons per five years; MT/yr = metric tons per year; CY = calendar year.

Notes:

1. Reductions are shown as negative values.
2. Annual reductions are greater than the CY 2020 reductions because the annual reductions reflect a theoretical full year of operation while the CY 2020 reductions account for the projects that started operating during 2020 and therefore had partial-year actual reductions.

6.4 Progress Toward the Dairy CAP Target

Table 6-2 shows the progress of the voluntary GHG emission reductions from County dairies and feedlots compared to the Dairy CAP target of 1.05 million metric tons of CO_2e reductions by 2023. The first table column shows the year. The second column shows the accumulation of emission reductions needed each year to meet the 2023 target, assuming a linear trend that started in 2017. The trajectory is merely a guide to serve as a reference for assessing the rate of progress of the emission reductions.

The third column in Table 6-2 shows the actual emission reductions achieved in each calendar year from the solar, digester, and AMMP projects that were operating in that year. The 2020 reduction of 303,618 metric tons was obtained from Table 6-1. The values in prior years were obtained from the *2020 Annual Report of Total Greenhouse Gas Emissions from Dairies and Feedlots for 2019* (County of Tulare, 2021).

The fourth table column shows the deviation of the actual emission reductions from the reference trajectory in the second column. The data show that the actual emission reductions in 2020 are 221,382 metric tons short of the reference trajectory and therefore behind schedule (hence the negative number). Section 6.5 describes some of the challenges responsible for the delayed start of some digester and AMMP projects at County dairies and feedlots. At the time of this analysis, data showed an additional 677,589 metric tons of annual CO_2e reductions from solar, digester, and AMMP projects planned to become operational after 2020. If fully realized, these additional future reductions would achieve 93 percent of the 2023 target.

The fifth table column shows the additional emission reductions needed by 2023 to reach the Dairy CAP target. The table shows that an additional 746,382 metric tons per year of reductions are needed after 2020 to reach the target. The last table column shows the percent of the Dairy CAP target that has been achieved. As of 2020, approximately 29 percent of the needed emission reductions have been achieved. Each subsequent version of this annual GHG emissions inventory report will populate an additional year of data in the table.

Table 6-2. Progress of Voluntary GHG Emission Reductions in Relation to the 2023 Dairy CAP Target

Year	Dairy CAP Emission Reduction Trajectory (MT CO_2e/yr)[1][2]	Actual Emission Reductions Achieved (MT CO2e/yr)[1][3]	Deviation from the Target Trajectory (MT CO2e/yr)[4]	Additional Reductions Needed to Reach the 2023 Target (MT CO2e/yr)[1]	Percent of Target Reached
2017	0	-23,990	23,990	-1,026,010	2%
2018	-175,000	-49,964	-125,036	-1,000,036	5%
2019	-350,000	-162,822	-187,178	-887,178	16%
2020	-525,000	-303,618	-221,382	-746,382	29%
2021	-700,000	TBD	TBD	TBD	TBD
2022	-875,000	TBD	TBD	TBD	TBD
2023	-1,050,000	TBD	TBD	TBD	TBD

Legend: MT CO_2e/yr = metric tons of carbon dioxide equivalent per year; TBD = to be determined in a future analysis.
Notes:

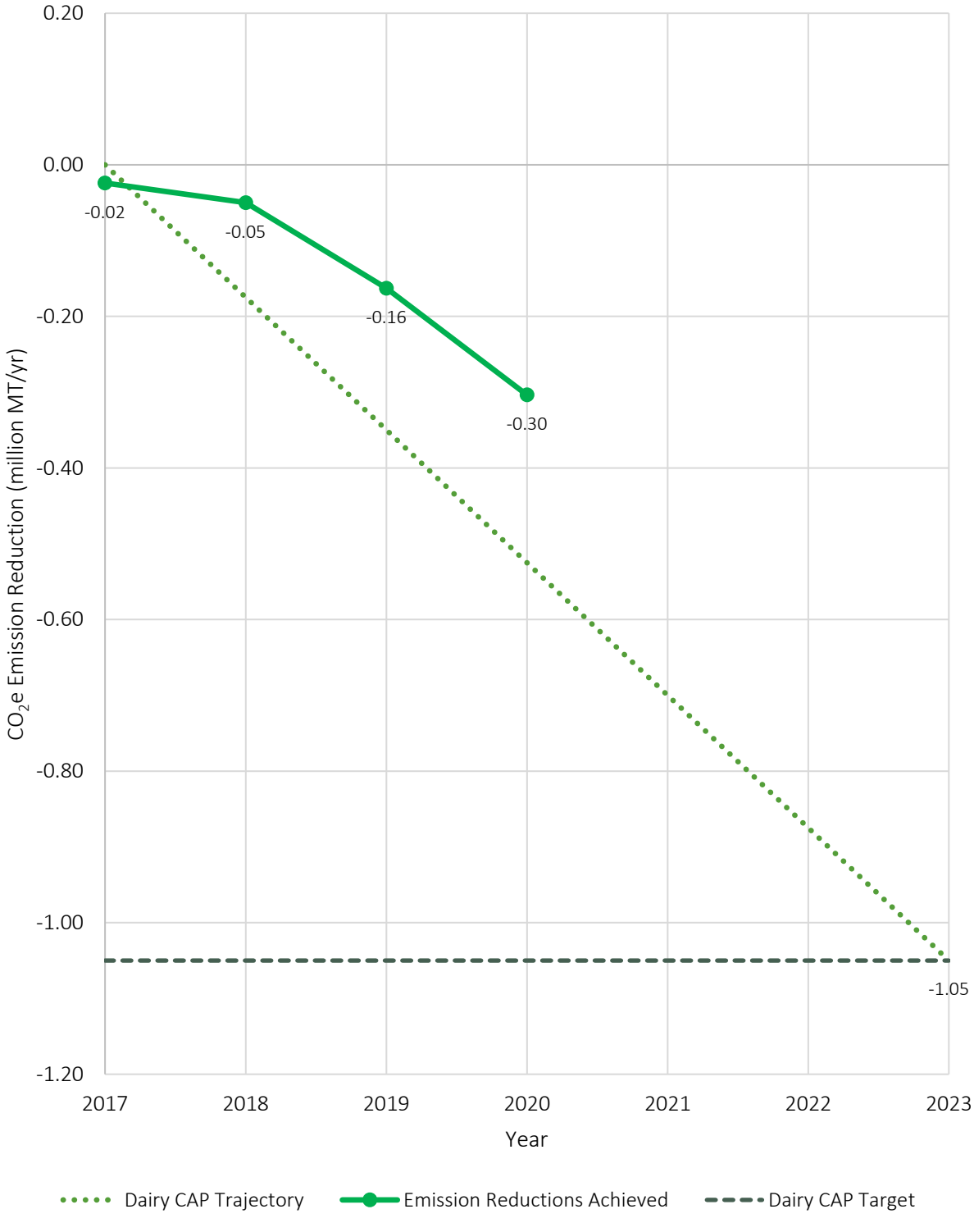
1. Reductions are shown as negative values.
2. The Dairy CAP trajectory assumes a linear path from 2017 to 2023. The value of -1,050,000 metric tons per year in 2023 is the Dairy CAP target.
3. CY 2020 emission reductions were obtained from Table 6-1 and represent reductions from solar, digester, and AMMP projects operating in 2020. Reductions from changes in cattle population are not included. Prior year emissions were obtained from the *2020 Annual Report of Total Greenhouse Gas Emissions from Dairies and Feedlots for 2019* (County of Tulare, 2021). Emissions for projects that began operating part-way through the year reflect only that portion of the year the projects operated.
4. A positive value means ahead of schedule; a negative value means behind schedule.

Figure 6-1 shows the progress of the County dairies and feedlots toward meeting the 2023 Dairy CAP target in graphical format. The solid line near the top left of the figure shows the actual emission reductions by year. The diagonal dotted line represents the reference trajectory that would meet the target by 2023. The horizontal dashed line across the bottom of the figure represents the Dairy CAP target.

6.5 Emission Reduction Project Challenges

The Stipulated Settlement requires that the County identify any reported problems with installed digesters. Although specific problems were not reported in the CDFA database, conversations with the digester installers indicated that bringing a digester project to full operation has taken longer than originally expected due to several reasons. One reason is that CDFA funding is partial, and it has taken time to secure additional funding. Another reason is that permitting is complex and can involve obtaining permits from up to six different agencies. Another reason is that the “hub and spoke” model, where several digesters feed digester gas into a central facility, is complex and components are not always built out simultaneously. Once digester installation is complete, start of operation may be delayed until downstream components are built out. Moreover, the continuation of the COVID-19 pandemic has resulted in additional delays due to staffing shortages and regulatory agency delays.

Figure 6-1
Progress of Voluntary GHG Emission Reductions
in Relation to the 2023 Dairy CAP Target



As mentioned in Section 6.4, at the time of this analysis, data show that there are 677,589 additional metric tons of annual CO_2e reductions from solar, digester, and AMMP projects that are planned to become operational after 2020. Many of these projects have already been completed and have started operating. For example, in 2021, 5 additional solar panel projects, 19 additional digester projects, and 4 additional AMMP projects started operating. These 2021 projects represent an additional 356,982 metric tons of annual CO_2e reductions beyond the 2020 reductions. These additional projects are identified in Appendix B.

7 Actual Emissions in 2020

This section presents the 2020 actual GHG emissions from County dairies and feedlots and compares the emissions to the 2030 SB 1383 target. Table 7-1 presents the estimated actual dairy and feedlot GHG emissions for calendar year 2020. The emissions were determined by subtracting the calendar year 2020 emission reductions in Table 6-1 from the 2020 BAU emissions in Table 5-1. The 2020 emissions were approximately 1 percent less than the previous inventory year (2019) emissions (County of Tulare, 2021). The reduction in emissions from 2019 to 2020 was primarily associated with a reduction in the dairy cow population and implementation of additional digester projects.

Table 7-1. Dairy and Feedlot 2020 Actual GHG Emissions

Source Category[(1)]	CO_2 (MT/yr)	CH_4 (MT/yr)	N_2O (MT/yr)	HFCs (MT/yr)	CO_2e (MT/yr)
Farm Equipment Exhaust	39,425	1	2	0.0	40,016
Farm Agricultural Soil	0	0	938	0.0	279,407
Farm Electricity Consumption	57,203	4	0	0.0	57,425
Dairy Equipment Exhaust	112,885	3	5	0.0	114,576
Truck Trips	20,916	0	3	0.0	21,911
Automobile Trips	11,368	1	1	0.0	11,565
Dairy Electricity Consumption	74,483	6	1	0.0	74,856
Dairy Refrigeration	0	0	0	4.9	71,941
Dairy Manure Decomposition	0	99,099	1,466	0.0	2,914,266
Dairy Enteric Digestion	0	90,457	0	0.0	2,261,423
Feedlot Manure Decomposition	0	599	113	0.0	48,770
Feedlot Enteric Digestion	0	13,200	0	0.0	329,994
Total Emissions	**316,279**	**203,370**	**2,529**	**4.9**	**6,226,151**

Legend: CO_2 = carbon dioxide; CH_4 = methane; N_2O = nitrous oxide; HFCs = hydrofluorocarbons; CO_2e = carbon dioxide equivalent; MT/yr = metric tons per year.

Notes:

1. Emission reductions from solar panels and solar thermal hot water systems were subtracted from the BAU dairy electricity consumption CO_2 emissions. Emission reductions from digesters and AMMP projects were subtracted from the BAU dairy manure decomposition methane emissions.

Table 7-2 compares the 2020 actual GHG emissions to the 2013 baseline emissions. The table shows that, from 2013 to 2020, the total CO_2e emissions decreased by 1,266,692 metric tons per year. Some source categories increased emissions while others decreased emissions. Some of the emissions changes since 2013 are primarily a result of changes in animal populations. For example, the decreases in

emissions from dairy manure decomposition and dairy enteric digestion reflect decreases in the dairy cow population (see Table 3-3). Other emissions changes are partially a result of the effects of climate change-related regulations. For example, the decreases in emissions from farm and dairy electricity consumption reflect a decrease in carbon intensity factors from the electric utilities (PG&E and Edison) in response to the California Renewables Portfolios Standard (CPUC, 2020).[5] Additionally, the decrease in automobile emissions reflect the effects of California's Low Carbon Fuel Standard (CARB, 2020b) and Greenhouse Gas Vehicle Emission Standards (CARB, 2020c).

Finally, some emissions changes are a result of changes in quantification methodologies rather than actual emissions changes. Specifically, the 2020 emissions of N_2O from farm agricultural soil are substantially lower than the 2013 emissions in part because of updated IPCC emission factors for direct emissions, indirect runoff, and indirect volatilization (IPCC, 2019). A portion of the CO_2e increase from dairy refrigeration resulted from a GWP revision for HFC-23 from 11,700 to 14,800 (IPCC, 2007).

Table 7-2. Comparison of 2020 Actual GHG Emissions to 2013 Baseline GHG Emissions

Source Category	2013 Baseline CO_2e Emissions (MT/yr)	2020 Actual CO_2e Emissions (MT/yr)	2020 Actual minus 2013 Baseline CO_2e Emissions (MT/yr)
Farm Equipment Exhaust	38,129	40,016	1,887
Farm Agricultural Soil	812,050	279,407	-532,643
Farm Electricity Consumption	79,480	57,425	-22,055
Dairy Equipment Exhaust	99,406	114,576	15,170
Truck Trips	23,137	21,911	-1,226
Automobile Trips	15,851	11,565	-4,286
Dairy Electricity Consumption	145,335	74,856	-70,478
Dairy Refrigeration	63,640	71,941	8,301
Dairy Manure Decomposition	3,496,077	2,914,266	-581,811
Dairy Enteric Digestion	2,463,071	2,261,423	-201,648
Feedlot Manure Decomposition	29,598	48,770	19,172
Feedlot Enteric Digestion	227,068	329,994	102,926
Total Emissions	**7,492,843**	**6,226,151**	**-1,266,692**

Legend: CO_2e = carbon dioxide equivalent; MT/yr = metric tons per year.

Table 7-3 presents the estimated dairy and feedlot methane emissions for calendar year 2020 from the manure management source categories only. These methane emissions are a subset of the GHG emissions shown in Table 7-1. They were used in the assessment of progress toward the 2030 SB 1383 target (see Section 7.1).

[5] The Renewables Portfolio Standard mandates that 20 percent of electricity retail sales must be served by renewable resources by 2017, 60 percent by 2030, and 100 percent from carbon-free resources by 2045 (CPUC, 2020).

Table 7-3. Dairy and Feedlot 2020 Actual CH_4 Emissions from Manure Management

Source Category	CH_4 (MT/yr)	CO_2e (MT/yr)[1]
Dairy Manure Decomposition	99,099	2,477,467
Dairy Enteric Digestion	90,457	2,261,423
Feedlot Manure Decomposition	599	14,981
Feedlot Enteric Digestion	13,200	329,994
Total Emissions	**203,355**	**5,083,865**

Legend: CH_4 = methane; CO_2e = carbon dioxide equivalent; MT/yr = metric tons per year.

Note:

1. Methane emissions are expressed as CO_2e.

Table 7-4 compares the 2020 actual methane emissions to the 2013 baseline methane emissions for the manure management source categories only (isolating methane from manure management is consistent with SB 1383). The 2020 emissions include the reductions from the 16 digesters and 4 AMMP projects that were operational by the end of 2020. The table shows that, from 2013 to 2020, methane emissions from manure management decreased by 699,203 metric tons per year (as CO_2e). This emissions decrease is primarily a result of a decrease in dairy cow population relative to 2013 (see Table 3-3) and the 16 digester projects implemented since 2013 (roughly equal contributions).

Table 7-4. Comparison of 2020 Actual Methane Emissions to 2013 Baseline Methane Emissions from Manure Management

Source Categories[1]	2013 Baseline CH_4 Emissions (MT CO_2e/yr)[2]	2020 Actual CH_4 Emissions (MT CO_2e/yr)[2]	2020 Actual minus 2013 Baseline CH_4 Emissions (MT CO_2e/yr)[2]
Dairy Manure Decomposition	3,083,219	2,477,467	-605,752
Dairy Enteric Digestion	2,463,071	2,261,423	-201,648
Feedlot Manure Decomposition	9,710	14,981	5,271
Feedlot Enteric Digestion	227,068	329,994	102,926
Total Emissions	**5,783,068**	**5,083,865**	**-699,203**

Legend: CH_4 = methane; MT CO_2e/yr = metric tons of carbon dioxide equivalent per year.

Notes:

1. Consistent with SB 1383, this table includes only methane emissions from manure decomposition and enteric digestion.
2. Methane emissions are expressed as CO_2e.

7.1 Progress Toward the SB 1383 Target

Table 7-5 shows the progress of the County dairies and feedlots toward meeting the SB 1383 target of 40 percent below 2013 methane levels by 2030 for manure management operations. The first table column shows the year. The second column shows the progression of year-to-year methane emissions needed from 2017 to 2030 to meet the 2030 target of 3,470,000 metric tons per year, assuming a linear trend. This trajectory is merely a guide to serve as a reference for assessing the rate of progress of the actual emissions. It is the same trajectory that was established in the prior year's report (County of Tulare, 2021).

The third column in Table 7-5 shows the BAU methane emissions by year for the County dairies and feedlots. Its purpose is to show what the dairy and feedlot emissions would be without the voluntary emission reduction projects described in Section 6. The values for 2017 through 2019 were obtained from the prior year's report.

The fourth table column shows the actual methane emissions by year for the County dairies and feedlots. The 2020 emissions of 5,083,865 metric tons (as CO_2e) include the reductions from the 16 digesters and 4 AMMP projects that operated in that year. The values for 2017 through 2019 were obtained from the prior year's report. The table shows that the 2020 emissions were 2 percent less than the previous inventory year (2019) emissions.

The fifth table column shows the percent that each year's actual methane emissions are above or below 2013 baseline levels. The 2013 baseline methane emissions were 5,783,068 metric tons as CO_2e (see Table 4-2). A positive percentage means the current year emissions are above 2013 levels; a negative percentage means the current year emissions are below 2013 levels. The SB 1383 target is 40 percent below 2013 levels by 2030. The table shows that the 2020 methane emissions were 12 percent below 2013 levels.

The sixth table column shows the deviation of the actual methane emissions from the reference trajectory in the second column. The data show that the 2020 actual emissions are lower than the SB 1383 reference trajectory and therefore ahead of schedule (hence the positive number in the fifth column). The reduction in the dairy cow population and implementation of the digester and AMMP projects are the primary reasons that the 2020 methane emissions are ahead of schedule. Moreover, at the time of this analysis, data show that there were approximately 670,289 additional metric tons of annual methane CO_2e reductions from digester and AMMP projects that are planned to begin operating sometime after 2020. Not including the effects of possible future declines in the dairy cow population, these additional reductions would bring the actual emissions to 24 percent below 2013 levels, which is 16 percent short of the 2030 target.

The last column in Table 7-5 shows the additional methane emission reductions needed by 2030 to meet the SB 1383 target. The table shows that an additional 1,613,865 metric tons per year of methane CO_2e reductions are needed after 2020 to meet the 2030 SB 1383 target.

Each subsequent version of this annual GHG emissions inventory report will populate an additional year of data in the table.

Figure 7-1 shows the progress of the County dairies and feedlots toward meeting the SB 1383 target in graphical format. The two solid lines near the top left of the figure show the BAU methane emissions by year (higher line) and actual methane emissions by year (lower line). The diagonal dotted line represents the reference trajectory that would meet the target by 2030. The horizontal dashed line across the bottom of the figure represents the SB 1383 target, which is 40 percent below 2013 methane emissions.

Table 7-5. Progress of Actual Methane Emissions in Relation to the 2030 SB 1383 Target

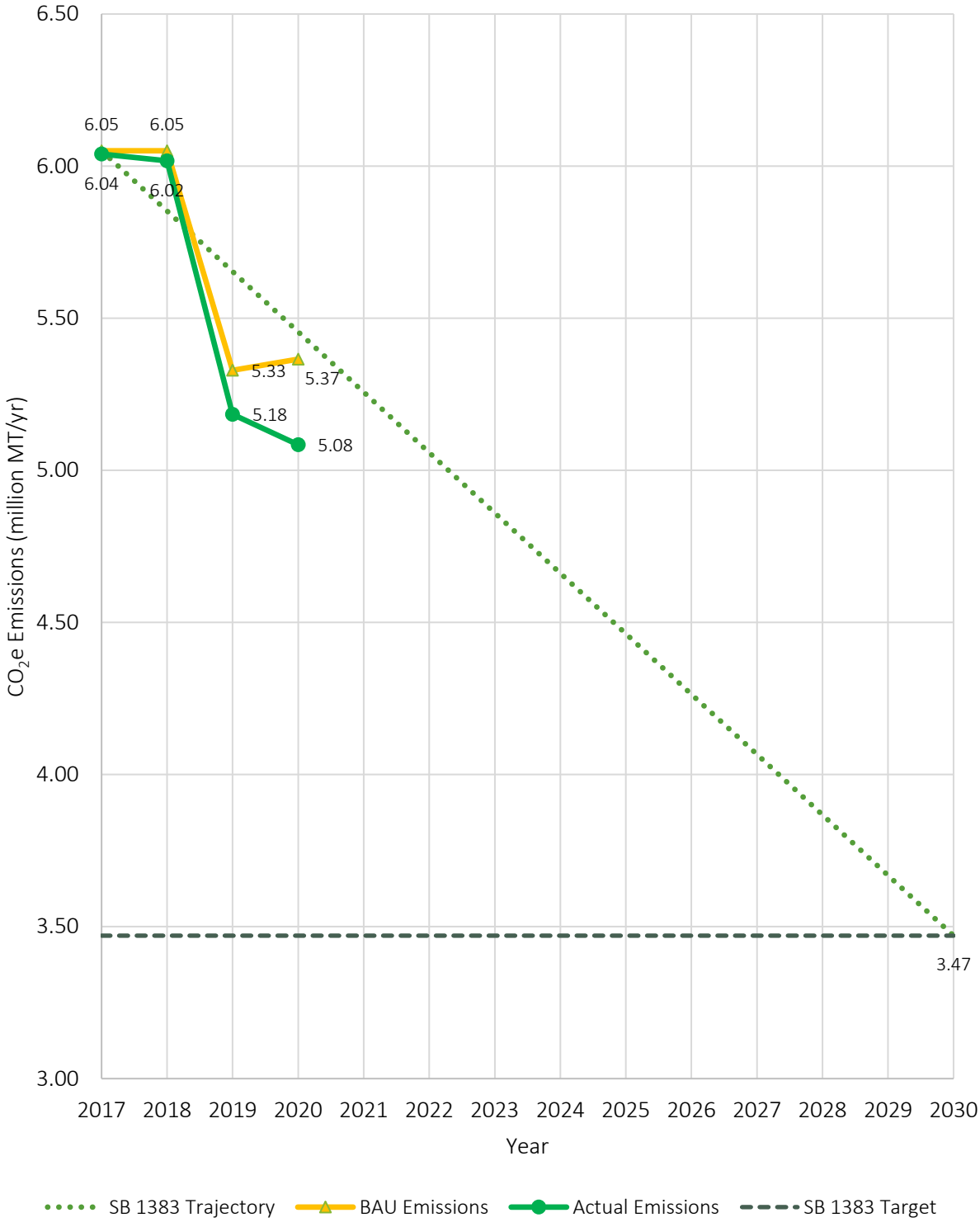
Year	SB 1383 Emissions Trajectory (MT CO_2e/yr)[1][2]	BAU Emissions (MT CO_2e/yr)[1]	Actual Emissions (MT CO_2e/yr)[1]	Percent Above/Below 2013 Emissions[3]	Deviation of Actual from Target Trajectory (MT CO_2e/yr)[4]	Additional Reductions Needed to Reach 2030 Target (MT CO2e/yr)[5]
2017	6,050,406	6,050,406	6,039,528	4%	10,879	-2,569,528
2018	5,852,000	6,050,406	6,017,583	4%	-165,583	-2,547,583
2019	5,653,000	5,328,594	5,183,929	-10%	469,071	-1,713,929
2020	5,455,000	5,365,738	5,083,865	-12%	371,135	-1,613,865
2021	5,256,000	TBD	TBD	TBD	TBD	TBD
2022	5,058,000	TBD	TBD	TBD	TBD	TBD
2023	4,859,000	TBD	TBD	TBD	TBD	TBD
2024	4,661,000	TBD	TBD	TBD	TBD	TBD
2025	4,462,000	TBD	TBD	TBD	TBD	TBD
2026	4,264,000	TBD	TBD	TBD	TBD	TBD
2027	4,065,000	TBD	TBD	TBD	TBD	TBD
2028	3,867,000	TBD	TBD	TBD	TBD	TBD
2029	3,668,000	TBD	TBD	TBD	TBD	TBD
2030	3,470,000	TBD	TBD	TBD	TBD	TBD

Legend: MT CO_2e/yr = metric tons of carbon dioxide equivalent per year; TBD = to be determined in a future analysis.

Notes:

1. Emissions are methane presented as CO_2e; manure decomposition and enteric digestion emissions only.
2. The SB 1383 trajectory assumes a linear path from 2017 to 2030. The value of 3,470,000 metric tons in year 2030 is the SB 1383 target of 40 percent below the 2013 baseline emissions.
3. The 2013 baseline methane emissions are 5,783,068 metric tons as CO_2e (see Table 4-2). A positive percentage means the current year emissions are above 2013 levels; a negative percentage means the current year emissions are below 2013 levels. The SB 1383 target is -40% by 2030.
4. A positive value means ahead of schedule; a negative value means behind schedule.
5. Reductions are shown as negative values.

Figure 7-1
Progress of Actual Methane Emissions
in Relation to the 2030 SB 1383 Target



8 Conclusions and Staff Recommendations

As required by the Stipulated Settlement, this Interim Report assessed the progress of County dairy and feedlot GHG reductions through 2020 with respect to the Dairy CAP and SB 1383 targets. This section summarizes these findings and includes staff recommendations to further reduce GHG emissions.

As discussed in Section 6, County dairies and feedlots operated 71 solar panel projects, 11 solar thermal hot water systems, 16 digester projects, and 4 AMMP projects in 2020. These voluntary projects provided 303,618 metric tons of GHG reductions in 2020, which was 29 percent of the Dairy CAP target of 1.05 million metric tons per year of reductions by 2023. Figure 6-1 shows that, as of 2020, the County was behind schedule in its progress toward meeting the Dairy CAP target. Several factors contributed to the slower-than-anticipated project implementation, including funding delays, complexity of permitting, complexity of construction, and COVID-19 related delays. To meet the target, County dairies and feedlots will need to reduce emissions by an additional 746,382 metric tons per year by 2023. At present, there are an additional 677,589 metric tons per year of forthcoming emission reductions from County solar, digester, and AMMP projects that have either started operating post-2020, are currently under construction, or are approved and funded for construction. Therefore, to meet the Dairy CAP target, another 68,793 metric tons per year of emission reductions from yet-to-be identified solar, digester, AMMP, or enteric projects will need to be implemented by 2023.

As discussed in Section 7, County dairies and feedlots produced 5,083,865 metric tons of methane CO_2e emissions from manure management in 2020. This emissions quantity is 12 percent below 2013 levels. Figure 7-1 shows that, as of 2020, the County was ahead of schedule in its progress to meet the SB 1383 target of 40 percent below 2013 levels by 2030. The reduction in the dairy cow population since 2013 and implementation of the 16 digester and 4 AMMP projects are the primary reasons that the County is ahead of schedule. To meet the SB 1383 target, County dairies and feedlots will need to further reduce methane CO_2e emissions by an additional 1,613,865 metric tons per year by 2030. At present, there are an additional 670,289 metric tons per year of forthcoming methane emission reductions from County digester and AMMP projects that have either started operating post-2020, are currently under construction, or are approved and funded for construction. Therefore, to meet the SB 1383 target, the County will need to reduce methane CO_2e emissions by another 943,576 metric tons per year from yet-to-be-identified digester, AMMP, or enteric projects by 2030. Changes to the animal population would also affect the emissions.

In summary, through 2020, County dairies and feedlots have made significant progress in reducing their GHG emissions. To meet the Dairy CAP and SB 1383 targets, however, substantial additional reductions will be needed by 2023 for the Dairy CAP target and by 2030 for the SB 1383 target. The County will continue to track and regulate dairies and feedlots through its ACFP framework. Specific County actions with regard to GHG reductions will include (a) monitoring facilities in the ACFP list that have implemented voluntary reduction measures and, to the extent possible, facilitate early identification and resolution of any operational or performance issues that would inhibit the stated emission reductions; (b) track the facility herd sizes and enforce the permitted herd size limits; and (c) for new and expanding dairies, confirm adequate selection of the GHG reduction strategies set forth in the ACFP and periodically verify that the strategies are being fully implemented at the facilities.

At present, CARB has not begun development of any regulation to reduce GHG emissions from dairies and feedlots under SB 1383. Therefore, aside from herd size reductions, the implementation of additional voluntary digester, AMMP, and enteric projects remains the only viable path by which dairies and feedlots can reduce their emissions enough to meet the Dairy CAP and SB 1383 targets. Continued State and federal incentive funding will be necessary to make these projects economically feasible for the dairy industry. Therefore, County staff will continue to support and engage with CARB and the CDFA wherever necessary to secure future incentive funding for the dairy industry.

9 References

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Appendix A – 2020 Business-As-Usual Emission Calculations

Appendix A - 2020 Business-As-Usual Emission Calculations

Table A.1
Dairy and Feedlot 2020 Business-As-Usual Emissions

Source Category	CO_2 (MT/yr)	CH_4 (MT/yr)	N_2O (MT/yr)	HFCs (MT/yr)	CO_2e (MT/yr)
Farm Equipment Exhaust	39,425	1	2	0.0	40,016
Farm Agricultural Soil	0	0	938	0.0	279,407
Farm Electricity Consumption	57,203	4	0	0.0	57,425
Dairy Equipment Exhaust	112,885	3	5	0.0	114,576
Truck Trips	20,916	0	3	0.0	21,911
Automobile Trips	11,368	1	1	0.0	11,565
Dairy Electricity Consumption	96,228	6	1	0.0	96,601
Dairy Refrigeration	0	0	0	4.9	71,941
Dairy Manure Decomposition	0	110,374	1,466	0.0	3,196,139
Dairy Enteric Digestion	0	90,457	0	0.0	2,261,423
Feedlot Manure Decomposition	0	599	113	0.0	48,770
Feedlot Enteric Digestion	0	13,200	0	0.0	329,994
Total Emissions	**338,024**	**214,644**	**2,529**	**4.9**	**6,529,769**

Notes:

1. BAU emissions reflect 2020 actual dairy and feedlot cattle populations. BAU emissions also reflect the use of manure management systems in the same proportions as the 2013 baseline year. Emission calculations used methodologies consistent with the most recent available CARB California GHG Emission Inventory (year 2018). BAU emissions exclude the GHG reduction projects implemented by the dairies and feedlots since the 2013 baseline year.
2. CO_2e was quantified using global warming potentials from the IPCC fourth assessment report (AR4), which are consistent with the CARB California GHG Emission Inventory.

Table A.2
Dairy and Feedlot Reported Animal Populations

Year	Dairy Cows[1]	Dairy Heifers 0-12 mos.	Dairy Heifers 12-24 mos.	Dairy Calves	Feedlot Cattle	Total Animals
2013 (baseline year)[2]	543,431	137,985	148,928	65,770	133,886	**1,030,000**
2018[3]	569,140	125,636	167,099	59,636	204,272	**1,125,783**
2019[3]	487,382	165,914	183,410	61,871	179,261	**1,077,838**
2020 (current inventory year)[3]	484,574	175,335	183,216	61,411	214,271	**1,118,807**

Notes:

1. Includes milk cows and dry cows.
2. Source: *County of Tulare Dairy and Feedlot Climate Action Plan* . August 2017. Appendix A, Tables A-1 and A-3.
3. Source: Tulare County Resource Management Agency. ACR and dairy vs feedlot breakdown.

Table A.3
No. of Active Dairy and Feedlot Animal Confined Facilities

Year	No. of Facilities
2013 (baseline year)[1]	330
2018[2]	283
2019[2]	281
2020 (current inventory year)[2]	288

Notes:

1. Source: Tulare County RMA. *Draft EIR for the Animal Confinement Facilities Plan, and Dairy and Feedlot Climate Action Plan* . January 2016. Appendix G, Page 1-2.
2. Source: Tulare County Resource Management Agency. Includes all facilities that reported non-zero herd sizes.

Table A.4
Dairy and Feedlot Animal Units

Year	Total Animal Units
2013 (baseline year)[1]	741,040
2018[2]	745,337
2019[2]	707,131
2020 (current inventory year)[2]	711,635

Notes:

1. Source: Tulare County RMA. *Draft EIR for the Animal Confinement Facilities Plan, and Dairy and Feedlot Climate Action Plan* . January 2016. Appendix G, Page 1-2.
2. Source: Tulare County Resource Management Agency.

Table A.5
California 2019 Cattle Population

Cattle Type	Total Population[1]	Dairy Cows Population	Dairy Heifers Population	Feedlot
Beef calves	264,965			264,965
Beef cows	630,000			630,000
Beef replacements 0-12 months	26,590			26,590
Beef replacements 12-24 months	61,676			61,676
Bulls	60,000			60,000
Dairy calves	886,986		886,986	
Dairy cows	1,732,869	1,732,869		
Dairy replacements 0-12 months	216,999		216,999	
Dairy replacements 12-24 months	510,532		510,532	
Heifer feedlot	174,028			174,028
Heifer stockers	113,678			113,678
Steer feedlot	287,478			287,478
Steer stockers	260,137			260,137
Total Population:	**5,225,938**	**1,732,869**	**1,614,517**	**1,878,552**

Notes:

[1]Used in annual emission calculations for Enteric (dairies and feedlots) and Manure Management (feedlots only).
Source: CARB 2000-2019 GHG Inventory Query Tool, 14th Edition. Most recent year available (2019).
Available: https://ww2.arb.ca.gov/applications/greenhouse-gas-emission-inventory-0. Accessed March 21, 2022.

Table A.6
2020 Tulare Dairy and Feedlot Herd Counts

Facility Type	Cows in Milk	Mature Bulls[1]	Dry Cows	Heifers/Bulls 1-2 yrs	Heifers/Bulls 3 months - 1 yr	Calves under 3 months	Total
Dairies	414,752	0	69,822	183,216	175,335	61,411	904,536
Feedlots	20	1,228	5,972	17,329	56,967	132,755	214,271
Total	**414,772**	**1,228**	**75,794**	**200,545**	**232,301**	**194,166**	**1,118,807**

Note:
[1] For emission calculation purposes, all mature bulls were assigned to the feedlot category even if they were reported on a dairy.

Table A.7
Emission Factors for Diesel Farm Equipment

Emission Factor (kg/gal)		
CO_2 [1]	CH_4 [2]	N_2O [2]
10.21	2.80E-04	4.90E-04

Notes:
1. The CO_2 emission factor is from The Climate Registry, 2021 Default Emission Factors, Table 2.1 (Diesel Fuel). Available: https://www.theclimateregistry.org/. Accessed March 2022.
2. The CH_4 and N_2O emission factors are from The Climate Registry, 2021 Default Emission Factors, Table 2.7 (Agricultural Equipment).

Table A.8
Emissions Associated with Farm Equipment

2013 Cultivated Acres	2020 Cultivated Acres [1]	Fuel Usage Factor (gal/yr per acre) [2]	2020 Fuel Use (gal/yr) [1]	2020 Annual Emissions (metric ton/yr)			
				CO_2	CH_4	N_2O	CO_2e
160,839	154,457	25	3,861,418	39,425	1.1	1.9	40,016

Notes:
1. The 2020 cultivated acreage was scaled from 2013 in proportion to the total number of animal units.
2. Source: CARB, 2018. *Analysis of California's Diesel Agricultural Equipment Inventory according to Fuel Use, Farm Size, and Equipment Horsepower* . October 3. Available: https://ww3.arb.ca.gov/msei/ordiesel/agfuelstudy2018.pdf. Accessed July 2020. Figure 3.3: Fuel per Acre, by Commodity. Hay, Forage, Pasture, Row Crops.

Table A.9
Emissions of N_2O from Agricultural Soil

Crop Type	2020 Cultivated Acres	Nitrogen Requirement per Crop (lb/acre/yr)	No. of Crops per Year[1]	N_f Nitrogen in Fertilizer (ton/yr)	CF Conversion Factor N_2O-N to N_2O[2]	N_2O Emission Factor (kg N_2O-N/kg N)			F_{leach} Fraction of N Lost through Leaching & Runoff[4]	F_{gasm} Fraction of N Volatilization as NH_3 and NO_x[4]	2020 Annual GHG Emissions (metric ton/yr)[5]	
						EF_1 Direct from Soils[3]	EF_5 Indirect from Runoff[4]	EF_4 Indirect from Volatilization[4]			N_2O	CO_2e
Corn Silage (double)	154,457	250	2	38,614	1.57	0.005	0.011	0.005	0.24	0.21	478	142,554
Alfalfa	154,457	480	1	37,070	1.57	0.005	0.011	0.005	0.24	0.21	459	136,852
Total	--	--	--	**75,684**	--	--	--	--	--	--	**938**	**279,407**

Notes:

1. Assume the support crop acreage has 2 summer crops of corn and 1 winter crop of alfalfa (alfalfa was conservatively selected over wheat because it has a higher nitrogen requirement).
2. Source: IPCC, 2019. *2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories* . Volume 4, Chapter 11. May 12, 2019. Available: https://www.ipcc-nggip.iges.or.jp/public/2019rf/index.html. Accessed 7/1/2020.
3. Source: IPCC, 2019. Table 11.1. Dry climate.
4. Source: IPCC, 2019. Table 11.3. Dry climate.
5. The N_2O emission rate is calculated based on Equations 11.1 (direct), 11.9 (volatilization), and 11.10 (runoff) in IPCC, 2019. The combined equation is:
   $Emission\ Rate = N_f \times CF \times [EF_1 + (EF_5 \times F_{leach}) + (EF_4 \times F_{gasm})] \times 0.9072$

Table A.10
Emissions Associated with Support Crop Irrigation

2020 Cultivated Acres	Usage Factor for Electric Irrigation Pumps (MWh/acre/yr)[1]	2020 Electricity Usage (MWh/yr)[2]	2020 Emission Factors (lb/MWh)[3]			Annual Emissions (metric ton/yr)			
			CO_2	CH_4	N_2O	CO_2	CH_4	N_2O	CO_2e
154,457	1.59	245,586	513.5	0.032	0.004	57,203	3.6	0.4	57,425

Notes:

1. Source: Tulare County RMA. *Draft EIR for the ACFP and Dairy CAP* . January 2016. Appendix E.2.
2. Calculations assume all ACF support crop irrigation pumps are electric.
3. Source: U.S. EPA. Emissions & Generation Resources Integrated Database (eGRID). eGRID Summary Tables 2020. CAMX Subregion. Available: https://www.epa.gov/system/files/documents/2022-01/egrid2020_summary_tables.pdf. Accessed March 2022.

Table A.11
Emission Factors for Diesel Dairy Equipment

Emission Source	Emission Factor (kg/gal)		
	CO_2 [1]	CH_4 [2]	N_2O [2]
Agricultural Tractor 51-120 hp	10.21	2.80E-04	4.90E-04
Rubber Tired Loader 121-175 hp	10.21	2.80E-04	4.90E-04
Off-Highway Truck 251-500 hp	10.21	2.80E-04	4.90E-04
Generator Set 251-500 hp	10.21	2.80E-04	4.90E-04

Notes:

1. The CO_2 emission factor is from The Climate Registry, 2021 Default Emission Factors, Table 2.1 (Diesel Fuel). Available: https://www.theclimateregistry.org/. Accessed March 2022.
2. The CH_4 and N_2O emission factors are from The Climate Registry, 2021 Default Emission Factors, Table 2.7 (Agricultural Equipment).

Table A.12
Emissions Associated with Dairy Equipment

Emission Source	2013 Equipment Annual Work Done (hp-hr/yr)	2020 Equipment Annual Work Done (hp-hr/yr)[2]	2020 Fuel Use (gal/yr)[1]	2020 Annual Emissions (metric ton/yr)			
				CO_2	CH_4	N_2O	CO_2e
Dairy Tractor 51-120 hp	80,652,507	77,452,121	3,998,499	40,825	1.1	2.0	41,437
Loader 121-175 hp	54,730,496	52,558,726	2,713,367	27,703	0.8	1.3	28,119
Feed Mixer Truck 251-500 hp	87,599,377	84,123,331	4,342,903	44,341	1.2	2.1	45,006
Standby Generator 251-500 hp	33,600	29,324	1,514	15	0.0	0.0	16
Total	**223,015,980**	**214,163,501**	**11,056,282**	**112,885**	**3.1**	**5.4**	**114,576**

Notes:

1. Fuel use (gal/yr) = Annual Work (hp-hr/yr) x BSFC (lb/hp-hr) / Fuel Conversion (lb/gallon)
Brake specific fuel consumption (BSFC) (lb/hp-hr): *0.367*
Diesel Fuel conversion (lb/gallon) *7.1089*
CARB, MSEI Documentation Off-Road Diesel Equipment, 2017 Off-road Diesel Emission Factors. *ordas_ef_fcf_2017_v7.xlsx.*
Available: https://ww2.arb.ca.gov/our-work/programs/mobile-source-emissions-inventory/road-documentation/msei-documentation-road. Accessed March 2022.
2. Annual work done in 2020 was scaled from 2013 in proportion to the No. of facilities for standby generators and the No. of animal units for all other source categories.

Table A.13
On-Road Vehicle Emissions

Vehicle Description	Vehicle Type[1]	2013 Round Trips (trips/yr)	2020 Round Trips (trips/yr)[2]	One-Way Trip Length (mi/trip)	2020 Annual VMT (mi/yr)	2020 Annual Emissions (metric ton/yr)[3]			
						CO_2	CH_4	N_2O	CO_2e
Silage Truck 3-axle, 10-ton	T6 Instate Tractor Class 6-7	573,151	550,408	1	1,100,815	1,227	0.0	0.2	1,285
Silage Truck 5-axle, 20-ton	T7 Tractor Class 8	71,644	68,801	1	137,602	232	0.0	0.0	243
Hay Truck 3-axle, 10-ton	T6 Instate Tractor Class 6-7	12,882	12,371	2	49,483	55	0.0	0.0	58
Hay Truck 5-axle, 20-ton	T7 Tractor Class 8	57,972	55,672	20	2,226,864	3,754	0.1	0.6	3,933
Concentrated Feed Truck 5-axle, 20-ton	T7 Tractor Class 8	202,104	194,084	20	7,763,371	13,088	0.3	2.1	13,712
Calf Milk Replacer Truck 2-axle, 10-ton	T6 Instate Tractor Class 6-7	817	785	20	31,383	35	0.0	0.0	37
Cattle Truck - baby calves from dairies to calf ranches	T6 Instate Tractor Class 6-7	12,607	12,107	10	242,135	270	0.0	0.0	283
Cattle Truck - weaned heifer calves from calf ranches to dairies	T6 Instate Tractor Class 6-7	6,380	6,127	10	122,537	137	0.0	0.0	143
Cattle Truck - weaned bull calves from calf ranches to foothill pasture	T6 Instate Tractor Class 6-7	1,418	1,362	25	68,087	76	0.0	0.0	79
Cattle Truck - weaned bull calves from calf ranches to background feedlots	T7 Tractor Class 8	1,588	1,525	50	152,499	257	0.0	0.0	269
Cattle Truck - other cattle trips from calf ranches	T7 Tractor Class 8	1,418	1,362	20	54,469	92	0.0	0.0	96
Cattle Truck - beef cattle from foothill pasture to finishing feedlots	T6 Instate Tractor Class 6-7	4,721	4,534	75	680,050	758	0.0	0.1	794
Cattle Truck - dairies to beef processing facilities - gooseneck trailers	T6 Instate Tractor Class 6-7	17,008	16,333	20	653,324	728	0.0	0.1	763
Cattle Truck - dairies to beef processing facilities - semi tractor/trailers	T7 Tractor Class 8	1,278	1,227	50	122,729	207	0.0	0.0	217
Total - Trucks		**964,988**	**926,696**		**13,405,348**	**20,916**	**0.4**	**3.3**	**21,911**
Dairy Employee trips	LDT1-2	1,349,040	1,177,344	10	23,546,880	9,170	0.6	0.5	9,329
Dairy Visitor trips (vet, breeder, sales, delivery)	LDT1-2	161,616	141,047	20	5,641,868	2,197	0.2	0.1	2,235
Total - Automobiles		**1,510,656**	**1,318,391**		**29,188,748**	**11,368**	**0.8**	**0.6**	**11,565**

Notes:

1. All trucks are assumed to be Medium-Heavy Duty Diesel Trucks (T6 Class 6, 19,501-26,000 lbs GVWR; T6 class 7, 26,001-33,000 lbs GVWR) and Heavy-Heavy Duty Diesel Trucks (T7 Class 8; above 33,000 lbs GVWR). All employees and visitors are conservatively assumed to drive light-duty trucks (LDT1; 0-3,750 lbs and LDT2; 3,751-5,750 lbs equivalent test weight).
2. Trips in 2020 were scaled from 2013 in proportion to the number of animal units for trucks and the number of facilities for automobiles.
3. Emissions include running, idle, and starting exhaust and GHGs from electricity usage.

Table A.14
EMFAC 2021 Output
Source: EMFAC2021 (v1.0.1) Emissions Inventory
Region Type: County
Region: Tulare
Calendar Year: 2020
Season: Annual
Vehicle Classification: EMFAC202x Categories
Units: miles/day for CVMT and EVMT, trips/day for Trips, kWh/day for Energy Consumption, tons/day for Emissions, 1000 gallons/day for Fuel Consumption

Region	Calendar Year	Vehicle Category	Model Year	Speed	Fuel	Population	Total VMT	CVMT	EVMT	Trips	Energy Consumption
Tulare	2020	LDT1	Aggregate	Aggregate	Gasoline	18,291	473,695	473,695	0	76,806	0.0
Tulare	2020	LDT1	Aggregate	Aggregate	Diesel	15	220	220	0	47	0.0
Tulare	2020	LDT1	Aggregate	Aggregate	Electricity	6	156	0	156	28	60.3
Tulare	2020	LDT1	Aggregate	Aggregate	Plug-in Hybrid	1	29	15	14	3	4.1
Tulare	2020	LDT2	Aggregate	Aggregate	Gasoline	65,092	2,067,505	2,067,505	0	299,152	0.0
Tulare	2020	LDT2	Aggregate	Aggregate	Diesel	127	4,507	4,507	0	601	0.0
Tulare	2020	LDT2	Aggregate	Aggregate	Electricity	7	202	0	202	36	78.0
Tulare	2020	LDT2	Aggregate	Aggregate	Plug-in Hybrid	101	4,410	2,322	2,088	416	630.7
Tulare	2020	T6 Instate Tractor Class 6	Aggregate	Aggregate	Diesel	13	619	619	0	151	0.0
Tulare	2020	T6 Instate Tractor Class 7	Aggregate	Aggregate	Diesel	320	19,443	19,443	0	3,700	0.0
Tulare	2020	T6 Instate Tractor Class 7	Aggregate	Aggregate	Natural Gas	3	218	218	0	31	0.0
Tulare	2020	T7 Tractor Class 8	Aggregate	Aggregate	Diesel	1,368	121,844	121,844	0	19,883	0.0
Tulare	2020	T7 Tractor Class 8	Aggregate	Aggregate	Natural Gas	22	2,029	2,029	0	316	0.0

Legend: VMT = vehicle miles traveled; CVMT = conventional vehicle miles traveled; EVMT = electric vehicle miles traveled; CO2 = carbon dioxide; CH4 = methane; N2O = nitrous oxide; RUNEX = running exhaust emissions; IDLEX = idle exhaust emissions; STREX = start exhaust tailpipe emissions; TOTEX = total exhaust emissions; LDT1 = light-duty trucks (GVWR <6000 lbs and ETW <= 3750 lbs); LDT2 = light-duty trucks (GVWR <6000 lbs and ETW 3751-5750 lbs); T6 Instate Tractor Class 6 = Medium-Heavy Duty Tractor Truck (GVWR 19501-26000 lbs); T6 Instate Tractor Class 7 = Medium-Heavy Duty Tractor Truck (GVWR 26001-33000 lbs); T7 Tractor Class 8 = Heavy-Heavy Duty Tractor Truck (GVWR 33001 lbs and over); GVWR = gross vehicle weight rating; ETW = equivalent test weight.

Source: EMFAC2021 Web Database (v1.0.1). Available: https://arb.ca.gov/emfac/emissions-inventory/03b58526e5b3bcf6910ba43e0194d2884825e80c. Accessed March 22, 2022.

Table A.14 (Continued)
EMFAC 2021 Output
Source: EMFAC2021 (v1.0.1) Emissions Inventory
Region Type: County
Region: Tulare
Calendar Year: 2020
Season: Annual
Vehicle Classification: EMFAC202x Categories
Units: miles/day for CVMT and EVMT, trips/day for Trips, kWh/day for Energy Consumption, tons/day for Emissions, 1000 gallons/day for Fuel Consumption

Region	Calendar Year	Vehicle Category	Model Year	Speed	Fuel	CO2_RUNEX	CO2_IDLEX	CO2_STREX	CO2_TOTEX	CH4_RUNEX	CH4_IDLEX	CH4_STREX	CH4_TOTEX
Tulare	2020	LDT1	Aggregate	Aggregate	Gasoline	1.88E+02	0.00E+00	8.82E+00	1.97E+02	9.11E-03	0.00E+00	1.66E-02	2.57E-02
Tulare	2020	LDT1	Aggregate	Aggregate	Diesel	9.65E-02	0.00E+00	0.00E+00	9.65E-02	3.36E-06	0.00E+00	0.00E+00	3.36E-06
Tulare	2020	LDT1	Aggregate	Aggregate	Electricity	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Tulare	2020	LDT1	Aggregate	Aggregate	Plug-in Hybrid	4.40E-03	0.00E+00	2.19E-04	4.62E-03	1.30E-08	0.00E+00	1.19E-07	1.32E-07
Tulare	2020	LDT2	Aggregate	Aggregate	Gasoline	8.63E+02	0.00E+00	3.30E+01	8.96E+02	1.28E-02	0.00E+00	3.87E-02	5.14E-02
Tulare	2020	LDT2	Aggregate	Aggregate	Diesel	1.63E+00	0.00E+00	0.00E+00	1.63E+00	4.85E-06	0.00E+00	0.00E+00	4.85E-06
Tulare	2020	LDT2	Aggregate	Aggregate	Electricity	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Tulare	2020	LDT2	Aggregate	Aggregate	Plug-in Hybrid	6.88E-01	0.00E+00	3.77E-02	7.25E-01	2.03E-06	0.00E+00	1.89E-05	2.09E-05
Tulare	2020	T6 Instate Tractor Class 6	Aggregate	Aggregate	Diesel	7.59E-01	3.42E-02	0.00E+00	7.94E-01	3.65E-06	2.83E-07	0.00E+00	3.93E-06
Tulare	2020	T6 Instate Tractor Class 7	Aggregate	Aggregate	Diesel	2.30E+01	8.53E-01	0.00E+00	2.39E+01	8.49E-05	5.01E-06	0.00E+00	8.99E-05
Tulare	2020	T6 Instate Tractor Class 7	Aggregate	Aggregate	Natural Gas	2.32E-01	1.49E-02	0.00E+00	2.47E-01	1.67E-04	3.67E-05	0.00E+00	2.04E-04
Tulare	2020	T7 Tractor Class 8	Aggregate	Aggregate	Diesel	2.14E+02	1.29E+01	0.00E+00	2.27E+02	4.54E-04	2.29E-04	0.00E+00	6.83E-04
Tulare	2020	T7 Tractor Class 8	Aggregate	Aggregate	Natural Gas	2.89E+00	4.07E-01	0.00E+00	3.30E+00	2.24E-03	1.54E-03	0.00E+00	3.78E-03

Legend: VMT = vehicle miles traveled; CVMT = conventional vehicle miles traveled; EVMT = electric vehicle miles traveled; CO2 = carbon dioxide; CH4 = methane; N2O = nitrous oxide; RUNEX = running exhaust emissions; IDLEX = idle exhaust emissions; STREX = start exhaust tailpipe emissions; TOTEX = total exhaust emissions; LDT1 = light-duty trucks (GVWR <6000 lbs and ETW <= 3750 lbs); LDT2 = light-duty trucks (GVWR <6000 lbs and ETW 3751-5750 lbs); T6 Instate Tractor Class 6 = Medium-Heavy Duty Tractor Truck (GVWR 19501-26000 lbs); T6 Instate Tractor Class 7 = Medium-Heavy Duty Tractor Truck (GVWR 26001-33000 lbs); T7 Tractor Class 8 = Heavy-Heavy Duty Tractor Truck (GVWR 33001 lbs and over); GVWR = gross vehicle weight rating; ETW = equivalent test weight.

Source: EMFAC2021 Web Database (v1.0.1). Available: https://arb.ca.gov/emfac/emissions-inventory/03b58526e5b3bcf6910ba43e0194d2884825e80c. Accessed March 22, 2022.

Table A.14 (Continued)
EMFAC 2021 Output
Source: EMFAC2021 (v1.0.1) Emissions Inventory
Region Type: County
Region: Tulare
Calendar Year: 2020
Season: Annual
Vehicle Classification: EMFAC202x Categories
Units: miles/day for CVMT and EVMT, trips/day for Trips, kWh/day for Energy Consumption, tons/day for Emissions, 1000 gallons/day for Fuel Consumption

Region	Calendar Year	Vehicle Category	Model Year	Speed	Fuel	N2O_RUNEX	N2O_IDLEX	N2O_STREX	N2O_TOTEX	Fuel Consumption
Tulare	2020	LDT1	Aggregate	Aggregate	Gasoline	1.22E-02	0.00E+00	4.39E-03	1.66E-02	20.75
Tulare	2020	LDT1	Aggregate	Aggregate	Diesel	1.52E-05	0.00E+00	0.00E+00	1.52E-05	0.01
Tulare	2020	LDT1	Aggregate	Aggregate	Electricity	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00
Tulare	2020	LDT1	Aggregate	Aggregate	Plug-in Hybrid	1.82E-08	0.00E+00	6.02E-08	7.84E-08	0.00
Tulare	2020	LDT2	Aggregate	Aggregate	Gasoline	2.49E-02	0.00E+00	1.55E-02	4.04E-02	94.44
Tulare	2020	LDT2	Aggregate	Aggregate	Diesel	2.56E-04	0.00E+00	0.00E+00	2.56E-04	0.15
Tulare	2020	LDT2	Aggregate	Aggregate	Electricity	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00
Tulare	2020	LDT2	Aggregate	Aggregate	Plug-in Hybrid	2.83E-06	0.00E+00	9.53E-06	1.24E-05	0.08
Tulare	2020	T6 Instate Tractor Class 6	Aggregate	Aggregate	Diesel	1.20E-04	5.39E-06	0.00E+00	1.25E-04	0.07
Tulare	2020	T6 Instate Tractor Class 7	Aggregate	Aggregate	Diesel	3.63E-03	1.34E-04	0.00E+00	3.76E-03	2.13
Tulare	2020	T6 Instate Tractor Class 7	Aggregate	Aggregate	Natural Gas	4.74E-05	3.05E-06	0.00E+00	5.04E-05	0.03
Tulare	2020	T7 Tractor Class 8	Aggregate	Aggregate	Diesel	3.37E-02	2.04E-03	0.00E+00	3.57E-02	20.27
Tulare	2020	T7 Tractor Class 8	Aggregate	Aggregate	Natural Gas	5.90E-04	8.30E-05	0.00E+00	6.73E-04	0.38

Legend: VMT = vehicle miles traveled; CVMT = conventional vehicle miles traveled; EVMT = electric vehicle miles traveled; CO2 = carbon dioxide; CH4 = methane; N2O = nitrous oxide; RUNEX = running exhaust emissions; IDLEX = idle exhaust emissions; STREX = start exhaust tailpipe emissions; TOTEX = total exhaust emissions; LDT1 = light-duty trucks (GVWR <6000 lbs and ETW <= 3750 lbs); LDT2 = light-duty trucks (GVWR <6000 lbs and ETW 3751-5750 lbs); T6 Instate Tractor Class 6 = Medium-Heavy Duty Tractor Truck (GVWR 19501-26000 lbs); T6 Instate Tractor Class 7 = Medium-Heavy Duty Tractor Truck (GVWR 26001-33000 lbs); T7 Tractor Class 8 = Heavy-Heavy Duty Tractor Truck (GVWR 33001 lbs and over); GVWR = gross vehicle weight rating; ETW = equivalent test weight.

Source: EMFAC2021 Web Database (v1.0.1). Available: https://arb.ca.gov/emfac/emissions-inventory/03b58526e5b3bcf6910ba43e0194d2884825e80c. Accessed March 22, 2022.

Table A.15
Vehicle Exhaust GHG Emission Factors

Region	Calendar Year	Vehicle Category	Model Year	Speed	Fuel	Regional Totals[1] VMT (mi/day)	Regional Totals[1] CO_2 Emissions (ton/day)	Regional Totals[1] CH_4 Emissions (ton/day)	Regional Totals[1] N_2O Emissions (ton/day)	GHG Emission Factors CO_2 (g/mi)	GHG Emission Factors CH_4 (g/mi)	GHG Emission Factors N_2O (g/mi)
Tulare	2020	LDT1-2	Aggregate	Aggregate	Aggregate	2,550,724	1,094.8	0.0772	0.0572	389.4	0.027	0.020
Tulare	2020	T6 Instate Tractor Class 6-7	Aggregate	Aggregate	Aggregate	20,280	24.9	0.0003	0.0039	1,114.5	0.013	0.176
Tulare	2020	T7 Tractor Class 8	Aggregate	Aggregate	Aggregate	123,873	230.2	0.0045	0.0364	1,685.9	0.033	0.267

Notes:

Legend: LDT1-2 = light-duty trucks (GVWR <6000 lbs and ETW <= 5750 lbs); T6 Instate Tractor Class 6-7 = Medium-Heavy Duty Tractor Truck (GVWR 19501-33000 lbs); T7 Tractor Class 8 = Heavy-Heavy Duty Tractor Truck (GVWR 33001 lbs and over); GVWR = gross vehicle weight rating; ETW = equivalent test weight; VMT = vehicle miles traveled.

1. Source: EMFAC2021 Web Database (v1.0.1). Tulare County. Emission factors include running, idle, and starting exhaust.

Table A.16
Vehicle Electricity Usage GHG Emission Factors

Region	Calendar Year	Vehicle Category	Model Year	Speed	Fuel	Regional Totals[1] VMT (mi/day)	Regional Totals[1] Electricity Usage (kWh/day)	2020 Electricity Usage Emission Factors[2] CO_2 (lb/MWh)	2020 Electricity Usage Emission Factors[2] CH_4 (lb/MWh)	2020 Electricity Usage Emission Factors[2] N_2O (lb/MWh)	GHG Emission Factors CO_2 (g/mi)	GHG Emission Factors CH_4 (g/mi)	GHG Emission Factors N_2O (g/mi)
Tulare	2020	LDT1-2	Aggregate	Aggregate	Aggregate	2,550,724	773	513.5	0.032	0.004	0.071	4.40E-06	5.50E-07
Tulare	2020	T6 Instate Tractor Class 6-7	Aggregate	Aggregate	Aggregate	20,280	0	513.5	0.032	0.004	0	0	0
Tulare	2020	T7 Tractor Class 8	Aggregate	Aggregate	Aggregate	123,873	0	513.5	0.032	0.004	0	0	0

Notes:

Legend: LDT1-2 = light-duty trucks (GVWR <6000 lbs and ETW <= 5750 lbs); T6 Instate Tractor Class 6-7 = Medium-Heavy Duty Tractor Truck (GVWR 19501-33000 lbs); T7 Tractor Class 8 = Heavy-Heavy Duty Tractor Truck (GVWR 33001 lbs and over); GVWR = gross vehicle weight rating; ETW = equivalent test weight; VMT = vehicle miles traveled; kWh = kilowatt hours; MWh = megawatt hours.

1. Source: EMFAC2021 Web Database (v1.0.1).

2. Source: U.S. EPA. Emissions & Generation Resources Integrated Database (eGRID). eGRID Summary Tables 2020. CAMX Subregion. Available: https://www.epa.gov/system/files/documents/2022-01/egrid2020_summary_tables.pdf. Accessed March 2022.

Table A.17
Vehicle Combined Exhaust and Electricity Usage GHG Emission Factors

Region	Calendar Year	Vehicle Category	Model Year	Speed	Fuel	Combined GHG Emission Factors CO_2 (g/mi)	Combined GHG Emission Factors CH_4 (g/mi)	Combined GHG Emission Factors N_2O (g/mi)
Tulare	2020	LDT1-2	Aggregate	Aggregate	Aggregate	389.5	0.027	0.020
Tulare	2020	T6 Instate Tractor Class 6-7	Aggregate	Aggregate	Aggregate	1,114.5	0.013	0.176
Tulare	2020	T7 Tractor Class 8	Aggregate	Aggregate	Aggregate	1,685.9	0.033	0.267

Legend: LDT1-2 = light-duty trucks (GVWR <6000 lbs and ETW <= 5750 lbs); T6 Instate Tractor Class 6-7 = Medium-Heavy Duty Tractor Truck (GVWR 19501-33000 lbs); T7 Tractor Class 8 = Heavy-Heavy Duty Tractor Truck (GVWR 33001 lbs and over); GVWR = gross vehicle weight rating; ETW = equivalent test weight; VMT = vehicle miles traveled.

Table A.18
Emissions Associated with Dairy Electricity Use

2020 Population (Dairy Cows and Heifers)	Dairy Electricity Usage per Cow (MWh/cow/yr)[1]	2020 Electricity Usage (MWh/yr)	2020 Emission Factors (lb/MWh)[2]			2020 Annual Emissions (metric ton/yr)			
			CO_2	CH_4	N_2O	CO_2	CH_4	N_2O	CO_2e
843,125	0.49	413,131	513.5	0.032	0.004	96,228	5.997	0.750	96,601

Notes:

1. Source: Tulare County RMA. *Draft EIR for the ACFP, and Dairy CAP* . January 2016. Appendix E.2.
2. Source: U.S. EPA. Emissions & Generation Resources Integrated Database (eGRID). eGRID Summary Tables 2020. CAMX Subregion. Available: https://www.epa.gov/system/files/documents/2022-01/egrid2020_summary_tables.pdf. Accessed March 2022.

Table A.19
Emissions Associated with Dairy Refrigeration Equipment

2013 Total Refrigerant Charge (lb)	2020 Total Refrigerant Charge (lb)[1]	Refrigerant Type[2]	Global Warming Potential[3]	Annual Refrigerant Loss Rate[4]	2020 Annual Emissions (metric ton/yr)	
					HFCs	CO_2e
48,072	42,865	HFC-23	14,800	25%	4.86	71,941

Notes:

1. The 2020 refrigerant charge was scaled from 2013 in proportion to the number of dairy cows.
2. HFC-23 was conservatively selected as a worst case refrigerant for industrial refrigeration in terms of its global warming potential.
3. GWP is from the IPCC fourth assessment report (AR4). GWP is consistent with the CARB California Greenhouse Gas Emission Inventory Program. Available: https://ww2.arb.ca.gov/our-work/programs/ghg-inventory-program. Accessed March 21, 2022.
4. Source: The Climate Registry. *2021 Default Emission Factors* . May 2021. Table 4.1. Industrial Refrigeration including Food Processing and Cold Storage.

Table A.20
California Manure Management System Apportionment in the 2013 Base Year

Manure Management System	Manure Fraction[1][2]	
	Dairy Cows	Dairy Heifers
Anaerobic Digester	1.19E-02	0.00E+00
Anaerobic Lagoon	5.82E-01	0.00E+00
Daily Spread	1.06E-01	1.08E-01
Deep Pit	1.04E-03	0.00E+00
Dry Lot	0.00E+00	8.74E-01
Liquid/Slurry	2.02E-01	8.74E-03
Pasture	6.71E-03	9.25E-03
Solid Storage	9.10E-02	0.00E+00
Total	**1.00E+00**	**1.00E+00**

[1] Source: CARB, Annex 3B - Manure Management (IPCC 3A2). Available: http://www.arb.ca.gov/cc/inventory/doc/methods_00-12/annex_3b_manure_management.pdf; which is found in the 2014 Edition Archive of California's 2000-2012 Greenhouse Gas Emissions Inventory Technical Support Document: https://ww3.arb.ca.gov/cc/inventory/pubs/reports/2000_2012/ghg_inventory_00-12_technical_support_document.pdf; which is found on CARB's website: https://ww2.arb.ca.gov/ghg-inventory-archive.

[2] The manure fractions reflect 2013 assumptions to preserve business-as-usual manure management practices for the 2020 BAU emission calculations.

Table A.21
Tulare County 2020 Dairy Cattle Herd Counts

Dairy Cows	Dairy Heifers
484,574	419,962

Note: Year 2020 cattle populations were provided by the Tulare County RMA. The Dairy Cows category includes milk cows and dry cows. The Dairy Heifers category includes all heifers and calves.

Table A.22
CH_4 Business-As-Usual Emissions from Manure Management - Dairy Cows

Manure Management System	Tulare County Current Inventory Year (2020)[a]						
	$CH_{4,man}$ (MT/yr)[b]	V_{ex} (MT/yr)[c]	$WMS*N_{animals}$ (animals)[d]	VS (kg VS/animal/yr)[e]	B_o (m^3 CH_4/kg VS)[f]	MCF (%)[g]	c_1 (kg/m^3)[h]
Anaerobic Digester	474.7	16,505	5,777	2,857	0.24	0.181	0.662
Anaerobic Lagoon	93,556.7	805,542	281,954	2,857	0.24	0.731	0.662
Daily Spread	116.1	146,091	51,134	2,857	0.24	0.005	0.662
Deep Pit	73.6	1,434	502	2,857	0.24	0.323	0.662
Dry Lot	0.0	0	0	2,857	0.24	0.015	0.662
Liquid/Slurry	14,346.7	279,564	97,852	2,857	0.24	0.323	0.662
Pasture	22.1	9,293	3,253	2,857	0.24	0.015	0.662
Solid Storage	800.8	125,999	44,102	2,857	0.24	0.04	0.662
Total	**109,390.6**	--	**484,574**	--	--	--	--

Table A.23
CH_4 Business-As-Usual Emissions from Manure Management - Dairy Heifers

Manure Management System	Tulare County Current Inventory Year (2020)[a]						
	$CH_{4,man}$ (MT/yr)[b]	V_{ex} (MT/yr)[c]	$WMS*N_{animals}$ (animals)[d]	VS (kg VS/animal/yr)[e]	B_o (m^3 CH_4/kg VS)[f]	MCF (%)[g]	c_1 (kg/m^3)[h]
Anaerobic Digester	0.0	0	0	1,252	0.17	0.181	0.662
Anaerobic Lagoon	0.0	0	0	1,252	0.17	0.731	0.662
Daily Spread	32.0	56,796	45,364	1,252	0.17	0.005	0.662
Deep Pit	0.0	0	0	1,252	0.17	0.323	0.662
Dry Lot	775.7	459,536	367,041	1,252	0.17	0.015	0.662
Liquid/Slurry	167.0	4,596	3,671	1,252	0.17	0.323	0.662
Pasture	8.2	4,865	3,886	1,252	0.17	0.015	0.662
Solid Storage	0.0	0	0	1,252	0.17	0.04	0.662
Total	**983.0**	--	**419,962**	--	--	--	--

Notes:

[a] 2020 BAU emission calculations used the 2020 Tulare County herd population and calculation methodology consistent with the California GHG 2000-2019 Inventory (Website: https://ww2.arb.ca.gov/applications/greenhouse-gas-emission-inventory-0. Accessed March 21, 2022).

[b] $CH_{4,man}$: Methane emissions estimated using Equation 1 (see below).

Equation 1 $CH_{4,man} = V_{ex} \times B_o \times MCF \times c_1$

[c] V_{ex}: Volatile solids excreted estimated using Equation 2 (see below).

Equation 2 $V_{ex} = VS \times (WMS*N_{animals}) \times (kg\ to\ MT)$

[d] $WMS*N_{animals}$: Equivalent number of animals per waste (manure) management system. Apportionment factors are from Table A.20.

[e] VS: Volatile solids excreted per animal.

[f] B_o: Maximum methane producing capacity.

[g] MCF: Methane conversion factor.

[h] c_1: Conversion factor representing density of methane at 25C.

Other abbreviations: kg = kilogram; m^3 = cubic meter; MT = metric ton; yr = year.

Table A.24
N_2O Business-As-Usual Emissions from Manure Management - Dairy Cows

Manure Management System	Tulare County Current Inventory Year (2020)[a]		N_{ex}[d] (g/yr)	Direct N as N_2O[e] (g N_2O-N/g)	Volatilization fraction[f] (fraction)	Indirect N as N_2O, volatilized[g] (g N_2O-N/g)	Runoff fraction[h] (fraction)	Indirect N as N_2O, runoff[i] (g N_2O-N/g)
	N_2O_{man}[b] (MT/yr)	WMS*$N_{animals}$[c] (animals)						
Anaerobic Digester	6.3	5,777	158,656	0	0.43	0.01	0.008	0.0075
Anaerobic Lagoon	306.4	281,954	158,656	0	0.43	0.01	0.008	0.0075
Daily Spread	12.7	51,134	158,656	0	0.10	0.01	0	0.0075
Deep Pit	0.6	502	158,656	0.002	0.24	0.01	0	0.0075
Dry Lot	0.0	0	158,656	0.02	0.15	0.01	0.02	0.0075
Liquid/Slurry	186.8	97,852	158,656	0.005	0.26	0.01	0.008	0.0075
Pasture	0.0	3,253	158,656	0	0.00	0.01	0	0.0075
Solid Storage	84.6	44,102	158,656	0.005	0.27	0.01	0	0.0075
Total	**597.5**	**484,574**	--	--	--	--	--	--

Table A.25
N_2O Business-As-Usual Emissions from Manure Management - Dairy Heifers

Manure Management System	Tulare County Current Inventory Year (2020)[a]		N_{ex}[d] (g/yr)	Direct N as N_2O[e] (g N_2O-N/g)	Volatilization fraction[f] (fraction)	Indirect N as N_2O, volatilized[g] (g N_2O-N/g)	Runoff fraction[h] (fraction)	Indirect N as N_2O, runoff[i] (g N_2O-N/g)
	N_2O_{man}[b] (MT/yr)	WMS*$N_{animals}$[c] (animals)						
Anaerobic Digester	0.0	0	68,911	0	0.43	0.01	0.008	0.0075
Anaerobic Lagoon	0.0	0	68,911	0	0.43	0.01	0.008	0.0075
Daily Spread	4.9	45,364	68,911	0	0.10	0.01	0	0.0075
Deep Pit	0.0	0	68,911	0.002	0.24	0.01	0	0.0075
Dry Lot	860.3	367,041	68,911	0.02	0.15	0.01	0.02	0.0075
Liquid/Slurry	3.0	3,671	68,911	0.005	0.26	0.01	0.008	0.0075
Pasture	0.0	3,886	68,911	0	0.00	0.01	0	0.0075
Solid Storage	0.0	0	68,911	0.005	0.27	0.01	0	0.0075
Total	**868.3**	**419,962**	--	--	--	--	--	--

Notes:

[a] 2020 BAU emission calculations used the 2020 Tulare County herd population and calculation methodology consistent with the California GHG 2000-2019 Inventory (Website: https://ww2.arb.ca.gov/applications/greenhouse-gas-emission-inventory-0. Accessed March 21, 2022).

[b] N_2O_{man}: Nitrous oxide emissions estimated using Equation 1 (see below).

Equation 1 $N_2O = WMS*N_{animals} \times N_{ex} \times [D_{EF} + (V_{frac} \times V_{EF}) + (R_{frac} \times R_{EF})] \times 1.5711 \times (g \text{ to } MT)$

[c] WMS*$N_{animals}$: Equivalent number of animals per waste (manure) management system. Apportionment factors are from Table A.20.

[d] N_{ex}: Nitrogen excreted per animal.

[e] Direct N a N_2O: Emission factor representing direct nitrogen as N_2O-N for the particular waste management system.

[f] Volatilization fraction of N for the animal group.

[g] Emission factor representing indirect nitrogen as N_2O-N for redeposited volatilized N.

[h] Runoff fraction of N for the animal group.

[i] Emission factor representing indirect nitrogen as N_2O-N for runoff N.

Other abbreviations: kg = kilogram; g = gram; MT = metric ton; yr = year.

Table A.26
Dairy Cattle Herd Counts for Enteric Fermentation Calculation

Category	Dairy Cows	Dairy Heifers 0-12 mo	Dairy Heifers 12-24 mo	Dairy Calves
California (2019)[1]	1,732,869	216,999	510,532	886,986
Tulare County (2020)[2]	484,574	175,335	183,216	61,411

Notes:

1. California populations are from the CARB 2000-2019 GHG Inventory Query Tool, 14th Edition. Most recent year available (2019). Available: https://ww2.arb.ca.gov/applications/greenhouse-gas-emission-inventory-0. Accessed March 21, 2022.
2. Year 2020 cattle counts were provided by the Tulare County RMA. Dairy cows include cows in milk and dry cows.

Table A.27
Emissions from Enteric Fermentation - Dairies

	CH_4 Emissions (MT/yr)				
Source	Dairy Cows	Dairy Heifers 0-12 mo	Dairy Heifers 12-24 mo	Dairy Calves	Total
California (2019)[1]	250,582	9,445	33,546	10,318	**303,892**
Tulare County (2020)[2]	70,072	7,632	12,039	714	**90,457**

Notes:

1. California populations are from the CARB 2000-2019 GHG Inventory Query Tool, 14th Edition. Most recent year available (2019). Available: https://ww2.arb.ca.gov/applications/greenhouse-gas-emission-inventory-0. Accessed March 21, 2022.

2. CARB and EPA use the same methodology to estimate emissions from enteric fermentation. As such, this table assumes that Tulare emissions are proportional to the California emissions based on animal population.

Abbreviations:

CARB - California Air Resources Board
CH_4 - methane
CO_2e - carbon dioxide equivalent
kg - kilogram
mo - months old
MT - metric tonne
yr - year

Table A.28
CARB GHG Inventory - Enteric Fermentation
GHG Emission Inventory Summary [2000 - 2019]
Main Sector: Agriculture & Forestry
Sub Sector Level 1: Enteric Fermentation
Sub Sector Level 2: Cattle
Inventory Accounting: Included
Measurement: CO2Eq
GWP: AR4
Unit: tonnes

Inventory Accounting	Main Sector	Sub Sector Level 1	Sub Sector Level 2	Sub Sector Level 3	Main Activity	Activity Subset	GHG	2019 Emission (MT/yr)
Included	Agriculture & Forestry	Enteric Fermentation	Cattle	None	Livestock population	Beef calves	CH4	71,102
Included	Agriculture & Forestry	Enteric Fermentation	Cattle	None	Livestock population	Beef cows	CH4	1,503,262
Included	Agriculture & Forestry	Enteric Fermentation	Cattle	None	Livestock population	Beef replacements 0-12 months	CH4	40,698
Included	Agriculture & Forestry	Enteric Fermentation	Cattle	None	Livestock population	Beef replacements 12-24 months	CH4	108,800
Included	Agriculture & Forestry	Enteric Fermentation	Cattle	None	Livestock population	Bulls	CH4	148,036
Included	Agriculture & Forestry	Enteric Fermentation	Cattle	None	Livestock population	Dairy calves	CH4	257,960
Included	Agriculture & Forestry	Enteric Fermentation	Cattle	None	Livestock population	Dairy cows	CH4	6,264,542
Included	Agriculture & Forestry	Enteric Fermentation	Cattle	None	Livestock population	Dairy replacements 0-12 months	CH4	236,133
Included	Agriculture & Forestry	Enteric Fermentation	Cattle	None	Livestock population	Dairy replacements 12-24 months	CH4	838,656
Included	Agriculture & Forestry	Enteric Fermentation	Cattle	None	Livestock population	Heifer feedlot	CH4	178,405
Included	Agriculture & Forestry	Enteric Fermentation	Cattle	None	Livestock population	Heifer stockers	CH4	173,617
Included	Agriculture & Forestry	Enteric Fermentation	Cattle	None	Livestock population	Steer feedlot	CH4	286,775
Included	Agriculture & Forestry	Enteric Fermentation	Cattle	None	Livestock population	Steer stockers	CH4	382,424

California 2019 Enteric Fermentation Emissions					
Facility Type	Total	Dairy Cows	Dairy Heifers 0-12 mo	Dairy Heifers 12-24 mo	Dairy Calves
Dairy					
Total CH_4 (MT/yr):	**303,892**	250,582	9,445	33,546	10,318
Total CO_2e (MT/yr):	**7,597,292**	6,264,542	236,133	838,656	257,960
Feedlot:					
Total CH_4 (MT/yr):	**115,725**				
Total CO_2e (MT/yr):	**2,893,117**				

Source: CARB 2000-2019 GHG Inventory Query Tool, 14th Edition. Most recent year available (2019). Available: https://ww2.arb.ca.gov/applications/greenhouse-gas-emission-inventory-0. Accessed March 21, 2022.

Table A.29
Feedlot Cattle Herd Counts for Enteric Fermentation and Manure Management Calculations

Category	Feedlot Cattle
California (2019)[1]	1,878,552
Tulare County (2020)[2]	214,271

Notes:

1. Population is from the CARB 2000-2019 GHG Inventory Query Tool, 14th Edition. Most recent year available (2019). Available: https://ww2.arb.ca.gov/applications/greenhouse-gas-emission-inventory-0. Accessed March 21, 2022. Reflects all cattle other than dairy cows, replacement dairy heifers (0-24 months), and dairy calves.
2. Year 2020 year cattle counts were provided by the Tulare County RMA. Reflects all animals in feedlot facilities and mature bulls identified in dairies.

Table A.30
Emissions from Enteric Digestion and Manure Management - Feedlots

Source	Enteric Digestion	Manure Management	
	CH_4 (MT/yr)	CH_4 (MT/yr)	N_2O (MT/yr)
California (2019)[1]	115,725	5,254	994
Tulare County (2020)[2]	13,200	599	113

Notes:

1. California emissions are from the CARB 2000-2019 GHG Inventory Query Tool, 14th Edition. Most recent year available (2019). Available: https://ww2.arb.ca.gov/applications/greenhouse-gas-emission-inventory-0. Accessed March 21, 2022.
2. CARB and EPA use the same methodology to estimate emissions from enteric fermentation and manure management. As such, this table assumes that Tulare emissions are proportional to the California emissions based on animal population.

Table A.31
CARB GHG Inventory - Manure Management
GHG Emission Inventory Summary [2000 - 2019]
Main Sector: Agriculture & Forestry
Sub Sector Level 1: Manure Management
Sub Sector Level 2: Cattle
Inventory Accounting: Included
Measurement: CO2Eq
GWP: AR4
Unit: million tonnes

Inventory Accounting	Main Sector	Sub Sector Level 1	Sub Sector Level 2	Sub Sector Level 3	Main Activity	Activity Subset	GHG	2019 Emission (million MT/yr)
Included	Agriculture & Forestry	Manure Management	Cattle	Anaerobic digester	Livestock population	Dairy cows	CH4	0.0425
Included	Agriculture & Forestry	Manure Management	Cattle	Anaerobic digester	Livestock population	Dairy cows	N2O	0.0067
Included	Agriculture & Forestry	Manure Management	Cattle	Anaerobic lagoon	Livestock population	Dairy cows	CH4	8.3683
Included	Agriculture & Forestry	Manure Management	Cattle	Anaerobic lagoon	Livestock population	Dairy cows	N2O	0.3266
Included	Agriculture & Forestry	Manure Management	Cattle	Daily spread	Livestock population	Dairy cows	CH4	0.0104
Included	Agriculture & Forestry	Manure Management	Cattle	Daily spread	Livestock population	Dairy cows	N2O	0.0136
Included	Agriculture & Forestry	Manure Management	Cattle	Daily spread	Livestock population	Dairy heifers	CH4	0.0014
Included	Agriculture & Forestry	Manure Management	Cattle	Daily spread	Livestock population	Dairy heifers	N2O	0.0025
Included	Agriculture & Forestry	Manure Management	Cattle	Deep pit	Livestock population	Dairy cows	CH4	0.0066
Included	Agriculture & Forestry	Manure Management	Cattle	Deep pit	Livestock population	Dairy cows	N2O	0.0006
Included	Agriculture & Forestry	Manure Management	Cattle	Dry lot	Livestock population	Dairy heifers	CH4	0.0336
Included	Agriculture & Forestry	Manure Management	Cattle	Dry lot	Livestock population	Dairy heifers	N2O	0.4442
Included	Agriculture & Forestry	Manure Management	Cattle	Liquid/slurry	Livestock population	Dairy cows	CH4	1.2841
Included	Agriculture & Forestry	Manure Management	Cattle	Liquid/slurry	Livestock population	Dairy cows	N2O	0.1991
Included	Agriculture & Forestry	Manure Management	Cattle	Liquid/slurry	Livestock population	Dairy heifers	CH4	0.0072
Included	Agriculture & Forestry	Manure Management	Cattle	Liquid/slurry	Livestock population	Dairy heifers	N2O	0.0016
Included	Agriculture & Forestry	Manure Management	Cattle	Pasture	Livestock population	Dairy cows	CH4	0.0020
Included	Agriculture & Forestry	Manure Management	Cattle	Pasture	Livestock population	Dairy heifers	CH4	0.0004
Included	Agriculture & Forestry	Manure Management	Cattle	Solid storage	Livestock population	Dairy cows	CH4	0.0716
Included	Agriculture & Forestry	Manure Management	Cattle	Solid storage	Livestock population	Dairy cows	N2O	0.0902
Included	Agriculture & Forestry	Manure Management	Cattle	Dry lot	Livestock population	Feedlot - heifers 500+ lbs	CH4	0.0096
Included	Agriculture & Forestry	Manure Management	Cattle	Dry lot	Livestock population	Feedlot - heifers 500+ lbs	N2O	0.0994
Included	Agriculture & Forestry	Manure Management	Cattle	Dry lot	Livestock population	Feedlot - steers 500+ lbs	CH4	0.0179
Included	Agriculture & Forestry	Manure Management	Cattle	Dry lot	Livestock population	Feedlot - steers 500+ lbs	N2O	0.1959
Included	Agriculture & Forestry	Manure Management	Cattle	Liquid/slurry	Livestock population	Feedlot - heifers 500+ lbs	CH4	0.0034
Included	Agriculture & Forestry	Manure Management	Cattle	Liquid/slurry	Livestock population	Feedlot - heifers 500+ lbs	N2O	0.0004
Included	Agriculture & Forestry	Manure Management	Cattle	Liquid/slurry	Livestock population	Feedlot - steers 500+ lbs	CH4	0.0034
Included	Agriculture & Forestry	Manure Management	Cattle	Liquid/slurry	Livestock population	Feedlot - steers 500+ lbs	N2O	0.0004
Included	Agriculture & Forestry	Manure Management	Cattle	Pasture	Livestock population	Not on feed - beef cows	CH4	0.0503
Included	Agriculture & Forestry	Manure Management	Cattle	Pasture	Livestock population	Not on feed - bulls 500+ lbs	CH4	0.0050
Included	Agriculture & Forestry	Manure Management	Cattle	Pasture	Livestock population	Not on feed - calves <500 lbs	CH4	0.0171
Included	Agriculture & Forestry	Manure Management	Cattle	Pasture	Livestock population	Not on feed - heifers 500+ lbs	CH4	0.0103
Included	Agriculture & Forestry	Manure Management	Cattle	Pasture	Livestock population	Not on feed - steers 500+ lbs	CH4	0.0143

California 2019 Manure Management Emissions - Feedlot

Total CO2e from CH4:	131,341	MT/yr
Total CO2e from N2O:	296,235	MT/yr
Total CH4:	5,254	MT/yr
Total N2O:	994	MT/yr

Source: CARB 2000-2019 GHG Inventory Query Tool, 14th Edition. Most recent year available (2019). Available: https://ww2.arb.ca.gov/applications/greenhouse-gas-emission-inventory-0. Accessed March 21, 2022.

Table A.32
Global Warming Potentials

CO_2	CH_4	N_2O	HFC-23
1	25	298	14,800

Note: Values are 100-yr GWPs from the IPCC fourth assessment report (AR4). GWPs are consistent with the CARB California Greenhouse Gas Emission Inventory Program. Available: https://ww2.arb.ca.gov/our-work/programs/ghg-inventory-program. Accessed March 21, 2022.

Appendix B – 2020 Emission Reduction Calculations

Appendix B - 2020 Emission Reduction Calculations

Table B.1
Dairy and Feedlot Emission Reductions from Solar, Digester, and AMMP Projects Operating in 2020

Project Type	5-Year CO_2e Reductions (MT/5-yrs)[1]	Annual CO_2e Reductions (MT/yr)	CY 2020 CO_2e Reductions (MT/yr)[2]
Solar Panels	-114,363	-22,873	-21,701
Solar Thermal Hot Water Systems	-219	-44	-44
Digesters	-1,520,858	-304,172	-267,122
Alternative Manure Management Program	-84,669	-16,934	-14,751
Total	**-1,720,108**	**-344,022**	**-303,618**

Notes:

1. Reductions are shown as negative values.

2. Calendar year (CY) 2020 reductions are less than the annual reductions because some projects became operational during 2020 and therefore had partial-year reductions.

Table B.2
Progress of Solar, Digester, and AMMP GHG Emission Reductions in Relation to the 2023 Dairy CAP Target

Year	Dairy CAP Emission Reduction Trajectory (MT CO_2e/yr)[1][2]	Actual Emission Reductions Achieved (MT CO2e/yr)[1][3]	Deviation from Trajectory (MT CO2e/yr)[4]	Additional Reductions Needed to Reach 2023 Target (MT CO2e/yr)[1]	Percent of Target Reached
2017	0	-23,990	23,990	-1,026,010	2%
2018	-175,000	-49,964	-125,036	-1,000,036	5%
2019	-350,000	-162,822	-187,178	-887,178	16%
2020	-525,000	-303,618	-221,382	-746,382	29%
2021	-700,000	TBD	TBD	TBD	TBD
2022	-875,000	TBD	TBD	TBD	TBD
2023	-1,050,000	TBD	TBD	TBD	TBD

Legend: TBD = To be determined in a future analysis.

Notes:

1. Reductions are shown as negative values.
2. The Dairy CAP trajectory assumes a linear path from 2017 to 2023.
3. CY 2020 emission reductions were obtained from Table B.1.
4. A positive value means ahead of schedule; a negative value means behind schedule.

Table B.3
Dairy and Feedlot 2020 Actual GHG Emissions

Source Category	CO_2 (MT/yr)	CH_4 (MT/yr)	N_2O (MT/yr)	HFCs (MT/yr)	CO_2e (MT/yr)
Farm Equipment Exhaust	39,425	1	2	0.0	40,016
Farm Agricultural Soil	0	0	938	0.0	279,407
Farm Electricity Consumption	57,203	4	0	0.0	57,425
Dairy Equipment Exhaust	112,885	3	5	0.0	114,576
Truck Trips	20,916	0	3	0.0	21,911
Automobile Trips	11,368	1	1	0.0	11,565
Dairy Electricity Consumption	74,483	6	1	0.0	74,856
Dairy Refrigeration	0	0	0	4.9	71,941
Dairy Manure Decomposition	0	99,099	1,466	0.0	2,914,266
Dairy Enteric Digestion	0	90,457	0	0.0	2,261,423
Feedlot Manure Decomposition	0	599	113	0.0	48,770
Feedlot Enteric Digestion	0	13,200	0	0.0	329,994
Total Emissions	**316,279**	**203,370**	**2,529**	**4.9**	**6,226,151**

Notes:
1. Emission reductions from Table B.1 were applied to the BAU emissions from Table A.1 to produce the 2020 Actual Emissions. Emissions reductions from solar panels and solar thermal hot water systems were applied to the Dairy Electricity Consumption CO_2 emissions. Emission reductions from digesters and AMMP projects were applied to the Dairy Manure Decomposition CH_4 emissions.

Table B.4
Dairy and Feedlot 2020 Actual CH_4 Emissions from Manure Management

Source Category	CH_4 (MT/yr)	CO_2e (MT/yr)
Dairy Manure Decomposition	99,099	2,477,467
Dairy Enteric Digestion	90,457	2,261,423
Feedlot Manure Decomposition	599	14,981
Feedlot Enteric Digestion	13,200	329,994
Total Emissions	**203,355**	**5,083,865**

Table B.5
Progress of Actual CH_4 Emissions in Relation to the 2030 SB 1383 Goal

Year	SB 1383 Emissions Trajectory (MT CO_2e/yr)[1][2]	BAU Emissions (MT CO_2e/yr)[1][3]	Actual Emissions (MT CO_2e/yr)[1][4]	Percent Above/Below 2013 Emissions[5]	Deviation from Target Trajectory (MT CO_2e/yr)[6]	Additional Reductions Needed to Reach 2030 Target (MT CO2e/yr)[7]
2017	6,050,406	6,050,406	6,039,528	4%	10,879	-2,569,528
2018	5,852,000	6,050,406	6,017,583	4%	-165,583	-2,547,583
2019	5,653,000	5,328,594	5,183,929	-10%	469,071	-1,713,929
2020	5,455,000	5,365,738	5,083,865	-12%	371,135	-1,613,865
2021	5,256,000	TBD	TBD	TBD	TBD	TBD
2022	5,058,000	TBD	TBD	TBD	TBD	TBD
2023	4,859,000	TBD	TBD	TBD	TBD	TBD
2024	4,661,000	TBD	TBD	TBD	TBD	TBD
2025	4,462,000	TBD	TBD	TBD	TBD	TBD
2026	4,264,000	TBD	TBD	TBD	TBD	TBD
2027	4,065,000	TBD	TBD	TBD	TBD	TBD
2028	3,867,000	TBD	TBD	TBD	TBD	TBD
2029	3,668,000	TBD	TBD	TBD	TBD	TBD
2030	3,470,000	TBD	TBD	TBD	TBD	TBD

Legend: ND = no data; TBD = To be determined in a future analysis.

Notes:

1. Emissions are CH_4 presented as CO_2e. Manure decomposition and enteric digestion emissions only.
2. The SB 1383 trajectory assumes a linear path from 2017 to 2030. The 2017 BAU emissions were used as the 2017 trajectory starting point. The trajectory value of 3,470,000 MT/yr in year 2030 is the SB 1383 target (40 percent below the 2013 baseline emissions). Trajectory values after 2017 were rounded to the nearest thousand.
3. BAU 2017 emissions were not directly quantified. For the purposes of graphing the SB 1383 progress, BAU 2017 emissions were assumed to be equal to BAU 2018 emissions, which were quantified.
4. Actual 2017 emissions were not directly quantified. For the purposes of graphing the SB 1383 progress, actual 2017 emissions were assumed to equal 2017 BAU emissions minus the reduction from one digester project that began operating in 2017 (see Appendix B, Table B.4; emissions reflect number of digester operating days in 2017).
5. The 2013 baseline methane emissions are 5,783,068 MT/yr as CO2e. A positive percentage means the current year emissions are higher than 2013; a negative percentage means the current year emissions are lower than 2013. The SB 1383 goal is -40% by 2030.
6. A positive value means ahead of schedule; a negative value means behind schedule.
7. Reductions are shown as negative values.

Table B.6
Emission Reductions from a Hypothetical 1,000 kW Solar Panel Project in Tulare County

Description	DC System Size (kW)	System Output (kWh/year)[(1)]	GHG Reduction Over 30-Year Lifetime ($MT CO_2e$)[(2)]	GHG Reduction Over 5 Years ($MT CO_2e$)[(3)]	GHG Reduction Over 1 Year ($MT CO_2e$)[(3)]
Standard module, fixed array (open rack), 20 deg tilt, 180 deg azimuth	1,000	1,604,034	10,621	1,770	354

Notes:

1. Source: National Renewable Energy Laboratory (NREL) PVWatts Calculator, version 6.2.4. Available at: https://pvwatts.nrel.gov. Accessed: March 2022.
2. Source: CARB. Low-Income Weatherization Program Benefits Calculator Tool. California Climate Investments. Version 2. Website: https://ww2.arb.ca.gov/resources/documents/cci-quantification-benefits-and-reporting-materials. Accessed: March 2022.
3. GHG reductions over 5 and 1 years were scaled from the 30-year reductions.

Table B.7
Emission Reductions from Solar Panel Projects at Tulare County Dairies

Facility Name[1]	Permit #	Permit Issue Date	Permit Finaled Date	Size (kW)	5-Year GHG Reduction ($MT CO_2e$)[2]	Annual GHG Reduction ($MT CO_2e$)[2]	CY 2020 GHG Reduction ($MT CO_2e$)[3]
Fern Oak Farms	A1301506	2/7/2013	11/6/2014	922	1,632	326	326
DG Farms	A1403104	9/12/2014	3/11/2015	1,109	1,963	393	393
Moonlight Dairy	A1500022	10/2/2015	4/22/2015	1,109	1,963	393	393
13397 AVE 232 TULARE, CA	A1503630	10/7/2015		1,107	1,960	392	392
Rancho Teresita Dairy	A1402852	11/19/2014	4/29/2015	1,122	1,986	397	397
Four Star Fruit	A1403112	3/12/2014	6/11/2015	1,269	2,246	449	449
Terra Linda Dairy	A1500299	9/3/2015	8/14/2015	830	1,469	294	294
15172 AVE 160 TULARE, CA	A1500379	3/17/2015		1,109	1,963	393	393
Legacy Ranch #2 Dairy	A1500954	4/21/2015	9/8/2015	840	1,487	297	297
Pete Vander Poel Dairy	A1500778	2/4/2015	9/23/2015	1,098	1,944	389	389
Bar VP Dairy	A1500799	4/16/2015	9/23/2015	1,098	1,944	389	389
Ron Verhoeven Family Dairy	A1403278	1/26/2015	10/19/2015	820	1,452	290	290
Lemstra Dairy	A1501662	11/6/2015	11/10/2015	840	1,487	297	297
12075 Avenue 144, Tipton	A1503631	10/7/2015	2/26/2016	1,110	1,965	393	393
7123 AVE 204 TULARE, CA	A1402386	9/25/2014		963	1,705	341	341
Robert Vander Eyk & Sons Dairy	A1503907	1/12/2015	3/11/2016	1,107	1,960	392	392
5 Star Dairy	A1503908	1/12/2015	4/20/2016	1,110	1,965	393	393
Dystra Dairy	A1504116	1/12/2015	4/29/2016	1,046	1,852	370	370
Parreira Gaspar Dairy	A1600266	9/3/2016	5/27/2016	539	953	191	191
Riverbend Farms Dairy	A1600733	3/16/2016	7/21/2016	1,107	1,960	392	392
Manuel C Leal Diary	A1601333	10/5/2016	8/11/2016	520	920	184	184
SBS AG	A1601142	10/5/2016	8/25/2016	762	1,348	270	270
18337 Road 24 Tulare, CA	A1501019	5/17/2016		412	729	146	146
Friesian Farms	A1601590	6/15/2016	9/16/2016	1,107	1,960	392	392
F&L Barcellos Dairy	A1601056	4/13/2016	9/20/2016	573	1,015	203	203
T-Bar Dairy	A1601861	8/7/2016	9/27/2016	682	1,208	242	242
Felicita Dairy	A1601593	6/15/2016	10/21/2016	1,109	1,963	393	393
JR Dairy	A1601592	6/15/2016	11/23/2016	1,107	1,960	392	392
Oakview Dairy	A1601996	3/8/2016	12/12/2016	1,107	1,960	392	392
KG Farms	A1602619	8/31/2016	12/12/2016	254	450	90	90
Four J Farms and Jerseys	A1602867	3/10/2016	12/12/2016	962	1,703	341	341
Vanderham West Dairy	A1600476	3/15/2016	12/13/2016	1,105	1,956	391	391
Arthur Leyendekker Dairy	A1600755	3/31/2016	12/15/2016	544	963	193	193
35301 Road 100, Visalia	A1600756	3/31/2016	12/15/2016	1,088	1,926	385	385
Horizon Jerseys Dairy	A1602130	7/20/2016	4/19/2017	840	1,488	298	298
Rob Van Grouw Dairy	A1603967	1/18/2017	4/20/2017	1,107	1,960	392	392
Aukeman Farms	A1603968	2/2/2017	4/21/2017	1,107	1,960	392	392
Airoso Dairy	A1700087	2/2/2017	5/1/2017	1,111	1,967	393	393
R&M Cattle	A1604445	2/2/2017	5/11/2017	1,107	1,960	392	392
Mario Simoes Family Dairy	A1603927	12/29/2016	5/23/2017	1,111	1,967	393	393
Decade Dairy LLC	A1700354	2/22/2017	5/24/2017	928	1,643	329	329
Jer-Z Boyz Ranch	A1700741	10/4/2017	5/31/2017	1,107	1,960	392	392
Vander Tuig Dairy	A1700780	5/4/2017	6/2/2017	670	1,186	237	237
Skyline Dairy	A1700088	2/2/2017	6/8/2017	803	1,421	284	284

Table B.7
Emission Reductions from Solar Panel Projects at Tulare County Dairies

Facility Name[1]	Permit #	Permit Issue Date	Permit Finaled Date	Size (kW)	5-Year GHG Reduction ($MT CO_2e$)[2]	Annual GHG Reduction ($MT CO_2e$)[2]	CY 2020 GHG Reduction ($MT CO_2e$)[3]
Heritage Dairy	A1700739	5/4/2017	6/13/2017	737	1,305	261	261
Willem De Boer Dairy	A1700783	5/4/2017	6/13/2017	1,101	1,949	390	390
Schott Dairy	A1604446	2/2/2017	6/15/2017	1,107	1,960	392	392
Sierra Cattle Company	A1700593	7/3/2017	6/15/2017	1,101	1,949	390	390
John Mendonca & Son Dairy	A1700782	5/4/2017	6/15/2017	365	646	129	129
Scheenstra Dairy	A1700857	5/4/2017	6/15/2017	928	1,643	329	329
Tom Dejong Dairy	A1700859	5/4/2017	6/15/2017	1,111	1,967	393	393
John Scheenstra Dairy	A1701020	5/4/2017	6/15/2017	180	318	64	64
Boertje & Sons Dairy	A1700740	10/4/2017	6/16/2017	556	984	197	197
Riverbend Dairy	A1701277	10/5/2017	6/22/2017	678	1,200	240	240
S&S Dairy	A1600425	4/25/2016	8/9/2017	1,100	1,947	389	389
Cornerstone Dairy	A1603456	8/11/2016	12/7/2017	1,116	1,975	395	395
Richard Westra Dairy	A1702954	10/24/2017	12/14/2017	1,107	1,959	392	392
Rijlaarsdam Dairy	A1701786	3/7/2017	12/19/2017	653	1,156	231	231
6831 Avenue 360 A Kingsburg, CA 93631	A1701785	7/3/2017		1,330	2,354	471	471
Joe Simoes Family Dairy	A1700781	5/4/2017	4/5/2018	522	924	185	185
9993 Road 80 #B Pixley, CA 93272	A1801628	8/2/2018		1,111	1,967	393	393
Vander Eyk Dairy	A1800879	12/4/2018	10/22/2018	1,107	1,960	392	392
Jongsma Dairy	A1802264	8/20/2018	11/5/2018	582	1,030	206	206
Will De Groot #1	A1801463	5/9/2018	11/7/2018	376	666	133	133
Will De Groot #2	A1801464	7/25/2018	11/7/2018	376	666	133	133
Hamstra Dairy	A1802149	8/28/2018	11/7/2018	1,069	1,893	379	379
Nunes & Sons Dairy	A1801196	6/14/2018	11/20/2018	790	1,398	280	280
Visser	A2000718	4/20/2020	6/15/2020	771	1,365	273	149
D & V Dairy	A2000454	4/1/2020	11/9/2020	1,085	1,921	384	56
Milk Maid Dairy	A2000293	4/30/2020	11/24/2020	1,084	1,919	384	40
Holstein Farms	A2001542	7/14/2020	12/23/2020	1,086	1,923	385	9
FL Heifers	A2002448	10/28/2020	4/1/2021	1,070	1,894	379	0
Van Beek Brothers Dairy	A2002832	12/1/2020	9/13/2021	1,080	1,912	382	0
Mancebo Dairy #1	A2002928	12/1/2020	9/28/2021	620	1,097	219	0
Dick Vanderham & Sons Dairy	A2001506	7/14/2020	10/12/2021	1,080	1,912	382	0
K A Dairy	A2101157	5/19/2021	11/5/2021	1,094	1,936	387	0
SBS Ag Dairy	A1402386	9/25/2014	n/a	962	1,703	341	0
GTA Dairy	A1602329	2/8/2016	n/a	696	1,232	246	0
Curtimade Dairy	A1501019	5/17/2016	n/a	412	729	146	0
Avenue 128 Dairy	A1601191	5/24/2016	n/a	600	1,062	212	0
Mendonca Dairy	A1603966	12/29/2016	n/a	480	849	170	0
Junio Dairy	A1604447	2/2/2017	n/a	306	541	108	0
Rijlaarsdam Dairy	A1701785	3/7/2017	n/a	1,330	2,354	471	0
Bosman Dairy	A1801627	10/7/2018	n/a	662	1,171	234	0
Mancebo Dairy #2	A2002999	12/1/2020	n/a	1,004	1,777	355	0
Cross Creek Dairy	A2101515	6/17/2021	n/a	1,063	1,881	376	0
Rancho Sierra Vista	A2102830	10/8/2021	n/a	1,091	1,930	386	0
COS Dairy	A2103468	11/3/2021	n/a	1,077	1,907	381	0

Table B.7
Emission Reductions from Solar Panel Projects at Tulare County Dairies

Facility Name[1]	Permit #	Permit Issue Date	Permit Finaled Date	Size (kW)	5-Year GHG Reduction ($MT CO_2e$)[2]	Annual GHG Reduction ($MT CO_2e$)[2]	CY 2020 GHG Reduction ($MT CO_2e$)[3]
18980 Road 48, Tulare	A2103756	12/21/2021	n/a	1,025	1,815	363	0
11401 Avenue 64, Earlimart	A2103613	2022	n/a	1,077	1,907	381	0
Angiola Dairy	A2102066	2022	n/a	583	1,032	206	0
Solar Projects Operating in 2020	**71**	--	--	**64,607**	**114,363**	**22,873**	**21,701**
All Existing and Future Solar Projects	**91**	--	--	**81,918**	**145,005**	**29,001**	**21,701**

Notes:

1. Source for project list: Tulare County RMA. *Building Permits Running List for Dairy Solar Projects 2-8-2022.xlsx* . Email from Sandy Roper. February 8 and 21, 2022.
2. GHG reductions were estimated by the applicants using CARB's Benefits Calculator Tool for the Low-Income Weatherization Program: Single-Family Energy Efficiency and Solar Photovoltaics Multi-Family Energy Efficiency and Renewables.
3. The calendar year 2020 emission reductions for projects that started full operation in 2020 were prorated by the number of days remaining in 2020.

Table B.8
Emission Reductions from Solar Thermal Hot Water Systems at Tulare County Dairies

Facility Name[1]	Permit #	Permit Issue Date	Permit Finaled Date	5-Year GHG Reduction (MT CO_2e)	Annual GHG Reduction (MT CO_2e)[2]	CY 2020 GHG Reduction (MT CO_2e)[3]
Tiemersma Dairy	A1700139	2/2/2017	2/9/2017	19.9	3.99	3.99
Manuel Leal & Son Dairy	A1700140	2/2/2017	3/3/2017	19.9	3.99	3.99
John Mendoca & Son Dairy	A1700667	3/13/2017	3/16/2017	19.9	3.99	3.99
Black Road Ranch	A1700522	3/6/2017	3/22/2017	19.9	3.99	3.99
29800 Road 60 VISALIA, CA 93291	A1701022	4/6/2017		19.9	3.99	3.99
30030 Road 60 Visalia , CA 93291	A1701023	4/6/2017		19.9	3.99	3.99
Tipton Dairy	A1701220	5/10/2017	5/16/2017	19.9	3.99	3.99
FM Ranch #1	A1701222	5/10/2017	5/26/2017	19.9	3.99	3.99
Nunes and Sons Dairy	A1702065	7/12/2017	n/a	19.9	3.99	3.99
Souza Dairy	A1702083	7/12/2017	n/a	19.9	3.99	3.99
Aveline Partners Dairy	A1702084	7/12/2017	n/a	19.9	3.99	3.99
Solar Projects Operating in 2020	**11**	--	--	**219.2**	**43.8**	**43.8**
All Existing and Future Solar Projects	**11**	--	--	**219.2**	**43.8**	**43.8**

Notes:

1. Source for project list: Tulare County RMA. "Building Permits Running List for Dairy Solar Projects 2-8-2022.xlsx". Email from Sandy Roper. February 8 and 21, 2022.
2. An average annual GHG reduction rate of 3.985 MT CO_2e/year per "Commercial/Multifamily Residential" system in Tulare County was obtained from California Solar Initiative (CSI)-Thermal Program Data, "Presented Data". Website: http://www.csithermalstats.org/download.html. Accessed March 18, 2022.
3. All systems were installed prior to 2020 and therefore produced full year reductions in 2020.

Table B.9
Emission Reductions from Digester Projects at Tulare County Dairies

Facility ID	Facility Name[1]	Project Title	Location	Start of Full Operation	10-Year GHG Reduction ($MT CO_2e$)[2]	5-Year GHG Reduction ($MT CO_2e$)[3]	Annual GHG Reduction ($MT CO_2e$)[3]	CY 2020 GHG Reduction ($MT CO_2e$)[4]
246	GJ TeVelde Ranch	Te Velde Tipton Dairy Digester	Tipton	6/5/2017	189,080	94,540	18,908	18,908
358	Circle A Dairy	Circle A Dairy Digester Fuel Pipeline Project	Pixley	8/30/2018	138,745	69,373	13,875	13,875
241	Legacy Dairy	Legacy Dairy Digester Fuel Pipeline	Pixley	12/3/2018	207,209	103,605	20,721	20,721
265A	R Vander Eyk Dairy	R Vander Eyk Dairy Digester Fuel Pipeline Project	Pixley	12/17/2018	132,586	66,293	13,259	13,259
256	Van Beek	Van Beek Brothers Dairy Digester	Tipton	1/7/2019	106,240	53,120	10,624	10,624
313	Cornerstone Dairy	Cornerstone Dairy Digester Pipeline Project	Tipton	4/17/2019	185,238	92,619	18,524	18,524
236	Sousa & Sousa Dairy	Sousa & Sousa Dairy Digester Pipeline Project	Tipton	7/17/2019	68,700	34,350	6,870	6,870
330	Vander Poel Dairy	Vander Poel Dairy Digester Pipeline Project	Pixley	8/6/2019	290,060	145,030	29,006	29,006
346	Hilarides	Hilarides Dairy Digester Renovation	Lindsay	8/30/2019	564,000	282,000	56,400	56,400
326	K&M Visser Dairy	K&M Visser Dairy Digester Fuel Pipeline Project	Pixley	9/3/2019	203,416	101,708	20,342	20,342
328	Riverview Dairy	Riverview Dairy Digester Pipeline Project	Pixley	10/3/2019	90,093	45,047	9,009	9,009
40	Little Rock Dairy; Blue Moon Dairy	Little Rock Centralized Dairy Digester Pipeline Project	Tipton	12/13/2019	146,839	73,420	14,684	14,684
218	4K Dairy	4K Dairy Digester Pipeline Project	Pixley	1/24/2020	192,143	96,072	19,214	18,007
118	Hamstra Dairy	Hamstra Dairy Biogas	Tulare	8/6/2020	205,115	102,558	20,512	8,294
226	S&S Dairy	S&S Dairy Biogas	Visalia	9/21/2020	167,417	83,709	16,742	4,666
298	Moonlight Dairy	Moonlight Dairy Biogas	Visalia	9/30/2020	154,834	77,417	15,483	3,934
245	Double J Dairy	Double J Dairy Biogas	Visalia	1/27/2021	285,496	142,748	28,550	0
185	FM Jerseys Dairy	FM Jerseys Dairy Digester Vitural Pipeline Project	Tipton	3/8/2021	161,960	80,980	16,196	0
261	Rob Van Grouw Dairy	Rob Van Grouw Dairy Biogas	Visalia	4/21/2021	140,442	70,221	14,044	0
50 and/or 61	Aukeman Dairy	Aukeman Dairy Biogas	Tulare	4/28/2021	207,701	103,851	20,770	0
323	Dykstra Dairy	Dykstra Dairy Biogas	Tulare	4/28/2021	265,936	132,968	26,594	0
336	Horizon Jerseys Dairy	Horizon Jerseys Dairy Biogas	Tipton	4/28/2021	335,398	167,699	33,540	0
19	Udder Dairy	Udder Dairy Biogas	Visalia	5/11/2021	135,701	67,851	13,570	0
364	Mineral King Dairy	Mineral King Dairy Biogas	Visalia	5/13/2021	194,751	97,376	19,475	0
177	Mellema Dairy	Mellema Dairy Biogas	Visalia	5/14/2021	152,057	76,029	15,206	0
63	Jacobus De Groot #2 Dairy	Jacobus De Groot #2 Dairy Biogas	Visalia	5/20/2021	61,616	30,808	6,162	0
36	Rancho Sierra Vista Dairy	Rancho Sierra Vista Dairy Biogas	Visalia	5/20/2021	172,958	86,479	17,296	0
139	Rancho Teresita Dairy	Rancho Teresita Dairy Biogas	Tulare	5/27/2021	236,251	118,126	23,625	0
189	Riverbend Dairy	Riverbend Dairy Biogas	Tulare	5/27/2021	245,930	122,965	24,593	0
33	Bos Farms Dairy	Bos Farms Dairy Biogas	Tulare	5/28/2021	168,398	84,199	16,840	0
256 and/or 352	El Monte Dairy	El Monte Dairy Biogas	Tipton	6/4/2021	118,903	59,452	11,890	0
300	Scheenstra Dairy	Scheenstra Dairy Biogas	Tulare	6/15/2021	220,360	110,180	22,036	0
359	Decade Dairy; Richard Westra Dairy	Decade Centralized Dairy Digester Pipeline Project	Tulare	7/8/2021	192,558	96,279	19,256	0
215	Ribeiro Dairy	Ribeiro Dairy Biogas	Tulare	11/23/2021	132,348	66,174	13,235	0
213	Rib-Arrow Dairy	Rib-Arrow Dairy Biogas	Tulare	11/30/2021	76,343	38,172	7,634	0
50	Elk Creek Dairy	Elk Creek Dairy Biogas	Tulare	2/28/2022	59,555	29,778	5,956	0
337	Fern Oaks Dairy	Fern Oaks Dairy Digester Pipeline Project	Tulare	2022	169,370	84,685	16,937	0

Table B.9
Emission Reductions from Digester Projects at Tulare County Dairies

Facility ID	Facility Name[1]	Project Title	Location	Start of Full Operation	10-Year GHG Reduction ($MT CO_2e$)[2]	5-Year GHG Reduction ($MT CO_2e$)[3]	Annual GHG Reduction ($MT CO_2e$)[3]	CY 2020 GHG Reduction ($MT CO_2e$)[4]
97, 231, 232, 233, and/or 234	Mario Simoes Family Dairy; Joe M Simoes Family Dairy	Simoes Centralized Digester Pipeline Project	Tipton	2022	161,275	80,638	16,128	0
342	Schott Dairy	Schott Dairy Digester Pipeline Project	Tulare	2022	129,082	64,541	12,908	0
121 and/or 122	Hettinga Dairy Farm; Avenue 128 Dairy	Hettinga Centralized Dairy Digester Pipeline Project	Tulare	2022	167,339	83,670	16,734	0
299	Northstar Dairy	Northstar Dairy Digester Pipeline Project	Tulare	2022	170,658	85,329	17,066	0
60	De Boer Dairy	De Boer Dairy Digester Pipeline Project	Tulare	2022	191,647	95,824	19,165	0
219	JR Dairy	JR Dairy Digester Project	Tulare	2023	191,049	95,525	19,105	0
11	Gerben Leyendekker Dairy	Gerben Leyendekker Dairy Biogas	Visalia	2023	85,419	42,710	8,542	0
101	Friesian Farms Dairy	Friesian Farms Dairy Biogas	Tulare	2023	63,145	31,573	6,315	0
289	Rio Blanco Dairy	Rio Blanco Dairy Biogas	Tulare	2023	100,886	50,443	10,089	0
56	Curtimade Dairy	Curtimade Dairy Biogas	Tulare	2023	174,734	87,367	17,473	0
76	Art Leyendekker Dairy	Art Leyendekker Dairy Biogas	Tulare	2023	77,697	38,849	7,770	0
324	Elkhorn Dairy	Elkhorn Dairy Biogas	Tulare	2023	211,940	105,970	21,194	0
207 and/or 249	JR Dairy	JR Dairy Digester Pipeline	Tulare	2023	168,134	84,067	16,813	0
352	Dairyland Farms Dairy	Dairyland Farms Dairy Biogas	Tulare	2023	177,475	88,738	17,748	0
PIXLEY	Pixley Dairy	Pixley Dairy Digester Fuel Pipeline Project	Pixley	TBD	212,622	106,311	21,262	0
151	Clearlake Dairy	Clearlake Dairy Digester Pipeline Project	Tulare	TBD	95,510	47,755	9,551	0
Digester Projects Operating in 2020		**16**	**--**	**--**	**3,041,715**	**1,520,858**	**304,172**	**267,122**
All Existing and Future Digester Projects		**53**	**--**	**--**	**9,154,359**	**4,577,180**	**915,436**	**267,122**

Notes:

1. Source for project lists: California Department of Food and Agriculture. Dairy Digester Research and Development Program. Projects Selected for Award of Funds. "1.C. - UPDATED 2-22-2022 DIGESTER PROJECT LIST FOR TULARE COUNTY.xlsx" provided by the Tulare County RMA.
2. The 10-year GHG reductions were estimated by the applicants using CARB's California Climate Investments (CCI) DDRDP Benefits Calculator Tool.
3. 5-Year and annual GHG reductions were scaled from the 10-year reductions by the number of years.
4. The calendar year 2020 emission reductions for projects that started full operation in 2020 were prorated by the number of days remaining in 2020.

Table B.10
Emission Reductions from Alternative Manure Management Projects at Tulare County Dairies

Facility ID	Facility Name[1]	Project Title	Start of Full Operation	5-Year GHG Reduction ($MT CO_2e$)[2]	Annual GHG Reduction ($MT CO_2e$)[3]	CY 2020 GHG Reduction ($MT CO_2e$)[4]
25	Milk River	Milk River GHG Reduction Project (conversion from flush to scrape; solar drying)	4/30/2019	16,012	3,202	3,202
58	SBS AG	Solid Separation (conversion from settling ponds to processing pit and separating system)	5/31/2019	7,887	1,577	1,577
104	Henry A. Garcia Dairy	Flush to scrape; solar drying	2/4/2020	25,720	5,144	4,666
64	Sierra View Dairy	Sierra View Dairy AMMP Grant (pasture based management; conversion from flush to scrape; solar drying)	3/30/2020	35,050	7,010	5,305
294	Creekside Dairy	Solid separation	1/5/2021	9,150	1,830	0
20	Jesse & James Jongsma Dairy	Solid separation	1/15/2021	7,193	1,439	0
133	James Jongsma Dairy	Solid separation	12/23/2021	2,719	544	0
315	Tri Palm Dairy	Compost Bedded Pack Barn	12/31/2021	4,545	909	0
194	Rainimaid	Compost bedded pack barn	2022	8,930	1,786	0
144	Westwood Farms	Compost bedded pack barn	2022	20,422	4,084	0
28	A&L Dairy	Solid separation	2022	2,620	524	0
135	Tony & Julie Jorge Dairy	Flush-to-Scrape	2022	8,558	1,712	0
210	Backroad Ranch	Compost bedded pack barn	2023	13,639	2,728	0
190	Brian James Jongsma Dairy	Solid separation	2023	4,988	998	0
350	South Creek Dairy	Solid separation	2023	16,197	3,239	0
AMMP Projects Operating in 2020		**4**	--	**84,669**	**16,934**	**14,751**
All Existing and Future AAMP Projects		**15**	**--**	**183,630**	**36,726**	**14,751**

Notes:

1. Source for project lists: California Department of Food and Agriculture. "1.B. - AMMP FOR TULARE COUNTY Updated 3-3-2022.xlsx" provided by the Tulare County RMA.
2. The 5-year GHG reductions were estimated by the applicants using CARB's California Climate Investments (CCI) AMMP Benefits Calculator Tool.
3. Annual GHG reductions were assumed to be 1/5 of the 5-year reductions.
4. The calendar year emission reductions for Projects were prorated by the number of days remaining in that calendar year.

EXHIBIT "B" OF ATTACHMENT NO. 1

ALTERNATIVE MANURE MANAGEMENT PROGRAM FOR TULARE COUNTY UPDATED 2/23/2022

Dairy Facility ID Number	Year Awarded Grant	Project Title	Project Description	Total Cost	CDFA Funding	Matching Funds	Construction Status	Location	GHG Reduction (5 years) (in MTCO2e)	Start Date	Completion Date
64	2017	Sierra View Dairy AMMP Grant	Remodel Existing Dairy, with both Open Lot corrals and Covered milk cow Feed Lanes flushed facility to a bed-pack compost barn (pasture based management) and collect manure from feed lanes through scraping with mobile equipment with scraper (conversion of flush to scrape). All scraped material will be dried utilizing open solar drying.	$ 1,578,778.00	$ 750,000.00	$ 828,778.00	Construction Complete	13376 Avenue 224, Tulare County	35,050	2/1/2018	3/30/2020
25	2017	Milk River GHG Reduction Project	Reducing greenhouse gas emissions by 72% by introducing a vacuum scraping system into our previously flushed lanes to collect lactating cow manure. This scraped product will be run through screw presses to reduce the moisture content. This manure will then be solar dried for future use as bedding or field nutrient/amendments. This process will prevent the manure from entering the anaerobic conditions present in the manure lagoons.	$ 339,881.00	$ 339,881.00	$ -	Began operating in April of 2019	34292 Road 124, Tulare County	16,012	2/1/2108	5/20/2019
104	2018	Henry A. Garcia Dairy	Converting flush lanes to a vacuum scrape system utilizing a Loewen Honey Vac. Collected manure will be deposited in a newly constructed concrete bunker, processed through a de-watering screw press and then receiving a second treatment through the existing sloped screen separator. Separated solids will then be spread on a concrete solar drying pad for final drying and stock piled and covered to prevent re-watering. By reducing the organic matter entering the lagoon system we will reduce our greenhouse gas emissions by 79% annually. The total estimated mtCO2e reduction over a 5 year period is 25,720 and reductions should continue to accumulate after.	$ 545,901.00	$ 545,901.00	$ -	Began operating in February of 2020	12521 Avenue 200, Tulare, Tulare County	25,720	9/1/2018	2/4/2020
58	2018	SBS AG	Change of Waste Water Handling and Solid Collection Management for the reduction of GHG produced. Converting from Settling Ponds to Processing pit and Separating System to capture volatile solids before the lagoons.	$ 423,846.00	$ 385,404.00	$ 38,442.00	Began operating in May of 2019	7123 Avenue 204, Tulare County	7,887	9/1/2018	8/29/2019

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294	2019	Creekside Dairy	Solid Separation	$ 611,702.00	$ 611,642.00	$ 60.00	Completed	Tulare County	9,150	1/1/2020	1/5/2021
194	2019	Rainimaid	Compost Bedded Pack Barn	$ 1,188,883.00	$ 749,820.00	$ 439,063.00	Completed	33640 Road 124, Tulare County	8,930	1/1/2020	5/31/2022
20	2019	Jesse & James Jongsma Dairy	Solid Separation	$ 936,266.00	$ 750,000.00	$ 186,266.00	Completed	6780 Avenue 144, Tulare County	7,193	1/1/2020	1/15/2021
144	2019	Westwood Farms	Compost Bedded Pack Barn	$ 1,058,201.00	$ 749,698.00	$ 308,503.00	50% done with construction	Tulare County	20,422	1/1/2020	5/31/2022
133	2019	James Jongsma Dairy	Solid Separation	$ 770,511.00	$ 727,508.00	$ 43,003.00	Completed	9229 Road 164, Tulare County	2,719	1/1/2020	12/23/2021
28	2019	A&L Dairy	Solid Separation	$ 420,189.00	$ 420,189.00	$ -	Completed & Operating	23929 Road 48, Tulare County	2,620	1/1/2020	5/31/2022
210	2020	Backroad Ranch	Compost Bedded Pack Barn	$ 940,800.00	$ 750,000.00	$ 190,800.00	Haven't started construction due to material acquistion complications	22000 Road 28, Tulare	13,639	2/1/2021	1/31/2023
190	2020	Brian James Jongsma Dairy	Solid Separation	$ 911,150.00	$ 750,000.00	$ 161,150.00	Under Construction	16026 Road 64, Tipton	4,988	2/1/2021	1/31/2023
135	2019	Tony & Julie Jorge Dairy	Flush-to-Scrape	$ 271,549.00	$ 271,549.00	$ -	Breaking ground within Q2 of 2022.	4645 Avenue 120, Corcoran	8,558	1/1/2020	9/30/2022
315	2019	Tri Palm Dairy	Compost Bedded Pack Barn	$ 749,894.00	$ 749,894.00	$ -	Completed	2429 Idaho Avenue (Avenue 264) Hanford	4,545	1/1/2020	12/31/2021
350	2020	South Creek Dairy	Solid Separation	$ 805,144.00	$ 750,000.00	$ 55,144.00	Under Construction	11450 Avenue 64, Earlimart	16,197	2/1/2021	1/31/2023
				$ 11,552,695.00	$ 9,301,486.00	$ 2,251,209.00			183,630		

EXHIBIT "C"

DAIRY DIGESTER PROJECT LIST FOR TULARE COUNTY UPDATED 2/22/2022

Dairy No.	Operation Name	Project Title	Total Cost	CDFA Funding	Matching Funds	Construction Status	Location	GHG Reduction (10 years) (in $MTCO_2e$)	How Captured Methane is Used	Year of Application	Developer or Vendor for Project Implementation and/or Operation
60	De Boer Dairy	De Boer Dairy Digester Pipeline Project	$ 3,650,523.00	$ 1,825,261.00	$ 1,825,262.00	To be completed 12/31/2022	14799 and 14976 Avenue 168,Tulare County	191,647	RNG generation and pipeline injection for vehicle fuel use	2019	Maas Energy Works
352	Dairyland Farms Dairy	Dairyland Farms Dairy Biogas	$ 4,900,813.00	$ 1,760,347.00	$ 3,140,466.00	To be completed 3/31/2023	15920 Road 152, Tulare County	177,475	RNG generation and pipeline injection for vehicle fuel use	2019	California Bioenergy
324	Elkhorn Dairy	Elkhorn Dairy Biogas	$ 6,645,917.00	$ 2,125,882.00	$ 4,520,035.00	To be completed 3/31/2023	10400 Avenue 368, Tulare County	211,940	RNG generation and pipeline injection for vehicle fuel use	2019	California Bioenergy
76	Art Leyendekker Dairy	Art Leyendekker Dairy Biogas	$ 3,685,068.00	$ 769,784.00	$ 2,915,284.00	To be completed 3/31/2023	8651 Avenue 388, Dinuba, Tulare County	77,697	RNG generation and pipeline injection for vehicle fuel use	2019	California Bioenergy
213	Rib-Arrow Dairy	Rib-Arrow Dairy Biogas	$ 4,175,150.00	$ 657,231.00	$ 3,517,919.00	Completed 11/30/2021	18287 Road 136, Tulare County	76,343	RNG generation and pipeline injection for vehicle fuel use	2019	California Bioenergy
50	Elk Creek Dairy	Elk Creek Dairy Biogas	$ 4,109,208.00	$ 512,706.00	$ 3,596,502.00	Completed 2/28/2022	17993 Road 96, Tulare County	59,555	RNG generation and pipeline injection for vehicle fuel use	2019	California Bioenergy
56	Curtimade Dairy	Curtimade Dairy Biogas	$ 4,773,194.00	$ 1,747,336.00	$ 3,025,858.00	To be completed 3/31/2023	18337 Road 24, Tulare County	174,734	RNG generation and pipeline injection for vehicle fuel use	2019	California Bioenergy

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289	Rio Blanco Dairy	Rio Blanco Dairy Biogas	$ 3,558,815.00	$ 1,002,797.00	$ 2,556,018.00	To be completed 3/31/2023	5041 Avenue 192, Tulare County	100,886	RNG generation and pipeline injection for vehicle fuel use	2019	California Bioenergy
	~~GP Dairy~~	~~GP Dairy Biogas~~	~~$ 3,418,177.00~~	~~$ 502,554.00~~	~~$ 2,915,623.00~~	~~Under Construction, 4 Percent Complete~~	~~Tulare County~~	~~50,722~~	~~RNG generation and pipeline injection for vehicle fuel use~~	~~2019~~	~~California Bioenergy~~
215	Ribeiro Dairy	Ribeiro Dairy Biogas	$ 2,738,844.00	$ 1,124,962.00	$ 1,613,882.00	Completed 11/23/2021	17983 Road 128, Tulare, Tulare County	132,348	RNG generation and pipeline injection for vehicle fuel use	2019	California Bioenergy
101	Friesian Farms Dairy	Friesian Farms Dairy Biogas	$ 3,814,785.00	$ 639,602.00	$ 3,175,183.00	To be completed 3/31/2023	5593 Avenue 176, Tulare, Tulare County	63,145	RNG generation and pipeline injection for vehicle fuel use	2019	California Bioenergy
11	Gerben Leyendekker Dairy	Gerben Leyendekker Dairy Biogas	$ 3,748,357.00	$ 845,589.00	$ 2,902,768.00	To be Completed 3/31/2023	8517 Avenue 360, Visalia, Tulare County	85,419	RNG generation and pipeline injection for vehicle fuel use	2019	California Bioenergy
299	Northstar Dairy	Northstar Dairy Digester Pipeline Project	$ 3,152,876.00	$ 1,576,438.00	$ 1,576,438.00	Completed 1/31/2022	12718 Road 144, Tulare County	170,658	RNG generation and pipeline injection for vehicle fuel use	2019	Maas Energy Works
121 and/or 122	Hettinga Dairy Farm; Avenue 128 Dairy	Hettinga Centralized Dairy Digester Pipeline Project	$ 4,705,818.00	$ 2,352,909.00	$ 2,352,909.00	Completed 1/31/2022	13002 Avenue 128 and/or 13400 Avenue 120, Tipton, Tulare County	167,339	RNG generation and pipeline injection for vehicle fuel use	2019	Maas Energy Works
342	Schott Dairy	Schott Dairy Digester Pipeline Project	$ 2,889,184.00	$ 1,444,592.00	$ 1,444,592.00	Completed 1/31/2022	13602 Road 96, Tulare County	129,082	RNG generation and pipeline injection for vehicle fuel use	2019	Maas Energy Works

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97, 231, 232, 233, and/or 234	Mario Simoes Family Dairy; Joe M Simoes Family Dairy	Simoes Centralized Digester Pipeline Project	$ 4,072,920.00	$ 2,036,460.00	$ 2,036,460.00	To be completed 12/31/2022	13185 Avenue 136, Tipton, and 13585 Road 136, Tipton, Tulare County	161,275	RNG generation and pipeline injection for vehicle fuel use	2019	Maas Energy Works
337	Fern Oaks Dairy	Fern Oaks Dairy Digester Pipeline Project	$ 3,377,788.00	$ 1,688,894.00	$ 1,688,894.00	To be completed 12/31/2022	17001 Avenue 160, Porterville	169,370	RNG generation and pipeline injection for vehicle fuel use	2019	Maas Energy Works
207 and/or 249	JR Dairy	JR Dairy Digester Pipeline	$ 3,173,859.00	$ 1,300,000.00	$ 1,873,859.00	To be completed 1/31/2023	13806 Avenue 152 Tipton and/or 3800 Avenue 176 Tulare, Tulare County	168,134	RNG generation and pipeline injection for vehicle fuel use	2019	Maas Energy Works
151	Clearlake Dairy	Clearlake Dairy Digester Pipeline Project	$ 2,789,296.00	$ 1,394,648.00	$ 1,394,648.00	Not yet applied to Tulare County	24643 Road 36, Tulare County	95,510	RNG generation and pipeline injection for vehicle fuel use	2019	Maas Energy Works
330	Vander Poel Dairy	Vander Poel Dairy Digester Pipeline Project	$ 4,194,558.00	$ 1,972,485.00	$ 2,222,073.00	Completed 8/6/2019	19493 Road 140, Pixley, Tulare County	290,060	RNG generation and pipeline injection for vehicle fuel use	2018	Maas Energy Works
19	Udder Dairy	Udder Dairy Biogas	$ 3,279,615.00	$ 1,153,459.00	$ 2,126,156.00	Completed 5/11/2021	28723 Road 56, Visalia, Tulare County	135,701	RNG generation and pipeline injection for vehicle fuel use	2018	California Bioenergy
236	Sousa & Sousa Dairy	Sousa & Sousa Dairy Digester Pipeline Project	$ 1,779,865.00	$ 886,934.00	$ 892,931.00	Completed 7/17/2019	13510 Road 72, Tipton, Tulare County	68,700	RNG generation and pipeline injection for vehicle fuel use	2018	Maas Energy Works
300	Scheenstra Dairy	Scheenstra Dairy Biogas	$ 5,266,771.00	$ 1,873,064.00	$ 3,393,707.00	Completed 6/15/2021	16900 Road 96, Tulare, Tulare County	220,360	RNG generation and pipeline injection for vehicle fuel use	2018	California Bioenergy

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261	Rob Van Grouw Dairy	Rob Van Grouw Dairy Biogas	$ 4,559,769.00	$ 1,193,757.00	$ 3,366,012.00	Completed 4/21/2021	32843 Road 76, Visalia, Tulare County	140,442	RNG generation and pipeline injection for vehicle fuel use	2018	California Bioenergy
328	Riverview Dairy	Riverview Dairy Digester Pipeline Project	$ 2,718,420.00	$ 1,332,070.00	$ 1,386,350.00	Operational Completed 11/20/2019	9599 Avenue 88, Pixley, Tulare County	90,093	RNG generation and pipeline injection for vehicle fuel use	2018	Maas Energy Works
189	Riverbend Dairy	Riverbend Dairy Biogas	$ 4,755,042.00	$ 2,090,404.00	$ 2,664,638.00	Completed 5/27/2021	20799 Road 132, Tulare, Tulare County	245,930	RNG generation and pipeline injection for vehicle fuel use	2018	California Bioenergy
36	Rancho Sierra Vista Dairy	Rancho Sierra Vista Dairy Biogas	$ 4,515,689.00	$ 1,470,143.00	$ 3,045,546.00	Completed 5/20/2021	32866 Road 108, Visalia, Tulare County	172,958	RNG generation and pipeline injection for vehicle fuel use	2018	California Bioenergy
364	Mineral King Dairy	Mineral King Dairy Biogas	$ 4,734,379.00	$ 1,655,384.00	$ 3,078,995.00	Completed 5/13/2021	33803 Road 108, Visalia, Tulare County	194,751	RNG generation and pipeline injection for vehicle fuel use	2018	California Bioenergy
67	~~Milky Way Dairy~~	~~Milky Way Dairy Biogas~~	~~$ 7,198,161.00~~	~~$ 2,953,427.00~~	~~$ 4,244,734.00~~	~~Applications to County and Construction to begin Q3 2020~~	~~34800 Road 80, Visalia, Tulare County~~	~~347,462~~	~~RNG generation and pipeline injection for vehicle fuel use~~	~~2018~~	~~California Bioenergy~~
177	Mellema Dairy	Mellema Dairy Biogas	$ 4,634,713.00	$ 1,292,485.00	$ 3,342,228.00	Completed 5/14/2021	9420 Avenue 320, Visalia, Tulare County	152,057	RNG generation and pipeline injection for vehicle fuel use	2018	California Bioenergy
40	Little Rock Dairy; Blue Moon Dairy	Little Rock Centralized Dairy Digester Pipeline Project	$ 4,365,473.00	$ 2,096,578.00	$ 2,268,895.00	Completed 2/6/2020	13955 Road 80, Tipton, Tulare County	146,839	RNG generation and pipeline injection for vehicle fuel use	2018	Maas Energy Works

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63	Jacobus De Groot #2 Dairy	Jacobus De Groot #2 Dairy Biogas	$ 3,147,822.00	$ 523,736.00	$ 2,624,086.00	Completed 5/20/2021	8827 Avenue 312, Visalia, Tulare County	61,616	RNG generation and pipeline injection for vehicle fuel use	2018	California Bioenergy
336	Horizon Jerseys Dairy	Horizon Jerseys Dairy Biogas	$ 6,639,614.00	$ 2,850,886.00	$ 3,788,728.00	Completed 4/28/2021	8798 Avenue 160, Tipton, Tulare County	335,398	RNG generation and pipeline injection for vehicle fuel use	2018	California Bioenergy
185	FM Jerseys Dairy	FM Jerseys Dairy Digester Vitural Pipeline Project	$ 4,028,077.00	$ 2,010,747.00	$ 2,017,330.00	Completed 3/8/2021	11595 Avenue 164, Tipton, Tulare County	161,960	RNG generation and pipeline injection for vehicle fuel use	2018	Maas Energy Works
256 and/or 352	El Monte Dairy	El Monte Dairy Biogas	$ 4,037,389.00	$ 1,010,674.00	$ 3,026,715.00	Completed 6/4/2021	10410 Avenue 160 and/or 15920 Road 152, Tipton, Tulare County	118,903	RNG generation and pipeline injection for vehicle fuel use	2018	California Bioenergy
323	Dykstra Dairy	Dykstra Dairy Biogas	$ 5,536,693.00	$ 2,260,454.00	$ 3,276,239.00	Completed 4/28/2021	6801 Avenue 176, Tulare, Tulare County	265,936	RNG generation and pipeline injection for vehicle fuel use	2018	California Bioenergy
245	Double J Dairy	Double J Dairy Biogas	$ 7,477,915.00	$ 2,426,716.00	$ 5,051,199.00	Completed 4/21/2021	6656 Avenue 328, Visalia, Tulare County	285,496	RNG generation and pipeline injection for vehicle fuel use	2018	California Bioenergy
359	Decade Dairy; Richard Westra Dairy	Decade Centralized Dairy Digester Pipeline Project	$ 3,949,951.00	$ 1,773,587.00	$ 2,176,364.00	Completed 7/8/2021	3313 Avenue 256, Tulare, Tulare County	192,558	RNG generation and pipeline injection for vehicle fuel use	2018	Maas Energy Works
313	Cornerstone Dairy	Cornerstone Dairy Digester Pipeline Project	$ 2,541,716.00	$ 1,266,053.00	$ 1,275,663.00	Completed 4/29/2019	8769 Avenue 128, Tipton, Tulare County	185,238	RNG generation and pipeline injection for vehicle fuel use	2018	Maas Energy Works

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50 and/or 61	Aukeman Dairy	Aukeman Dairy Biogas	$ 4,837,895.00	$ 1,765,457.00	$ 3,072,438.00	Completed 4/28/2021	17993 Road 96 and/or 17297 Road 96, Tulare, Tulare County	207,701	RNG generation and pipeline injection for vehicle fuel use	2018	California Bioenergy
218	4K Dairy	4K Dairy Digester Pipeline Project	$ 3,656,154.00	$ 1,780,588.00	$ 1,875,566.00	Operational Completed 1/24/2020	5147 Avenue 228, Pixley, Tulare County	192,143	RNG generation and pipeline injection for vehicle fuel use	2018	Maas Energy Works
	Pixley Dairy	Pixley Dairy Digester Fuel Pipeline Project	$ 3,275,681.00	$ 1,600,000.00	$ 1,675,681.00	Verification in Process	Pixley, Tulare County	212,622	RNG combustion in cogeneration turbines for bioethanol production	2017	Maas Energy Works
226	S&S Dairy	S&S Dairy Biogas	$ 6,838,833.00	$ 1,600,000.00	$ 5,238,833.00	Completed 9/21/2020	5311 Avenue 272, Visalia, Tulare County	167,417	RNG generation and pipeline injection for vehicle fuel use	2016	California Bioenergy
358	Circle A Dairy	Circle A Dairy Digester Fuel Pipeline Project	$ 2,479,945.00	$ 1,050,000.00	$ 1,429,945.00	Complete 9/18/2018	11275 Road 96, Pixley, Tulare County	138,745	RNG combustion in cogeneration turbines for bioethanol production	2016	Maas Energy Works
265A	R Vander Eyk Dairy	R Vander Eyk Dairy Digester Fuel Pipeline Project	$ 2,604,440.00	$ 1,000,000.00	$ 1,604,440.00	Completed 12/28/2018	9993 Road 80, Pixley, Tulare County	132,586	RNG combustion in cogeneration turbines for bioethanol production	2016	Maas Energy Works
298	Moonlight Dairy	Moonlight Dairy Biogas	$ 7,940,123.00	$ 1,500,000.00	$ 6,440,123.00	Completed 9/15/2020	5061 Avenue 280, Visalia, Tulare County	154,834	RNG generation and pipeline injection for vehicle fuel use	2016	California Bioenergy
241	Legacy Dairy	Legacy Dairy Digester Fuel Pipeline	$ 3,437,320.00	$ 1,550,000.00	$ 1,887,320.00	Completed 1/22/2019	8660 Ave 96, Pixley, CA 93256	207,209	RNG combustion in cogeneration turbines for bioethanol production	2016	Maas Energy Works

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33	Bos Farms Dairy	Bos Farms Dairy Biogas	$ 6,699,492.00	$ 1,500,000.00	$ 5,199,492.00	Completed 5/28/2021	20397 Road 152, Tulare, Tulare County	168,398	RNG generation and pipeline injection for vehicle fuel use	2016	California Bioenergy
118	Hamstra Dairy	Hamstra Dairy Biogas	$ 8,630,543.00	$ 2,000,000.00	$ 6,630,543.00	Completed 9/14/2020	7590 Avenue 260, Tulare, Tulare County	205,115	RNG generation and pipeline injection for vehicle fuel use	2016	California Bioenergy
139	Rancho Teresita Dairy	Rancho Teresita Dairy Biogas	$ 7,600,336.00	$ 2,100,000.00	$ 5,500,336.00	Completed 5/27/2021	21744 Road 152, Tulare, Tulare County	236,251	RNG generation and pipeline injection for vehicle fuel use	2016	California Bioenergy
326	K&M Visser Dairy	K&M Visser Dairy Digester Fuel Pipeline Project	$ 3,402,047.00	$ 1,500,000.00	$ 1,902,047.00	Completed 9/3/2019	9279 Avenue 96, Pixley, Tulare County	203,416	RNG combustion in cogeneration turbines for bioethanol production	2016	Maas Energy Works
246	GJ TeVelde Ranch	Te Velde Tipton Dairy Digester	$ 2, 500,000.00	N/A		Operational	5850 Avenue 160, Tipton, California 93,272	189,080	Electrical generation		Maas Energy Works
256	Van Beek	Van Beek Brothers Dairy Digester	$ 2, 700,000.00	N/A		Operational	14808 Road 152, Tipton, California 93272	106,240	Electrical generation		Maas Energy Works
346	Hilarides	Hilarides Dairy Digester Renovation	$ 1, 300,000.00	N/A		Operational	24163 Road 188, Lindsay, California 93247	564,000	Electrical generation		Maas Energy Works
219	JR Dairy	JR Dairy Digester Project	$ 3,173,859.00	$ 1,300,000.00	$ 1,873,856.00	To be completed 1/31/2023	13202a Road 104, Tipton, Tulare County	191,049	RCNC	2020	Maas Energy Works
			$ 223,862,911.00	$ 76,191,099.00	$ 144,215,828.00			9,154,359			

= Facilities Listed on the CDFA Dairy Digester Research and Development Program Project-Level Data Updated 12/20/2021

Attachment “2”

Notice of Exemption

NOTICE OF EXEMPTION

Fee Exempt per Government Code Section 6103

To: ☒ Office of Planning and Research
1400 Tenth Street, Room 121
Sacramento, CA 95814

☒ Tulare County Clerk
Room 105, Courthouse
221 South Mooney Blvd.
Visalia, CA 93291

DATE RECEIVED FOR FILING AT TULARE COUNTY CLERK'S OFFICE

Lead Agency: Tulare County Resource Management Agency
5961 South Mooney Blvd
Visalia, CA 93277 (559) 624-7000
Attn: hguerra@tularecounty.ca.gov
jwillis@tularecounty.ca.gov

Applicant(s): Tulare County Resource Management Agency
5961 South Mooney Blvd
Visalia, CA 93277 (559) 624-7000

Project Title: 2021 Interim Report of total Greenhouse Gas ("GHG") emissions from dairies and feedlots for 2020

Project Location - Specific: The project would apply to the unincorporated area of Tulare County that is zoned Agricultural

Project Location- Section, Township, Range: N/A

Project Location - City: N/A **Project Location - County:** Tulare

Description of Nature, Purpose, and Beneficiaries of Project: 2021 Interim Report of total GHG emissions from dairies and feedlots for 2020.

Exempt Status: (*check one*)

- ☐ Ministerial (Sec. 21080(b)(1); 15268);
- ☐ Declared Emergency (Sec. 21080(b)(3); 15269(a));
- ☐ Emergency Project (Sec. 21080(b)(4); 15269(b)(c));
- ☒ Common Sense Rule: CEQA guidelines 15061(b)(3)
- ☒ Categorical Exemption: **CEQA Guidelines Class 6 Section 15306 Information Collection**
- ☐ Statutory Exemptions: **CEQA Guidelines Section**

Reasons why project is exempt:
This action is consistent with Section 15061(b)(3), which states that a project is exempt from CEQA if "The activity is covered by the common sense exemption that CEQA applies only to projects which have the potential for causing a significant effect on the environment. Where it can be seen with certainty that there is no possibility that the activity in question may have a significant effect on the environment, the activity is not subject to CEQA." The use of Section 15061(b)(3) is applicable and appropriate because preparing the 2021 Interim Report of total dairy GHG emissions from 2020 will not make any physical change to the environment since it only involves gathering information to prepare a written report concerning whether or not the County of Tulare is in compliance with the 2017 Animal Confinement Facilities Plan ("2017 ACFP") and the 2017 Dairy and Feedlot Climate Action Plan ("2017 Dairy CAP").

This action is consistent with Section 15306 Class 6, pertaining to basic data collection, research, experimental management, and resource evaluation activities which do not result in a serious or major disturbance to an environmental resource. The use of Section 15306 is applicable and appropriate because preparing the 2021 Interim Report of total dairy GHG emissions from 2020 will not make any physical change to the environment because it only involves gathering information to prepare a written report concerning whether or not the County of Tulare is in compliance with the 2017 ACFP and the 2017 Dairy CAP.

Name of Public Agency Approving Project: Tulare County Board of Supervisors

Project Planner/Representative: Sandy Roper/ Planner IV **Telephone:** (559) 624-7101

Signature: _____ Date: _____ Title: Chief Environmental Planner
Hector Guerra

Signature: _____ Date: _____ Title: Environmental Assessment Officer
. Reed Schenke, P.E. RMA Director

☒ Signed by Lead Agency