APPENDIX VI

Opportunities for Local Carbon Offset Credits in the Waste Category

A Preliminary Review of Regulations and Protocols Related to Solid Waste, Wastewater, and Composting

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EPIC
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The Energy Policy Initiatives Center is a research center of the USD School of Law that studies energy policy issues affecting California and the San Diego region. Energy Policy Initiatives Center's mission is to increase awareness and understanding of energy- and climate-related policy issues by conducting research and analysis to inform decision makers and educating law students.

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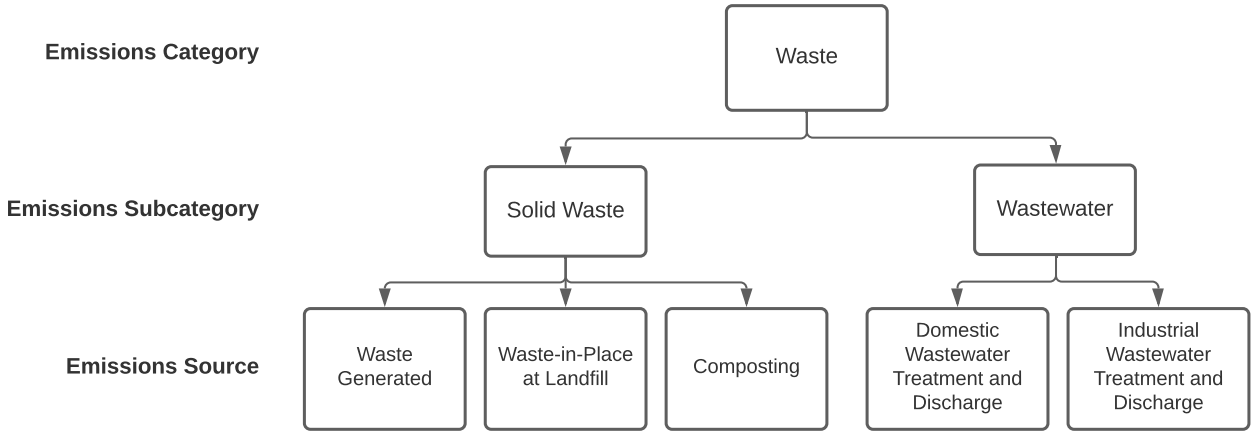
1 INTRODUCTION

The waste emissions category, which accounts for about 5% of emissions in the San Diego region,[1] has two subcategories: solid waste and wastewater. Most emissions are associated with the solid waste subcategory. Each subcategory can be further broken down into sources of emissions (Figure 1). This general framework is based on the California Air Resources Board (CARB) statewide greenhouse gas (GHG) inventory[2] and the U.S. Community Protocol.[3]

Separating out the sources of emissions in this way aligns with the methods to reduce emissions in the waste category. For example, distinguishing between waste that is already in place in a landfill and waste that has been generated but has not yet been disposed in a landfill is important because the methods to reduce emissions in each case are different. Capturing landfill gas (LFG) from decomposed waste already in a landfill is different from reducing and diverting waste streams away from landfills for some alternate use.

Figure 1 Waste Emissions Framework



1.1 Project Purpose and Methods

The goal of this project is to identify project opportunities to reduce or remove GHG emissions in the San Diego region that could be used to generate carbon offset credits (offset credits). To support this overall goal, the Energy Policy Initiatives Center (EPIC) identified categories of GHG emissions in the San Diego region; identified activities to reduce or remove emissions; identified

[1] San Diego Association of Governments, San Diego Forward: The Regional Plan, Appendix D 2012 Regional Greenhouse Gas Emission Inventory for the San Diego Region and Projections, 2015, p. 26: https://www.sdforward.com/pdfs/RP_final/AppendixD-2012GreenhouseGasEmissionsInventoryfortheSanDiegoRegionandProjections.pdf. (Note this is the last publicly available estimate of regional emissions.)

[2] See California Air Resources Board, Documentation of California's 2000-2018 GHG Inventory: Index to Documentation Pages for years 2000 to 2018: https://ww2.arb.ca.gov/applications/california-ghg-inventory-documentation.

[3] ICLEI – Local Governments for Sustainability USA: U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions, Appendix E: Solid Waste Emission Activities and Sources, Version 1.1, 2013.

related regulations that require such activities; identified related offset credit protocols; evaluated these protocols based on applicability to conditions in the San Diego region and the number of projects developed in the United States (U.S.), California, and the San Diego region; and, determined whether the offset credit protocols and related activities would be considered additional to what would have happened otherwise. The additionality determination is based on a two part test. The legal requirement test determines whether the activity is required by legislation or regulation or otherwise legally mandated. The common practice test determines whether the project activity is considered a common practice and would have happened otherwise for financial or technological reasons. A more detailed discussion of the project approach is provided in Section 3 of the main project report.

This report summarizes the findings of this analysis for the waste category, including solid waste and wastewater.

1.2 Key Findings

The following key findings are based on analysis conducted for this report.

- There are Limited Opportunities for Local Offset Credit Projects in the Waste Category – There are limited opportunities for additional offset credits in the waste emissions category in the San Diego region. This is due to high levels of regulation and the common practice of capturing methane for beneficial use at landfills and wastewater treatment plants.
- California Requirements to Divert Organic Waste Limit Available Feedstocks – Related to emissions from waste disposal, California law regulates much of the organic waste generated in the state and has stated its intent is to achieve 100% diversion.[4] These requirements reduce the amount of feedstocks that would be available for projects to divert, digest or compost organic waste, thus limiting the potential for related offset credit projects. Nonetheless, limited, targeted opportunities may exist based on the exemptions in state law to use organic waste from smaller operations and tribal lands.
- California's Landfill Gas Regulation Limits Opportunities for Related Projects – Related to emissions from waste already buried at landfills, CARB's Landfill Methane Control Measure (LMCM) applies to most of the active landfills in the region. Of the 14 landfills listed on the EPA's Landfill Methane Outreach Program (LMOP), eight are closed and seven already have gas collection systems. There are six open landfills, four of which have greater than 450,000 tons of waste in place. All of them have gas collection systems. As a result, it appears that the potential for offset credit projects at landfills is minimal. Further research would be required to determine whether closed or smaller landfills have sufficient gas production to make offset credit projects viable.
- None of the Carbon Offset Credit Protocols Reviewed are Considered Additional – Of the 13 protocols identified, 11 were active and covered activities applicable to the San Diego region, and none were considered additional (Table 1). Because there is limited potential for targeted offset credit projects related to organic waste digestion and composting that would go beyond state requirements, related protocols were categorized as "Likely Not Additional"

[4] California Air Resources Board, Short-Lived Climate Pollutant Reduction Strategy, 2017, p. 73: https://ww2.arb.ca.gov/sites/default/files/2020-07/final_SLCP_strategy.pdf.

(Table 2). Also, projects receiving credits in the Low-Carbon Fuel Standard would not be considered additional.

Table 1 Number of Waste-Related Protocols Evaluated

Protocol Category	All Protocols Evaluated	Active, Applicable	And Additional
Landfill Gas Capture & Combustion	5	3	0
Solid Waste Diversion	6	6	0
Wastewater Treatment	2	2	0
Total	**13**	**11**	**0**

- There are Few Waste-Related Carbon Offset Credit Projects in California – Of the active and applicable offset credit protocols reviewed for this project, there are seven projects in California and none in the San Diego region (Table 2). Of the projects in California, they are about evenly split between landfill gas capture and combustion, solid waste diversion, and wastewater treatment.

Table 2 Summary of Active and Applicable Protocols in the Waste Category

	Number of Projects			
GHG Reduction Activity/Protocol Category/Protocol	US	CA	San Diego Region	Additionality Determination
Solid Waste	**149**	**5**	**0**	
Landfill Gas Capture & Combustion	**137**	**3**	**0**	
CAR U.S. Landfill	116	3	0	Not Additional
VCS ACM0001: Flaring or Use of Landfill Gas, Version 19.0	19	0	0	Not Additional
VCS AMS-III.G.: Landfill Methane Recovery, Version 10.0	2	0	0	Not Additional
Solid Waste Diversion	**12**	**2**	**0**	
CAPCOA Updated Organic Waste Digestion Version 2.1 (CAR)	0	0	0	Likely Not Additional
CAR Organic Waste Composting	7	1	0	Likely Not Additional
CAR Organic Waste Digestion*	2	1	0	Likely Not Additional
VCS ACM0022: Alternative Waste Treatment Processes, Version 2.0*	1	0	0	Likely Not Additional
VCS AM0025: Avoided Emissions from Organic Waste through Alternative Waste Treatment Processes	2	0	0	Likely Not Additional
VCS VM0018 Energy Efficiency and Solid Waste Diversion Activities within a Sustainable Community*	0	0	0	Likely Not Additional
Wastewater Process emissions	**13**	**2**	**0**	
Wastewater Treatment	**13**	**2**	**0**	
VCS ACM0014: Treatment of Wastewater, Version 8.0	5	0	0	Likely Not Additional
VCS AMS-III.Y.: Methane Avoidance through Separation of Solids from Wastewater or Manure Treatment Systems, Version 4.0 (VMR0003)*	8	2	0	Likely Not Additional
Total	**162**	**7**	**0**	

*Protocol included in more than one category.

2 SOLID WASTE

Anaerobic decomposition of organic materials in landfills produces methane, a GHG with global warming potential approximately 85 times higher than carbon dioxide (CO_2) over a 20-year time period and 25 times higher over 100 years. Landfills emit the majority of human-caused methane emissions in California.[5]

Several activities cause emissions in the solid waste subcategory.

- Waste Generated – Methane emissions result from decomposition of organic matter disposed into landfills each year. In this case, waste is generated but not yet disposed in a landfill. Emissions from these sources are prospective and are considered on a forward-looking basis. That is, each ton of organic waste disposed will result in an estimated amount of methane emissions as it decomposes over time. Including this category allows for activities that divert organic material from landfills for alternate uses, thus avoiding associated emissions.
- Waste-in-place at Landfills – Distinct from waste generated, this category captures methane emissions that result from decomposition of organic matter already in landfills. This category is backward looking and represents methane emissions from organic waste already in the landfill. Emissions from solid waste in existing landfills is not included in regional emissions totals and are tracked separately. Nonetheless, emissions from waste-in-place can be mitigated and therefore are included here.
- Composting – Emissions from composting result from transporting feedstocks, energy required to process compost, and fugitive emissions during the composting process. Only fugitive emissions are considered here. Composting is also not considered in the regional inventory and represents minimal level of emissions statewide.

2.1 Waste Generated

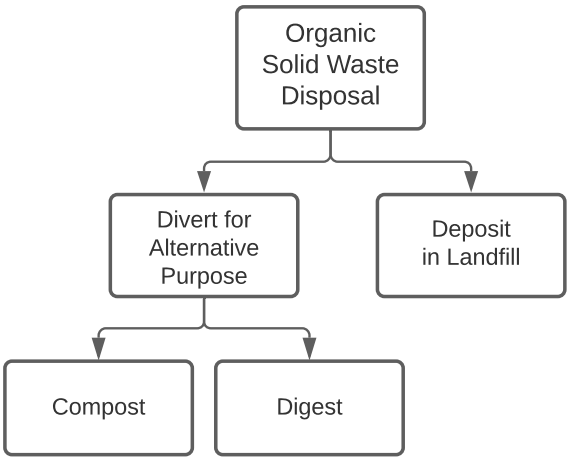
This section describes potential methods to reduce emissions from solid waste generated but not yet disposed into a landfill, the regulations currently in place related to these activities, related offset credit protocols, a discussion about which activities and protocols may be additional, other considerations, and a summary of GHG opportunities.

2.1.1 Methods to Reduce Emissions

There are different strategies to reduce emissions from each emissions-causing activity (Figure 2). The main way to reduce emissions from waste disposed is to divert waste from landfills to compost or anaerobically digest the organic matter. These processes reduce methane emissions by avoiding the anaerobic decomposition of organic matter that would otherwise occur in landfills. Note that methods to mitigate emissions from waste-in-place is covered in Section 2.2.

[5] California Department of Resources Recycling and Recovery (CalRecycle), Organic Materials Management and Climate Change, March 2, 2021: https://www.calrecycle.ca.gov/Climate/Organics/.

Figure 2 Methods to Reduce Methane Emissions from Organic Waste



As part of the Climate Change Investments (CCI) program, the California Department of Resources Recycling and Recovery (CalRecycle) developed methods to quantify GHG emission reductions from a range of project types related to reducing organic waste.[6] Examples of projects eligible for Greenhouse Gas Reduction Fund (GGRF) funding under CCI, which illustrate the types of projects that are considered in this report, include:[7]

- Composting of organic material;
- Standalone anaerobic digestion (AD) of organics producing biofuels or bioenergy;
- Co-digestion of organics at wastewater treatment plants producing biofuels or bioenergy; and
- Edible food rescue and food waste prevention.

2.1.2 Legislation and Regulation

This section summarizes legislation and regulation at the state and local levels related to solid waste generation, particularly diversion requirements.

2.1.2.1 State

California has a long history of law and policy to divert solid waste. In 1989, California enacted Assembly Bill 939 (Sher, Chapter 1095, Statutes of 1989) (Integrated Waste Management Act), which, among other things, required local jurisdictions to meet diversion goals of 25% by 1995 and 50% by the year 2000. Since then, California has set additional targets for waste diversion, including organics. CARB's Short-Lived Climate Pollutant Reduction Strategy states that California "has

[6] California Air Resources Board, Quantification Methodology California Department of Resources Recycling and Recovery Organics Program, 2020, p. 6: https://ww2.arb.ca.gov/sites/default/files/classic//cc/capandtrade/auctionproceeds/calrecycle_organics_finalqm_6-15-20.pdf?_ga=2.30243007.1438072048.1605559700-596240287.1605559700.

[7] Ibid.

already established its intent to phase out the disposal of organics from landfills."[8] The following bills set forth requirements for solid waste in California.[9]

- Senate Bill 1383 (Lara, Chapter 395, Statutes of 2016) Organic Waste Reduction – SB 1383 (2016) sets a target to reduce the amount of organic waste disposed in landfills by 50 % below 2014 levels by 2020 and 75% by 2025. This bill also grants CalRecycle regulatory authority to achieve the organic waste disposal reduction targets and establishes an additional target that not less than 20% of currently disposed edible food is recovered for human consumption by 2025.
- Assembly Bill 1826 (Chesbro, Chapter 727, Statutes of 2014) Commercial Organic Waste Recycling – AB 1826 (2014) requires businesses that generate four cubic yards or more of commercial solid waste per week to have organic waste recycling. The bill also includes a provision that allows CalRecycle to lower the threshold for compliance to two cubic yards of commercial solid waste per week, if in 2020, disposal of solid waste is not reduced by 50 % below 2014 levels. Based on a 2020 assessment, CalRecycle lowered the threshold to two cubic yards in September 2020.[10] Under AB 1826 (2014), local jurisdictions must implement an organic waste recycling program to divert organic waste generated by businesses, including multifamily residential dwellings that consist of five or more units.
- Assembly Bill 1594 (Williams, Chapter 719, Statutes of 2014) Alternative Daily Cover – AB 1594 (2014) clarifies that green materials are a viable feedstock for composting, but are sometimes used to cover waste in landfills, a practice known as alternative daily cover (ADC). Green materials used for daily cover break down anaerobically in a landfill, the same as if they were disposed. As mandated in AB 1594 (2014), starting January 1, 2020, the use of green material as ADC will no longer be considered diversion and will instead be considered disposal.
- Assembly Bill 341 (Chesbro, Chapter 476, Statutes of 2011) Solid Waste Diversion – AB 341 (2011) set a goal of a 75% reduction in the amount of waste going to landfills by the year 2020, to be achieved through source reduction, recycling, and composting.

In addition, other legislation seeks to plan for and promote composting of organic waste.

- Assembly Bill 876 (McCarty, Chapter 593, Statutes of 2015) Organics Management Infrastructure Planning – AB 876 (2015) requires starting August 1, 2017 that a county or regional agency to include in its annual report to CalRecycle an estimate of the amount of organic waste that will be generated in the county or region over a 15-year period, an estimate of the additional organic waste recycling facility capacity that will be needed to process that amount of organic waste, and areas identified by the county or regional agency as locations for new or expanded organic waste recycling facilities.

[8] California Air Resources Board, Short-Lived Climate Pollutant Reduction Strategy, 2017, p. 73: https://ww2.arb.ca.gov/sites/default/files/2020-07/final_SLCP_strategy.pdf.
[9] See California Department of Resources Recycling and Recovery (CalRecycle), Organic Materials Management and Climate Change, March 2, 2021: https://www.calrecycle.ca.gov/Climate/Organics/.
[10] California Department of Resources Recycling and Recovery (CalRecycle), Mandatory Commercial Organics Recycling, October 28, 2020: https://www.calrecycle.ca.gov/Recycle/Commercial/Organics/.

- Assembly Bill 1045 (Irwin, Chapter 596, Statutes of 2015) Composting Organic Waste – AB 1045 (2015) directs the California Environmental Protection Agency (CalEPA) and CalRecycle to coordinate with CARB, the State Water Resources Control Board, and California Department of Food and Agriculture (CDFA) to develop and implement policies to aid in diverting organic waste from landfills by promoting the composting of organic waste and by promoting the appropriate use of that compost throughout the State.

2.1.2.2 Local

There are several jurisdictions in the San Diego region that seek to divert waste from landfills.

- City of San Diego – In July 2015, the City Council adopted a Zero Waste Objective (ZWO) that established the targets for this ZWO of 75% diversion of waste from landfills by 2020 and Zero Waste by 2040.[11] Staff is additionally targeting the goal of 90% diversion by 2035 as proposed in the City's 2015 Climate Action Plan (CAP).[12]
- County of San Diego – As part of its Strategic Plan to Reduce Waste, the County of San Diego has established a target to divert 75% of solid waste from landfills by 2025 and 80% by 2030.
- City of Encinitas – As part its CAP, the City of Encinitas has established a target to divert 65% of total solid waste generated by 2020 and 80% by 2030.

Measures to reduce emissions by diverting solid waste are common in CAPs in the San Diego region. Many jurisdictions in the region have included CAP measures to encourage or require recycling at public and city-sponsored events, recycling of construction and demolition waste, and diversion of organic waste. While the policies listed above and those included in CAPs do not all specify organic waste targets, taken together represent significant action related to diverting solid waste from landfills and should be considered when evaluating specific offset credit projects.

2.1.3 Protocols

EPIC identified six active and applicable protocols related to using diverted organic waste (Table 3). Note that the CAPCOA protocol is the same as the CAR Waste Digestion protocol. No CARB compliance protocols exist for organic waste.

- Climate Action Reserve (CAR) Organic Waste Composting Project Protocol, Version 1.1[13] – This protocol addresses the diversion of eligible organic wastes away from landfill disposal systems and to composting operations where the material degrades in a controlled aerobic process.
- CAR Organic Waste Digestion Project Protocol, Version 2.1[14] – This protocol addresses the diversion of organic waste and/or wastewater away from anaerobic treatment and disposal systems and to a biogas control system (BCS). For the purposes of this protocol, a BCS consists of an anaerobic digester, a biogas collection and monitoring system, and one or

[11] The City of San Diego, California, Minutes for Regular Council Meeting of Monday, July 13.
[12] City of San Diego Environmental Services Department, City of San Diego Zero Waste Plan Road to Zero Waste, next stop 75%, 2015, p. 4: https://www.sandiego.gov/sites/default/files/zwplan.pdf.
[13] Climate Action Reserve, Organic Waste Composting Protocol, Version 1.1, 2013: http://www.climateactionreserve.org/how/protocols/organic-waste-composting/.
[14] Climate Action Reserve, Organic Waste Digestion Protocol, Version 2.1, 2014: http://www.climateactionreserve.org/how/protocols/organic-waste-digestion/.

more biogas destruction devices. Also, the protocol for CAPCOA listed in Table 3 is based on the CAR protocol, so it is not listed again here. Eligible waste streams for this protocol include:[15]

- MSW Food Waste and Food-Soiled Paper Waste: Uneaten food, spoiled food, food preparation wastes, and non-recyclable food-soiled paper wastes from homes, restaurants, kitchens, grocery stores, campuses, cafeterias, and similar institutions is predominantly disposed of at managed landfills. Note that these same waste materials are covered by California diversion laws.
- Agro-industrial Wastewater: Organic loaded wastewater from industrial or agricultural processing operations, if treated onsite at the facility, may be treated in uncontrolled anaerobic or semi-anaerobic lagoons, ponds, or tanks. Thus, for the purposes of this protocol, the baseline emissions from agro-industrial wastewater streams are calculated based on the wastewater treatment system in place prior to the installation of the BCS. The project developer must demonstrate that the pre-project wastewater treatment system utilized anaerobic treatment processes and did not incorporate methane capture and control technologies.
- Livestock Manure: For projects that co-digest eligible organic waste streams together with livestock manure, the baseline emissions for manure management draw from the CAR Livestock Project protocol. Each livestock operation contributing manure waste to the digestion project shall account for baseline emissions from all sources within the GHG Assessment Boundary.

- VCS AM0022: Large-Scale Consolidated Methodology for Alternative Waste Treatment Processes[16] – This covers a range of project activities to reduce GHG emissions in the waste sector, including composting, anaerobic digestion, thermal treatment, mechanical treatment, and incineration.
- VCS AM0025: Alternative Waste Treatment Processes[17] – This protocol is similar to AM0022 and includes the same project types.
- VCS VM0018: Energy Efficiency and Solid Waste Diversion Activities within a Sustainable Community[18] – This protocol applies grouped projects that reduce GHG emissions using energy efficiency and waste management activities. As related to waste diversion, the included methodology only applies to methane avoidance. It is not approved for landfill gas

[15] Id. at 6–7.
[16] UNFCCC Clean Development Mechanism, Large-Scale Consolidated Methodology: Alternative Waste Treatment Processes, Version 2.0: https://cdm.unfccc.int/Panels/meth/meeting/13/059/mp59_an11.pdf (Verra recognizes protocols developed for the Clean Development Mechanism (CDM). Protocols listed here are those that have had projects in the U.S. that use CDM protocols.)
[17] UNFCCC Clean Development Mechanism, Alternative Waste Treatment Processes, AM0025, Version 14.0.0, 2012: https://cdm.unfccc.int/filestorage/w/a/D3ILGQEHWVNMY1K6J0ZUFP9CA4BOXT.pdf/EB%2068_repan08_AM0025_ver14.0.0.pdf?t=RWJ8cXE1MDJ3fDCoCPM_3orbEWJQhX9TxLxE. (Verra recognizes protocols developed for the Clean Development Mechanism (CDM). Protocols listed here are those that have had projects in the U.S. that use CDM protocols.)
[18] Verra, Energy Efficiency and Solid Waste Diversion Activities within a Sustainable Community, VCS Approved Methodology VM0018, Version 1.0, 2012: https://verra.org/wp-content/uploads/2017/10/VM0018v1.0.pdf.

flaring or electricity or other energy production. This methodology is applicable to cardboard recycling, organic composting, and aerobic decomposition.

These protocols are not widely used in the United States. There are a total of 12 projects using these protocols in the U.S., two in California, and none located in the San Diego region. The CAR Organic Waste Digestion protocol also applies to certain wastewater-related projects (Section 3). Also, the California Air Pollution Control Officers Association (CAPCOA) protocol is the same as the CAR Organic Waste Diversion protocol and is not summarized above. Table 3 lists the active and applicable protocols related to solid waste diversion.

Table 3 Projects Using Active and Applicable Protocols Related to Solid Waste Diversion

Protocol	US	CA	San Diego Region
CAPCOA Updated Organic Waste Digestion Version 2.1 (CAR)	0	0	0
CAR Organic Waste Composting	7	1	0
CAR Organic Waste Digestion*	2	1	0
Verra ACM0022: Alternative Waste Treatment Processes, Version 2.0*	1	0	0
VCS AM0025: Avoided Emissions from Organic Waste through Alternative Waste Treatment Processes	2	0	0
VCS VM0018 Energy Efficiency and Solid Waste Diversion Activities within a Sustainable Community*	0	0	0
*Protocol included in more than one category.	**12**	**2**	**0**

2.1.4 Additionality

This section evaluates whether the protocols listed above, or similar activities would lead to GHG reductions that would not have occurred otherwise. In the context of offset credits, it is important to determine whether a project and associated GHG reductions or removals would have happened in the absence of any benefit derived from creating an offset credit; that is, whether the reduction or removal is in addition to what would have otherwise happened. Additionality is a defining characteristic of offset credits and there are several different ways to determine, or test, whether a project is additional.

California regulation defines "additional" to mean "greenhouse gas emission reductions or removals that exceed any greenhouse gas reduction or removals otherwise required by law, regulation or legally binding mandate, and that exceed any greenhouse gas reductions or removals that would otherwise occur in a conservative business-as-usual scenario."[19] This definition creates a two-part test of additionality: a legal requirement test and a common practice test (sometimes called performance test). Even though this test is developed in the context of CARB's compliance offsets, it is similar to that used by offset credit programs, and thus can serve as a reasonable framework to evaluate whether offset credit protocols and resulting GHG emission reductions or removals would be considered additional.

[19] 17 California Code of Regulations (CCR) § 95802(a).

Additionality must be determined on a project-by-project basis. For our purposes here we consider a preliminary screen of protocols and project types (e.g., composting or anaerobic digestion) to determine whether as a group they could be considered additional. The additionality determination provided here is intended as a preliminary determination and specific additionality screening would have to be applied to a specific project to determine whether the associated GHG reductions or removals are additional.

A more detailed discussion of additionality is provided in Section 2.3 of the project report.

Additionality Tests

There are several different tests to determine additionality. This report uses two common tests.

- Legal Requirement Test – This test determines whether there are any laws, regulations, policies, or legally-binding mandates that would have required the activity. If the activity does not exceed requirements, related emissions reductions would fail the legal requirement test and be considered not additional.
- Common Practice Test – This test determines whether in the absence of a requirement the activity would have happened anyway due to technological, financial, or other considerations. For example, if the activity is cost effective without the proceeds from offset credits or represents a common practice, it could be considered not additional.

2.1.4.1 Legal Requirement

Existing regulations and requirements in California would capture much of the organic waste available for diversion. SB 1383 (2016) sets target for 75% organic diversion by 2025 and both CAR organic waste-related protocols only count as eligible feedstocks food waste and soiled paper waste. Further, provisions in AB 1826 (2014) require businesses generating 4 cubic yards or more of commercial solid waste to recycle organic waste. Note this threshold was recently dropped to 2 cubic yards of commercial solid waste because 2020 targets are not met, a provided for in AB 1826 (2014).

CAPs in the San Diego region commonly include solid waste diversion measures, including some requirements.

2.1.4.2 Common Practice Test

CAR acknowledges in its protocol that "[b]ased upon the results of the performance standard research, food waste and co-mingled non-recyclable food soiled paper waste are the sole composting feedstocks deemed eligible per this protocol."[20] This would limit the number and amount of eligible feedstocks that would be diverted under both the composting and digestion protocols.

[20] Climate Action Reserve, Organic Waste Composting Protocol, Version 1.1, 2013, p. 7: http://www.climateactionreserve.org/how/protocols/organic-waste-composting/.

Furthermore, California has demonstrated a trend toward increasingly strict regulation of organic waste and California has developed a strategy for Short-lived Climate Pollutants, which includes landfills. The Short-Lived Climate Pollutant Reduction Strategy states that California "has already established its intent to phase out the disposal of organics from landfills."[21] This would be an important consideration in determining whether projects to compost or digest organic waste in the San Diego region would have happened otherwise.

2.1.5 Other Considerations

Eligible projects under the protocols identified here could also generate credits in California's Low Carbon Fuel Standard.[22] The LCFS serves as the primary mechanism to reduce the carbon intensity of transportation fuel in California.[23] The LCFS is designed to reduce the carbon intensity (CI) of fuel by at least 20% by 2030 from a 2010 baseline. The program sets CI benchmarks for gasoline, diesel, and replacements (e.g., electricity, renewable diesel, hydrogen, etc.) by calculating the complete CI of the lifecycle of the fuel. Fuels and fuel blendstocks introduced into the California fuel system that have a CI higher than the benchmark generate deficits. Fuels and fuel blendstocks with CIs below the benchmark generate a credit. Credits can be generated from a range of less carbon intensive fuels. Annual compliance is achieved when a regulated party uses credits to match deficits.

LCFS credits can be generated by capturing methane from diverted solid waste, landfill gas, and wastewater and refining the gas for vehicle use. A project that generates and uses a credit in the LCFS credit market could not also use the resulting GHG impacts to generate an offset credit through an existing protocol.

LCFS credit value is significantly higher than the value of voluntary offset credits, averaging over $100 per credit. While a cap on LCFS credit value was put in place it will remain significantly higher than the voluntary market.[24] Figure 3 shows prices and volumes for the week of April 19–25, 2021, from the LCFS credit transfer activity. The higher value of LCFS credits may limit the viability of related GHG offset credit projects under the protocols identified for this project.

Figure 3 Weekly LCFS Credit Transfer Activity Report

LCFS Weekly Snapshot	19th April 2021 - 25th April 2021	
Transfer Type	All Non Zero	Type 1
Average Price [3] ($/MT)	$191.87	$177.28
Price Range ($/MT)	$174.50 - $208.00	$174.50 - $195.00
Total Volume (MT)	520,137	139,770
Total Value ($)	$99,800,684	$24,917,716

[21] California Air Resources Board, Short-Lived Climate Pollutant Reduction Strategy, 2017, p. 73: https://ww2.arb.ca.gov/sites/default/files/2020-07/final_SLCP_strategy.pdf.
[22] 17 CCR §§ 95480–95503.
[23] See CARB LCFS Program Information: https://ww2.arb.ca.gov/our-work/programs/low-carbon-fuel-standard.
[24] See Weekly LCFS Credit Transfer Activity Report: https://ww3.arb.ca.gov/fuels/lcfs/credit/lrtweeklycreditreports.htm.

2.1.6 Summary of GHG Opportunities

While California law covers much of the organic waste generated in the state and the diversion-related protocols identified here are likely not additional (Table 4 below), limited opportunities may exist for offset credit projects. For example, the requirements of AB 1826 (2014) do not apply to:

- Tribal lands
- Multifamily dwellings with 5 units or fewer
- Multifamily dwellings with 5 units or more are not required to arrange for the organic waste recycling services specified in subdivision (b) for food waste that is generated by the business.

In addition, the law provides for case-by-case exemptions, including the following:

- Lack of sufficient space in multifamily complexes or businesses to provide additional organic material recycling bins.
- The current implementation by a business of actions that result in the recycling of a significant portion of its organic waste.
- The business or group of businesses does not generate at least one-half of a cubic yard of organic waste per week.
- Limited-term exemptions for extraordinary and unforeseen events.
- The business or group of businesses does not generate at least one cubic yard of organic waste per week.

Further research would be necessary to determine whether projects related to these exempted categories would be feasible.

Table 4 Summary of Additionality Determination for Protocols Related to Solid Waste Diversion

Protocol	Additionality Determination
CAPCOA Updated Organic Waste Digestion Version 2.1 (CAR)	Likely Not Additional
CAR Organic Waste Composting	Likely Not Additional
CAR Organic Waste Digestion*	Likely Not Additional
Verra ACM0022: Alternative Waste Treatment Processes, Version 2.0*	Likely Not Additional
VCS AM0025: Avoided Emissions from Organic Waste through Alternative Waste Treatment Processes	Likely Not Additional
VCS VM0018 Energy Efficiency and Solid Waste Diversion Activities within a Sustainable Community*	Likely Not Additional

*Protocol included in more than one category.

The CAR Organic Waste Digestion protocol also allows agro-industrial wastewater as a feedstock. This would include organic loaded wastewater from industrial or agricultural processing operations that, prior to the project, was treated in an uncontrolled anaerobic lagoon, pond, or tank at a

privately owned treatment facility. It is not clear how much of this feedstock is available in the San Diego region (see Section 3.2).

It is not clear whether the exemptions in AB 1826 (2014) and agro-industrial wastewater provide viable and feasible opportunities to reduce emissions. Additional research would be required to determine project feasibility. Similarly, additional research would be needed to determine whether sufficient agro-industrial wastewater exists in the San Diego region to justify collection and digestion.

Any offset credit project that generates transportation fuels could not also get credit under California's LCFS, which has much higher credit values than voluntary offset credit markets. This could create an economic signal for related projects to seek LCFS credits.

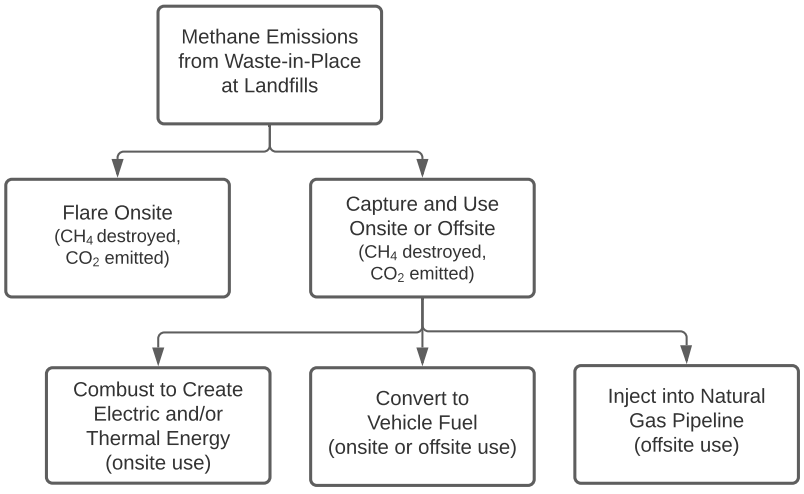
2.2 Waste-in-Place at Landfills

The regional GHG emissions inventory accounts for waste disposed and does not account for waste-in-place, or waste already disposed in landfills. This is because much of the LFG generated from waste already in the landfill is captured and beneficially used and there are few other ways of controlling the LFG emissions. By contrast, there are several ways to divert organic waste from landfills as noted above.

2.2.1 Methods to Reduce Emissions

The main activity to reduce emissions in this category is to collect and destroy the methane generated by previously deposited organic waste. This can be done by flaring, which destroys the methane, but is not considered a beneficial use, or by capturing and using the methane either onsite or offsite for a beneficial use. Uses can include combusting methane to create electric or thermal energy (generally on site), convert captured methane to be used as vehicle fuel (on site or offsite), or injecting methane into the natural gas pipeline to be combusted offsite. Figure 4 summarizes the opportunities to reduce methane emissions from waste-in-place in landfills. While not exhaustive, this provides a range of the types of activities that could reduce GHG emissions and potentially be considered for offset credits.

Figure 4 Opportunities to Reduce Methane Emissions from Waste-in-Place in Landfills



2.2.2 Legislation and Regulation

This section summarizes legislation and regulations at the federal, state, and local levels that are relevant to the waste emissions category.

2.2.2.1 Federal

Federal regulation (40 Code of Federal Regulations (CFR) Part 60 Subpart WWW) requires certain landfills that initiated construction, reconstruction, or modification on or after May 30, 1991, but before July 18, 2014, with a design capacity greater than 2.5 million metric tons and an emission rate greater than 50 metric tons per year to install a collection and control system. Section 60.753(d) provides that landfill owners must operate the collection system so that the methane concentration is less than 500 parts per million (ppm) above background at the surface of the landfill. The landfills in San Diego County were opened before the May 1991 date in the regulation. Further research is required to determine whether there were subsequent reconstruction or modification projects to the landfills in the San Diego region.

2.2.2.2 State

In 2010, CARB adopted its Landfill Methane Control Measure (LMCM). This regulation requires active municipal solid waste landfills with greater than or equal to 450,000 tons of waste-in-place and an LFG heat input capacity greater than 3 million British Thermal Units per hour (MMBTU/hr) to plan and build a gas collection and control system. Landfill operators must then demonstrate that after four consecutive quarterly monitoring periods there is no measured concentration of methane of 200 parts per million by volume (ppmv) or greater using the instantaneous surface monitoring procedures.

2.2.2.3 Local

San Diego Air Pollution Control District (SDAPCD) has two rules related to emissions from waste disposal sites.

- **Rule 59 (Control of Waste Disposal Site Emissions)** – This rule requires landfills that are greater than one acre in size to be equipped with a LFG control system using the best available control technology, or show that the landfill can be maintained at all times using a LFG control system or maintenance practices such that the concentration of organic compounds does not exceed 500 ppmv, expressed as methane, at any point; the concentration of any toxic air contaminant emitted does not exceed the threshold level established by CARB and the American Conference of Governmental Industrial Hygienists for that toxic air contaminant, whichever is more stringent, or any concentration that poses an unacceptable health risk.
- **Rule 59.1 (Municipal Solid Waste Landfills)** – This rule requires municipal solid waste landfills with a design capacity of 2.75 million tons (2.5 million Mgs) and 3.27 million cubic yards (2.5 million cubic meters) or more with uncontrolled emissions of 55 tons per year (55 Mgs per year) or more of non-methane organic compounds to install an emissions collection system[25] and install an emissions control system.[26] Every owner or operator of a landfill subject to these requirements is then required to operate the collection system to ensure the methane

[25] 40 Code of Federal Regulations (CFR) § 60.752(b)(2)(ii)(A).
[26] 40 CFR § 62.752(b)(2)(ii)(B) or (C).

concentration is less than 500 ppmv above background at the surface of the landfill; not allow any gas leaks along the LFG transfer path which result in a concentration of 1375 ppmv or more, measured as methane, at a distance of 1.3 centimeters (cm) (0.5 inches) from the transfer path; not allow leachate and/or condensate from the landfill to reach any surface where non-methane organic compounds can be evaporated into the atmosphere; and comply with all other operational standards and monitoring requirements specified.[27]

2.2.3 Protocols

EPIC identified five protocols for projects that collect and destroy LFG; three protocols are active and applicable. No CARB compliance protocols exist for this activity.

- CAR U.S. Landfill Project Protocol, Version 5.0[28]
- VCS ACM0001: Flaring or Use of Landfill Gas, Version 19.0[29]
- VCS AMS-III.G.: Landfill Methane Recovery, Version 10.0[30]

These protocols cover a wide range of activities to capture and combust LFG, including, but not limited to:

- The destruction of landfill gas onsite in an open or closed flare;
- The conversion of landfill gas onsite to produce electric or thermal energy;
- The enhancement of landfill gas for injection into a natural gas pipeline for offsite destruction; and
- The enhancement of landfill gas for use in fleet vehicles, trucks and cars, both onsite and offsite.

There were a total of 137 projects using these active and applicable protocols in the U.S., three in California, and none located in the San Diego region. The only protocol used in the California is the CAR U.S. Landfill Gas Protocol.

[27] 40 CFR § 60.753(d); 40 CFR § 60.756.
[28] U.S. Landfill Project Protocol, Version 5.0, 2019: https://www.climateactionreserve.org/wp-content/uploads/2019/07/U.S._Landfill_Project_Protocol_V5.0.pdf.
[29] UNFCCC Clean Development Mechanism, Large-scale Consolidated Methodology: Flaring or use of landfill gas, Version 19.0, 2019: https://cdm.unfccc.int/Panels/meth/meeting/13/059/mp59_an07.pdf (Verra recognizes protocols developed for the Clean Development Mechanism (CDM). Protocols listed here are those that have had projects in the U.S. that use CDM protocols.)
[30] UNFCCC Clean Development Mechanism, Small-scale Methodology: Landfill methane recovery, Version 10.0, 2019: https://cdm.unfccc.int/methodologies/DB/0KHNES8D09H134V3TZDQ47C3LQL3H2.

Table 5 Projects Using Active and Applicable Landfill Gas Related Protocols

Protocol	US	CA	San Diego Region
CAR U.S. Landfill	116	3	0
VCS ACM0001: Flaring or Use of Landfill Gas, Version 19.0	19	0	0
VCS AMS-III.G.: Landfill Methane Recovery, Version 10.0	2	0	0
Total	**137**	**3**	**0**

2.2.4 Additionality

This section evaluates whether the protocols listed above would lead to GHG reductions that would not have occurred otherwise. A brief discussion of additionality is provided in Section 2.1.4.

2.2.4.1 Legal Requirement Test

All protocols would fail the legal requirement test for open landfills greater than or equal to 450,000 tons of waste-in-place because collection and control technologies are already required by CARB. Further research would be required to determine whether projects at landfills that fall outside this threshold could be additional.

2.2.4.2 Common Practice Test

It appears that collection and control technologies are also common practice among landfills, even among those not currently covered by the CARB LMCM. The EPA's Landfill Methane Outreach Program (LMOP)[31] reports data on 14 landfills in San Diego County.[32] Of this total, eight are closed and seven of them already have gas collection systems (Table 6). Data is not reported for the South Miramar Landfill. Of the six open landfills, four have greater than 450,000 tons of waste in place. All of them have gas collection systems and several have energy conversion projects. The two open landfills without reported LFG collection systems (San Onofre and Borrego) both fall below the CARB LMCM waste-in-place threshold.

[31] United States Environmental Protection Agency, Landfill Methane Outreach Program (LMOP) Landfill Gas Energy Project Data, November 18, 2020: https://www.epa.gov/lmop/landfill-gas-energy-project-data.
[32] United States Environmental Protection Agency, Landfill Methane Outreach Program (LMOP) Landfill Technical Data, November 17, 2020: https://www.epa.gov/lmop/landfill-technical-data.

Table 6 Landfill in the San Diego Region

Landfill Name	Landfill Owner Organization(s)	Year Landfill Opened	Landfill Closure Year	Current Landfill Status	Waste in Place (tons)	Waste in Place Year	LFG Collection System In Place?
San Marcos LF	County of San Diego, CA	1979	1997	Closed	12,902,208	1997	Yes
North Miramar SLF	City of San Diego, CA	1973	1983	Closed	6,901,184	1983	Yes
South Chollas SLF	City of San Diego, CA	1951	1981	Closed	4,750,000	1981	Yes
Arizona Street LF	City of San Diego, CA	1952	1974	Closed	1,940,000	1974	Yes
Jamacha Landfill	County of San Diego, CA	1960	1978	Closed	1,800,000	N/A	Yes
Ramona Avenue Landfill	Republic Services, Inc.	1962	2009	Closed	947,800	2002	Yes
Bonsall Landfill	County of San Diego, CA	N/A	N/A	Closed	N/A	1998	Yes
South Miramar LF	City of San Diego, CA	1959	1973	Closed	N/A	N/A	Unknown
West Miramar SLF	United States Navy	1983	2025	Open	43,828,172	2018	Yes
Otay LF	Republic Services, Inc.	1963	2028	Open	39,827,486	2018	Yes
Sycamore SLF	Republic Services, Inc.	1962	2091	Open	30,161,247	2018	Yes
Las Pulgas LF	United States Marine Corps	1972	2058	Open	2,076,052	2018	Yes
San Onofre LF	United States Marine Corps	1974	2257	Open	238,200	N/A	No
Borrego Landfill	Republic Services, Inc.	1973	2046	Open	107,389	N/A	No

N/A - data not reported

2.2.5 Other Considerations

Eligible projects under the protocols identified here could also generate credits in other carbon markets, including California's LCFS.[33] LCFS credits can be generated by capturing methane from diverted solid waste, landfill gas, and wastewater and refining the gas for vehicle use. A project that generates and uses a credit in the LCFS credit market could not also use the resulting GHG impacts to generate an offset credit through an existing protocol. The LCFS is discussed further in 2.1.5.

CAR notes that there are "market opportunities for the upgrade of landfill gas into high-Btu fuels, that provide an incentive sufficient to raise additionality concerns. Such opportunities include the federal Renewable Fuel Standard (RFS) and the California Low Carbon Fuel Standard (LCFS), where the carbon incentive is often orders of magnitude greater than that provided by the sale of offset credits. Analysis reveals that the strength of these incentives is driving investment in landfill gas projects at present, and that such projects can be considered 'business as usual,' without the additional presence of offset credit revenues. Therefore, projects that receive mitigation credits for upgrading landfill gas into high-Btu fuels *will not be eligible to receive offset credits* for the same period of time under this protocol."[34] [emphasis added]

2.2.6 GHG Opportunity Summary

Based on the Legal Requirement and Common Practice Tests, the three identified protocols would be considered not additional (Table 7). Broadly speaking, the opportunity for offset credit projects to reduce emissions in this category in the San Diego region is limited. There are a few smaller landfills that may not have LFG capture systems; however available LFG may be limited at those

[33] 17 CCR §§ 95480–95503.

[34] Climate Action Reserve, U.S. Landfill Project Protocol Version 5.0, 2019, p. 8: https://www.climateactionreserve.org/wp-content/uploads/2019/07/U.S._Landfill_Project_Protocol_V5.0.pdf

sites. According to the County of San Diego GHG inventory report, "[a]mong the landfills within the Unincorporated County and those that receive waste from the unincorporated area, only Borrego [Springs], Viejas, and Imperial Waste landfills do not have LFG capture systems installed. Although the two landfills were open at the time CARB's LMCM became effective in 2010, neither landfill currently operates a LFG capture system, nor is either included in the LMOP's candidate landfill project list. Due to the relatively small size of Borrego [Springs] and Imperial Waste landfills, it is assumed that neither landfill will install a LFG capture system through 2050."[35]

Also, the regional GHG inventory assumes a 75% LFG capture rate in 2020 and beyond, which also suggests that even if not all landfill gas is captured, the remaining portion could be relatively small.[36] Any offset credit project that generates transportation fuels could not also get credit under California's LCFS, which has much higher credit values than voluntary offset credit markets. This could create an economic signal for related projects to seek LCFS credits.

Table 7 Summary of Additionality Determination for Protocols Related to Landfills

Protocol	Additionality Determination
CAR U.S. Landfill	Not Additional
VCS ACM0001: Flaring or Use of Landfill Gas, Version 19.0	Not Additional
VCS AMS-III.G.: Landfill Methane Recovery, Version 10.0	Not Additional
Total	

2.3 Composting

Composting organic waste is generally seen as a way to reduce emissions. There are emissions associated with composting that result from the following three activities:[37]

- Transportation Emissions – Collecting and delivering feedstocks to the composting facility (transportation), process, and fugitive emissions. For this reason, CARB considers landfilling and composting to be functionally equivalent with regard to transportation emissions. Therefore, transportation emissions is assumed to be equal to zero for purposes of estimating emissions from composting.[38]
- Process Emissions – The energy required to grind material (electricity), turn and manage the compost pile (e.g., diesel use), and the emissions associated with water use on the compost

[35] County of San Diego, Appendix A 2014 Greenhouse Gas Emissions Inventory and Projections, 2017, p. 54: https://www.sandiegocounty.gov/content/dam/sdc/pds/advance/cap/publicreviewdocuments/CAPfilespublicreview/Appendix%20A%20Greenhouse%20Gas%20Emissions%20Inventory%20and%20Projections.pdf.

[36] Energy Policy Initiatives Center, Appendix D 2012 Greenhouse Gas Emissions Inventory and Projections for the San Diego Region, 2015, p. 26: https://www.sdforward.com/pdfs/RP_final/AppendixD-2012GreenhouseGasEmissionsInventoryfortheSanDiegoRegionandProjections.pdf.

[37] See California Air Resources Board, California Environmental Protection Agency, METHOD FOR ESTIMATING GREENHOUSE GAS EMISSION REDUCTIONS FROM DIVERSION OF ORGANIC WASTE FROM LANDFILLS TO COMPOST FACILITIES FINAL DRAFT, 2017: https://ww2.arb.ca.gov/sites/default/files/classic/cc/waste/cerffinal.pdf.

[38] Id. at 11.

pile. Because process emissions from composting likely fall within the same range as process emissions from landfilling, and are relatively insignificant to the total emission reduction estimate, CARB considers landfilling and composting to be functionally equivalent with regard to process emissions. Similarly, the process emissions is assumed to be equal to zero for purposes of estimating emissions from composting.[39]

- Fugitive Emissions – This represents the methane and nitrous oxide released during the composting process and constitutes the main source of emissions from composting.

Given the estimated and estimated emissions factors for each ton of feedstock for composting[40] and the amount of feedstock processed in 2018,[41] the total emissions from composting statewide was about 0.4 $MMTCO_2e$. Because transportation and process emissions are set to zero, only activities to reduce fugitive emissions from composting can be considered here. Also, emissions from transportation, water, and electricity are already accounted for in other categories of the emissions inventory and are regulated separately. Note that the emissions from composting are minimal compared to the other emissions sources in the solid waste emissions category.[42] In addition, there are no protocols to reduce fugitive emissions at composting facilities. As a result, no further analysis was conducted for this emissions category.

[39] Id. at 12.
[40] Id. at 14.
[41] See California Air Resources Board, Documentation of California's 2000-2018 GHG Inventory: Index to Documentation Pages for years 2000 to 2018: https://ww2.arb.ca.gov/applications/california-ghg-inventory-documentation. See documentation for Waste 4B Biological Treatment of Solid Waste.
[42] See California Air Resources Board, ARB Emissions Inventory Methodology for Composting Facilities, 2015: https://ww3.arb.ca.gov/ei/areasrc/composting_emissions_inventory_methodology_final_combined.pdf.

3 WASTEWATER

Wastewater from households, commercial activities, and industrial production contains soluble organic matter, suspended particles, pathogenic organisms, and chemical contaminants. In California, a large percentage of wastewater is collected and processed in centralized wastewater treatment plants (WWTPs). Methane is emitted from biosolids when treated in anaerobic conditions. Nitrous oxide is emitted as the result of the nitrification and denitrification processes, which take place at wastewater treatment plants, but also in the water bodies where effluent is discharged.[43]

Total annual emissions from the wastewater treatment process represented less than 1% of regional emissions.[44] This low level of emissions is due to the high level of capture and beneficial use already in place.

3.1 Domestic Wastewater Treatment and Discharge

This section describes potential methods to reduce emissions from wastewater treatment, the regulations currently in place related to these activities, related offset credit protocols, a discussion about which activities and protocols may be additional, other considerations, and a summary of GHG opportunities.

3.1.1 Methods to Reduce Emissions

Similar to methane emissions captured at landfills, the main activity to reduce emissions in this category is to collect and destroy the methane generated during the wastewater treatment and discharge processes, typically by combusting the methane. This can be done by flaring, which destroys the methane but does not result in another useful outcome, or by capturing and using the methane either onsite or offsite. Uses can include, but are not limited to, combusting methane to create electric or thermal energy (generally on site), converting captured methane to be used as vehicle fuel (on or offsite), or injecting methane into the natural gas pipeline to be combusted offsite. Figure 5 summarizes the opportunities to reduce methane emissions from the wastewater treatment process. As an illustrative example, the City of San Diego Public Utilities Department or a private company employ all four methods to destroy methane from anaerobic digestion at City wastewater treatment plants.[45]

Note that combusting methane still results in GHG emissions, but because methane has a GWP 25 times higher than CO_2, net emissions on a CO_2 equivalency (CO_2e) basis are lower.

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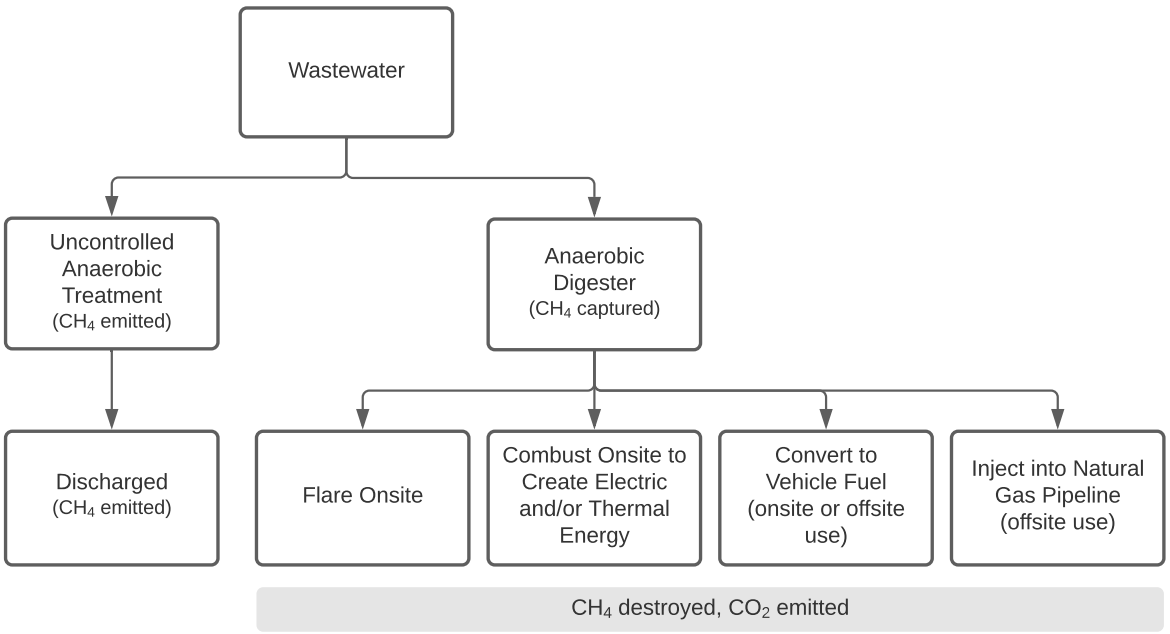
[43] California Air Resources Board Air Quality Planning and Science Division, California's 2000–2014 Greenhouse Gas Emission Inventory Technical Support Document, 2016, p. 138: https://ww3.arb.ca.gov/cc/inventory/pubs/reports/2000_2014/ghg_inventory_00-14_technical_support_document.pdf.

[44] San Diego Association of Governments, San Diego Forward: The Regional Plan, Appendix D 2012 Regional Greenhouse Gas Emission Inventory for the San Diego Region and Projections, 2015, p. 26: https://www.sdforward.com/pdfs/RP_final/AppendixD-2012GreenhouseGasEmissionsInventoryfortheSanDiegoRegionandProjections.pdf. (Note this is the last publicly available estimate of regional emissions.)

[45] City of San Diego Public Utilities Department Website: https://www.sandiego.gov/public-utilities/sustainability/renewable-energy.

Figure 5 Methods to Reduce GHG Emissions from Wastewater Treatment Plants



3.1.2 Legislation and Regulation

While there do not appear to be any specific regulations for methane capture and destruction, WWTPs may be required to capture methane as part of an operating permit. For example, the Point Loma Wastewater Treatment Plant permit to operate flares and digesters from the San Diego Air Pollution Control District includes a condition that "[t]here shall be no release of uncontrolled emissions of digester gas through the Plant" except for those associated with construction, repair, and routine maintenance.[46]

3.1.3 Protocols

EPIC identified two protocols specifically covering projects related to wastewater treatment.

- VCS ACM0014: Treatment of Wastewater, Version 8.0[47] – This protocol covers three project types: generating biogas through anaerobic digestion of biosolids, then capturing resulting methane, and flaring or using the generated biogas for electricity or heat generation; dewatering biosolids and applying the resulting product to land; and treatment of wastewater in the same treatment plant as in the baseline situation but treatment of the sludge from primary and/or secondary settler either in a new anaerobic digester or treatment of sludge under clearly aerobic conditions.

[46] County of San Diego, Air Pollution Control District. Permit to Operate. Permit Record ID: APCD2009-PTO-950315.
[47] UNFCCC Clean Development Mechanism, ACM0014 Large-scale Consolidated Methodology: Treatment of wastewater, Version 08.0, 2019: https://cdm.unfccc.int/methodologies/DB/PPKHX1MHNHF6DYVE6SFD2GBPFU92Y2 (Verra recognizes protocols developed for the Clean Development Mechanism (CDM). Protocols listed here are those that have had projects in the U.S. that use CDM protocols.)

- VCS AMS-III.Y.: Methane Avoidance through Separation of Solids from Wastewater or Manure Treatment Systems, Version 4.0 (VMR0003)[48] – This protocol covers projects that avoid or reduce methane from anaerobic wastewater treatment systems and anaerobic manure management systems through removal and treatment of solids in the wastewater or manure waste. This protocol is cross listed with the agriculture emissions category and is included here to address wastewater projects.

There are 13 projects nationwide using this protocol, two in California, and none in the San Diego region (Table 8). Because the VCS protocol related to separation of solids is cross listed with the agriculture emissions category, it is not clear whether the projects listed are related to wastewater or manure feedstocks. Two other protocols previously described also include wastewater related-project activities. The CAR Organic Waste Digestion Project Protocol, Version 2.1 allows certain wastewater as an eligible waste stream. The VCS AM0025: Alternative Waste Treatment Processes Protocol also has provisions for wastewater. Projects related to these protocols are reported in Section 2.1. It is not clear whether any projects listed are related to wastewater projects.

Table 8 Projects Using Wastewater Treatment Protocols

Protocol	US	CA	San Diego Region
VCS ACM0014: Treatment of Wastewater, Version 8.0	5	0	0
VCS AMS-III.Y.: Methane Avoidance through Separation of Solids from Wastewater or Manure Treatment Systems, Version 4.0 (VMR0003)*	8	2	0
Total	**13**	**2**	**0**

*Protocol included in more than one category.

3.1.4 Additionality

This section evaluates whether the protocols listed above would lead to GHG reductions that would not have occurred otherwise. A brief discussion of additionality is provided in Section 2.1.4. While this analysis evaluated categories of projects, the ultimate determination of additionality is made on a project-by-project basis.

3.1.4.1 Legal Requirement Test

In San Diego County, wastewater treatment plants may be required as a condition of their permit to operate to control all emissions of digester gas. This would be considered an effective regulation of methane emissions in a wastewater treatment plan.

3.1.4.2 Common Practice Test

Based on the permit requirements mentioned above, it appears that it is common practice in the San Diego region for WWTPs to flare methane or use it in a beneficial use projects (e.g., power

[48] UNFCCC Clean Development Mechanism, AMS-III.Y. Small-scale methodology: Methane avoidance through separation of solids from wastewater or manure treatment systems, Version 0.40, 2016: https://cdm.unfccc.int/methodologies/DB/IR1ULTHWQKPQO992O3UJTTLELME23L.

generation).[49] The City of San Diego reports that they capture nearly all the GHG from their WWTP operations. The two largest WWTPs in the region, Point Loma WWTP and Encina WPCF both use anaerobic digestion and power generation.

Specific analysis may be required to determine whether any given project would have captured excess methane for use in a biogas control system if not for the support from offset credits.

3.1.5 Other Considerations

Eligible project under the protocols identified here could also generate credits in California's Low Carbon Fuel Standard.[50] Credits can be generated by capturing methane from diverted solid waste, landfill gas, and wastewater and refining the gas for vehicle use. A project that generates and uses a credit in the LCFS credit market could not also use the resulting GHG impacts to generate an offset credit through an existing protocol. The LCFS is discussed further in 2.1.5.

3.1.6 GHG Opportunity Summary

There does not appear to be additional offset credit projects in the wastewater treatment category since existing practice is to capture and destroy methane, typically for a beneficial use (Table 9).

Table 9 Summary of Additionality Determination for Wastewater Protocols

Protocol	Additionality Determination
VCS ACM0014: Treatment of Wastewater, Version 8.0	Likely Not Additional
VCS AMS-III.Y.: Methane Avoidance through Separation of Solids from Wastewater or Manure Treatment Systems, Version 4.0 (VMR0003)*	Likely Not Additional
Total	

*Protocol included in more than one category.

3.2 Industrial Wastewater and Discharge

This category is not included in the San Diego regional inventory. Either the activity does not occur or data is not available to estimate emissions in the San Diego region. Based on the activity categories included in the statewide GHG inventory for industrial wastewater listed below, emissions in this category for the San Diego region would be very limited.

- Manufacturing: Wastewater Treatment: Fugitives > Fugitive emissions
- Oil & Gas: Production & Processing: Wastewater Treatment: Fugitives > Fugitive emissions
- Petroleum Marketing: Wastewater Treatment: Fugitives > Fugitive emissions
- Wastewater Treatment: Industrial Wastewater > Production processed - Apples
- Wastewater Treatment: Industrial Wastewater > Production processed - Citrus fruit
- Wastewater Treatment: Industrial Wastewater > Production processed - Non-citrus fruit

[49] City of San Diego Public Utilities Department Website: https://www.sandiego.gov/public-utilities/sustainability/renewable-energy.
[50] 17 CCR §§ 95480–95503.

- Wastewater Treatment: Industrial Wastewater > Production processed - Other vegetables
- Wastewater Treatment: Industrial Wastewater > Production processed - Potatoes
- Wastewater Treatment: Industrial Wastewater > Production processed - Poultry
- Wastewater Treatment: Industrial Wastewater > Production processed - Pulp and Paper
- Wastewater Treatment: Industrial Wastewater > Production processed - Red meat
- Wastewater Treatment: Industrial Wastewater > Production processed - Wine grapes
- Wastewater Treatment: Industrial Wastewater > Wastewater flow - Petroleum Refining

4 CONCLUSION

Emissions from the waste category accounts for about 5% of regional emissions.[51] Of this total, the vast majority of emissions are in the solid waste subcategory. Significant regulation of solid waste, particularly statutory targets for organic waste diversion; permitting conditions related to digester emissions in wastewater treatment plants; and the common practice of capturing methane for beneficial use both at landfills and wastewater treatment plants, limit the opportunities for additional GHG reductions from the waste category.

Based on our analysis, none of the offset credit protocols related to the waste are considered additional. Protocols related to landfill gas are considered not additional given the CARB LMCM regulation and the common use of capture of landfill gas and beneficial use. Those related to solid waste disposal are considered likely not additional because despite significant regulation there are specific exemptions, including for Tribal lands, that could result in eligible projects. Wastewater treatment represents minimal emissions due to high levels of methane capture for beneficial use. Also, of the offset credit protocols reviewed for this project, there are seven projects in California and none in the San Diego region. Of the projects in the California, they are about evenly split between landfill gas capture and combustion, solid waste diversion, and wastewater treatment.

[51] San Diego Association of Governments, San Diego Forward: The Regional Plan, Appendix D 2012 Regional Greenhouse Gas Emission Inventory for the San Diego Region and Projections, 2015, p. 26: https://www.sdforward.com/pdfs/RP_final/AppendixD-2012GreenhouseGasEmissionsInventoryfortheSanDiegoRegionandProjections.pdf. (Note this is the last publicly available estimate of regional emissions.)