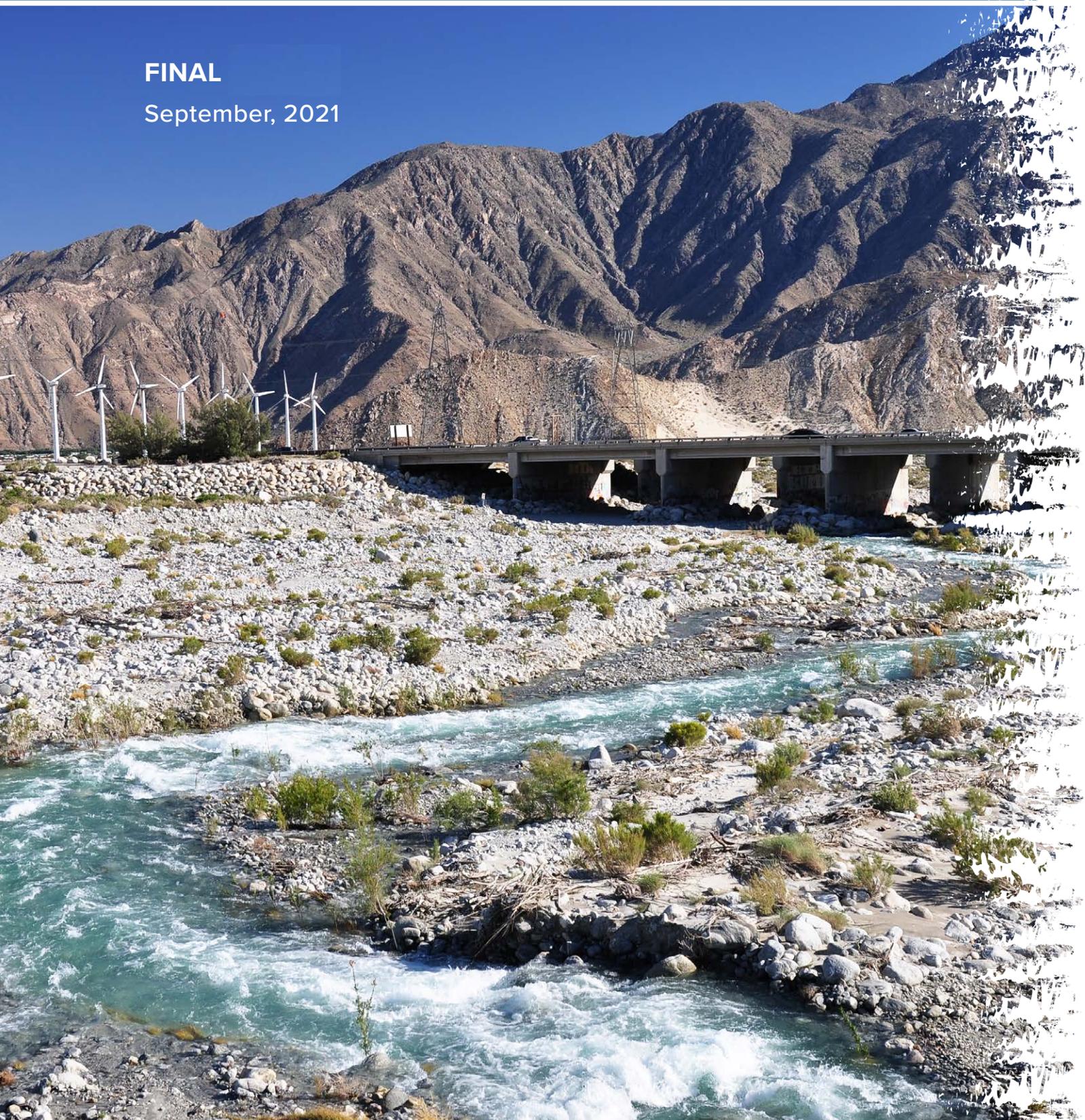


# CLIMATE ACTION & ADAPTATION PLAN



FINAL

September, 2021





## CAAP Lead Agency

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# EXECUTIVE SUMMARY

## CAAP MISSION STATEMENT

The Coachella Valley Water District (CVWD) recognizes the potential impact of climate change to its mission of providing high quality water to the Coachella Valley region at a reasonable cost in a reliable manner. CVWD has been reliably providing water since 1918, yet has begun

to experience the high variability effects of climate change from extreme rainfall and 52 recorded flooding events between 1997 and 2018 to persistent drought conditions that have escalated to extreme or exceptional drought conditions every year between 2014 and 2018.



This Climate Action and Adaption Plan (CAAP) provides a comprehensive assessment of CVWD's current operations and water supplies, and identifies the measures, policies, and projects that have been developed to reduce operational greenhouse gas (GHG) emissions. The development of the CAAP is part of CVWD's Fiscal

Year 2021 Strategic Initiative. As such, the CAAP will support CVWD's efforts to identify projects to reduce GHG emissions and improve water supply resiliency in the face of climate change, as well as to obtain funding necessary to implement such projects and further support CVWD's mission.

## CVWD SUCCESSES

CVWD is actively working to improve sustainability in its operations and end uses among its customers. CVWD runs rebate programs for homeowners to invest in water-efficient landscaping and washing equipment, seminars and workshops to educate its customers, including commercial and agricultural end-users, water conservation contests for homes and businesses, and a number of other water conservations programs that target commercial and agricultural water efficiency.

CVWD also operates five water reclamation plants that provide water recycling services to further conserve water within its service area. CVWD complies with the Sustainable Groundwater Management Act and adopted a Sustainable Groundwater Management Plan. CVWD's emphasis on sustainable water management provides the catalyst for developing its first CAAP to reduce GHG emissions from the district's operations while adapting to climate change.

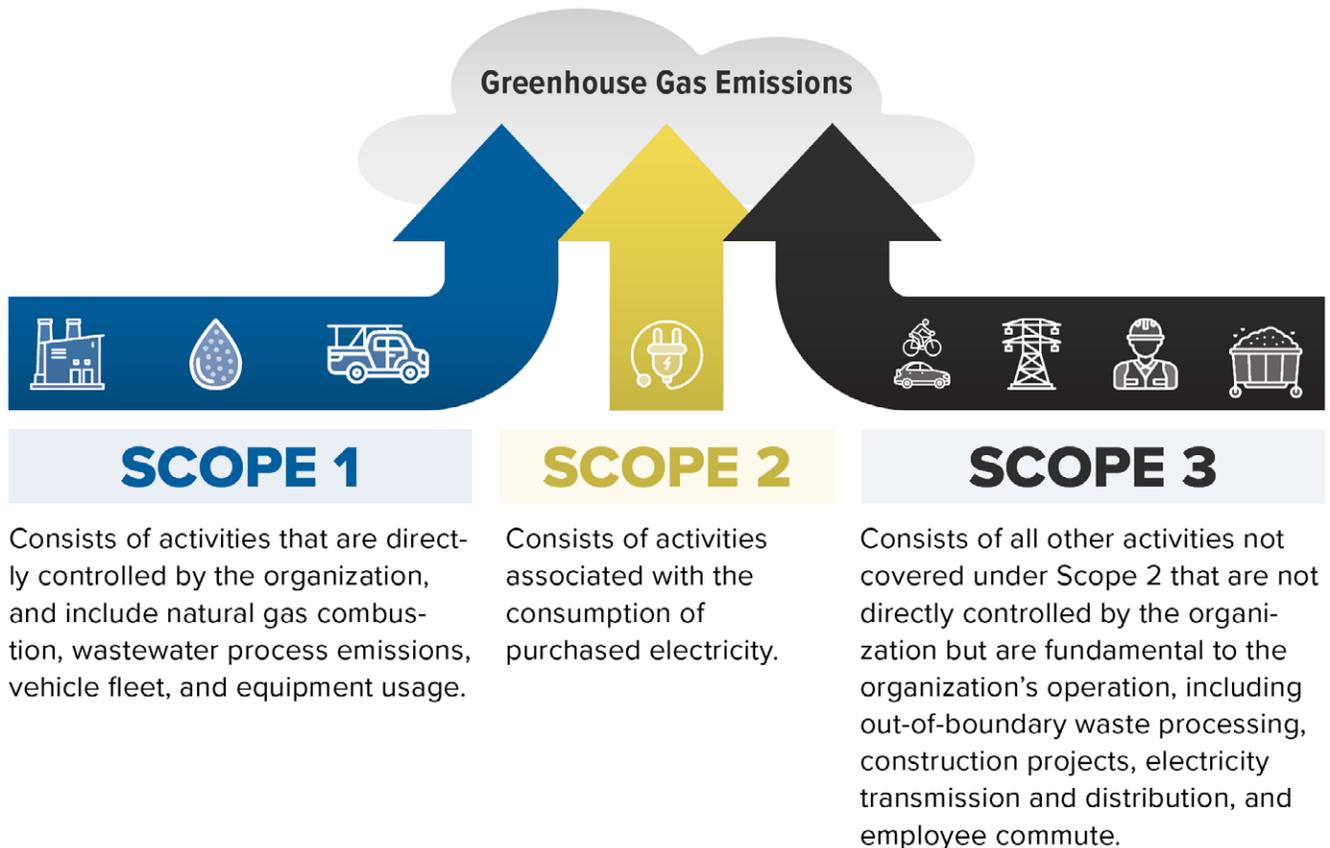


## GHG EMISSIONS INVENTORY

CVWD operations generate GHG emissions through natural gas combustion, wastewater process emissions, vehicle fleet and equipment usage, electricity usage, out-of-boundary waste processing, construction projects, electricity transmission and distribution, and employee commuting. As part of the CAAP development process, a multi-year inventory of GHG emissions resulting from CVWD's

GHG-generating activities was prepared for CVWD operations between 2016 and 2019. CVWD exercises direct control over some of their GHG-generating activities, while other activities, such as employee commute, are not directly under CVWD's control. GHG-generating activities are therefore, categorized into three "scopes" which describe three levels of operational control (Figure ES-1).

**Figure ES-1. Scope Categories**



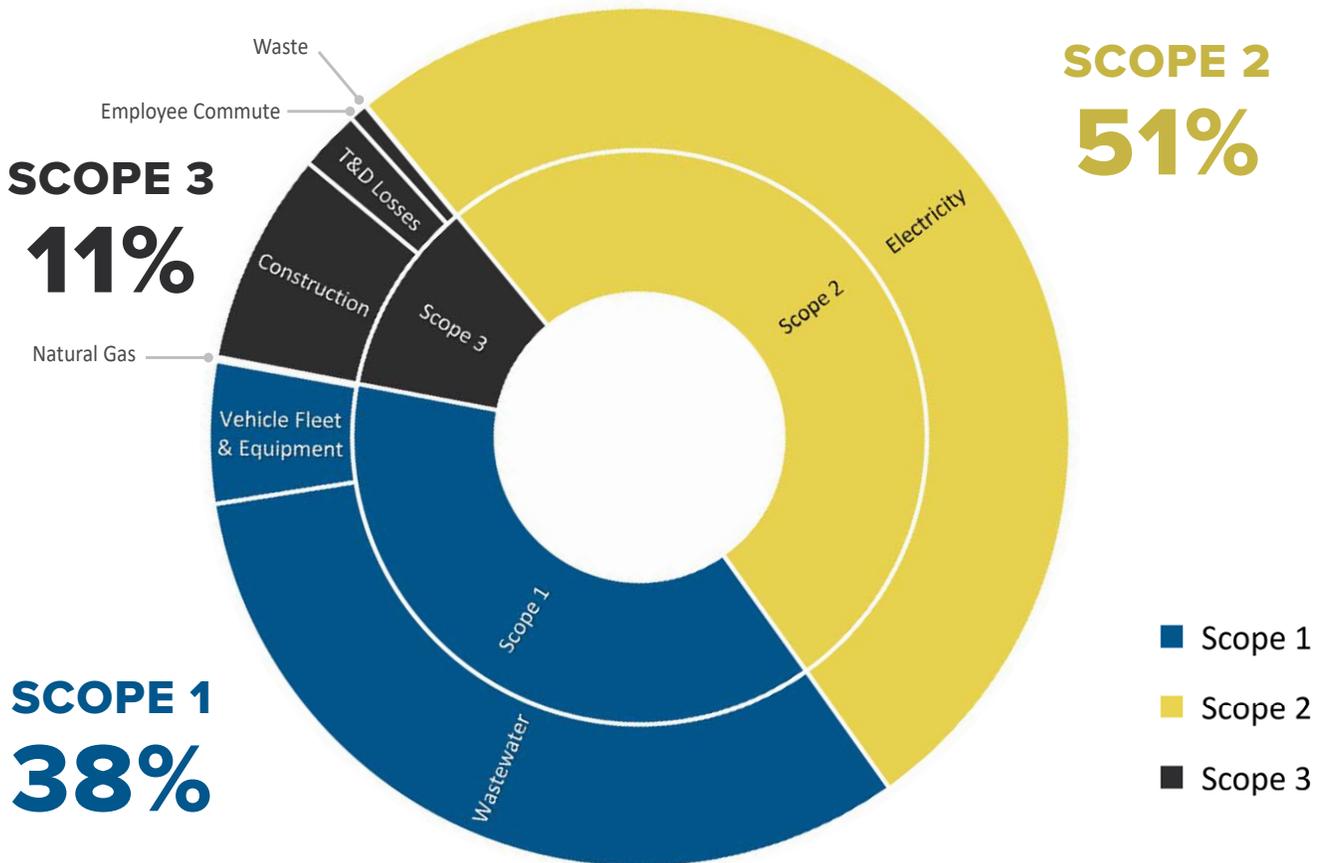


# Climate Action & Adaptation Plan

CVWD emitted approximately 68,000 metric tons (MT) of carbon dioxide (CO<sub>2</sub>e) per year on average between 2016 and 2019. As shown in Figure ES-2, the largest source of GHG emissions at CVWD is electricity usage (Scope 2 at 51%), followed by wastewater treatment, vehicle fleet and natural gas combustion (Scope 1 at 38%). Indirect emissions (Scope 3), including

construction, employee commute, waste generation, and transmission and distribution losses associated with electricity, make up the remaining 11 percent of CVWD's GHG emission profile. As such, the largest portion of GHG emissions generated by CVWD (i.e., Scope 1 and Scope 2 emissions) are under CVWD's operational control.

**Figure ES-2. Average GHG Emissions by Scope**



## CVWD GHG TARGETS

The primary drivers of climate action at the state level are Assembly Bill (AB) 32, Senate Bill (SB) 32, and Executive Order (EO) B-55-18. SB 32, the successor to AB 32, requires the state of California to achieve a statewide reduction in GHG emissions of 40 percent below 1990 levels by 2030, while EO B-55-18 established the statewide goal to reach carbon neutrality by no later than 2045. While CVWD is not beholden to AB 32, SB 32, or EO B-55-18, and currently faces no legislative requirements to reduce their GHG emissions, the state's SB 32 Scoping Plan adopted in 2017 recognizes water agencies as one of the largest opportunities for reducing

energy emissions in California. Further, it is anticipated that additional legislation and regulations will be established in the future that could require CVWD to adopt low-carbon practices and operations. As such, CVWD has elected to establish GHG emission reduction goals in alignment with the state's goals to provide a framework for achieving voluntary GHG emissions reductions in future years.

As shown in Table ES-1, this CAAP establishes a climate action target or reduction goal for 2030 and a longer-term GHG emissions reduction goal for 2045. The 2030 and 2045 targets align with California SB 32 and EO B-55-18, respectively.

**Table ES-1. CVWD Climate Action Targets**

Target Description		1990	2030	2045
CVWD's Climate Action Targets	Percent Reduction from 1990	N/A	40%	100%
	Per Capita Emissions (MT CO <sub>2</sub> e/person) <sup>1</sup>	0.26	0.16	0.00
	Absolute Emissions (MT CO <sub>2</sub> e)	76,558	49,927	0

*Note: CVWD has established per capita targets and will monitor progress towards these targets using per capita metrics. For reference, the per capita targets have been translated to absolute emissions in units of MT CO<sub>2</sub>e, but these values do not represent CVWD's official targets.*

<sup>1</sup> Per capita emissions are calculated by dividing the emissions attributable to CVWD operations by the customer base that CVWD serves.



## REDUCTION STRATEGY SUMMARY

CVWD’s targets represent the best intentions with respect to GHG emissions reduction efforts. To move CVWD towards their established GHG targets, the CAAP includes 12 measures, each with their own supporting actions. Table ES-2 shows each of the 12 measures and their expected contribution to CVWD’s GHG emissions reductions. As shown in Table ES-2, these measures have the potential to reduce GHG emissions by 9,816 MT CO<sub>2</sub>e by 2030 and an additional 5,848 MT CO<sub>2</sub>e by 2045. While the measures and actions identified in this CAAP will not fully close the gap

between CVWD’s forecasted emissions and its GHG emission targets, implementation of these measures will lead to significant progress in reducing GHG emissions, provide a foundation for aligning with State goals, and improve resiliency of CVWD’s facilities. CVWD is committed to monitoring their progress and continuing to identify opportunities for further reductions to achieve their targets.. This CAAP includes an implementation and monitoring plan (Section 6) to guide CVWD on the steps to achieve and track the CAAP over the next five to ten years.

**Table ES-2. Measures – At a Glance**

ID	Measure	2030 GHG Reduction (MT CO <sub>2</sub> e)	2045 GHG Reduction (MT CO <sub>2</sub> e)
<b>Scope 1</b>			
DC-1	Phase out natural gas combustion at CVWD facilities, such that 50% of natural gas combustion equipment is replaced with electric equivalents by 2030.	55	122
FL-1	Replace vehicle fleet with zero-emission vehicles as technology allows in alignment with the Advanced Clean Fleet Rule, such that by 2030 40% of vehicle fleet are zero emissions vehicles and by 2045 100% of the vehicle fleet are zero emissions.	761	4,080
FL-2	Use alternative fuels to bridge the technology gap to zero emission vehicles and off-road equipment by achieving 100% replacement of #2 diesel with 100% renewable diesel by 2030.	1,066	1,210
FL-3	Reduce vehicle miles traveled and fuel use for non-ZEV/EV fleet vehicles.	417	0

ID	Measure	2030 GHG Reduction (MT CO <sub>2</sub> e)	2045 GHG Reduction (MT CO <sub>2</sub> e)
WW-1	Reduce GHG process emissions associated with wastewater treatment.	Supportive <sup>1</sup>	Supportive <sup>1</sup>
<b>Scope 2</b>			
E-1	Utilize low-carbon and carbon-free electricity.	4,486	0
EE-1	Improve energy efficiency at CVWD facilities and buildings.	2,965	0
<b>Scope 3</b>			
WG-1	Increase organic waste diversion to achieve 75% reduction in landfilled organic waste by 2025 and zero-waste by 2045.	10	32
TR-1	Incentivize more sustainable commutes.	56	95
WC-1	Increase water conservation and local water supply.	Supportive <sup>1</sup>	Supportive <sup>1</sup>
CS-1	Investigate and implement carbon capture and sequestration opportunities.	Supportive <sup>1</sup>	Supportive <sup>1</sup>
CR-1	Reduce construction-related GHG emissions by CVWD through emissions reduction controls and/or equipment requirements.	Supportive <sup>1</sup>	Supportive <sup>1</sup>
<b>GHG Reduction Summary</b>			
<b>Total GHG reductions with full implementation of all measures</b>		<b>9,816</b>	<b>5,848</b>
<b>Total GHG reductions needed to meet targets<sup>3</sup></b>		<b>19,499</b>	<b>45,781</b>
<b>GHG reductions remaining</b>		<b>9,683</b>	<b>39,933</b>

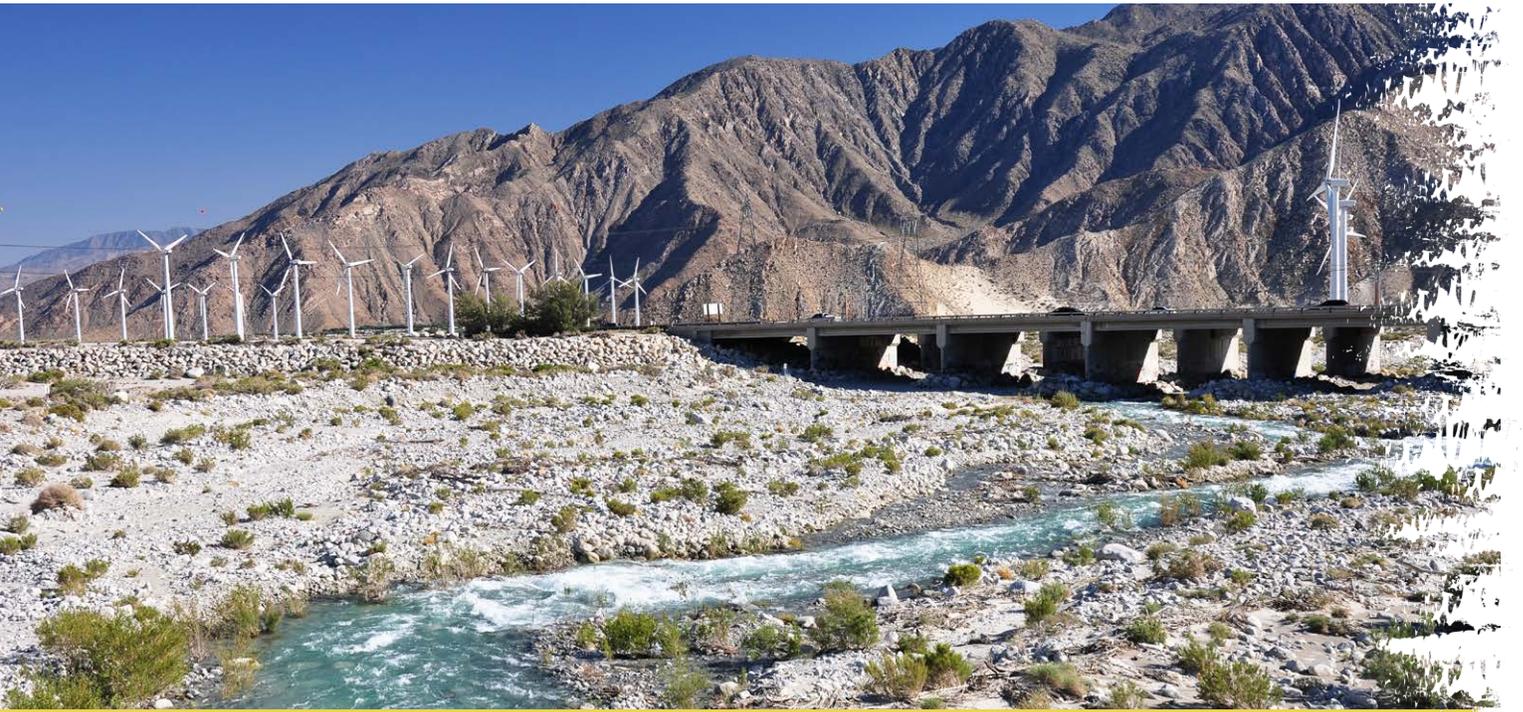
Notes: Values have been rounded and may not add up exactly. See Appendix C for methodology and calculations details. MT CO<sub>2</sub>e = metric tons of carbon dioxide equivalent; ZEV/EV = zero emission vehicle/ electric vehicle; GHG = greenhouse gas; DC = Direct Combustion; FL = Fleet; WW = Wastewater; E = Electricity; EE = Energy Efficiency; WG = Waste Generation; TR = Transportation; WC = Water Conservation; CS = Carbon Sequestration; CR = Construction.

<sup>1</sup> Supportive measures are those that are not quantifiable as a standalone action but may support quantifiable actions through providing opportunities for studying technologies, establishing policies, etc. Additionally, some measures are listed as supportive as they are in the early phase of implementation and the extent of quantifiable GHG reductions is dependent on the completion of the preceding actions (e.g., conduct feasibility study). Therefore, such measures are conservatively listed as supportive to not overestimate GHG reduction potential.

<sup>2</sup> GHG emission reduction potential is based on all electricity switching to a 50% green rate tier through SCE and IID as part of Measure E-1. The GHG emission reduction potential would increase to 29,712 MT CO<sub>2</sub>e by 2030 with all electricity switched to 100% renewable electricity as part of Measure E-1.

<sup>3</sup> As described in Section 4, CVWD established GHG reduction goals in alignment with a SB 32 Efficiency Target pathway.





# 1. INTRODUCTION

## VISION

The Coachella Valley Water District's (CVWD) Climate Action and Adaption Plan (CAAP) provides a comprehensive assessment of CVWD's current greenhouse gas (GHG) emissions related to operations and water supplies. The CAAP includes an inventory of existing, historic, and projected GHG emissions, and identifies the measures that have been developed to

reduce GHG emissions and increase climate resiliency. CVWD exercises direct and indirect control over GHG generating activities, and understands the responsibility and contribution to be made towards the larger cumulative effort to address climate change in California. Implementation of this CAAP will increase CVWD's resilience to both existing and anticipated



# Climate Action & Adaptation Plan

climate change effects through 2045. The CAAP demonstrates CVWD's commitment to aligning with California's GHG reduction goals to work towards limiting global temperature rise below 2 degrees Celsius in this century, while continuing to provide reliable, safe, and affordable water throughout CVWD's service area.

The development of CVWD's inaugural CAAP was identified within CVWD's FY21 Strategic Plan as Initiative 2 (Goal: Water Quality & Environmental Leadership), and is intended to improve project eligibility for state/Federal grant and loan application packages to support CVWD's Capital Improvement Programs. As such, the CAAP will support CVWD's efforts to identify projects that reduce GHG emissions and improve water supply resiliency in the face of climate change, as well as to obtain funding necessary to implement such projects, thereby supporting CVWD's mission. Additionally, the CAAP complements CVWD's long-range planning efforts including the *2020 Coachella Valley Regional Urban Water Management Plan*, *2018 Coachella Valley Integrated Regional Water Management (IRWM) & Stormwater Resources (SWR) Plan*, the *2019 Coachella Valley Water District Hazard Mitigation Plan*, the *Coachella Valley Water District Sanitation Master Plan Update 2020*, and ongoing water conservation programs.

CVWD recognizes that climate plays a central role in the operation, planning, and management of water resource systems for water supply, flood management, and environmental stewardship. Historically, an understanding of the climate system and experience with meteorological and hydrological events have been on the basis for planning and water resource management. However, climate change is impacting the timing and form of precipitation; the timing, magnitude, and distribution of runoff; and the availability of water for beneficial use in unpredictable ways.

The potential impacts of climate change on water resources may be felt through changes in temperature, precipitation, and runoff. In particular, the Colorado River Hydrologic Region is subject to climate vulnerabilities such as reduced quality and availability of imported water; reduced groundwater replenishment; increased frequency and intensity of flooding events; increased risk of large wildfires and impacts on affected infrastructure; and increased temperatures and extreme heat events (*Section 2*). Increased temperatures in the Coachella Valley cause increased water demands for crop and landscape irrigation, municipal water use, and contribute to evaporative losses from canals and open reservoirs. As such, the implications of climate change regionally and nationally may adversely impact the Coachella Valley's water resources.

## CVWD Mission and Water Supply Goal

CVWD's mission is to meet the water-related needs of the people through dedicated employees and providing high-quality water at a reasonable cost. This mission applies to all CVWD activities, as CVWD provides water-related services for domestic use and agricultural irrigation, manages drainage, replenishes the groundwater basin, collects and treats wastewater, distributes recycled water, and provides regional stormwater management and flood protection.

CVWD holds a unique water rights position, as a special water district with rights to Colorado River water and as a California State Water Project contractor.

Additionally, CVWD engages in several water conservation projects to supplement the needs of its service area, and offers numerous water conservation programs and rebates to its residential and business customers.

To meet CVWD's mission, this CAAP was developed to align with CVWD's goals and long-range planning efforts, with the intent to reduce GHG emissions associated with water distribution over time. The following section provides an overview of existing CVWD plans that provided the basis for this CAAP, to ensure cohesion among long-range planning efforts by CVWD.





## CVWD Long-Range Planning

As an urban water supplier, CVWD is required to prepare an Urban Water Management Plan (UWMP) every five years in response to the requirements of the UWMP Act, California Water Code Sections (CWC) 10610 through 10656. To this end, in June 2020, CVWD's Board of Directors approved the 2020 Coachella Valley Regional Urban Water Management Plan (RUWMP 2020). CVWD coordinated their planning efforts with several local water agencies to calculate demand projections, characterization of shared supplies, and planning for potential water shortages. This partnership included CVWD, Coachella Water Authority (CWA), Desert Water Agency (DWA), Indio Water Authority (IWA), Mission Springs Water District (MSWD), and Myoma Dunes Mutual Water Company (MDMWC). UWMPs are required to support long-term resource planning to ensure that adequate water supplies are available to meet existing and future water needs. UWMPs must assess the reliability of water sources over a 20-year planning horizon during normal, single-dry, and multiple-dry years; describe management measures and water shortage contingency plans; report progress toward meeting conservation goals and targeted reduction in per-capita urban water consumption; and discuss the current and planned uses of recycled water. To be consistent with anticipated growth in operations, water supply and demand projections are incorporated into the CAAP.

The *2018 Coachella Valley Integrated Regional Water Management & Stormwater Resources Plan* (IRWM & SWR Plan) addresses the requirements of the California Department of Water Resources (DWR). The IRWM & SWR Plan was developed by the Coachella Valley Regional Water Management Group (CVRWG), a partnership composed of five Coachella Valley water purveyors including CVWD. The IRWM & SWR Plan addresses reliability for long-term water supply as well as stormwater and dry weather runoff capture pursuant to SB 985. The IRWM & SWR Plan identifies water management issues and needs, evaluates resource management strategies, and establishes a framework for implementation of projects that focus on improving water quality, reduce local flowing and increase water supplies in the watershed. Per the requirements of the DWR, IRWM plans must include an analysis of the effects of climate change on water resources and identify climate change vulnerabilities. Given the identified vulnerabilities of the regions water supply and flood management to climate change, the IRWM & SWR Plan not only includes adaptation and mitigation for climate change as factors included for consideration in evaluating projects, but also established that priority projects are expected to mitigate climate change through reduction in energy consumption and GHG emission reductions whenever feasible.

Other long-range planning documents such as the 2019 Coachella Valley Water District Hazard Mitigation Plan (HMP), have identified CVWD's environmental hazards and vulnerabilities and recommend specific actions to minimize such vulnerabilities. This was the first hazard mitigation plan developed by CVWD and explicitly sets a goal to increase the resiliency of CVWD by "ensuring hazard mitigation and climate change policies, projects, and activities receive consideration for funding, integration, and implementation." Included in the plan, is a series of hazard mitigation actions to be completed by CVWD over the next few years to address hazards. The CAAP complements the strategy and hazard mitigation actions detailed in the HMP.

*The Coachella Valley Water District Sanitation Master Plan Update 2020 (SWP)* establishes the comprehensive, long-term capital improvement program (CIP) to be implemented at CVWD between 2021 and through the horizon year of 2040. The SMP includes recommendations for specific sanitation projects for CVWD to undertake such as refurbishment of existing assets, operation optimization, and sanitation system upgrades to allow CVWD to plan for expansion and projected capacity needs in the future. Although not explicitly addressed, projects optimizing the operation of the sanitation system or improving the wastewater treatment plant process and efficiency can reduce GHG emissions. Therefore, the CAAP aligns with and highlights opportunities within the SWP that would reduce GHG emissions.



## CVWD Service Area and Climate

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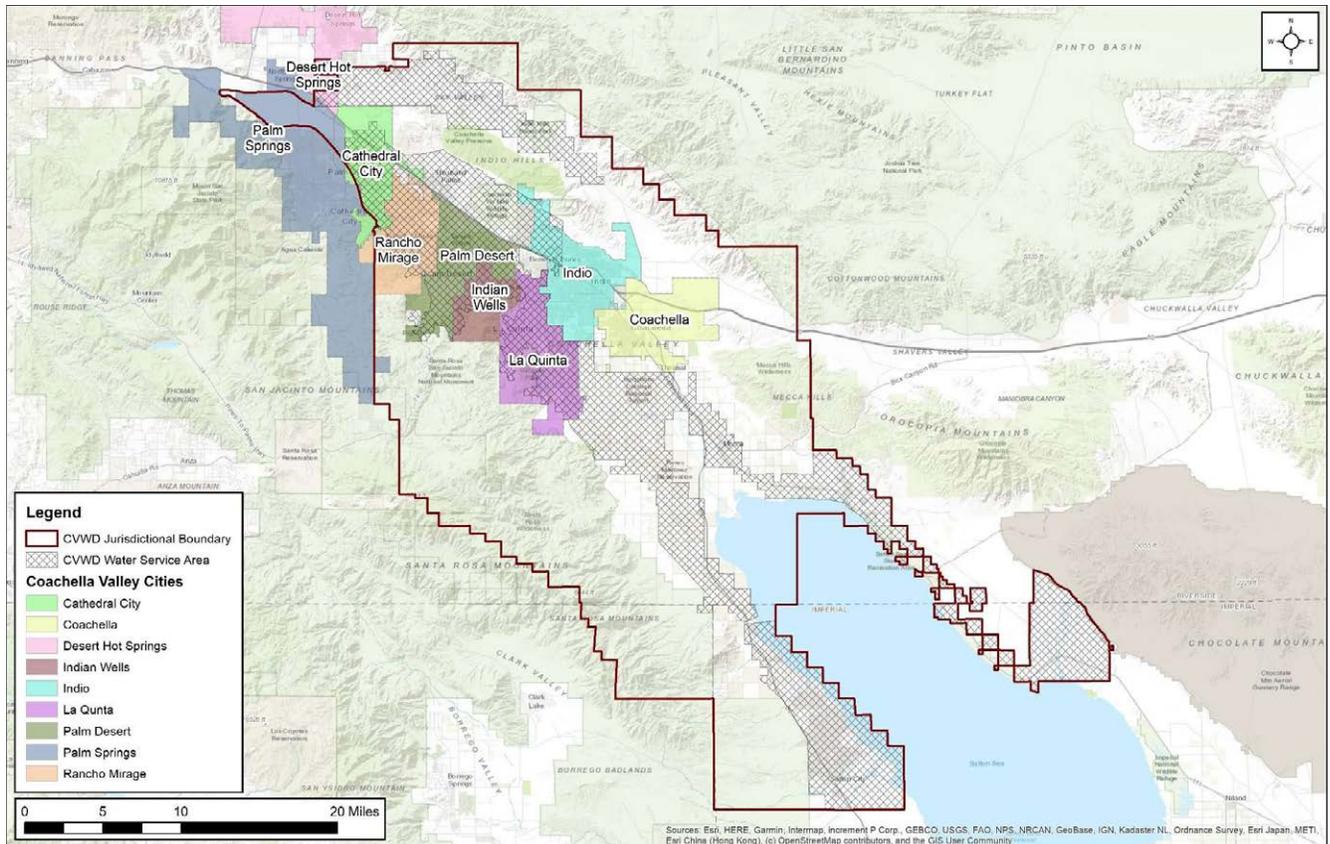
The CVWD service area, shown in Figure 1-1, is located in Northern Sonoran Desert of Southern California, and within the Colorado River Hydrologic Region as defined by the Department of Water Resources. Most of the Colorado River region has a subtropical desert climate with hot summers and short, mild winters. The mountain ranges on the northern and western borders, in particular the San Bernardino and San Jacinto Mountains, create a rain shadow effect for most of the region. Annual average rainfall amounts on the Valley floor range from a little over 6 inches to less than 3 inches. Most of the precipitation for the region occurs in the winter and spring. However, monsoonal thunderstorms, spawned by the movement

of subtropical air from the south, can occur in the summer and generate significant rainfall in some years. Higher annual rainfall and milder summer temperatures occur in the mountains to the north and west.

Data from climate stations in Palm Springs and Thermal (Desert Resorts Regional Airport) can be used as an indicator of climate in the CVWD service area. Monthly average temperature reaches as high as 108 degrees Fahrenheit (F) and monthly average low temperatures are 38 degrees F. Precipitation typically occurs during the winter months with an annual mean rainfall of approximately 5.5 inches in Palm Springs and 3.0 inches in Thermal.



Figure 1-1. CVWD Service Area Map



Source: 2020 Coachella Valley Regional Urban Water Management Plan  
<http://www.cvwd.org/DocumentCenter/View/5482/Coachella-Valley-RUWMP>





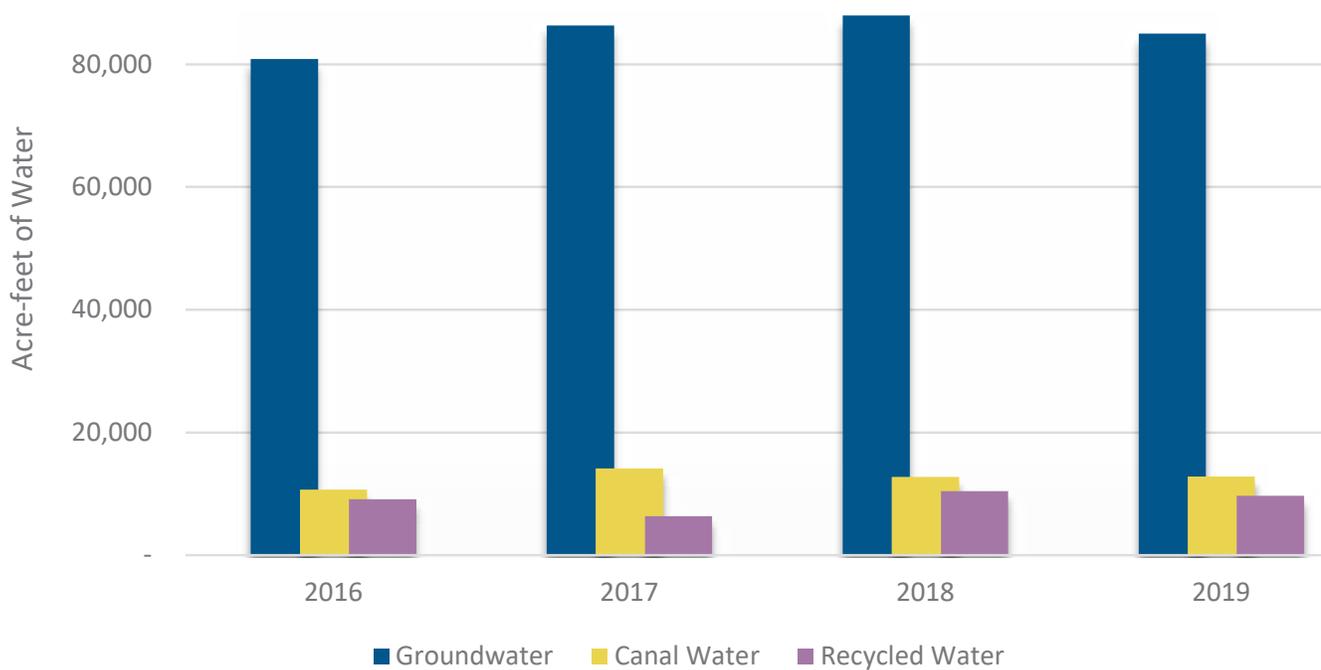
## CVWD Statistics

CVWD provides several water-related utility services to approximately 300,000 people in the Coachella Valley. This includes providing domestic and drinking water to approximately 108,000 homes and businesses, and serving over 94,000 wastewater accounts covering approximately 1,000 square miles with five CVWD owned and operated wastewater treatment plants. Additionally, CVWD maintains 123 miles of the Coachella Canal to provide Colorado River water for agriculture and irrigation needs, protects approximately 600 square miles of service area from flooding through stormwater control and management, and manages local groundwater through

groundwater replenishment. CVWD pumps, treats, and delivers groundwater for domestic uses and delivers canal water and recycled water for irrigation and other non-potable uses. Water delivered per year by CVWD from 2016-2019 is shown in Figure 1-2.

CVWD's GHG emissions associated with these water deliveries are primarily from the purchase and consumption of electricity used for water treatment, conveyance, and delivery of water throughout CVWD's service area, as well as process emissions associated with CVWD's five wastewater reclamation plants.

**Figure 1-2. Water Delivered per Year (AFY) by CVWD**



## CAAP PURPOSE

The CAAP is a long-range planning document that guides CVWD towards long-term emission reductions and adaptation to climate change impacts in alignment with the State of California goals, mandates, and current legislation. The CAAP includes an analysis of CVWD operations and associated emission sources, forecasts future emissions, highlights vulnerabilities, and establishes emission reduction and adaptation goals and measures. This CAAP will help inform policy and planning decisions on operations, water resources, capital investments, conservation, and local resource programs. Additionally, the CAAP aligns with CVWD's long-range plans including the 2020 RUWMP, IRWM & SWR Plan, SMP, and HMP. The CAAP will support CVWD's efforts to adjust operations as feasible to adapt to climate change effects and to obtain infrastructure grant/loan funding necessary for increasing resiliency.

In the CAAP, CVWD establishes GHG emissions reduction goals that align with those set by the State of California. The emissions inventory and forecast presented in Section 3 provides a basis for CVWD to establish goals for future GHG reductions. CVWD is setting a goal to reduce per capita GHG emissions 40 percent below 1990 levels by 2030, thereby aligning with the goals of SB 32, which requires

a 40 percent reduction in emissions from 1990 levels.

The CAAP creates a roadmap that provides CVWD with a broad range of measures to mitigate or reduce GHG emissions in line with state goals based on operational feasibility and cost. The CAAP will help CVWD reduce overall GHG emissions from its operations and aligns CVWD with state mandates and legislation, while providing consistency with CVWD's mission. In addition to establishing a pathway to CVWD's emissions reduction goal of 40 percent below 1990 levels by 2030, the CAAP does the following:

- Incorporates climate legislation and guidance from state, Federal, and international sources
- Identifies cost-effective energy efficiency and decarbonization measures
- Provides co-benefits, such as improved operational resilience and air quality
- Integrates actions to transition away from fossil fuel use in alignment with California's clean fleet goals and strategies to reduce GHG emissions from the transportation sector
- Identifies shovel-ready projects that are aligned with state and federal funding priorities



## CAAP Intent and Use

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The CAAP provides a comprehensive analysis of CVWD's operations and associated GHG emission sources as well as a programmatic guide for opportunities to reduce GHG emissions. This CAAP is not intended to serve as a qualified GHG Reduction Plan per the California Environmental Quality Act (CEQA) requirements of Section 15183.5(b). Although the CAAP discusses climate-related impacts and provides GHG reduction measures, it cannot be used to tier or streamline development projects as they relate to CEQA requirements. CVWD provides a critical service that is their priority; CVWD is also committed to implementing GHG reduction measures to the extent they are feasible and cost-effective. The CAAP's intent is to serve as an informative document that introduces concepts related to climate action planning and establishes a set of measures that align with the state's GHG reduction goals and associated legislation that CVWD can implement to reduce GHG emissions. By defining specific reduction goals, CVWD can track its progress towards meeting its goals and measure the success of its CAAP measures.

## CAAP Implementation Tracking

CVWD is committed to tracking the implementation of this CAAP using a specialized tracking tool called CAPDash.<sup>1</sup> CVWD will use this information to monitor its consistency with its GHG reduction goals (Section 4), evaluate the effectiveness of the CAAP at reducing GHG emissions, and adjust measures as necessary. The CAAP measures and actions in Section 5 include identification of the responsible entity/entities, timing, and monitoring approach. Section 6 details how GHG emissions will be measured on an annual basis, and how and when the CAAP will be updated. The CAAP is anticipated to be updated every five years, or sooner if needed, to ensure progress towards meeting CVWD's GHG reduction goals. CVWD can track the implementation of the CAAP measures and actions using CAPDash, and provide feedback information to refine its overall management strategies.

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1. CAPDash is a cloud based GHG Inventory Monitoring and Reporting Tool that generates a transparent GHG inventory that can be updated on an annual basis by uploading activity data and tracks the implementation of the CAAP measures over time. All final CAAP measures will be uploaded into CAPDash allowing CVWD to track activity data for each measure and monitor progress over time. The tool additionally serves as an automatically updating dashboard that displays data that can be used internally for reporting and for external display.

## HISTORY AND CURRENT OPERATIONS

This section provides an overview of CVWD's history and operations, including its water supply sources, treatment requirements, and infrastructure.

### CVWD Formation and Service Area

CVWD is a special district formed in 1918 under the County Water District Act provisions of the California Water Code. CVWD is governed by a five-member Board of Directors that are elected to four-year terms by the voters residing in the five directorial divisions. As a government agency, CVWD policies are regulated by state and Federal agencies rather than by the Public Utilities Commission.

The Coachella Valley encompasses the northwestern portion of the Salton Trough and is bounded by the Santa Rosa-San Jacinto Mountains on the west, and the San Bernardino Mountains to the north and northeast. CVWD's service area covers approximately 1,000 square miles from the San Gorgonio Pass to the Salton Sea, and is the largest urban water supplier in Coachella Valley. CVWD's service area includes nine incorporated cities, as well as several census designated places and unincorporated areas of three separate counties; CVWD is primarily within Riverside County, though its service area extends into the northeastern portion of

San Diego County and the northern portion of Imperial County.

Coachella Valley is divided geographically into the West Valley and the East Valley. The West Valley encompasses the cities of Palm Springs, Cathedral City, Rancho Mirage, Indian Wells and Palm Desert, while the East Valley included the cities of Coachella, Indio, La Quinta and the communities of Bermuda Dunes, Mecca, and Thermal. Water service to the West Valley is primarily based on resort- and recreation-based needs, and relies on local groundwater. The East Valley is primarily characterized by an agriculturally based economy and relies on both local groundwater and imported Colorado River water delivered via the Coachella Canal. Refer to Figure 1-1 for CVWD's Service Area Map.



## CVWD Water Operations Overview

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CVWD provides multiple water-related services including domestic (drinking) water supply, wastewater collection and treatment, recycled water, agricultural irrigation, drainage management, imported water supply, groundwater replenishment, stormwater management and flood control, and water conservation. The following sub-sections describe the water sources and supplies used to meet the needs of CVWD's water service customers.

### CVWD Water Sources and Supply

CVWD's water supplies include local groundwater from Whitewater River (Indio) Subbasin and the Mission Creek Subbasin common water supplies, recycled water from two CVWD-owned water reclamation plants, and imported supplies from the Colorado River. Water supplies are used to meet CVWD's urban and non-urban water demands and to replenish local groundwater supplies. CVWD also conducts groundwater replenishment to reduce groundwater overdraft and associated land subsidence issues. Groundwater is the principal source of municipal water supply in the Coachella Valley and meets 100 percent of CVWD's domestic and potable water demands.

### Domestic Water Delivery

CVWD is the largest urban water supplier in the Coachella Valley with over 100,000 municipal connections. CVWD's domestic water system has 64 pressure zones and consists of approximately 97 groundwater production wells, 2,000 miles of pipe, and 133 million gallons of storage in 65 enclosed tank reservoirs.

### Irrigation Water Delivery and Agricultural Drainage

CVWD's irrigation system provides Colorado River water to over 1,200 customers covering over 75,000 acres via the 123-mile, concrete-lined, Coachella Branch of the All-American Canal. The irrigation distribution system consists of 485 miles of buried pipe, 16 pumping plants, and 1,300 AF of storage. Due to a high perched groundwater table and concentration of salts in irrigated soils within CVWD's service area, an agricultural drainage system is necessary. CVWD operates and maintains an agricultural drainage system consisting of 166 miles of buried pipe ranging in size from 18 inches to 72 inches in diameter and 21 miles of open channels to serve as a drainage network for irrigated lands. The system receives water from on-farm drainage lines. In most areas, the drainage system flows to the Coachella Valley /Whitewater River Stormwater

Channel. However, in areas near the Salton Sea, a number of open channels convey flows directly to the sea.

## Groundwater Recharge

CVWD operates and maintains groundwater recharge facilities at three locations in the Coachella Valley: Whitewater River Groundwater Replenishment Facility, Palm Desert Groundwater Replenishment Facility and the Thomas E. Levy Groundwater Replenishment Facility.

## CVWD Wastewater and Recycled Water

CVWD owns and operates five wastewater reclamation plants (WRPs) that receive a combined average of 17 million gallons of wastewater a day and serving over 94,000 accounts. All five of the WRPs operate using aerobic methods with varying influent loads and Biochemical Oxygen Demand (BOD)<sup>5</sup>. Currently, approximately 6.3 billion gallons of wastewater is treated at these WRPs annually. However, CVWD's system has the capacity to increase treatment capabilities as population grows.

Recycled wastewater is used for groundwater replenishment and for outdoor irrigation. CVWD also delivers Colorado River water via the Coachella Canal for agricultural irrigation. CVWD maintains approximately 2,500 miles of on-farm drainage that conveys drained agricultural irrigation water to the Salton Sea. Two of the water

reclamation plants (WRP 7 and WRP10) recycle an average of about 8 MGD for golf course and municipal irrigation. The recycled water distribution systems serve a total of 20 customer accounts through 31 miles of pressurized distribution pipelines. The main focus of the recycled water system is to provide non-potable water to golf courses, but also serve non-potable water to municipal buildings and homeowner associations (HOAs) for landscape irrigation.

## Stormwater Protection

CVWD provides regional flood protection for its stormwater unit within the Coachella Valley. CVWD's stormwater unit extends from the Whitewater River Groundwater Replenishment Facility in Palm Springs to Salton City, encompassing approximately 380,000 acres. CVWD's regional flood control system consists of a series of debris basins, levees, and stormwater channels that divert floodwaters from the canyons and alluvial fans surrounding the Coachella Valley to the 50-mile Whitewater River/Coachella Valley Stormwater Channel (CVSC) that flows to the Salton Sea.

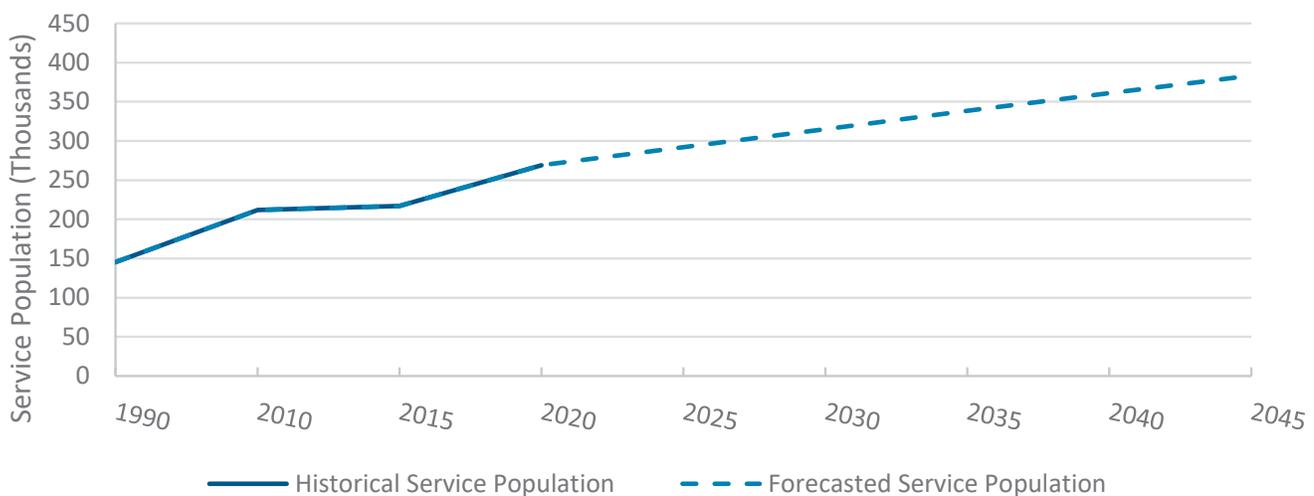


## CVWD Environmental Commitment and GHG Reduction History

CVWD’s GHG emissions are primarily related to the purchase and consumption of electricity used for operations and wastewater treatment throughout the CVWD service area. Historically, CVWD’s GHG emissions have remained relatively consistent. This is in part due to CVWD’s reliance on local groundwater sources, and pumping similar amounts each year, such that there has been minimal variability in pumping needs and associated GHG emissions. However, future GHG emissions are anticipated to increase due to expansion of CVWD’s services and increases in CVWD’s service population estimated in the 2020 RUWMP.<sup>2</sup> As shown in Figure 1-3, service population is estimated to grow

from approximately 268,952 in 2019 to 383,300 in 2045.<sup>3</sup> Impacts from the changing climate, such as increased frequency and severity of drought conditions, may impact local groundwater supplies and water quality, as well as the availability of imported water from the Colorado River. Prior to development of this CAAP, which is CVWD’s first climate action planning document, CVWD has reduced its GHG emissions through the implementation of operational efficiencies, renewable energy projects, and water conservation programs into their services. Some of these efforts and the associated effects on reducing GHG emissions are summarized below.

**Figure 1-3. Historical and Forecasted Service Population by CVWD**



2. <http://www.cvwd.org/DocumentCenter/View/5482/Coachella-Valley-RUWMP>  
 3. <http://cvwd.org/ArchiveCenter/ViewFile/Item/516>

## Infrastructure Energy Efficiency and Renewable Energy

Through Capital Investment and Annual Strategic Plans, CVWD has continually invested in projects and efforts to upgrade infrastructure and improve the energy efficiency of its operations. This has included energy audits and upgrades at WRPs to optimize energy use, as well as coordination with Southern California Edison for efficiency modifications.

CVWD has demonstrated commitment to energy efficiency improvements through the design of its facilities; for example, CVWD's Critical Support Services Building at its Palm Desert campus was designed in alignment with Leadership in Energy and Environmental Design (LEED) specifications.<sup>4</sup>

CVWD is continuing to develop new initiatives to further improve energy use at CVWD facilities. Current planning and operational efforts include: regularly auditing energy use and implement energy efficiency adjustments; incorporate time-of-use solar panels on parking structures; and installing a battery system for solar energy storage at the Palm Desert campus. With these improvements, a majority of all energy consumption at the Palm Desert campus may eventually be achieved through produced solar energy.

## Water Conservation

Since 2009, CVWD has developed a number of water conservation programs to reduce urban water use and align with the State of California's requirement that all water providers reduce their water deliveries by 20 percent by 2020. CVWD provides funding, education, and engagement for multiple water conservation programs, including a rebate program for residential and commercial customers for turf conversion, smart irrigation controllers, and high efficiency/ low-flow appliances (e.g. toilets, washing machines). Additionally, CVWD has conducted water audit and leak detection monitoring programs for large water users. Since the start of the Leak Detection Program in 2013, approximately 1,406 miles of water main have been surveyed and approximately 137 million gallons of water have been saved. As part of the Golf Course Conservation Program, CVWD has assisted in the removal of 24 acres of turf from golf courses to date, saving approximately 12 million gallons of water annually. Detailed descriptions of CVWD's water conservation efforts can be found online at <http://www.cvwd.org/31/Conservation>. The decrease in water consumption through water conservation efforts has the co-benefit of also reducing GHG emissions associated with the energy needs for water treatment and delivery.

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4. The Critical Support Service Building is not LEED certified, however was designed following LEED specifications.





## 2. SCIENTIFIC CONTEXT FOR CLIMATE CHANGE

### CLIMATE CHANGE CAUSES AND IMPACTS

This section provides an overview of the scientific context and forecasted impacts of climate change to CVWD's operations. Included are discussions of the greenhouse effect, GHG emissions

data in California, CVWD's GHG emissions sources, and climate change impacts and vulnerabilities specific to CVWD's operations<sup>5</sup>.

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<sup>5</sup> This section relies on best-available science-based climate modeling projections for the Coachella Valley. As climate modeling is inherently uncertain, projections represent best estimates of a future climate and are not meant to serve as exact predictions.

## Greenhouse Effect and Emissions Sources

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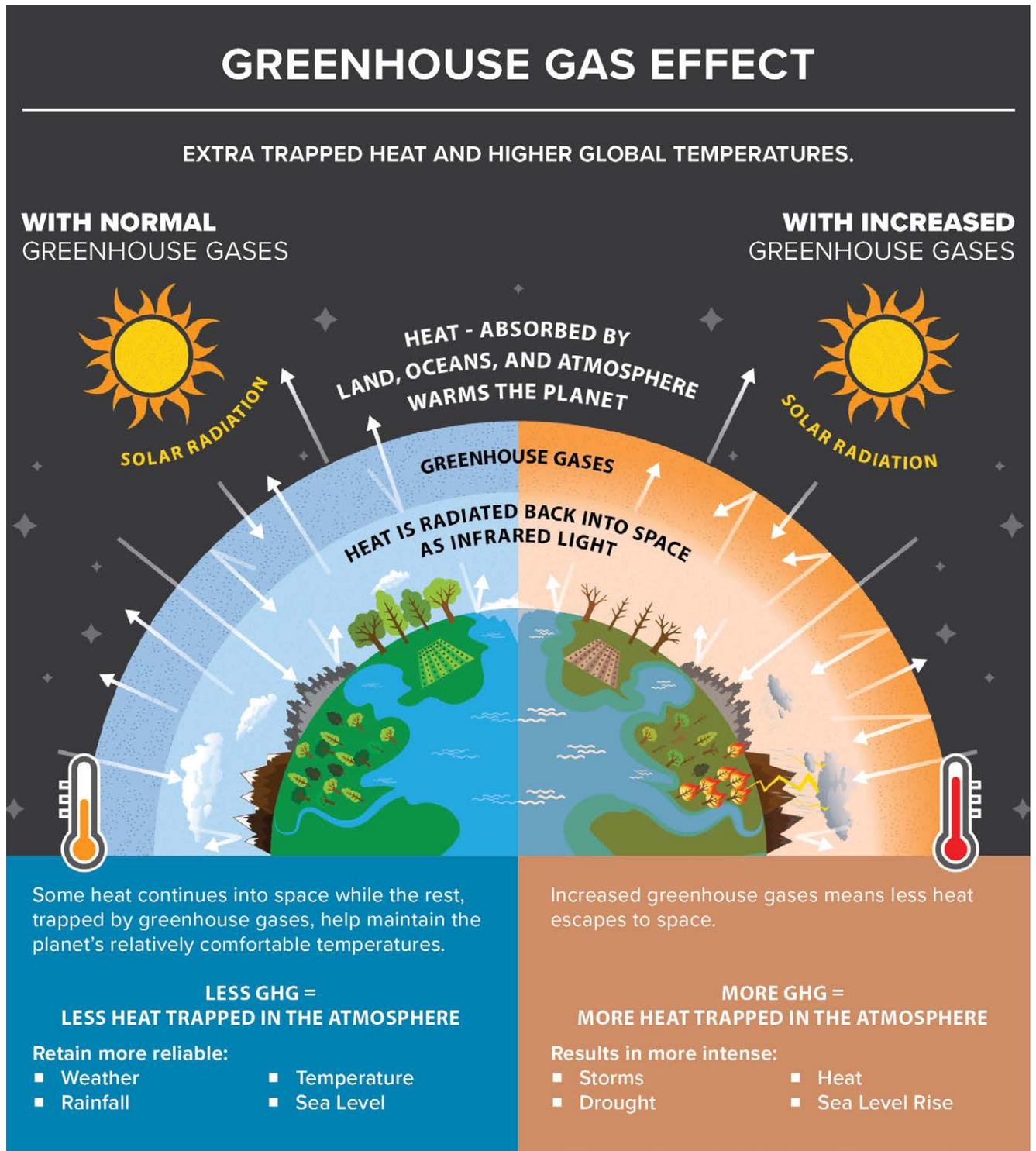
### Greenhouse Effect

Most of the energy that affects the Earth's climate comes from the sun. When solar radiation reaches the Earth, some fraction is adsorbed by the Earth's surface and some is reflected back into space. Gases in the Earth's atmosphere act like a blanket reducing the amount of energy radiated back into space from Earth's surface resulting in heat being trapped within the atmosphere. This is known as the "greenhouse effect" because atmospheric

gases function similar to the windows in a greenhouse, which trap the Sun's rays and create a much warmer space inside the greenhouse than the outside air. The greenhouse effect regulates the Earth's climate, maintaining conditions suitable for life on Earth. However, a rapid increase of GHG emissions can cause excess heat to be trapped, affecting global temperatures and climate. This process is depicted in Figure 2-1.



Figure 2-1. Greenhouse Gas Effect and Associated Climate Impacts<sup>6</sup>



<sup>6</sup> Information in Figure 2-1 regarding the Greenhouse Effect was obtained from <https://www.epa.gov/ghgemissions/sources-greenhouse-gas-emissions>

## Global Warming Potential

The primary GHGs that contribute to the greenhouse effect on Earth include carbon dioxide (CO<sub>2</sub>e), methane (CH<sub>4</sub>), and nitrous oxides (N<sub>2</sub>O). These are also the primary GHG's contributed to the atmosphere by human activities, for example through the combustion of fossil fuels for energy, agricultural and industrial activities, and other

processes. Of the GHG's contributed to the atmosphere by human activities, CO<sub>2</sub> makes up 76 percent of these emissions, CH<sub>4</sub> makes up 16 percent, N<sub>2</sub>O makes up 6%. The remaining 2 percent of emissions arise from other GHG's called fluorinated gases.

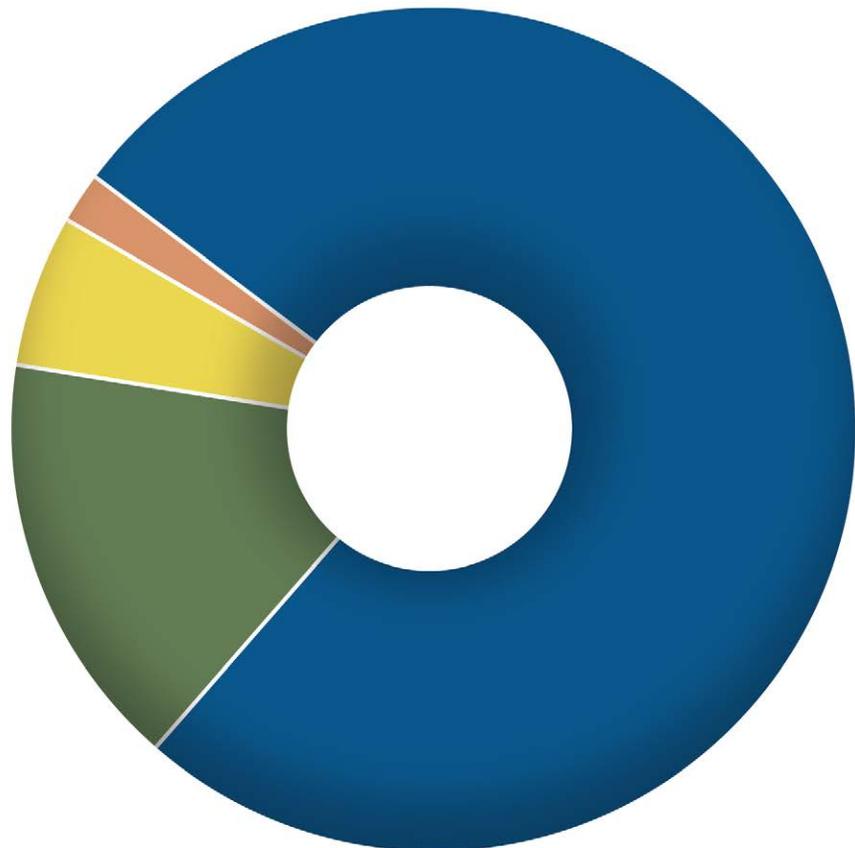
**Figure 2-2. GHGs from Human Activities**

**2%**  
**Fluorinated Gases**

**6%**  
**Nitro Oxide**

**16%**  
**Methane**

**76%**  
**Carbon Dioxide**



*(Source is IPCC 2014 AR5)*

Each GHG has its own global warming potential (GWP), which refers to the extent to which the GHG traps energy in the atmosphere.<sup>7</sup> The determination of a GHG's GWP utilizes CO<sub>2</sub> as a reference point, and compares the potential impact of different GHGs where CO<sub>2</sub> has a GWP of 1. Using the 100-year GWP values published in the International Panel on Climate Change (IPCC) *Fifth Assessment Report* (IPCC 2014), methane has a GWP of 28, meaning that each unit of methane causes 28 times more global warming potential than 1 unit of CO<sub>2</sub>, while nitrous oxide has a GWP of 265.<sup>8,9</sup> Other GHGs include the fluorinated gases, which can have a GWP of

up to 23,500. IPCC publishes Assessment Reports to update GWPs of several GHGs following advances in scientific knowledge on the radiative efficiencies and atmospheric lifetimes of GHGs. When individual GHGs are normalized based on their GWPs, we refer to them as carbon dioxide equivalents or CO<sub>2</sub>e. Generally, GHG emissions are quantified in terms of metric tons (MT) CO<sub>2</sub>e emitted per year. Figure 2-3 shows a comparison of the most common GHGs and their GWPs. While CO<sub>2</sub> has the lowest GWP of the GHGs, it is by far the largest contributor to climate change effects due to the total mass of CO<sub>2</sub> in the atmosphere.

**Figure 2-3. Comparison of GHG GWPs**

**1 MT Fluorinated Gases**

= < 23,000 MT CO<sub>2</sub>e

**1 MT N<sub>2</sub>O**

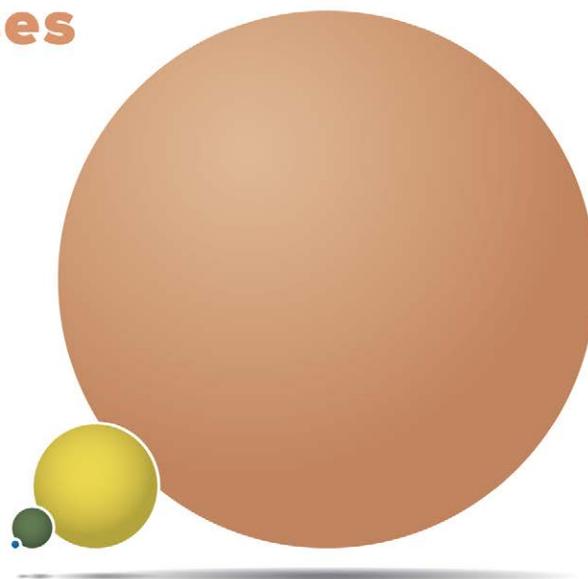
= 265 MT CO<sub>2</sub>e

**1 MT CH<sub>4</sub>**

= 28 MT CO<sub>2</sub>e

**1 MT CO<sub>2</sub>**

= 1 MT CO<sub>2</sub>e



Source: <https://climate.nasa.gov/evidence/>

7 According to the United States Environmental Protection Agency, the GWP was developed to allow comparisons of the global warming impacts of different gases. Specifically, it is a measure of how much energy the emissions of one ton of a gas will absorb over a given period of time, relative to the emissions of one ton of carbon dioxide (EPA 2017).

8 International Organization for Standardization (ISO) published ISO 14064-1 in 2006 (revised 2018) to provide an international standard for the quantification and reporting of GHG emissions.

9 [https://www.ghgprotocol.org/sites/default/files/ghgp/Global-Warming-Potential-Values%20%28Feb%2016%202016%29\\_1.pdf](https://www.ghgprotocol.org/sites/default/files/ghgp/Global-Warming-Potential-Values%20%28Feb%2016%202016%29_1.pdf)



## GHG Emission Sources

Anthropogenic processes that release GHGs include: the burning of fossil fuels for transportation, heating, and electricity generation; agricultural practices that release methane, such as livestock grazing and crop residue decomposition; and industrial processes that release smaller amounts of high-GWP gases. Deforestation and land cover conversion also contribute to global warming by reducing the Earth's capacity to remove CO<sub>2</sub> from the air and altering the Earth's albedo,<sup>10</sup> or surface reflectance, allowing for absorption of additional solar radiation. According to the U.S. Environmental Protection Agency (USEPA), gross GHG emissions nationwide have increased by 1.3 percent since 1990. While the continued shift from coal to natural gas and increased use of renewables in the power sector helps to reduce GHG emissions, continued increases in population growth and industrialization can lead to further increases in GHG emissions unless technology and practices transition to low carbon alternatives.

## CVWD GHG Emission Sources

CVWD's sources of GHG emissions include the following:

- Electricity usage to pump groundwater, conduct water quality sampling and treatment, provide water conveyance and distribution throughout the service area, and operate CVWD facilities such as pump stations, lift stations, water reclamation plants, and the Coachella and Palm Desert campuses;
- Combustion of fuels (such as natural gas) in buildings and stationary equipment, and during construction activities;
- Combustion of fuels (such as gasoline and diesel) for transportation (fleet vehicle and equipment internal combustion of fuel, and employee commutes);
- Emissions released from the processing and treatment of wastewater (e.g. methane from lagoons, nitrous oxide from nitrification or denitrification, and emissions in effluent discharge); and
- Waste emissions including combustion of fuels in waste collection vehicles and landfill equipment as well as emissions from the decomposition of waste at the landfill.

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<sup>10</sup> Albedo refers to the amount of diffuse radiation of energy out of the total, ranging from 0 (a black body that absorbs all radiation) to 1 where no energy/radiation is absorbed. Source: National Snow & Ice Data Center (NSIDC). 2020. <https://nsidc.org/cryosphere/seaice/processes/albedo.html>

## Climate Change Impacts

### Global Climate Change Impacts

Globally, climate change is linked to several changes which have potential to affect public health, natural resources, infrastructure, emergency response, tourism, and many other facets of society. Scientists have measured increasing global temperatures, warming oceans, shrinking ice sheets, less snow cover, sea level rise, and species extinction. Global climate change also has the potential to result in flooding of low-lying areas (due to sea level rise), reduction of fresh-water supply (due to rainfall and snowfall changes), adverse changes to biological resources and public health (due to increased temperature, less-productive habitats, and expansion of disease vectors), as well as many other adverse environmental consequences.<sup>11</sup>

### Regional Climate Change Impacts

California has undertaken extensive research at the state and local levels in order to support state and local agencies on long-range planning and adaptation strategies to protect infrastructure and resources. The impacts of climate change

from potential sea-level rise, changing weather patterns, extended drought, increased fire danger, and more severe storms have the potential to affect CVWD's infrastructure and water supply. By leveraging these studies as part of the climate action planning process, CVWD has identified potential climate vulnerabilities that may occur while also striving to reduce its GHG emissions. Potential vulnerabilities to climate change are presented in the following section to highlight possible impacts of climate change to CVWD's operations and infrastructure.

In the future, the most apparent effects of climate change in the southwestern United States, including the CVWD service area, will likely be more days of extreme heat and increased periods of drought, resulting in reductions in water supply availability. Additionally, the region could experience increased intensity and frequency of rain events which could lead to more damaging floods and debris flows, which could threaten CVWD infrastructure. Furthermore, the increased heat and reduced precipitation associated with climate change can increase fire danger, which may also threaten critical infrastructure.<sup>12,13</sup>

<sup>11</sup> IPCC 2019—<https://www.ipcc.ch/sr15/chapter/chapter-3/>

<sup>12</sup> [https://19january2017snapshot.epa.gov/climate-impacts/climate-impacts-southwest\\_.html](https://19january2017snapshot.epa.gov/climate-impacts/climate-impacts-southwest_.html)

<sup>13</sup> <https://www.nationalgeographic.com/science/2020/09/climate-change-increases-risk-fires-western-us/#close>

## CLIMATE CHANGE HAZARDS AND VULNERABILITIES AT CVWD

CVWD's water supplies include local groundwater and water allocations from the State Water Project (SWP) and the Colorado River. Imported water supply may be significantly impacted by climate change due to reduction in Sierra Nevada and Colorado River Basin snowpack volume resulting from higher temperatures and shorter winters; smaller snowpack results in decreased flows in the Colorado River and greatly impacts SWP sourced water. Although CVWD does not physically receive water from the SWP, prolonged drought occurrence in northern California due to climate change can impact the District if SWP

allocations are reduced. Groundwater is impacted by climate change less directly and occurs more slowly than effects to surface water. Groundwater supplies are directly and indirectly impacted by prolonged droughts which often correlate with long-term overdrafting of groundwater basins, where more water is removed from a given basin than is naturally and manually replenished. The effects of overdraft include a declining water table and increasing depth-to-groundwater which can result in land subsidence and water quality degradation, such as increasing concentrations of total dissolved solids (TDS). The climate-related changes



that are expected to most directly impact CVWD include: reduced quality and availability of imported water; reduced groundwater replenishment; increased frequency and intensity of flooding events; increased risk of large wildfires and impacts on affected infrastructure; and increased temperatures and extreme heat events, each of which are described in more detail below. A 2020 report by the U.S. Geological Survey (USGS) concluded that efforts by CVWD to replenish local aquifers in the Coachella Valley have been effective, leading to stable land surface elevations in most of the Coachella Valley. Areas with land subsidence identified in prior studies are now stable, uplifting, or experiencing substantial slowing of

subsidence. The USGS report identified three initiatives by CVWD that have been most effective in improving groundwater conditions in some of the historically most overdrafted areas of the valley. The initiatives are providing Colorado River water through the Mid-Valley Pipeline project since 2006 to reduce groundwater pumping; budget-based, tiered water rates in place since 2009 that have contributed to conservation; and aquifer replenishment at the Thomas E. Levy Groundwater Replenishment Facility since 2009. Historically, CVWD began importing water to the Coachella Valley in 1949 to help reduce groundwater pumping.<sup>14,15</sup>

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<sup>14</sup> <https://www.cvwd.org/CivicAlerts.aspx?AID=354>

<sup>15</sup> <https://pubs.er.usgs.gov/publication/sir20205093>



## Reduced Quality and Supply of Water from the Colorado River

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Changing precipitation patterns are causing increased rain and decreased snowfall, which may reduce Sierra Nevada and Rocky Mountains spring snowpacks by as much as 65 percent by the end of the century.<sup>16</sup> The shift in precipitation coming as rain versus snow alters the runoff patterns and volume such that runoff occurs early in the season, limiting the amount of water stored in snowpack that has been historically relied on for use during peak needs in the summer months.

Without the natural storage provided by a deep snowpack, less water will be available through California's dry summer months. In addition, increasing rates of evapotranspiration due to increased temperature, in combination with a

reduced snowpack, is projected to result in reduced Colorado River flows. One study from University of California, Santa Cruz, estimates that Colorado River flows will reduce 20 to 30 percent by mid-century, and 35 to 55 percent by the end of the century.<sup>17</sup> The Colorado River water delivered by the All American Canal, feeds into the 132-mile Coachella Canal branch which is operated by CVWD to meet water demands for irrigation and groundwater replenishment. A reduction in flow of the Colorado River could impact the allocations CVWD receives, thereby impacting CVWD water supply and ability to replenish the local groundwater basin. And it is important to note that CVWD holds senior water rights to Colorado River water.



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<sup>16</sup> <https://water.ca.gov/Programs/All-Programs/Climate-Change-Program/Climate-Change-and-Water>

<sup>17</sup> [https://www.energy.ca.gov/sites/default/files/2019-12/Water\\_CCA4-EXT-2018-006\\_ada.pdf](https://www.energy.ca.gov/sites/default/files/2019-12/Water_CCA4-EXT-2018-006_ada.pdf)

## Increased Frequency and Intensity of Floods

For the western U.S., such as Southern California where the CVWD service area is located, precipitation and flooding patterns are greatly impacted by the El Niño – Southern Oscillation (ENSO) Cycle. ENSO is the nomenclature used to describe the climate phenomenon consisting of an oscillating warming and cooling pattern of the ocean surface in the central and eastern tropical Pacific Ocean. El Niño describes a warmer than normal sea temperatures in the equatorial Pacific while Southern Oscillation describes the large-scale change in atmospheric pressure across the eastern equatorial Pacific and Indo-Australian areas. During the El Niño cycle, precipitation increases and results in wet winters, which in turn result in increased occurrence of floods and landslides. These effects have been observed recently throughout Southern California, including within CVWD’s service area. Climate change is projected to further intensify the ENSO cycles, such that though overall precipitation may be decreasing, the intensity of rain events will be greater resulting in greater risk of floods, debris flows, and landslides. Further, increased heat and temperature in the Coachella Valley can also result in soils becoming hydrophobic, reducing rainfall infiltration rates and leading to increased runoff and flooding when

precipitation is heavy. Increasing development in Coachella Valley with more impervious surfaces further exacerbates flooding issues due to decreased infiltration and attenuation, leading to increased runoff volumes and velocities. Over the last 18 years, CVWD has reported 52 flood occurrence and is considered to be vulnerable to future flooding events.<sup>18</sup> Flooding events can be destructive towards infrastructure, affect soil characteristics and ability to support agricultural activities, and can result in contamination of wells and reservoirs due to bacteria and chemicals present in surface water runoff.

CVWD provides regional flood protection for its stormwater unit within the Coachella Valley. CVWD’s stormwater unit extends from the Whitewater River Groundwater Replenishment Facility in Palm Springs to Salton City, encompassing approximately 380,000 acres. CVWD’s regional flood control system consists of a series of debris basins, levees, and engineered stormwater channels that divert floodwaters from the canyons and alluvial fans surrounding the Coachella Valley to the 50-mile Whitewater River/Coachella Valley Stormwater Channel (CVSC) that flows to the Salton Sea.

<sup>18</sup> <http://www.cvwd.org/DocumentCenter/View/4288/2019-Coachella-Valley-Hazard-Mitigation-Plan---Draft-PDF?bidId=>

The Whitewater River Stormwater Channel is a regional flood control channel, originating in north Palm Springs. The Coachella Valley Stormwater Channel is an engineered extension of the Whitewater River Stormwater Channel [originating in La Quinta and flowing downstream to the

Salton Sea]; and which serves subsurface drains on agricultural lands and conveys treated wastewater and urban and stormwater runoff. This 50-mile stormwater conveyance channel is routinely operated and maintained by CVWD.

## Increased Risk of Wildfires

Wildfires in the grasslands and chaparral ecosystems of Southern California are estimated to increase by approximately 30 percent toward the end of the 21<sup>st</sup> century. This is because increases in winter rain will stimulate the growth of more vegetation that will act as fuel in the summer and autumn months, when higher temperatures will increase wildfire risk. While the central valley region of CVWD's service area is less susceptible to wildfires, the mountainous lands that border the edges of the District are at the highest risk of wildfires. For CVWD, the greatest risk from increased wildfires is damage to infrastructure including above ground assets and flooding. Wildfires can exacerbate flooding events if heavy rainfall were to follow a fire event, due to hydrophobic soil conditions that can develop as a result of the gases which condense and form a waxy coating from the combustion of vegetative materials and root systems. In addition, in the rainstorms following wildfires, ash, sedi-

ment, excess nutrients, and other contaminants may be transported by runoff or overland flow into downstream waterways.<sup>19</sup>



<sup>19</sup> <https://www.epa.gov/sciencematters/wildfires-how-do-they-affect-our-water-supplies>

## Increased Temperatures and Extreme Heat Events

California is expected to see an average annual temperature increase of 2.5°F by 2030, with inland areas expected to see the most extreme changes.<sup>20</sup> Evidence of increasing annual temperatures has already been documented.<sup>21</sup> California is projected to experience an increase in average annual temperature of 2.7°F by 2050.<sup>22</sup> According to current climate prediction models, California’s average annual temperature increases could range from approximately 3.5°F to 11°F by the end of the century, relative to the annual average temperature for the 1961–1990 time period. In addition, the number of extreme heat days in Southern California are expected to increase from an average of four per year based on historical data between 1961–1990, to approximately 53 in 2050 and up to approximately 99 in 2100.<sup>23</sup> In this context, “extreme heat days” are defined as days with temperatures above the 98<sup>th</sup> percentile of computed maximum temperature by 2050. Cal-Adapt, the state’s web-based climate adaptation

planning tool, projects that the Coachella Valley will experience up to 42 extreme heat days between 2070–2099; this increase from an average of four extreme heat days per year is shown in Figure 2-5.<sup>24</sup> Extreme heat can degrade water quality due to eutrophication<sup>25</sup> and cause increased evapotranspiration<sup>26</sup> thereby decreasing flow. Extreme heat may also increase water demand pressure from customers of certain industries such as for agricultural or other irrigation needs.



20 <https://cal-adapt.org/tools/annual-averages/>

21 <https://www.climate.gov/news-features/event-tracker/extreme-overnight-heat-california-and-great-basin-july-2018>

22 [https://www.energy.ca.gov/sites/default/files/2019-11/Statewide\\_Reports-SUM-CCCA4-2018-013\\_Statewide\\_Summary\\_Report\\_ADA.pdf](https://www.energy.ca.gov/sites/default/files/2019-11/Statewide_Reports-SUM-CCCA4-2018-013_Statewide_Summary_Report_ADA.pdf)

23 <https://www.opr.ca.gov/facts/climate-change-and-public-health.html>

24 <https://cal-adapt.org/tools/extreme-heat/#climatevar=tasmax&scenario=rcp85&lat=33.53125&lng=-116.09375&boundary=local-grid&units=fahrenheit>

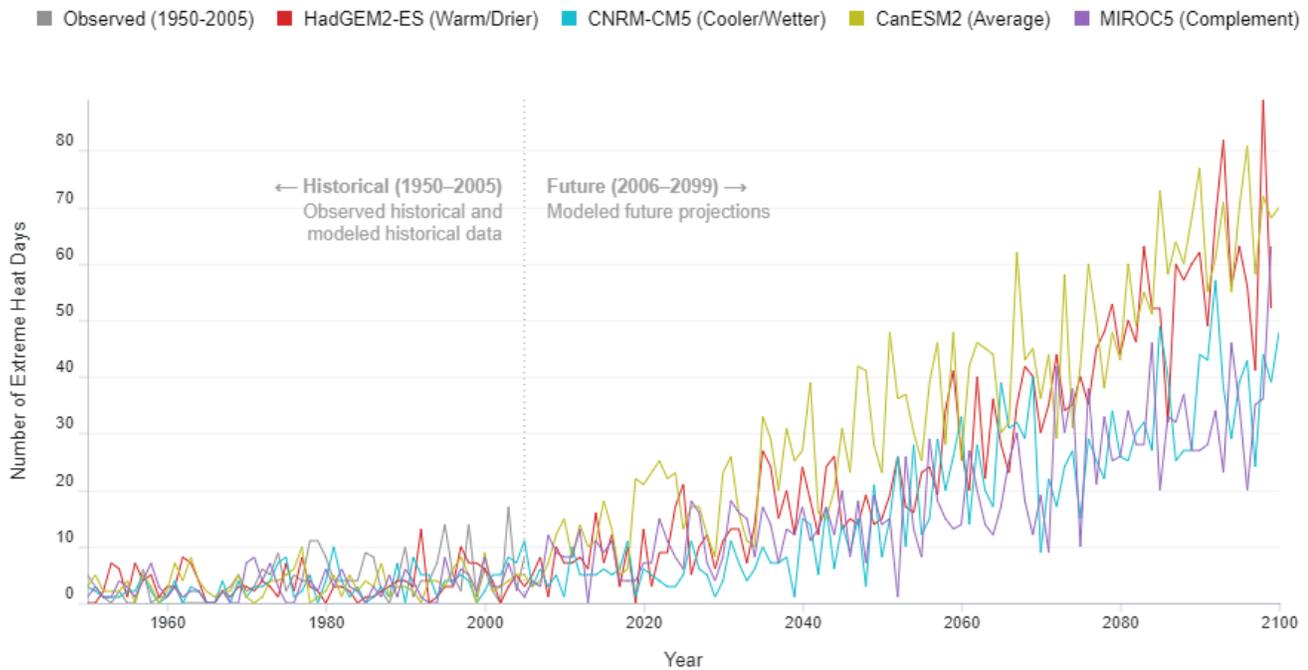
25 Eutrophication is the gradual increase in the concentration of nutrients, such as phosphorus and nitrogen, in the aquatic ecosystem leading to excessive growth of algae or plankton. The excessive growth can deplete oxygen levels in the water causing plant and animal death.

26 Evapotranspiration is the process of water evaporation from the soil and by plant transpiration.

**Figure 2-5. Historical and Project Extreme Heat Days in Coachella Valley**

### Number of Extreme Heat Days by Year

This chart shows number of days in a year when daily maximum temperature is above the extreme heat threshold of 114.7 °F. Data is shown for Grid Cell (33.53125, -116.09375) under the RCP 8.5 scenario in which emissions continue to rise strongly through 2050 and plateau around 2100.



- Source: Cal-Adapt. Data: LOCA Downscaled CMIP5 Projections (Scripps Institution of Oceanography), Gridded Observed Meteorological Data (University of Colorado, Boulder).
- Four models have been selected by California's Climate Action Team as priority models for research contributing to California's Fourth Climate Change Assessment (Pierce et al., 2018). Projected future climate from these four models can be described as producing:
  - A *warm/dry* simulation (HadGEM2-ES)
  - A *cooler/wetter* simulation (CNRM-CM5)
  - An *average* simulation (CanESM2)
  - The model simulation that is most unlike the first three for the best coverage of different possibilities (MIROC5)

## CVWD HAZARD MITIGATION PLAN

Climate change presents numerous challenges for our region. To address these challenges, CVWD's HMP evaluates hazards that threaten CVWD as they relate to climate change; the HMP also provides an assessment of existing plans and actions that are in place to address the effects of climate change, and sets up broad mitigation strategies and measures to address CVWD's vulnerabilities to the effects of climate change. In recent years, CVWD has also included climate change evaluation as a component of future scenario planning and in hazard identification. The IRWM & SWR Plan evaluates various future scenarios for water supply availability based on the effects of climate change.

Some of the climate change vulnerabilities addressed in the aforementioned plans include increases in the frequency, duration, and severity of drought and rising temperatures that threaten the reliability of CVWD's regional water supply.

CVWD's mission is to provide a reliable supply of high-quality water at a reasonable cost; and as it relates to climate change, meeting this mission statement requires CVWD be prepared to adapt to changing climactic conditions. The measures identified in this CAAP support CVWD's efforts to prepare for these future changes and align with mitigation strategies identified in the HMP, while also facilitating CVWD's ability to deliver its mission statement.







## 3. GHG EMISSIONS INVENTORY AND FORECAST

### CVWD OPERATIONAL BOUNDARY AND EMISSION SOURCES

As part of the CAAP development process, a multi-year inventory of GHG emissions was prepared for CVWD operations between 2016 and 2019. The inventory provides a measurement of GHG emissions associated with the operation and maintenance of CVWD's infrastructure,

including its buildings, facilities, fleet, and non-stationary equipment, as well as emissions from construction, waste streams, and employee commute.

Conducting a GHG inventory is an important component of the CAAP development



process, as it allows CVWD and its stakeholders to understand which activities contribute substantially to their GHG emissions footprint, and provides the groundwork for forecasting future GHG emissions and developing GHG emissions reduction targets.

The inventory of CVWD's GHG emissions is consistent with standard reporting protocols from the World Resources Institute (WRI), World Business Council for Sustainable Development (WBCSD), and the International Council for Local Environmental Initiatives (ICLEI). The WBCSD and WRI's *Corporate Standard GHG Protocol* requires that an inventory quantify emissions from all GHG-generating activities that fall under some level of the entity's operational control. GHG-generating activities are therefore categorized into three "scopes" which describe three levels of operational control.

**SCOPE 1** consists of activities that are directly controlled by the organization

**SCOPE 2** consists of activities associated with the consumption of purchased electricity<sup>28</sup>

**SCOPE 3** consists of all other activities not covered under Scope 2 that are not directly controlled by the organization but are fundamental to the organization's operation

CVWD's GHG-generating activities that were included in the inventory are shown categorized by scope in Figure 3-1. These activities include natural gas combustion, wastewater process emissions, vehicle fleet and equipment usage, electricity usage, out-of-boundary waste processing<sup>29</sup>, construction projects, electricity transmission and distribution,<sup>30</sup> and employee commute.

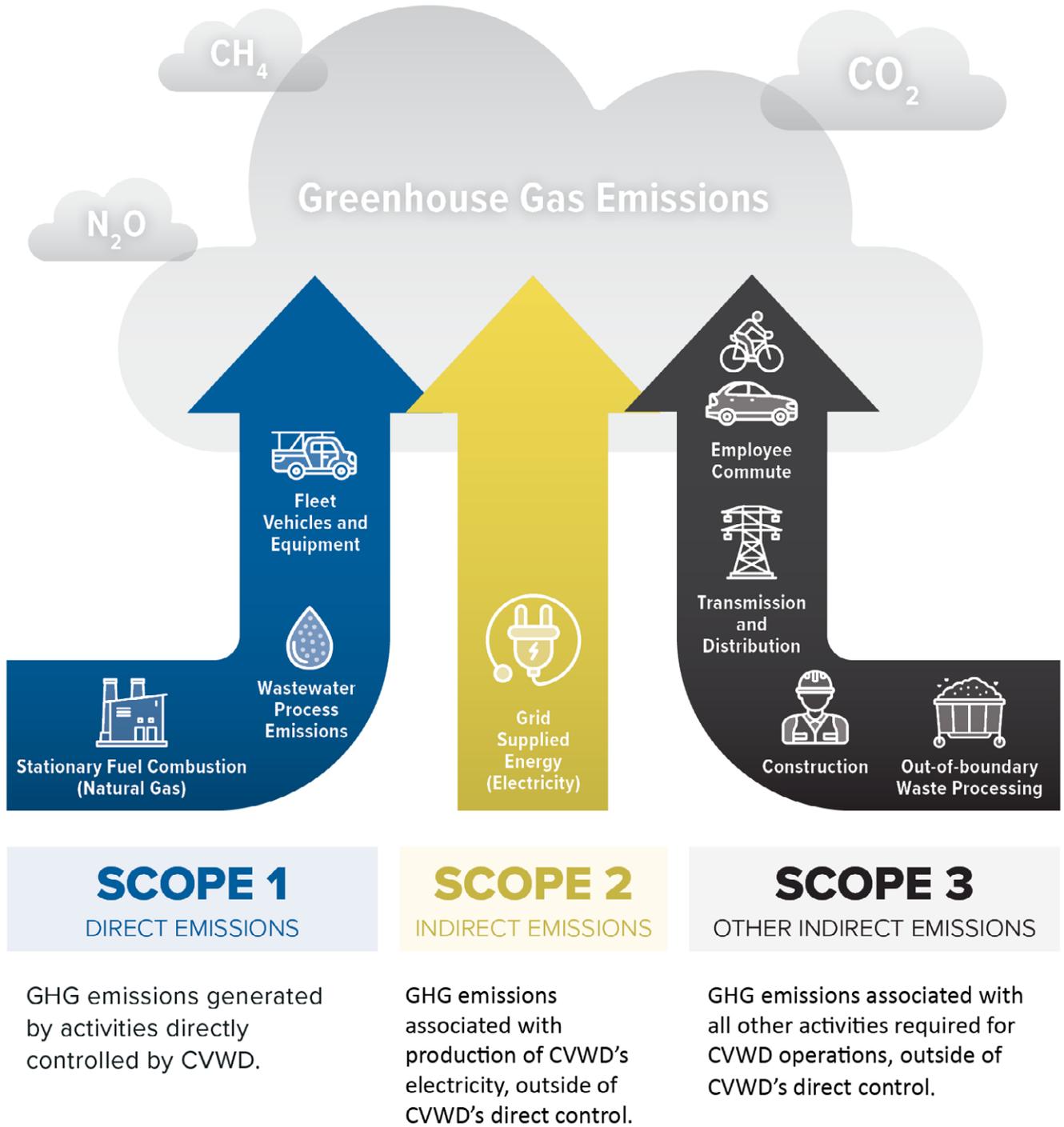
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28. Use of purchased electricity is considered an indirect GHG-generating activity, as the emissions from electricity are not generated on site, but are a direct result of activities under CVWD control.

29. Out-of-boundary waste processing includes emissions associated with combustion of fuel for collecting and transporting waste to a landfill, fuel combustion for landfill equipment, and waste decomposition emissions once landfilled.

30. Electricity usage is usually associated with some amount of transmission and distribution losses as a result of moving electricity from the location where it was generated to the facility where it is used. These out-of-boundary emissions are captured in the inventory as a Scope 3 activity.

Figure 3-1. CVWD’s GHG Emissions by Scope



( $CO_2$  = Carbon dioxide |  $CH_4$  = Methane |  $N_2O$  = Nitrous oxide)

Conducting the multi-year inventory for CVWD consisted of collecting summary data on each GHG-generating activity shown in Figure 3-1 for each year from 2016-2019, then converting the collected data to GHG emissions using science-based GHG emissions factors. GHG emissions inventories report GHG emissions in MT CO<sub>2</sub>e. One MT is equivalent to 2,205 pounds. As a point of comparison, the average passenger car generates one MT CO<sub>2</sub>e by driving from Palm Springs, California to Atlanta, Georgia.

Water districts can produce fluctuating GHG emissions year to year depending on the source of water delivered and the extent of water deliveries and wastewater treatment services provided, and other relevant operational fluctuations. To address this variability, CVWD elected to conduct a multi-year inventory rather than a single-year inventory. This multi-year inventory captures some of the year-to-year variability and provides an understanding of CVWD's GHG emissions over a broader time period. Details on the data sources and methods used to develop the multi-year inventory are included in Appendix A.



## CVWD'S CURRENT GHG EMISSIONS

The results of the multi-year GHG emissions inventory for CVWD are shown in Table 3-1. A four year average is presented in Table 3-1 that best characterizes CVWD annual emissions over this time period. CVWD's major sources of emissions are electricity usage (53 percent of total emissions on average), wastewater treatment processing (32 percent of total emissions on average), and construction (eight percent of total emissions on average). All other sources were less than five percent

of total emissions. These results show a trend of decreasing GHG emissions since 2016, primarily due to decreasing GHG emissions from electricity. Emissions reductions from electricity were primarily driven by an increase in carbon free electricity procured by CVWD's electricity providers in response to California's Renewable Portfolio Standard (RPS), which has reduced emissions in the electricity sector since 2016.<sup>31</sup>

**Table 3-1. CVWD GHG Emissions Inventory**

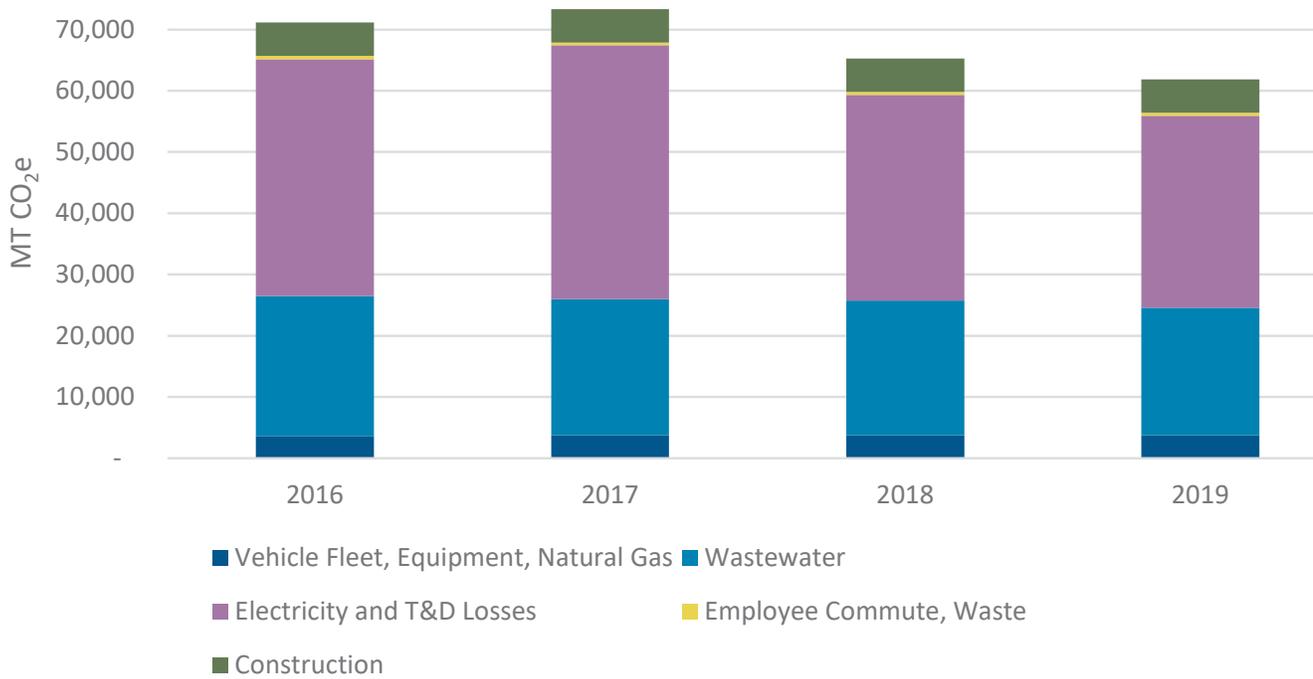
GHG-generating Activity	Scope	2016	2017	2018	2019	4-Year Average	Average % Contribution to Total
Vehicle Fleet and Equipment	Scope 1	3,523	3,675	3,674	3,617	3,622	5%
Natural Gas	Scope 1	104	97	95	124	105	0.2%
Wastewater	Scope 1	22,853	22,241	21,948	20,806	21,962	32%
Electricity	Scope 2	37,112	39,710	32,039	29,927	34,697	51%
T&D Losses	Scope 3	1,570	1,680	1,538	1,436	1,556	2%
Employee Commute	Scope 3	504	471	471	438	471	1%
Waste	Scope 3	13	21	21	29	21	<0.1%
Construction	Scope 3	5,448	5,448	5,448	5,448	5,448	8%
<b>Total in Metric Tons</b>		<b>71,127</b>	<b>73,342</b>	<b>65,234</b>	<b>61,825</b>	<b>67,882</b>	<b>100%</b>

Note: Values have been rounded and may not add up exactly.

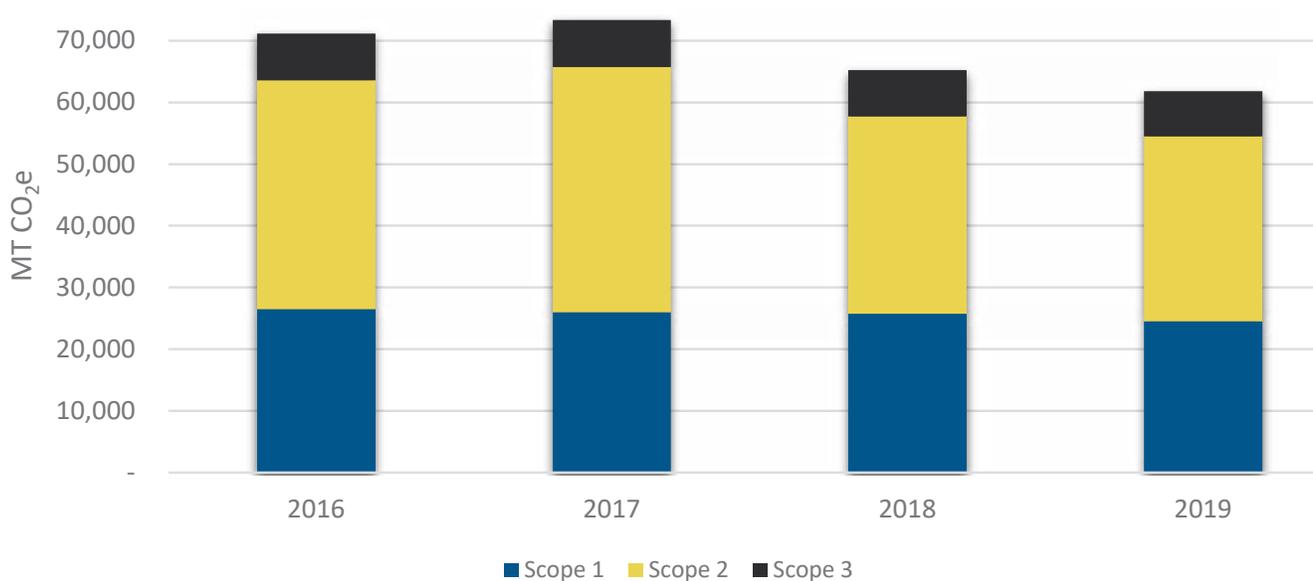
31. California's RPS requires all retail electricity providers in California to procure 50 percent of their electricity supply from carbon-free resources by 2026, 60 percent by 2030, and 100 percent by 2045. This will effectively reduce the GHG emissions intensity of electricity across the state, including the electricity CVWD purchases from Southern California Edison (SCE) and Imperial Irrigation District (IID).

Similar trends are demonstrated in regards to GHG emissions from CVWD's inventory, shown by sector in Figure 3-2. GHG emissions by scope (1- direct emissions, 2- indirect emissions, and 3- indirect emissions) are shown in Figure 3-3.

**Figure 3-2. CVWD GHG Emissions Inventory by Source**



**Figure 3-3. CVWD GHG Emissions Inventory by Scope**

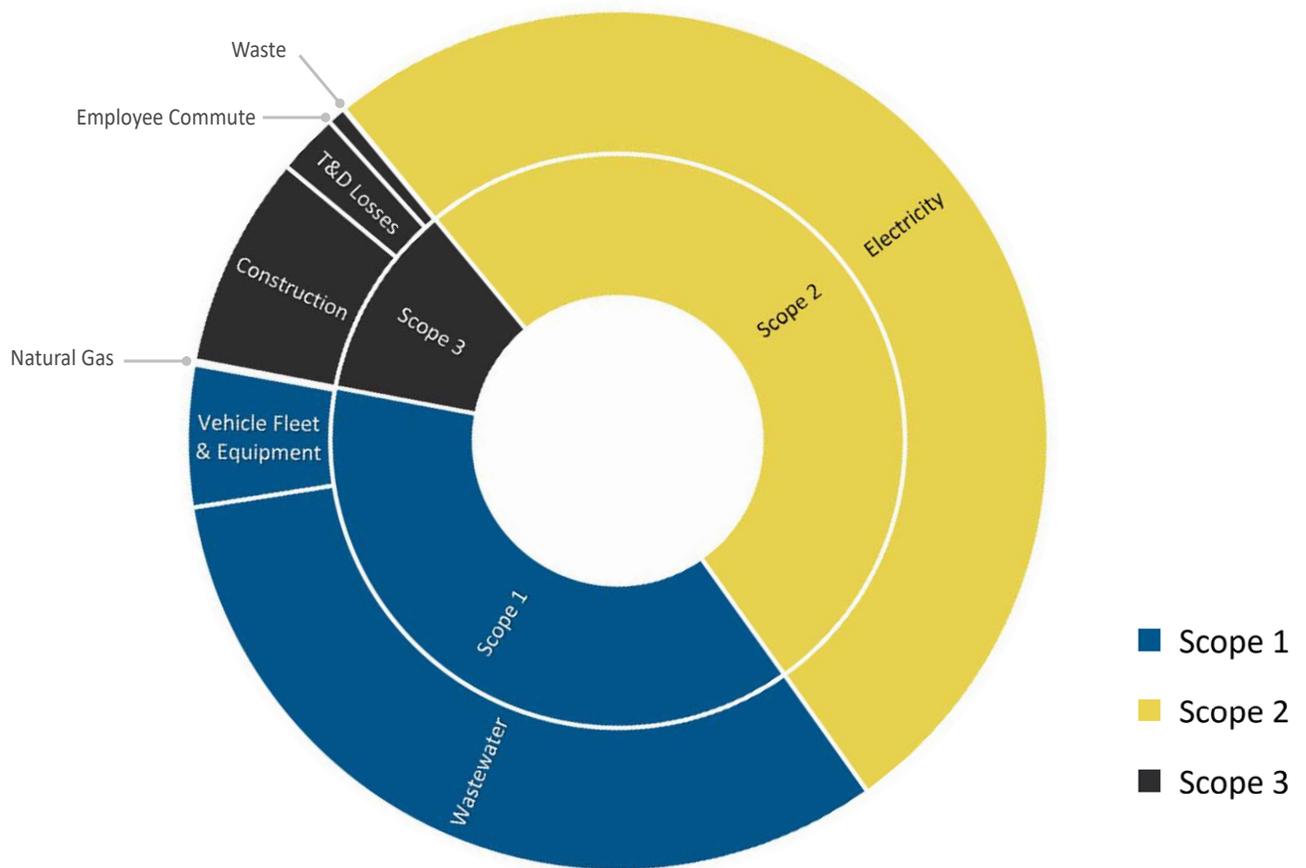


## GHG Emissions by Scope

The majority of GHG emissions occur under Scope 2 (51 percent of total emissions on average), and Scope 1 (38 percent of total emissions on average), followed by Scope 3 (11 percent of total emissions on average). As such, the largest portion of GHG emissions generated by CVWD (i.e., Scope 1 and Scope 2 emissions) are under

CVWD’s operational control. The largest source of emissions – Scope 2 emissions associated with electricity usage – will continue to decrease over time as electricity sources become carbon free due to the California’s RPS. Figure 3-4 shows CVWD’s GHG emissions by scope (inner ring), and each associated sector (outer ring).

**Figure 3-4. CVWD GHG Emissions Inventory by Scope and Sector**



*Note: Some GHG emissions sectors are too small relative to the overall emissions for labels to be visible on this graph including natural gas combustion (Scope 1), waste and employee commute (Scope 3).*

## SCOPE 1:

### Direct Emissions

CVWD's Scope 1 GHG emissions include emissions from vehicle fleet and equipment, combustion of natural gas in CVWD facilities, and wastewater treatment. Wastewater treatment is the largest contributor to Scope 1 (85 percent), followed by vehicle fleet and equipment (14 percent), and natural gas (0.4 percent). Scope 1 emissions have remained relatively steady between 2016 and 2019.

## SCOPE 2:

### Indirect Emissions

Scope 2 GHG emissions are 100 percent attributable to electricity purchased from Souther California Edison (SCE) and Imperial Irrigation District (IID) and used by CVWD for its buildings and facilities. CVWD uses electricity primarily for well pumping, water reclamation, and agricultural irrigation. Scope 2 emissions have decreased between 2016 and 2019 due to the increased requirements for carbon free electricity procurement on SCE and IID from California's RPS.

## SCOPE 3:

### Other Indirect Emissions

Scope 3 GHG emissions include electricity transmission and distribution (T&D) losses, employee commuting, waste disposal, and construction. Construction is the largest contributor to Scope 3 (74 percent), followed by T&D losses (21 percent), employee commute (six percent) and waste disposal (0.3 percent). Scope 3 emissions have remained relatively steady between 2016 and 2019.

## HISTORICAL CVWD GHG EMISSIONS

The GHG emissions inventory helps CVWD and its stakeholders understand the relative magnitude of GHG emissions arising from each GHG-generating activity associated with CVWD's current operations. This inventory also aided in the development of CVWD's GHG emissions targets. As described in Section 1, the State of California has adopted SB 32, which requires the State of California to reduce its GHG emissions 40 percent below 1990

levels by 2030. Calculating this target for CVWD requires an estimate of CVWD's 1990 emissions levels, because CVWD does not have a GHG emissions inventory for 1990. The methods used to develop a back-cast to CVWD's 1990 emissions levels is described in the following section. CVWD's adopted emissions targets are based on 1990 levels and are discussed in more detail in Section 4.





## Back-cast to 1990

To aid in determining CVWD’s 2030 GHG emissions target, a back-cast of GHG emissions to 1990 was developed based on the earliest inventory results available for CVWD – the 2016 inventory results. The 1990 back-cast assumes that CVWD’s emissions have followed approximately the same trajectory as the state’s emissions such that for a given year, emissions for CVWD and the state have increased or

decreased approximately the same percentage relative to 1990. For example, the state experienced an almost eight percent decrease in GHG emissions between 1990 and 2016; therefore, CVWD’s 1990 emissions were assumed to be about eight percent higher than the 2016 emissions levels quantified in the 2016 GHG emissions inventory. Table 3-2 shows this calculation in more detail.

**Table 3-2. CVWD's 1990 GHG Emissions Back-cast**

GHG Emissions	Total
State of CA 1990 Emissions (MMT CO <sub>2</sub> e)	311.7
State of CA 2016 Emissions (MMT CO <sub>2</sub> e)	287.9
1990 Change Factor (%)	(7.64%)
2016 CVWD Emissions (MT CO <sub>2</sub> e)	71,126.95
1990 CVWD Emissions (MT CO <sub>2</sub> e)	76,557.88

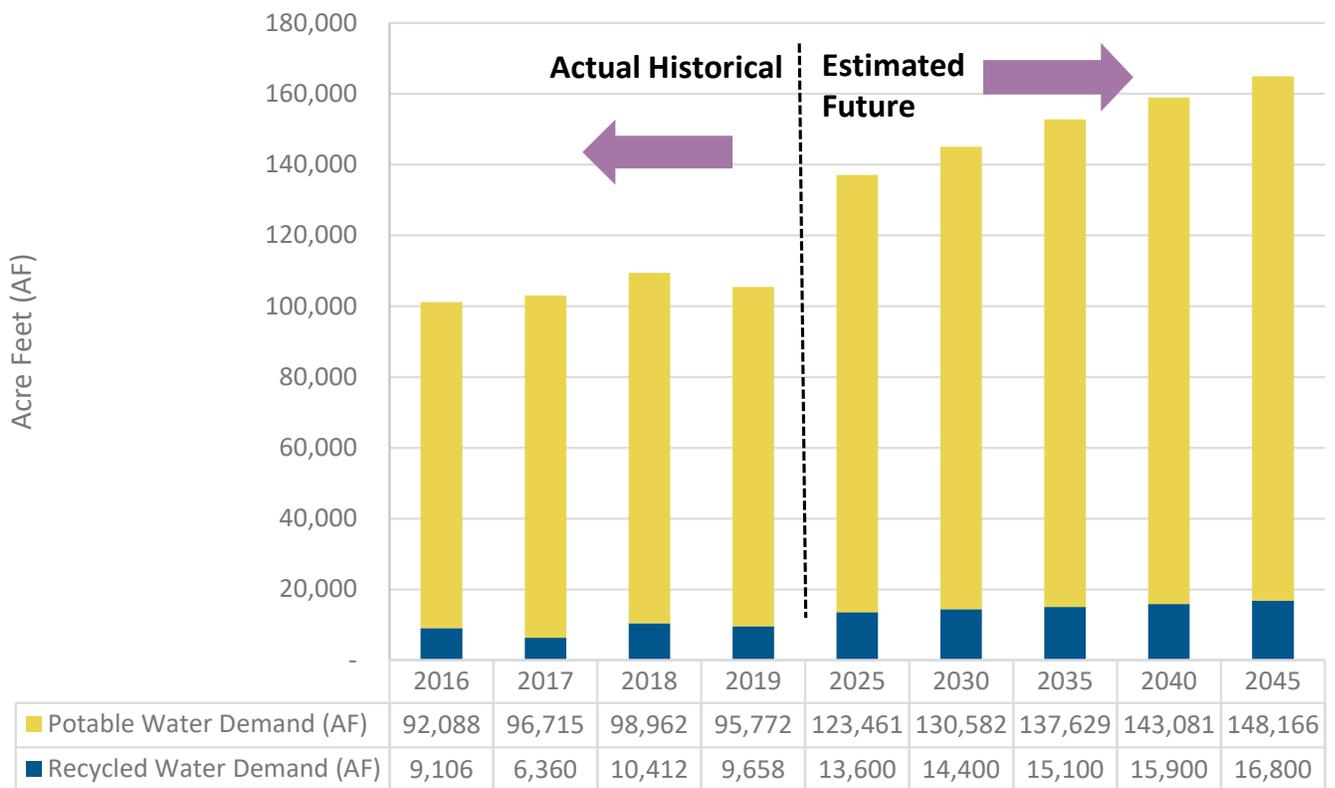
*Notes: State-level GHG emissions values used for the 1990 back-cast were sourced from CARB (2007 and 2016), and exclude emissions from the industrial, agricultural, and high-GWP emissions sectors, for better comparison to CVWD’s 2016 emissions inventory, which also excludes these sectors.*

## CVWD GHG EMISSIONS FORECAST

Using the 2016-2019 inventory, future operational GHG emissions were forecasted for CVWD. The forecast provides an estimate for how CVWD’s GHG emissions will look in the future, based primarily on projected services over time. These projections were derived from CVWD’s RUWMP. For example, electricity usage by CVWD is expected to increase in future years consistent with increased groundwater pumping and recycled water operations. This forecast allows

CVWD to estimate how GHG emissions will change based on expected water demand, and how much CVWD will need to reduce emissions in order to meet GHG reduction targets for 2030 and 2045. Historical and projected water demand<sup>32</sup> is shown in Figure 3-5. Total water demand is expected to increase by roughly 50% between now and 2045, in accordance with projected population growth in CVWD’s service area.

**Figure 3-5. Historical and Projected Water Demand**



32. Projected water deliveries were used as a proxy for all CVWD’s future services, with the assumption that CVWD operations scale approximately with water delivery to customers.

In order to clearly demonstrate how CVWD’s emissions will look in the future, two forecasts were developed – a business-as-usual (BAU) forecast, and an adjusted forecast. The BAU forecast shows what CVWD’s emissions would look based on water delivery projections alone. The adjusted forecast adjusts the BAU forecast to account for state-level implementation of policies and programs that will help California reduce its emissions through 2045. For CVWD, the adjusted forecast includes the California RPS, which will significantly reduce CVWD’s GHG emissions from electricity through 2045.

Incorporating state-level policies and programs in the adjusted forecast creates a more realistic picture of what CVWD’s emissions will look like in the future. The BAU forecast is useful for comparison with the adjusted forecast, to show the extent to which state-level policies and programs will help to reduce GHG emissions at CVWD (Figure 3-6). The numerical results of the forecast are included in Table 3-3. Details on the data sources and methods used to develop the forecast are included in Appendix A.

**Figure 3-6. CVWD GHG Emissions Forecast**

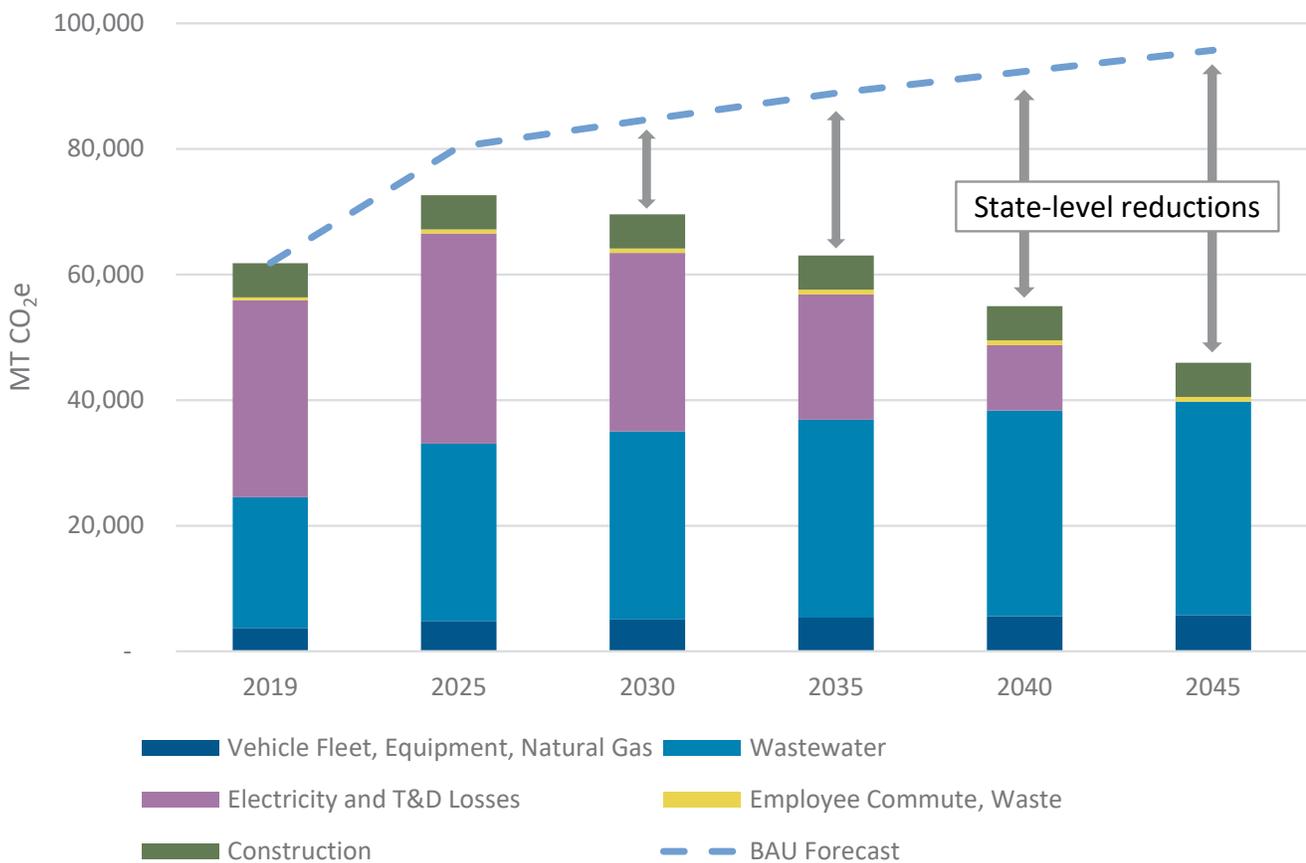
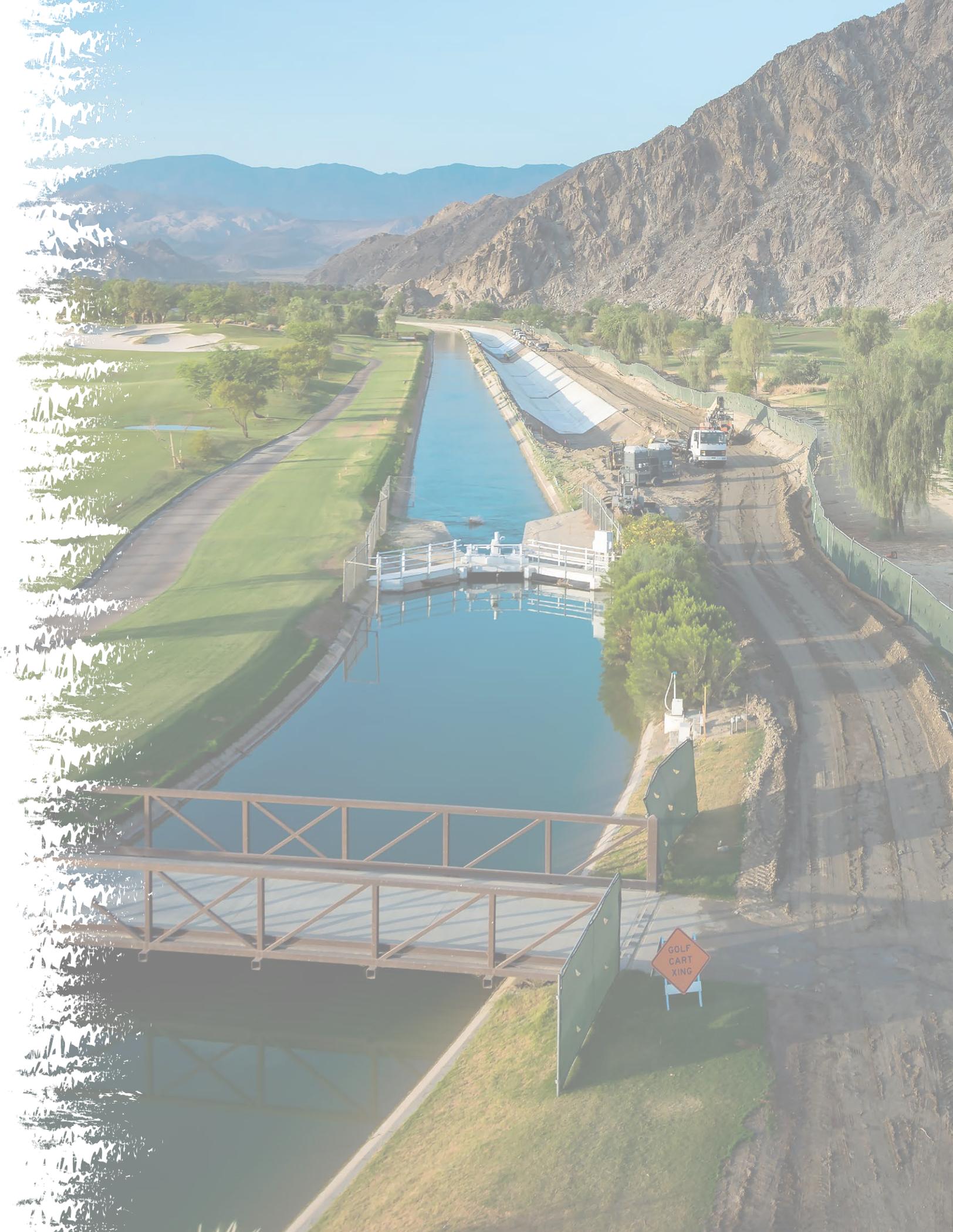


Table 3-3. CVWD GHG Emissions Forecast

Emissions Source	2025	2030	2035	2040	2045
<b>Forecast Summary (MT CO<sub>2</sub>e)</b>					
BAU Forecast	80,351	84,684	88,898	92,365	95,720
Adjusted Forecast	72,484	69,425	62,862	54,802	45,781
Legislative Reductions	7,867	15,259	26,036	37,563	49,939
<b>Adjusted Forecast Detail (MT CO<sub>2</sub>e)</b>					
Vehicle Fleet and Equipment	4,665	4,935	5,201	5,407	5,599
Natural Gas	135	143	151	156	162
Wastewater	28,308	29,941	31,557	32,807	33,973
Electricity	32,055	27,263	19,129	9,979	0
T&D Losses	1,374	1,168	821	427	0
Employee Commute	607	642	677	704	729
Waste	26	28	29	31	32
Construction	5,448	5,448	5,448	5,448	5,448

Note: Values have been rounded and may not add up exactly.



GOLF  
CART  
XING



## 4. CLIMATE ACTION TARGETS

### INTERNATIONAL CONTEXT

Climate change is a global phenomenon and a major driver for GHG reduction activities which have continued to evolve on the international level. The United Nations Framework Convention on Climate Change (UNFCCC) is an international environmental treaty, signed by 154 states at the United Nations Earth Summit in June 1992. The Framework established responsibilities for participating countries

to reduce their anthropogenic emissions and return to 1990 emissions levels. The treaty was superseded in 2016 by the Paris Agreement, which established a goal to keep the rise in global average temperatures below 2°C with efforts to limit increases to 1.5°C by reducing global GHG emissions to carbon neutrality by mid-century.<sup>33</sup> The Paris Agreement has been ratified by 191 members of the UNFCCC.<sup>34</sup>

<sup>33</sup> <https://www.ipcc.ch/sr15/>

<sup>34</sup> <https://unfccc.int/process/the-paris-agreement/status-of-ratification>



To assist in achieving these ambitious goals, the United Nations developed Sustainable Development Goals (SDGs) intended to be achieved by the year 2030. The SDGs are a collection of 17 interlinked

global goals designed to guide sustainable development. These international frameworks have become the drivers for many of California's own climate related legislation.

## CLIMATE ACTION AT THE STATE LEVEL

California has become a global leader in climate change action, having established extensive legislation, policies, and programs to reduce GHG emissions within the state over the last ten years. The primary drivers of climate action at the state level are AB 32, SB 32, and EO B-55-18. These regulations chart a path towards a carbon neutral<sup>35</sup> California by 2045, as explained below.

- **AB 32:** Codified the statewide goal of reducing GHG emissions to 1990 levels by 2020 and requires the California Air Resources Board (CARB) to prepare a Scoping Plan that outlines the main strategies the state will employ to meet the 2020 target. The AB 32 Scoping Plan was adopted in 2014.
- **SB 32:** The successor to AB 32 and requires the state of California to achieve a statewide reduction in GHG emissions of 40% below 1990 levels by 2030. The SB 32 Scoping Plan was adopted in 2017.

- **EO B-55-18:** Established a new statewide goal of achieving and maintaining carbon neutrality as soon as possible, and no later than 2045. Executive orders have not been codified by the state but are binding for state agencies and must therefore be addressed by qualified GHG reduction plans.

Programs and policies that support the goals established in the above bills and which will impact GHG emissions for CVWD include the California RPS, which, through SB 100, requires electricity providers to procure 100% renewable electricity by 2045. A full list of relevant state-level legislation is included in Appendix B.

<sup>35</sup> Carbon neutrality refers to achieving net-zero CO<sub>2</sub>e emissions, such that any GHG emissions created are offset by GHG emissions sequestering activities

## CVWD CLIMATE ACTION TARGETS

While CVWD is not beholden to the AB 32, SB 32, or EO B-55-18, and currently faces no legislative requirements to reduce their GHG emissions, the state recognizes water agencies as one of the largest contributors to energy emissions in California.<sup>36</sup> It is also anticipated that as California works towards the 2045 carbon neutrality goal, additional legislation and regulations will be established in the future that will could require CVWD to adopt low-carbon practices and operations. As part of the process of developing a CAAP, CVWD has elected to establish climate action targets that align with the state's to serve as goals for CVWD's operations going forward and provide a framework for achieving voluntary GHG emissions reductions in future years.

This CAAP establishes a climate action target for 2030 and a long-term GHG emissions goal for 2045. The 2030 target aligns with SB 32; the 2045 goal aligns with EO B-55-18.3 Per recommendations by the California Air Resource Board (CARB),<sup>36</sup> CVWD has adopted climate action targets on a per-capita basis, which focuses on GHG emissions reductions per person in CVWD's service population. CVWD's climate action targets are shown in Table 4-1. Figure 4-1 also shows the BAU forecast, adjusted forecast, and the 1990 baseline inventory back cast from the 2016 inventory as shown in Section 3 and described in further detail in Appendix A.



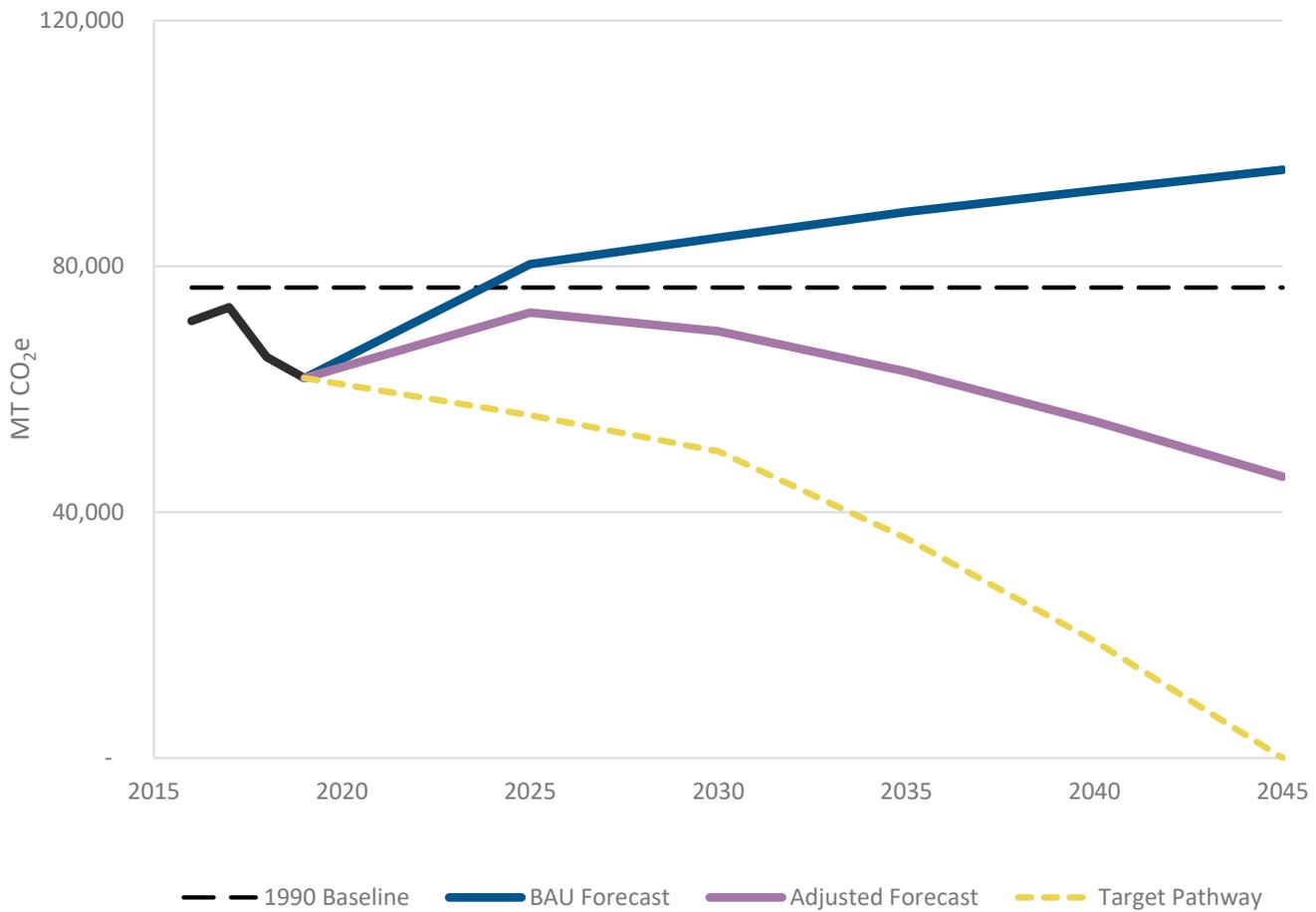
<sup>36</sup> [https://ww2.arb.ca.gov/sites/default/files/classic/cc/scopingplan/scoping\\_plan\\_2017.pdf](https://ww2.arb.ca.gov/sites/default/files/classic/cc/scopingplan/scoping_plan_2017.pdf)

**Table 4-1. CVWD Climate Action Targets**

Target Description		1990	2030	2045
CVWD's Climate Action Targets	Percent Reduction from 1990	N/A	40%	100%
	Per Capita Emissions (MT CO <sub>2</sub> e/person)	0.26	0.16	0.00
	Absolute Emissions (MT CO <sub>2</sub> e)	76,558	49,927	0

Note: CVWD has established per capita targets. For reference, the per capita targets have been translated to absolute emissions in units of MT CO<sub>2</sub>e, but these values do not represent CVWD's official targets. The final absolute emissions targets for future years will be calculated once the population numbers are known.

**Figure 4-1. CVWD Forecast and Climate Action Targets**



## GHG Emissions Gap

As shown in Figure 4-1, a gap remains between the projected emissions (purple line) and the target emissions (yellow line), even after accounting for reductions that will result from state legislation. This gap is equal to 0.06 MT CO<sub>2</sub>e per person in 2030 and 0.12 MT CO<sub>2</sub>e per person in 2045. In absolute emissions, this is equal to 19,499 MT CO<sub>2</sub>e in 2030 and 45,781 MT CO<sub>2</sub>e in

2045. This gap is how much CVWD will need to reduce its emissions to meet its reduction goals. CVWD aims to close this gap by implementing the GHG reduction measures presented in Section 5, and quantified for GHG emissions reduction potential in Appendix C. These measures will also increase CVWD's resilience to climate change in the coming years.







## 5. GHG EMISSIONS REDUCTION AND ADAPTATION MEASURES

CVWD has identified voluntary GHG emissions reduction and adaptation measures that were designed to make substantial progress towards reducing GHG emissions to levels that align with the state's GHG emissions reduction goals (i.e., SB 32 and EO B-55-18). Together, these measures will substantially reduce the gap between CVWD's forecasted GHG emissions and its GHG emissions reduction targets. While the measures do not fully achieve the GHG emissions reduction targets identified in Section 4, they serve as the foundation

of GHG reduction work at CVWD, with the expectation that additional measures may be identified in the future to achieve further reductions. The measures were selected based on their consistency with current CVWD programs and initiatives, and their ability to result in measurable GHG emissions reductions. As discussed in Section 1, a primary benefit of showing quantifiable progress towards CAAP goals improves CVWD's competitive edge for the state and Federal grant/loan application funding process.



Table 5-1 shows the potential GHG emission reductions that can be achieved through full implementation of each measure. The actual amount of GHG emissions reduced through implementation will be dependent on the degree of implementation of each measure and the combination of measures implemented. As shown in Table 5-1, implementation of these measures can significantly reduce GHG emissions and improve the operational resilience of CVWD’s facilities (see Appendix C for the GHG emissions reduction calculations for each measure). Actions for each measure are described within this section.

CVWD’s measures include specific goals that CVWD will work towards to reduce GHG emissions and improve operational

resilience. As a water district that provides a vital service to its customers, implementation of climate action measures must also be balanced against the cost of water for CVWD’s ratepayers. Increased water prices could have equity and other impacts if not thoughtfully considered, thus, each measure can only be implemented once it is deemed financially feasible or when funding/financing has been identified. However, CVWD also understands that failing to prepare for climate change could substantially increase costs in the future, so care must be taken to strike the right balance. Therefore, consistent with CVWD’s overall mission, measures that could result significant increase in costs were removed from consideration.

**Table 5-1. GHG Reduction and Adaptation Measures by Scope**

Measure Code	GHG Reduction Measure	2030 GHG Reduction Potential (MT CO <sub>2</sub> e)	2045 GHG Reduction Potential (MT CO <sub>2</sub> e)
<b>Scope 1–Direct Combustion and Process Emissions</b>			
DC-1	Phase out natural gas combustion at CVWD facilities, such that 50% of natural gas combustion equipment is replaced with electric equivalents by 2030.	55	122
FL-1	Replace vehicle fleet with zero-emission vehicles as technology allows in alignment with the Advanced Clean Fleet Rule, such that by 2030 40% of vehicle fleet are zero emissions vehicles and by 2045 100% of the vehicle fleet are zero emission.	761	4,080
FL-2	Use alternative fuels to bridge the technology gap to zero emission vehicles and off-road equipment by achieving 100% replacement of #2 diesel with 100% renewable diesel by 2030.	1,066	1,210

## 5. GHG Emissions Reduction and Adaptation Measures

Measure Code	GHG Reduction Measure	2030 GHG Reduction Potential (MT CO <sub>2</sub> e)	2045 GHG Reduction Potential (MT CO <sub>2</sub> e)
FL-3	Reduce vehicle miles traveled and fuel use for non-ZEV/EV fleet vehicles.	417	0
WW-1	Reduce GHG process emissions associated with wastewater treatment.	Supportive <sup>1</sup>	Supportive <sup>1</sup>
<b>Scope 2—Electrical Consumption</b>			
E-1	Utilize low-carbon and carbon-free electricity. <sup>2</sup>	4,486	0
EE-1	Improve energy efficiency at CVWD facilities and buildings.	2,965	0
<b>Scope 3 – Indirect Emissions and Sequestration</b>			
WG-1	Increase organic waste diversion to achieve 75% reduction in landfilled organic waste by 2025 and zero-waste by 2045.	10	32
TR-1	Incentivize more sustainable commutes.	56	95
WC-1	Increase water conservation and local water supply.	Supportive <sup>1</sup>	Supportive <sup>1</sup>
CS-1	Investigate and implement carbon capture and sequestration opportunities.	Supportive <sup>1</sup>	Supportive <sup>1</sup>
CR-1	Reduce construction-related GHG emissions through construction fleet requirements.	Supportive <sup>1</sup>	Supportive <sup>1</sup>
<b>GHG Emissions Reduction Summary</b>			
<b>Total GHG reduction potential with full implementation of all measures</b>		<b>9,816</b>	<b>5,848</b>
<b>Total GHG reductions needed to meet CVWD's Reduction Goals<sup>3</sup></b>		<b>19,499</b>	<b>45,781</b>
<b>GHG reductions remaining</b>		<b>9,683</b>	<b>39,933</b>

Notes: Values have been rounded and may not add up exactly. See Appendix C for methodology and calculations details. MT CO<sub>2</sub>e = metric tons of carbon dioxide equivalent; ZEV/EV = zero emission vehicle/ electric vehicle; GHG = greenhouse gas; DC = Direct Combustion; FL = Fleet; WW = Wastewater; E = Electricity; EE = Energy Efficiency; WG = Waste Generation; TR = Transportation; WC = Water Conservation; CS = Carbon Sequestration; CR = Construction

<sup>1</sup>Supportive measures are those that are not quantifiable as a standalone action but may support quantifiable actions through providing opportunities for studying technologies, establishing policies, etc. Additionally, some measures are listed as supportive as they are in the early phase of implementation and the extent of quantifiable GHG reductions is dependent on the completion of the preceding actions (e.g., conduct feasibility study). Therefore, such measures are conservatively listed as supportive to not overestimate GHG reduction potential.

<sup>2</sup>GHG emission reduction potential is based on all electricity switching to a 50% green rate tier through SCE and IID as part of Measure E-1. The GHG emission reduction potential would increase to 29,712 MT CO<sub>2</sub>e by 2030 with all electricity switched to 100% renewable electricity as part of Measure E-1.

<sup>3</sup>As described in Section 4, CVWD established GHG reduction goals in alignment with a SB 32 Efficiency Target pathway.

## MEASURE ORGANIZATION

CVWD's measures are organized by Scope, and consist of a suite of actions that support each measure:

- 1. Scope:** As described in Section 3, scope refers to the level of operational control CVWD has over a GHG emissions generating activity
  - Scope 1 refers to activities associated with direct combustion or process emissions,
  - Scope 2 refers to emissions associated with electrical consumption, and
  - Scope 3 refers to other indirect emissions generating activities. CVWD's measures are also organized by scope, referring to the category within which the measure's GHG emissions reductions will occur.
- 2. Measures:** Measures define quantitative goals within each scope that will contribute to reducing GHG emissions at CVWD.
- 3. Actions:** Actions consist of the specific activities CVWD will complete in support of each measure, which together accomplish each measure's goal.

Measures within each Scope address specific emissions sectors, including direct combustion (DC), fleet (FL), wastewater (WW), electricity (E), energy efficiency (EE),

waste generation (WG), employee commute/transportation (TR), water conservation (WC), carbon sequestration (CS), and construction (CR). Measures and their actions can be either "quantifiable" (i.e., with clearly defined GHG emissions reduction potential) or "supportive" (i.e., not quantifiable but contributing to the realization of GHG emissions reduction potential of other measures or actions). An example of a **quantifiable action** would be purchasing a specific amount of carbon-free electricity, while a **supportive action** would be implementing a sustainable purchasing policy. The first action reduces GHG emissions in a predictable way, which can be quantified based on available data. The second action may reduce GHG emissions, but that reduction is not quantifiable due to lack of specific metrics associated with a quantity of GHG emissions and attempting to quantify the measure could lead to double counting concerns. While supportive measures may not be quantifiable, they are still important for facilitating the success of the CAAP. Together, the measures and their actions establish a foundational pathway to make substantial progress towards achieving CVWD's 2030 and 2045 GHG reduction goals. Measures and actions will be tracked and re-evaluated on a regular basis to help ensure achievement of the projected reductions.

## MEASURE CO-BENEFITS

In addition to reducing GHG emissions, climate change mitigation measures have a range of additional co-benefits that result in a positive impact or benefit to CVWD and its customers. For example, expanding the water conservation programs that have demonstrated success in the past (Measure WC-1) decreases water demand, thereby reducing the pressure on CVWD's water supplies, especially in

times of drought. Phasing out natural gas and other fossil-fuel dependent vehicles and equipment (Measures DC-1, FL-1, and FL-2) will contribute to improved air quality in CVWD's service area which would have positive human respiratory health impacts. The following subsections detail the co-benefits expected from implementation of CVWD's GHG reduction and adaptation measures.

### Water Supply Reliability and Resilience

Retaining a robust and sustainable water supply is at the heart of CVWD's mission. As CVWD moves forward and faces more extreme impacts of climate change and population growth, water conservation will become even more essential. Water

conservation combined with operational resilience results in water supply reliability, and ultimately an ability to adapt to more frequent droughts and extreme weather events. This co-benefit is specifically demonstrated through Measure WC-1.



## Cost Savings>Returns on Investment

Although implementation of the GHG emissions reduction measures generally requires an investment of either time or money, many measures have longer-term cost savings that are attributable to reduced utility and transportation costs or avoided waste. The return on these investments can range in timeframe and magnitude, and do not account for the potentially significant economic benefits of avoiding impacts associated with climate change, such as increased drought and flooding risks, or the resiliency related benefits of avoided operational downtime.

For example, establishing a zero emissions fleet and replacing diesel fuel with renewable diesel, as outlined in Measure FL-1 and Measure FL-2, would result in lifecycle cost savings for CVWD. Replacing gasoline powered vehicles at the end of their

useful life with electric vehicles may result in a higher up-front cost. However, recent studies including one by Massachusetts Institute of Technology found that over the course of the vehicle's useful life, fuel savings and decreased maintenance needs result in lower lifecycle costs compared to both hybrid and internal combustion vehicles.<sup>37</sup> Maintenance costs on an electric car are much lower because they have fewer moving parts, fewer fluids to be replaced, and are easier on brake systems. Furthermore, the study found that electric vehicle (EV) lifecycle costs are fairly insensitive to electricity costs and that even a doubling of electricity costs does not change the relative cost comparison between battery electric vehicles and internal combustion vehicles.<sup>38</sup>



37. <https://www.carboncounter.com/>

38. [https://pubs.acs.org/doi/suppl/10.1021/acs.est.6b00177/suppl\\_file/es6b00177\\_si\\_001.pdf](https://pubs.acs.org/doi/suppl/10.1021/acs.est.6b00177/suppl_file/es6b00177_si_001.pdf)

## Community and Ecosystem Health

One of the primary co-benefits of reducing GHG emissions is directly improving community health. For example, replacing natural gas and propane consuming equipment with electrically-powered equivalents (e.g., Measure DC-1) results in a reduction in carbon monoxide, nitrogen dioxide, and particulate matter (PM) to the air.<sup>39</sup> According to a California Energy Commission study of public health and electrification, electrification would significantly reduce emissions, resulting in improved air quality and a reduction in mortality rates from pollution.<sup>40</sup> The analysis specifically notes that the monetized health benefits for combined changes in ozone and PM<sub>2.5</sub><sup>41</sup> from electrification would result in \$108 billion per year in cost-savings by 2050 for California. Similarly, reducing gasoline and diesel fuel combustion through fleet vehicle electrification (e.g., FL-2) results in incremental benefits to air quality and human health.

Ecosystem health is also improved through increased carbon sequestration (e.g., Measure CS-1), water conservation (e.g., Measure WC-1), and reduced waste (e.g., Measure WG-1). These measures reduce the pressure on local natural resources by allowing more space for trees and native habitats, preserving natural water supplies, and allowing natural waste processes to occur. This in turn improves and stabilizes local habitats to create a more resilient local ecosystem that better supports human life and our resource needs. The health of an ecosystem is directly correlated to the health of the humans living in it because we ultimately depend upon ecosystem products and services (such as availability of fresh water, food, and air).<sup>42</sup>

39. <https://www.epa.gov/indoor-air-quality-iaq/sources-combustion-products-introduction-indoor-air-quality>

40. <https://www2.energy.ca.gov/2019publications/CEC-500-2019-049/CEC-500-2019-049.pdf>

41. PM<sub>2.5</sub> stands for particulate matter below 2.5 micrometers (a unit of measurement). PM<sub>2.5</sub> is small particulates found in the air that can enter lungs and cause health issues. [https://www.cdc.gov/air/particulate\\_matter.html](https://www.cdc.gov/air/particulate_matter.html)

42. <https://www.who.int/globalchange/ecosystems/en/>



## **SCOPE 1 MEASURES: DIRECT COMBUSTION AND PROCESS EMISSIONS**

### **MEASURE DC-1: Phase out natural gas combustion at CVWD facilities, such that 50% of natural gas combustion equipment is replaced with electric equivalents by 2030**

California adopted SB 350 and AB 3232 as important strategies to reduce energy usage in buildings and transition to a low-carbon building stock, thereby supporting the state's overall GHG emission reduction goals (i.e. AB 32 and SB 32). As related to natural gas usage in buildings, SB 350 requires the state to double the energy efficiency savings in natural gas usage by 2030, while AB 3232 required the California Energy Commission (CEC) to assess how to reduce GHG emissions from the state's building stock by 40 percent below 1990 levels by 2030. The CEC's Building Energy Efficiency Standards (Title 24 Parts 6 and 11) includes building standards and codes that support decarbonization efforts through requiring improvements in energy efficiency of building equipment to occur at time of new construction and upgrades. The CEC's Building Energy Efficiency Standards are updated every 3 years and continually driving decarbonization in buildings.

Natural gas and other fossil fuels combusted in CVWD's buildings and facilities emit approximately 100 MT of CO<sub>2</sub>e per year. Phasing out natural gas and propane-powered equipment in favor of electric equipment, when combined with carbon-free electricity (Measure E-1), reduces GHG emissions associated with this equipment to zero. Electric appliances, particularly electric hot water heaters and HVAC, are also more efficient than those powered by natural gas and propane, resulting in long-term cost savings for CVWD. Natural gas-powered equipment in CVWD's offices and other facilities will be electrified over time, as financially feasible, as the equipment reaches the end of its useful life. Replacing fossil fuel combustion equipment with electric alternatives will align with the state policies and the CEC's Building Energy Efficiency Standards.

### ACTIONS

**ACTION DC1-1:** Conduct a survey of natural gas and propane consuming devices in offices, control buildings, and other CVWD structures. By 2025 establish a schedule to replace non-emergency use fossil fuel-consuming equipment with electric-powered equivalents based on operational lifespan estimates.

**ACTION DC1-2:** Explore rebate, grant, or partnership opportunities to fund the replacement of fossil-fuel consuming equipment like HVAC and hot water heaters with electric powered equivalents like heat pumps.

**ACTION DC1-3:** Based on feasibility and the replacement schedule, replace 50% of non-emergency fossil-fuel-consuming equipment with electrically powered equivalents in existing office and CVWD buildings by 2030. Additionally, with obtainment of funding establish goal to replace 75% of equipment by 2045.

### TARGET METRICS

- 50% reduction in natural gas by 2030
- 75% reduction in natural gas by 2045

### GHG EMISSIONS REDUCTIONS

- 55 MT CO<sub>2</sub>e in 2030
- 122 MT CO<sub>2</sub>e in 2045





## **MEASURE FL-1: Replace vehicle fleet with zero-emission vehicles as technology allows in alignment with the Advanced Clean Fleet Rule, such that by 2030, 40% of vehicle fleet are zero emissions vehicles and by 2045 100% of the vehicle fleet are zero emission**

A significant focus of California's climate policy is the decarbonization of the transportation sector either through implementations of zero emissions vehicles (ZEV) technology where feasible and the use of cleaner fuels for combustion everywhere else. CARB is currently developing a medium and heavy-duty zero-emission fleet regulation with a goal of all California truck and bus fleets being zero-emission by 2045. As a special district, CVWD will be required to comply with the requirements of the Advanced Clean Fleet Rule once adopted and implementation beginning in 2023, including meeting the ZEV targets as a percent of the total fleet in alignment with the ZEV Target Phase-In Schedule. As part of the compliance obligation, CVWD will be required to report on the fleet annually and when a new vehicle is added to the fleet either as a replacement or addition.

CVWD's fleet emits on average 3,600 MT of CO<sub>2</sub>e per year (5% of CVWD's total GHG emissions). Fully electrifying or otherwise decarbonizing CVWD's fleet and powering it with carbon-free electricity or other zero emission technology (e.g., renewable hydrogen) allows for this emission source to achieve carbon neutrality. While there

are already commercially available ZEV passenger cars and trucks, the recent EO N-79-20, which directs the California Air Resources Board to develop regulations to achieve 100 percent zero-emission car sales in California by 2035 and zero-emission medium- or heavy-duty vehicles by 2045, as well as supporting regulations such as the Clean Miles Standard, Advanced Clean Cars II Program, and Advanced Clean Fleets Rule, have accelerated ZEV technology for medium-duty, heavy-duty, and off-road equipment. Further, to support early adoption and promote infrastructure development, incentives are available for vehicle replacement as well as credits available for charging or hydrogen station owners under the Low Carbon Fuel Standard (LCFS) regulation that can offset the cost of fuel and ZEV vehicle replacements. Early implementation will ensure compliance with the Advanced Clean Fleet Rule as well as access to early action incentives.

### ACTIONS

**ACTION FL1-1:** As part of vehicle fleet replacement process, incorporate a return on investment analysis in the criteria to evaluate ZEV/EV options.

**ACTION FL1-2:** Adopt an ZEV/EV First Policy for fleet vehicles so that ZEV/EVs are purchased when replacements are needed unless technological, operational, or cost effectiveness issues are identified in alignment with EO B-48-18 and SB 350 transportation electrification goals. Revise policy requirements when the Advanced Clean Fleet regulation is formally adopted and implementation of Rule begins in 2023.

**ACTION FL1-3:** Pursuant to the Advanced Clean Trucks regulation adopted June 2020, comply with the Large Entity On-Time Reporting Requirement.

**ACTION FL1-4:** Convert 40% of the CVWD fleet to vehicles and equipment to be powered by electricity, fuel cells, and/or other ZE technologies by 2030 and aim to convert 100% of CVWD fleet to ZEV by 2045 in alignment the Advanced Clean Fleets Rule (Rule recommendation to Board December 2021; implementation begins 2023).

**ACTION FL1-5:** Investigate grant opportunities; local, state, and Federal incentives; and/or partnerships to purchase new EVs and install EV charging and/or ZEV infrastructure at facilities for fleet and public use. Conduct a return on investment analysis that assess cost savings from

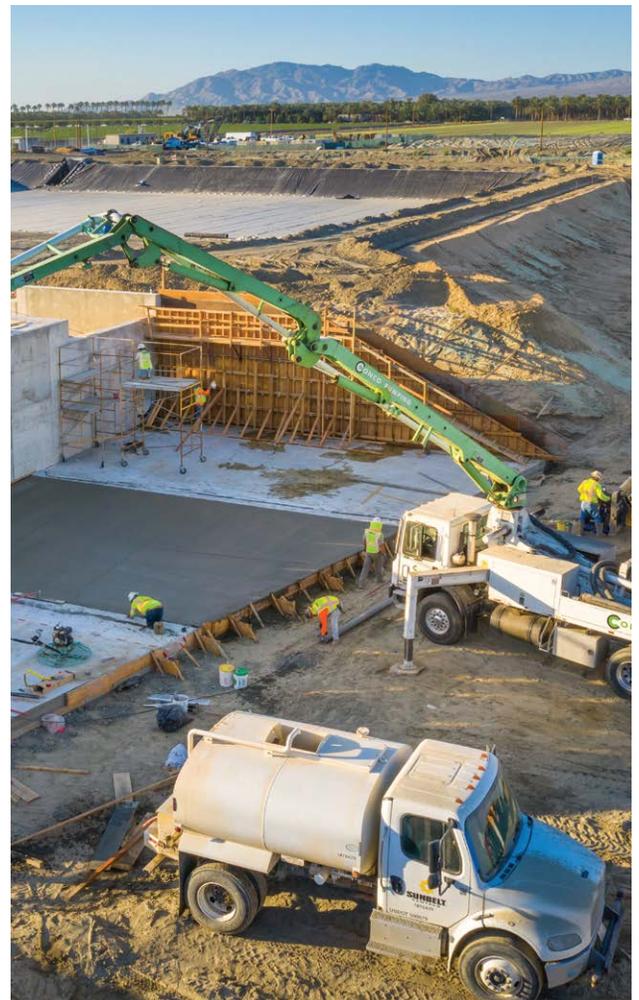
incentives for early replacement of fleet vehicles with ZEV/EV versus the traditional replacement schedule.

### TARGET METRICS

- 40% fleet conversion to ZEV by 2030
- 100% fleet conversion to ZEV by 2045

### GHG EMISSIONS REDUCTIONS

- 761 MT CO<sub>2</sub>e in 2030
- 4,080 MT CO<sub>2</sub>e in 2045





## **MEASURE FL-2: Use alternative fuels to bridge the technology gap to zero emission vehicles and off-road equipment by achieving 100% replacement of #2 diesel with 100% renewable diesel by 2030**

CVWD currently uses a combination of gasoline, diesel, and compressed natural gas to fuel its fleet. While zero-emission heavy-duty vehicles are not currently market-ready, using low-carbon intensity fuels like renewable diesel in existing vehicles and equipment does not require equipment alterations and helps reduce GHG emissions over the short-term. The use of alternative fuels allows for additional time to fully vet and/or pilot the new zero-emission technology before infrastructure investments are made, which could help improve the return on investment. The state's LCFS regulation is driving the market to increase the availability and decrease the cost of alternative fuels that may offer a return on investment benefit to switch to alternative fuels now in equipment and fleet vehicles that do not need technology changes. CVWD has already conducted a feasibility and cost analysis, identifying a source of renewable diesel that can be utilized in all existing vehicles and equipment currently utilizing diesel with no changes in technology necessary and minimal change in cost. Further, renewable diesel is anticipated to reduce maintenance costs of equipment over traditional diesel due to a decreased

need for diesel particulate filter (DPF) services as renewable diesel has less impurities such as sulfur, oxygen and other aromatic compounds.<sup>43</sup>

### **ACTIONS**

**ACTION FL2-1:** Prepare an assessment that determines the quantity of renewable diesel needed, any costs incurred from the transition, and identifies a reliable source of renewable diesel.

**ACTION FL2-2:** Present findings from the assessment of transitioning from diesel to renewable diesel (Action FL2-1) to Internal Stakeholders on the assessment of transitioning from diesel to renewable diesel.

**ACTION FL2-3:** Transition current diesel tanks at CVWD-owned fueling depots such that 50% of diesel-powered fleet vehicles and equipment can utilize renewable diesel by 2023 and 100% by 2027.

**ACTION FL2-4:** Partner with heavy-duty EV companies to conduct pilot studies and facilitate advancements in technology for vehicle classes which do not currently have viable options. Investigate grant opportunities for such projects and partnerships.

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43. <https://www.neste.us/neste-my-renewable-diesel/industries/public-fleets>

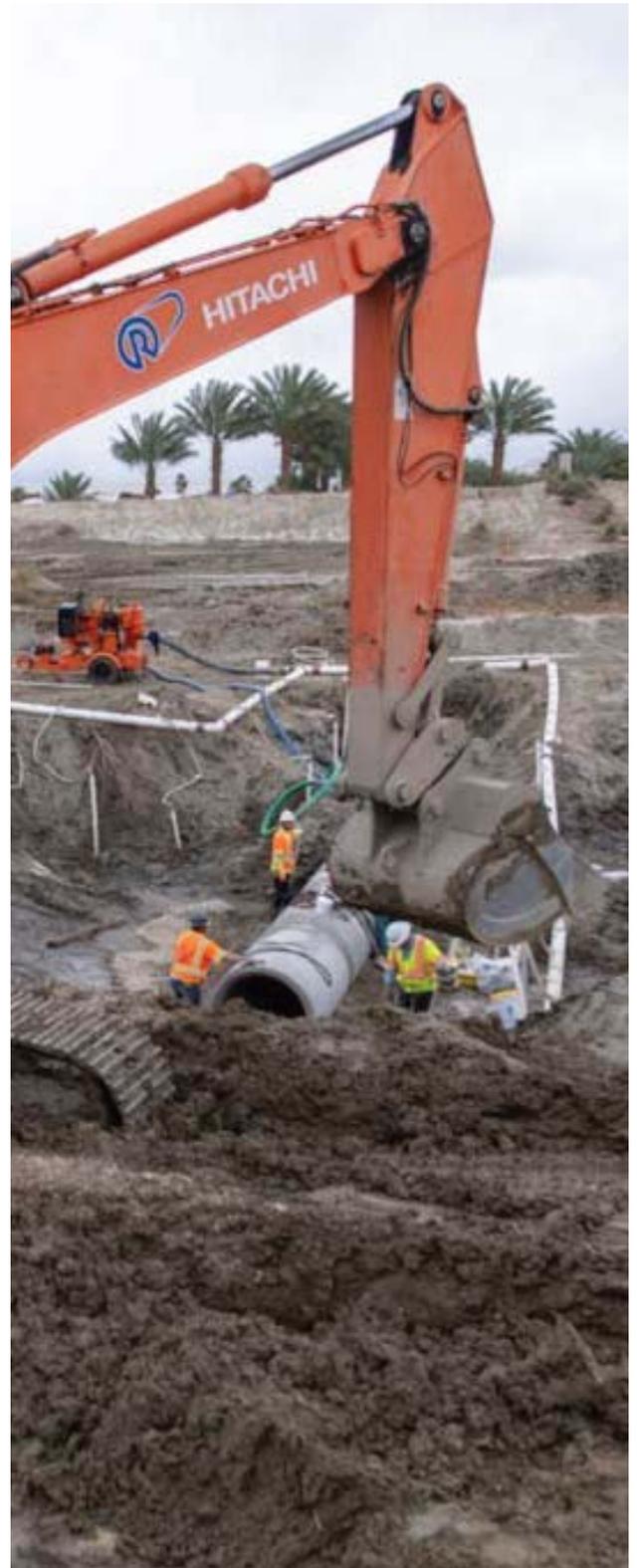
**ACTION FL2-5:** Ensure any on-road diesel-fueled medium heavy-duty and heavy heavy-duty engines in CVWD's vehicles fleet are in compliance with the Fleet Rule for Public Agencies and Utilities Fleet.

### TARGET METRICS

- 50% replacement of diesel with renewable diesel by 2023
- 100% replacement of diesel with renewable diesel by 2027

### GHG EMISSIONS REDUCTIONS

- 1,066 MT CO<sub>2</sub>e in 2030
- 1,210 MT CO<sub>2</sub>e in 2045





## MEASURE FL-3: Reduce vehicle miles traveled and fuel use for non-ZEV/EV fleet vehicles

The GHG emissions reduction potential that will be achieved due to the transition to a ZEV fleet, as mandated by the Advanced Clean Fleet Rule, is further maximized by prioritizing use of ZEVs for longer distance travel. Reducing VMT of non-ZEV fleet vehicles limits GHG emissions from mobile combustion of traditional fossil fuel and may also provide cost savings. The current GPS system in fleet vehicles currently gathers data every two minutes. By upgrading fleet vehicles' GPS systems with a more technologically advanced version that gathers data on a continuous basis, the fleet can operate more efficiently. Additionally, preventative maintenance of fleet vehicles optimizes vehicles operating conditions thereby reducing emissions.

### ACTIONS

**ACTION FL3-1:** Upgrade current GPS systems in vehicle fleet to improve mileage tracking, track idle time, and track performance. Adjust vehicle dispatch planning and reduce idle time as necessary to reduce VMT and improve vehicle operating conditions.

**ACTION FL3-2:** Continue to perform preventative maintenance on vehicle fleets to improve performance, including the procurement of low rolling resistance tires, using the correct tire air pressure, and regularly replacing air filters which will improve fuel efficiency.

### TARGET METRICS

- Upgrade GPS System for 100% of fleet vehicles by 2023

### GHG EMISSIONS REDUCTIONS

- 417 MT CO<sub>2</sub>e in 2030
- 309 MT CO<sub>2</sub>e in 2045<sup>44</sup>

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<sup>44</sup> If Measure FL-1 were fully implemented there would be no emission reductions as all fleet vehicles would be zero emission. EVs would charge from the grid which is required to be 100% carbon free by 2045.

## MEASURE WW-1: Reduce GHG process emissions associated with wastewater treatment

Wastewater treatment process emissions are CVWD's second largest GHG emissions source due to the release of methane. As buildings are decarbonized and energy like electricity becomes more carbon-free, wastewater emissions will become CVWD's predominant emission source and will need to be addressed as we approach 2045 to align with the states carbon neutrality goals. Because technology for reducing methane emissions from wastewater treatment plants can be expensive and requires advanced planning, this measure is focused on preliminary feasibility analysis and investigating funding opportunities for future implementation. Technology is advancing and programs such as LCFS may provide cost-effective opportunities to convert captured methane to biofuel for electricity generation or vehicle fleet use. It is anticipated that wastewater emissions will become a major focus of California for reducing GHG emissions in the future, at which point additional incentives for this work is expected to become available.

### ACTIONS

**ACTION WW1-1:** Investigate opportunities associated with design features of the CVWD Master Plan for wastewater treatment facilities to reduce emissions and/or capture methane. For example, as part of the proposed CIP project to install two new anaerobic digesters, consider conducting a pilot study for methane capture and conversion to biofuel under the LCFS Program.

**ACTION WW1-2:** Investigate potential partnerships with agencies or entities looking to obtain biogas for fuel production that would fund equipment costs.

### TARGET METRICS

- Identification of opportunities for methane reduction or use from wastewater treatment

### GHG EMISSIONS REDUCTIONS

- Supportive



## SCOPE 2 MEASURES: ELECTRICITY CONSUMPTION

### MEASURE E-1: Utilize low-carbon and carbon free electricity

Electricity consumption is CVWD's single largest emission source. While SB 100 ensures that emissions from retail electricity will be reduced to zero by 2045 through the California RPS, procuring carbon-free electricity now expedites this timeline and will provide significant reductions in CVWD's GHG emissions. By opting into a more renewable or "greener" electricity tier through current electricity providers, CVWD has the opportunity to achieve most of its GHG emissions reductions goal. Further, switching to low-carbon or carbon-free electricity will make other measures more impactful by further reducing GHG emissions. For example, electrification of buildings, equipment and vehicles will achieve a greater GHG emission reduction if the electricity sourced is low-carbon or carbon neutral. CVWD currently receives electricity from SCE and IID. For SCE the cost per kWh for opting into the Green Rate package ranges from 0.39 to 2.71 cents per kWh more for business customers depending on the rate schedule and green package tier.<sup>45</sup> IID also just

recently launched a Green Energy Rate Program where the cost per kWh for opting into the Green Energy Program ranges from 1.31 to 2.0 cents more depending on the tier selected in the program.<sup>46</sup> While there is a premium associated with opting into a more renewable or "greener" electricity tier with the current electricity providers, there are other opportunities to enter into a Power Purchase Agreement (PPA) directly with a renewable energy provider that may have cost benefits by locking in a low rate for electricity today that would be insulated from long term cost increases. The cost per kWh for PPAs with solar and storage are at historically low rates with some projects pushing below 2 cents per kWh.<sup>47</sup> Further, some electricity providers, such as SCE, award LEED points for participating in the "greener" electricity packages. LEED credits can qualify for tax rebates or credits, offsetting the cost of the premium. This measure also focuses on developing additional renewable energy generation and/or battery storage projects. GHG reduction potential is shown

45. <https://www.sce.com/residential/rates/standard-residential-rate-plan/green-rates>

46. <https://www.iid.com/home/showpublisheddocument/17257/636747759993730000>

47. <https://pv-magazine-usa.com/2019/06/28/los-angeles-seeks-record-setting-solar-power-price-under-2%C2%A2-kwh/>

for switching to the 50% green rate tier at both SCE and IID. Additional reductions would be achieved by switching to the 100% green rate tier.

### ACTIONS

**ACTION E1-1:** Conduct an annual return on investment analysis of green electricity packages available from current electricity providers, SCE and IID, as well as from joining Desert Community Energy (DCE). Return on investment analysis should include an evaluation of electricity accounts that can be switched, estimated cost for the switch, as well as benefits from achieving greater GHG emissions reduction as it relates to grant funding opportunities associated with the CAAP. Exceed the renewable electricity standard set by SB 100 for electricity purchases by opting into a green rate package with SCE and IID.

**ACTION E1-2:** Continue to analyze time-of-use emissions factors and costs to better model GHG emissions and costs for future projects. Include analysis as part of annual CAAP progress monitoring.

**ACTION E1-3:** When operationally feasible, schedule times of high pumping to coincide with times of high renewable energy availability and low demand to reduce GHG emissions and smooth demand curve. Establish a goal to shift 10% of pumping times to mid-day.

**ACTION E1-4:** Complete the installation of solar-topped parking structures and

battery storage system to cover 100% of CVWD Palm Desert Campus energy consumption needs by 2030.

**ACTION E1-5:** Investigate opportunities and partnerships with fuel providers within the LCFS program associated with generating low-carbon intensity (CI) electricity from wastewater treatment plants to generate LCFS credits or power for water reclamation plan electricity needs associated with the Palm Desert Campus (i.e., WRP 10).

**ACTION E1-6:** Investigate opportunities to reduce energy costs, improve resilience, and reduce electricity GHG emissions through additional on-site solar and battery storage to support CVWD operational energy use and/or investigate the cost effectiveness to enter a Power Purchase Agreement.

### TARGET METRICS

- Electricity accounts switched to 50% Green Rate option
- Shift 10% of pumping times to mid-day
- Install solar-topped parking structures and battery storage system to cover 100% of CVWD Palm Desert Campus

### GHG EMISSIONS REDUCTIONS

- 4,486 MT CO<sub>2</sub>e in 2030
- 0 MT CO<sub>2</sub>e in 2045<sup>48</sup>

<sup>48</sup> No emission reductions are achieved post 2045 as SB100 requires all retail electricity providers to obtain electricity from 100% renewable sources



## MEASURE EE-1: Improve energy efficiency at CVWD facilities and buildings

Improving pump efficiency, installing LED lighting, and installing energy recovery systems will all reduce the total demand for electricity from CVWD systems, saving money and reducing emissions. Improving equipment efficiency also aligns with the CEC's Building Energy Efficiency Standards. The cost of electricity from the grid varies throughout the day depending on supply and demand. When there is a high supply of renewable electricity available, such as solar-generated electricity during midday, both the cost and the emissions factor of the electricity is lower. Through implementation of time-of-use programs and scheduling pumping during times of high renewable energy and low demand and implementation of energy optimization measures at the Water Reclamation Plants (WRPs) CVWD will further reduce GHG emissions and increase cost savings.

### ACTIONS

**ACTION EE1-1:** As part of the Asset Management program, identify aging equipment due for replacement throughout CVWD facilities and identify energy efficient alternatives to use for the replacement (e.g., EnergyStar certifications). Include a return on an investment analysis as part of the replacement process that evaluates the capital investment for an energy efficient alternative piece of

equipment, cost savings associated with improved energy efficiency, and identifies any grants or rebates associated with such equipment replacement.

**ACTION EE1-2:** Continue to conduct energy audits annually and implement top energy recommendations. As part of CAAP monitoring, track energy improvements due to implementation of energy audit recommendations annually.

**ACTION EE1-3:** Based on the recommendations from Coachella Valley Water District WRP Energy Optimization Evaluation, implement the top Energy Efficiency Measures (EEM) at WRP 4, WRP 7 and WRP 10 with a Benefit-to-Cost Ratio Greater than 1.0 by 2030. The identified EEM are aligned with the Sanitation Master Plan and include energy optimization such as aeration improvements, treatment optimization, improved site and building lighting, and addition of solar panels to the WRPs.

**ACTION EE1-4:** Develop a policy that would require any new CVWD building to achieve a minimum level of LEED Gold certification or LEED equivalent to improve energy efficiency and reduce cost based on high return on investment greater than 20%.

**ACTION EE1-5:** Continue to utilize automated lighting controls for indoor/outdoor lighting for CVWD campuses pursuant to

the current CEC Building Energy Efficiency Standards (Title 24, Part 6 and 11).

**ACTION EE1-6:** Pursuant to the CEC 2019 Building Energy Efficiency Standards (Title 24, Part 6 and 11), require all new construction and building upgrades utilize light emitting diode (LED) lighting technology only. Establish goal to convert all interior and exterior lighting at 50% of CVWD facilities to LED technologies by 2027 and 100% by 2035.

**ACTION EE1-7:** Continue CVWD's time of use program that identifies and established permanent shifts of high-electricity use to times when renewable energy is plentiful through educational programs on energy and thermal storage, load timing/controls, pre-cooling/pre-heating, and other time-energy demand measures.

**ACTION EE1-8:** Continue to identify opportunities to develop and profile notable energy efficiency projects. Track energy reduction from implementation of energy efficiency projects and prepare a report detailing successes for internal stakeholders by 2030.

### TARGET METRICS

- Implement top Energy Efficiency Measures at Water Reclamation plants with a Benefit-to-Cost Ratio Greater than 1<sup>49</sup>
- 50% replacement of lighting fixtures with LEDs by 2027
- 100% replacement of lighting fixtures with LEDs by 2035

### GHG EMISSIONS REDUCTIONS

- 2,965 MT CO<sub>2</sub>e in 2030
- 0 MT CO<sub>2</sub>e in 2045<sup>50</sup>



49. Annual electricity savings estimated from implementation of the WRP energy optimization measures in the Coachella Valley Water District WRP Energy Optimization Evaluation equates to approximately 9% reduction in CVWD's electricity usage.

50. SB 100 requires all electricity providers in the state to provide 100% carbon free electricity by 2045; therefore, no GHG emissions reductions can be gained from energy efficiency measures in 2045, since the emissions factor for electricity will be zero.



## SCOPE 3 MEASURES: INDIRECT EMISSIONS AND SEQUESTRATION

### MEASURE WG-1: Increase waste diversion to achieve 75% reduction in landfilled organic waste by 2025 and zero-waste by 2045

Waste generation at CVWD contributes a small amount to the overall GHG emissions from CVWD operations. A majority of the GHG emissions resulting from waste sent to the landfill are caused by decomposition of organic material under anaerobic conditions. The remainder of the emissions come from inorganic wastes, such as plastic, which have both upstream and downstream emissions. Therefore, increasing the diversion of organic and inorganic waste streams is a primary measure to reduce waste related GHG emissions. In alignment with SB 1383 and AB 341, CVWD will develop and implement a waste diversion plan to reduce organic waste sent to the landfill by 75% using 2014 levels as a baseline and strive to achieve zero-waste sent to landfills by 2045. Additionally, CVWD will report biosolid quantity and destination to CalRecycle in compliance with AB 901.

#### ACTIONS

**ACTION WG1-1:** Conduct a waste audit by 2023 to determine what percentage of the waste stream is organic compared with the waste stream in 2014 and therefore, subject to SB 1383.

**ACTION WG1-2:** Expand CVWD's current waste management by developing net-zero waste policies and programs at all facilities to reduce landfilled organic waste by 75% by 2025 from 2014 levels and achieve zero landfilled waste by 2045 in alignment with AB 341 and SB 1383.

**ACTION WG1-3:** Continue to implement organic waste diversion strategies where green and wood waste is separated from other waste streams and sent to the Greenleaf Biomass Power Plant in Mecca or other biomass/renewable energy center.

**ACTION WG1-4:** Investigate funding opportunities to develop an organics program and deploy organic waste bins at all CVWD facilities such that organics generated from CVWD operations is collected and diverted from the landfill by 2025.

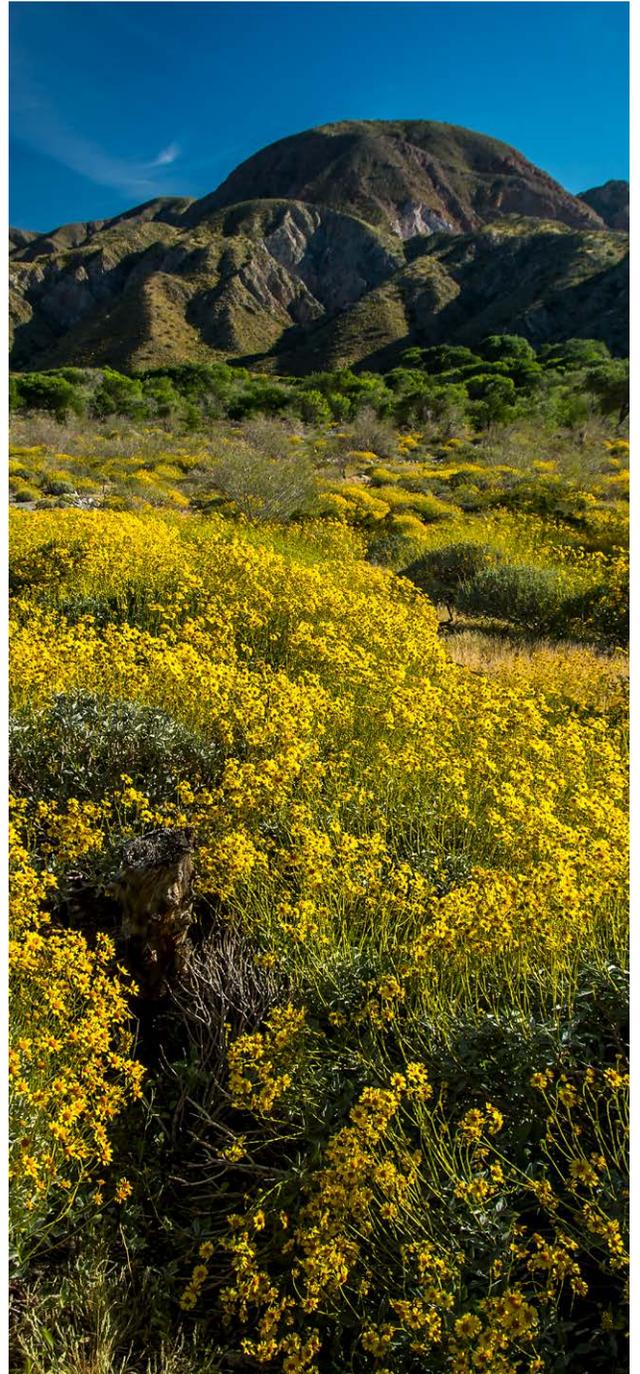
**ACTION WG1-5:** Pursuant to AB 901, report the quantity and destination of disposed biosolids from wastewater treatment plants to CalRecycle quarterly.

### TARGET METRICS

- Conduct waste audit by 2023
- 75% organic waste reduction by 2025 compared with 2014 baseline<sup>51</sup>
- 100% waste reduction by 2045 (i.e. approximately 4% reduction annually)

### GHG EMISSIONS REDUCTIONS

- 10 MT CO<sub>2</sub>e in 2030
- 32 MT CO<sub>2</sub>e in 2045



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51. SB 1383, effective 2022, sets statewide emissions reduction targets to 40 percent below 2013 levels by 2030 for methane, 75 percent reduction in organic material disposed in landfills from 2014 levels by 2025 and required jurisdictions to adopt ordinances or other enforceable mechanisms to impose penalties for non-compliance. CVWD will be required to comply with local jurisdictions ordinances established to meet SB 1383 requirements.



## MEASURE TR-1: Incentivize more sustainable commutes

CVWD currently tracks employee commuting habits and provides last mile facilities to encourage alternative commute options. In addition, providing education on alternative commute options, information on available ZEV incentives/rebates available, offering flexible work schedules (less cars commuting), and providing rideshare incentives and preferential parking for ZEVs in support of California's ZEV goals will further lower CVWD's carbon footprint associated with employee commutes. The increase of EVs and ZEV use by employees for commuting is inevitable with the establishment of Zero-Emission Vehicle Regulation and N-79-20, which requires auto manufacturers to provide more ZEVs for sale in California to achieve the state's goal of 100% of sales of new passenger vehicles to be ZEV by 2035. Programs like LCFS and the Clean Transportation Program (AB 118) provide credits or funding, respectively, for developing ZEV fueling infrastructure to incentivize the development of necessary ZEV infrastructure to support the new ZEVs on the road. Further, CARB established a rebate program for individuals to replace their vehicles with a ZEV. As such, it is anticipated that California's goals and incentives will lead to an increased use of ZEVs by CVWD employees. Under this measure, CVWD will evaluate incentives, credit generating opportunities, partnerships, and the return on investment to provide ZEV

infrastructure for employees and visitors which will further encourage employees to drive personal ZEVs.

### ACTIONS

**ACTION TR1-1:** Continue to conduct annual SCAQMD transportation surveys to monitor CVWD employees needs and motivation for traveling by single occupancy vehicles versus alternatives. Based on survey results, expand or promote programs and incentives that have proven successful strategies in reducing employee VMT.

**ACTION TR1-2:** Continue to offer rideshare incentives to employees who carpool. Consider offering other incentives to employees to use an alternative mode of transportation to commute (e.g. public transportation, bikes).

**ACTION TR1-3:** Allow all employees located at CVWD Palm Desert and Coachella Campuses to utilize flexible 9/80 schedule through 2030 to reduce travel time, VMT, and GHG emissions.

**ACTION TR1-4:** Conduct a ZEV/EV Feasibility Study by 2026 to investigate funding opportunities or partnerships to install ZEV/EV infrastructure at CVWD facilities and to determine the number and locations most effective for ZEV/EV infrastructure installation. Discuss with SCE their current pilot programs to install infrastructure at workplaces and evaluate future opportunities for CVWD to host pilot program.

**ACTION TR1-5:** Based on funding and ZEV/EV Feasibility Study, install ZEV and/or EV infrastructure to support at least a 15% transition to ZEVs/EVs by 2030 and 30% by 2045.

**ACTION TR1-6:** Expand provided preferred parking for EV/ZEVs to incentivize use of ZEVs/EVs by employees.

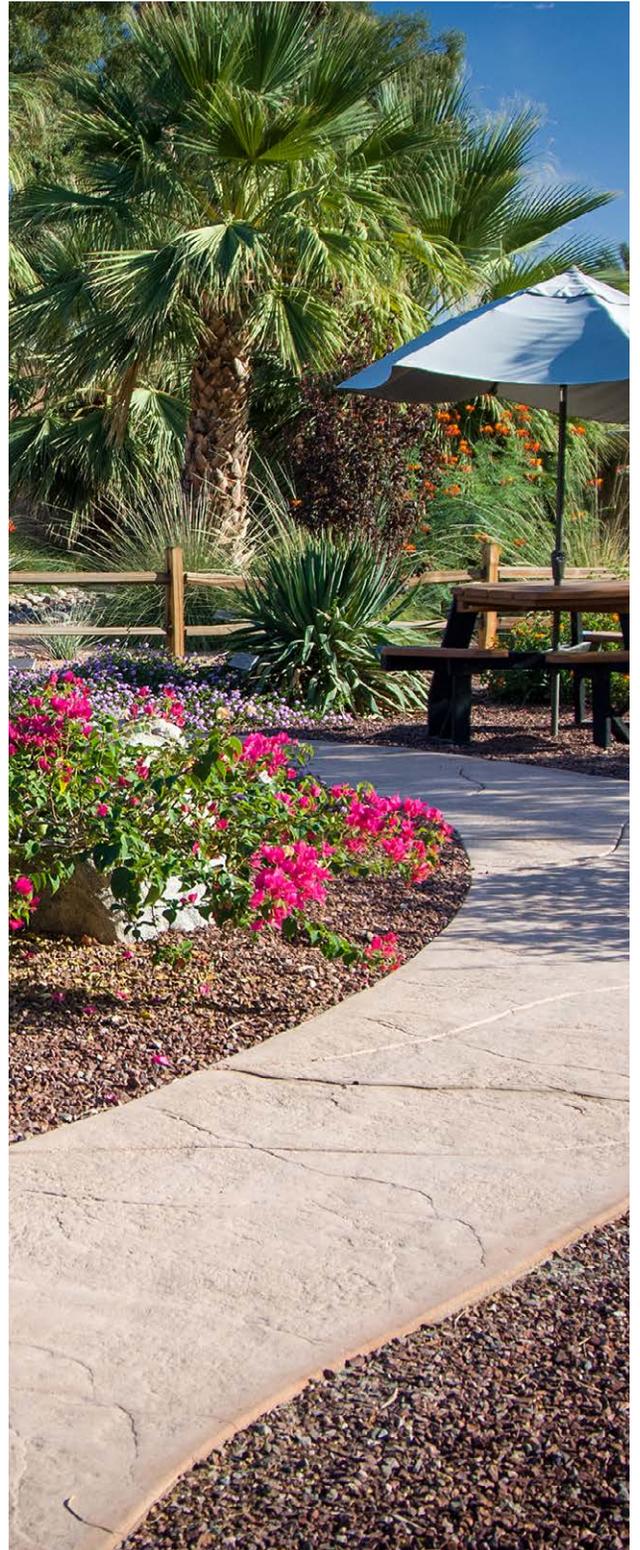
**ACTION TR1-7:** Promote employee use of carbon-free and low carbon transportation by providing educational materials (e.g. fliers in break rooms, info on transportation survey, info on websites) on the benefits of commute options including public transportation, EV/ZEV options, and vanpools.

### TARGET METRICS

- 85% participation in 9/80 schedule by 2030 and maintained through 2045
- 15% transition to EVs among employees by 2030

### GHG EMISSIONS REDUCTIONS

- 56 MT CO<sub>2</sub>e in 2030
- 95 MT CO<sub>2</sub>e in 2045





## MEASURE WC-1: Increase water conservation and local water supply

CVWD has a long history of promoting water conservation, which has resulted in measurable reduction in retail water usage and indirectly reduces GHG emissions. CVWD has had a number of successful water conservation programs such as providing indoor rebates for water efficient appliances, landscape rebate programs including turf reduction incentives for residences and golf courses, practicing and promoting water-efficient irrigation and low water usage planting, and developing education programs for specific customer groups such as the Agricultural Water Advisory Group. CVWD achieved a 20% reduction in per capita water use as required by the Water Conservation Act of 2009 as a direct result of these programs. CVWD will expand these water conservation efforts to achieve further reductions in per capita water use that will align with new state regulations. Reduced per capita water consumption allows CVWD to meet the water demands of a growing population and reduce operational emissions.

### ACTIONS

**ACTION WC1-1:** Expand programs which educate customers on water conservation initiatives through workshops and speaking engagements. In coordination with retail water suppliers, host regular workshops and classes on water conservation, including providing information on drought-tolerant landscaping, available

rebates for water retrofits, and water efficiency strategies in new buildings. Continue to offer workshops and classes even when drought conditions are not present. Develop outreach materials for water conservation.

**ACTION WC1-2:** Continue to work with local groups such as the Agricultural Water Advisory Group to teach farm owners, managers, and irrigators concepts in irrigation water and salinity management as well as promote new technology to help the conservation effort. Apply for grant-funded agricultural rebate programs to assist those in the agriculture industry to reduce water use.

**ACTION WC1-3:** Analyze current water use reduction programs to identify which programs have the highest adoption rate and water use reduction impacts. Expand those programs which are found to be most effective.

**ACTION WC1-4:** Prepare a formal landscape management plan for CVWD that consolidates and expands upon the goals and policies for landscaping at CVWD property. The Plan should identify whether and where there are resource-consumptive landscapes on CVWD property that can be changed out to more water-conserving, slower growth plants that require less maintenance. Continue to implement potable water conservation strategies in landscape design and maintenance (such

as replacing water intensive areas with drought-resilient native plants [Bermuda grass], using low-flow water fixtures, installing sophisticated irrigation software to control water, investing in systems to monitor pipe leakage, and limiting turf development).

**ACTION WC1-5:** Require new or redeveloped CVWD developments to be low water use through landscaping with drought tolerant plants, permeable paving, green infrastructure, and incorporating other low-impact development design features to allow for increased infiltration, even in heavy rains.

**ACTION WC1-6:** Continue to promote water conservation through water-efficient irrigation and desert horticulture demonstration gardens and educational material.

**ACTION WC1-7:** Complete and implement Irrigation Master Plan that establishes goals and a timeline for improved water conservation related to irrigation. The Plan should identify the opportunities for replacement of groundwater use for irrigation with recycled water use, including a cost assessment and prioritization of opportunities.

**ACTION WC1-8:** Seek additional grant funding to expand the Golf Course Conservation program with a goal to remove/replace an additional 115,000 square feet of turf by 2030.

**ACTION WC1-9:** Continue to implement and expand on successful water conservation rebate programs (e.g., Water audits program for large water users,

Residential smart controller rebate program, Commercial irrigation upgrade program, Commercial landscape rebate program, Residential landscape conversion rebate program, Commercial pre-rinse nozzle rebate program, Commercial water broom rebate program, Residential hot water recirculating pump rebate program, Commercial water efficient toilet rebate program, Residential ultra-low flush toilet replacement rebate program, Residential high efficiency washing machine rebate program) in alignment with the current statewide water conservation goals.

**ACTION WC1-10:** Develop and adopt a schedule for installation of water meters in existing buildings and irrigation zones to establish a water consumption baseline at CVWD owned properties with the Facilities Group. Reduce CVWD water consumption per capita at facilities in alignment with the current statewide goals.

**ACTION WC1-11:** Investigate new advance technology systems to increase District's recycled and ground-water recovery systems to maintain local water supply (e.g., Mid-Valley Pipeline Project). Invest in such technology as it becomes feasible and cost-effective.

### TARGET METRICS

- Reduced per capita water consumption by 2030 and 2045 in alignment with state policies

### GHG EMISSIONS REDUCTIONS

- Supportive



## MEASURE CS-1: Investigate and implement carbon sequestration opportunities

Measure CS-1 provides opportunities for negative emissions through carbon capture and storage and/or carbon sequestration on natural and working lands (e.g., rangeland, forests, woodlands, wetlands and coastal areas, grasslands, shrubland, farmland, riparian areas, and urban green space). Carbon capture and storage refers to the process of capturing CO<sub>2</sub> emissions from the atmosphere or an industrial process, transporting it, and storing it in deep geological formations, the ocean, or minerals.<sup>52</sup> Carbon sequestration programs will be an important tool to mitigate some of CVWD's emissions. While carbon capture and sequestration programs can require a large investment up-front, this cost could be mitigated through credit generation opportunities based on CARB's "Carbon Capture and Sequestration protocol" adopted in 2018 as well as through other voluntary and Federal carbon markets.

### ACTIONS

**ACTION CS1-1:** As part of the currently CVWD published Landscape Manual, include information regarding flora and fauna CO<sub>2</sub> sequestration potential to promote the incorporation of landscape plants that are both low water and CO<sub>2</sub> sequestering. Consider vegetative options with higher CO<sub>2</sub> sequestration potential for CVWD facilities landscaping.

**ACTION CS1-2:** Research/evaluate the carbon sequestration potential of the CVWD Constructed Habitat Project currently in design. Develop partnerships with appropriate agencies, such as the wildlife agency, to investigate potential carbon sequestration projects to collaborate on.

### TARGET METRICS

- Increased carbon sequestration on CVWD's natural and working lands

### GHG EMISSIONS REDUCTIONS

- Supportive

52. [https://www.ipcc.ch/site/assets/uploads/2018/03/srccs\\_wholereport-1.pdf](https://www.ipcc.ch/site/assets/uploads/2018/03/srccs_wholereport-1.pdf)

## MEASURE CR-1: Reduce construction-related GHG emissions through construction fleet requirements

Emissions from construction activities are estimated to contribute up to 8% of CVWD's overall GHG emission profile. Depending on the approved funding and Capital Investment Projects underway, emissions from construction can vary. Further, CVWD does not have direct control over construction emissions other than the contracting particular fleets for a project. However, by ensuring CVWD is only contracting with construction fleets that are in compliance with current regulations to phase-in newer engines, CVWD's overall construction emissions will continue to decrease. State goals to transition to zero-emissions off-road equipment will further reduce emissions as technology improves for such types of equipment. Construction fleets that CVWD contracts with will be required to comply with the Off-Road Diesel Regulation. With EO N-75-20, technology for off-road vehicles is anticipated to continue to advance, providing cost-effective options for off-road equipment.

### ACTIONS

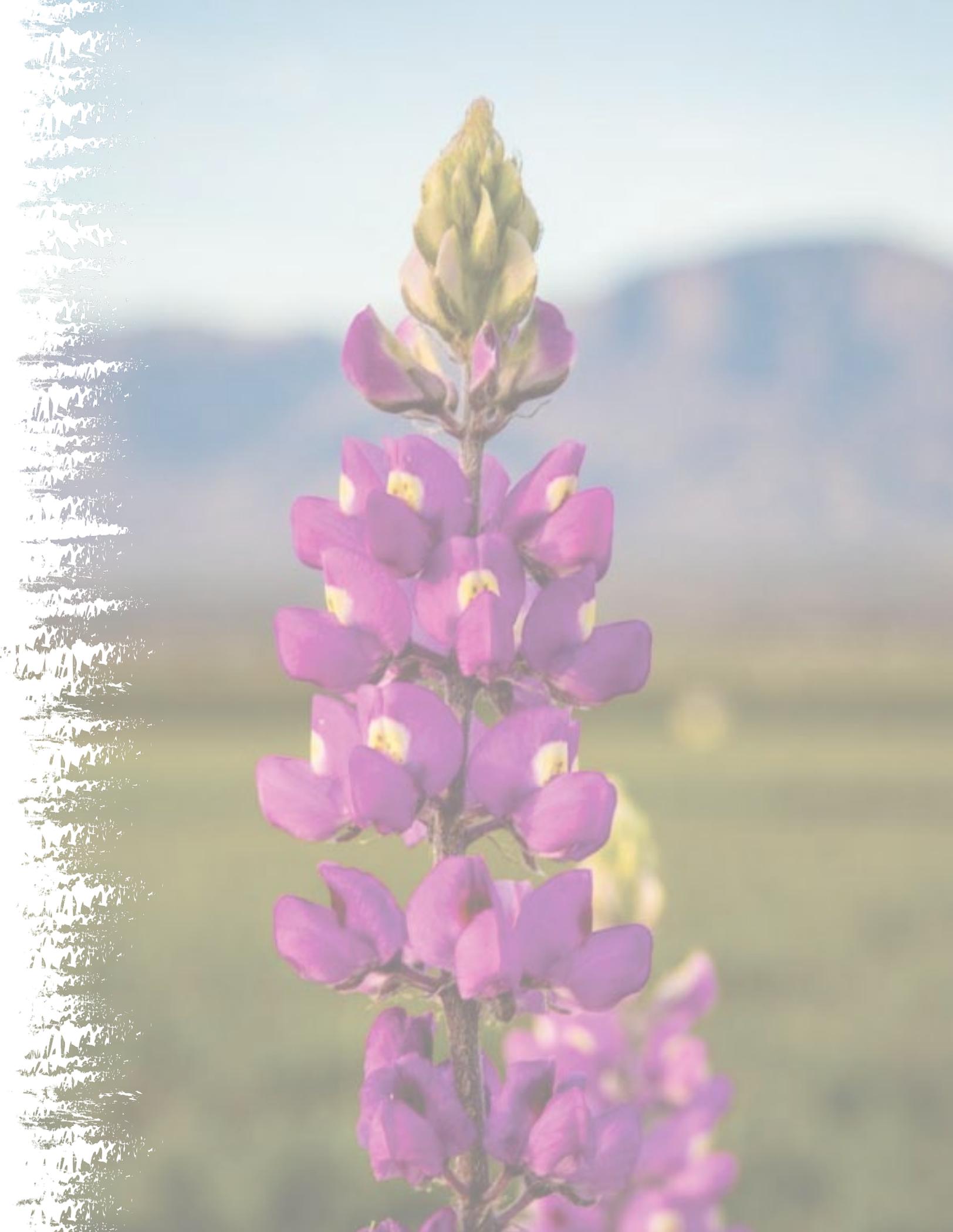
**ACTION CR1-1:** In alignment with California's Regulation for In-Use Off-Road Diesel-Fueled Fleets, adopt a policy requiring that construction fleets average fleet index are equal to or are less than the annual fleet average target and prioritizes Tier 3 off-road diesel-powered construction equipment greater than 50 hp when equipment is available and feasible. In addition, prioritize use of construction equipment that is outfitted with BACT devices certified by CARB, and emissions control devices used by the contractor shall achieve emissions reductions that are no less than what could be achieved by a Level 3 diesel emissions control strategy for a similar-sized engine as defined by CARB regulations by 2023.

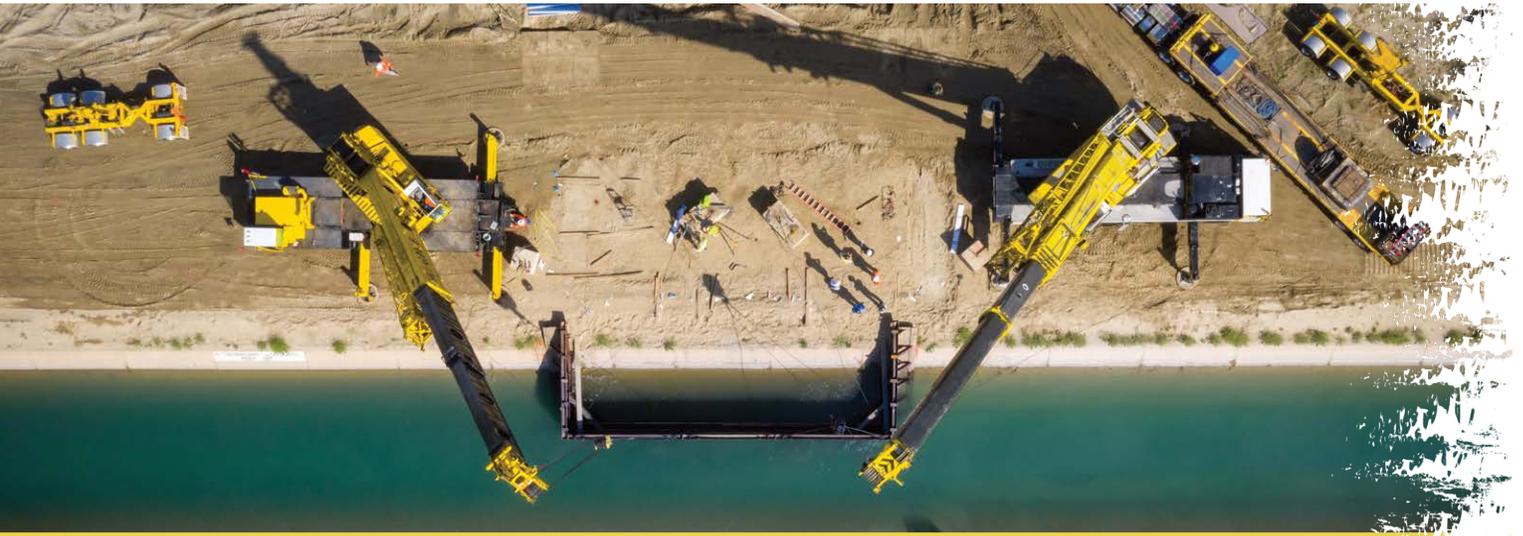
### TARGET METRICS

- Contracted construction fleets average fleet index are equal to or less than the annual fleet average target

### GHG EMISSIONS REDUCTIONS

- Supportive





## 6. IMPLEMENTATION AND MONITORING STRATEGY

### CAAP IMPLEMENTATION

This CAAP outlines specific strategies and measures to achieve demonstrative GHG emissions reduction and improve the resilience of CVWD's operations (see *Section 5*). Implementation of the CAAP is planned to occur between 2021 and 2045. Due to the long implementation time period of the CAAP measures and actions may evolve over time as CVWD tracks progress, new technologies and legislation emerge, and

funding opportunities for additional GHG emissions reduction opportunities are identified. This section details CVWD's implementation plan for the CAAP, which will include transforming measures and actions into on-the-ground policies, programs, and projects within CVWD. Implementation of this CAAP is grounded in science and current best practices in climate action planning.

## CAAP WORKING GROUP

Planned CAAP implementation is central to the success of any CAAP in achieving GHG reduction targets and increasing resiliency. Implementation planning involves identifying responsible parties for implementation. Several departments within CVWD will play a key role in the CAAP's implementation and monitoring.

To better define the division or department responsible for CAAP implementation and monitoring, CVWD has established a CAAP Working Group. The CAAP Working Group will be primarily responsible for driving implementation and annual monitoring of the CAAP and is composed of staff from CVWD's Environmental

Services Department (lead) and supported by staff from CVWD's Conservation and Communication, Engineering, Facilities and Maintenance, Operations, and Finance Departments. The inaugural 2020 CAAP Working Group convened at the start of the CAAP development process and has been responsible for evaluating the measures and actions included in this CAAP, as well as reviewing and approving each section of the CAAP document. Going forward, the CAAP Working Group will meet quarterly and will take the lead on tracking CAAP progress and educating and engaging other departments on the CAAP's implementation.

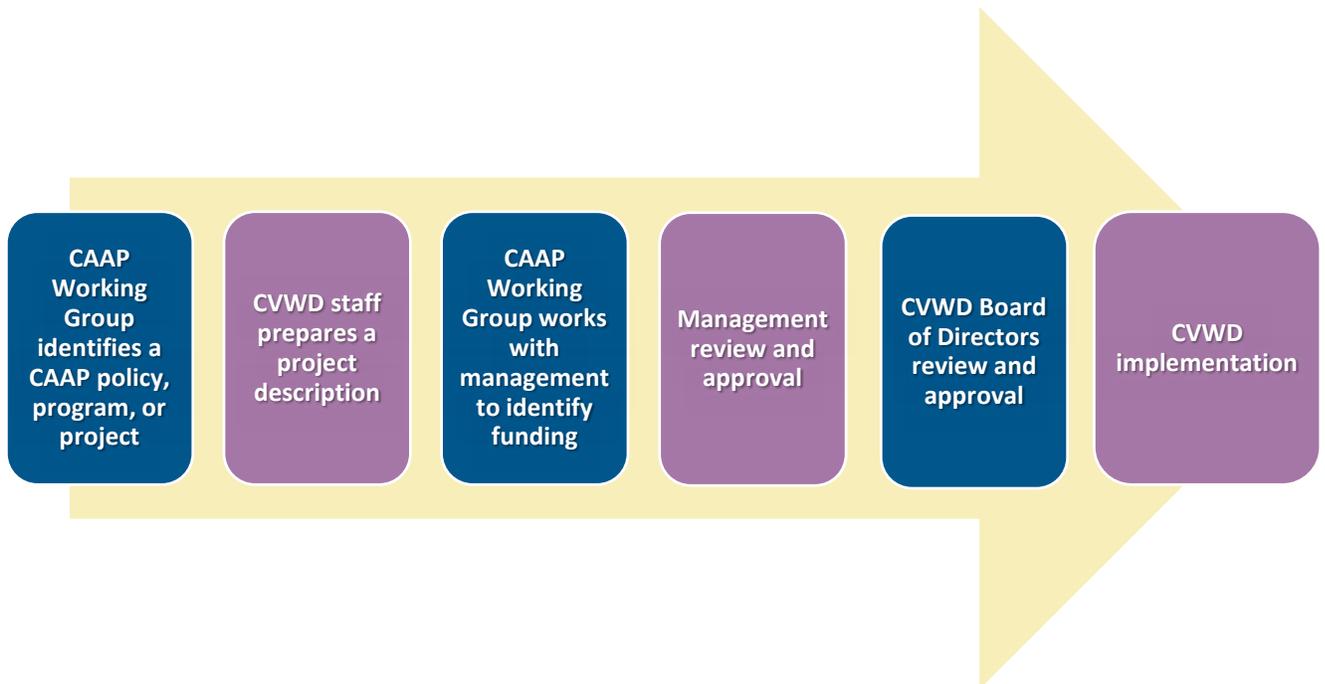


## Steps for Implementation

Implementation will occur through systematic implementation of the actions identified in the CAAP, which generally contain new policies, programs, and projects that CVWD will adopt or implement to achieve the intent of the actions. The CAAP Working Group will further define these policies, programs, and projects, work with relevant departments to draft and review

them, present them to CVWD's management and identify funding. As needed, proposed plans, programs, and relevant projects would be submitted to CVWD's Board of Directors to fund or adopt. Figure 6-1 provides a visual demonstration of the steps for CAAP implementation that will be managed by the CAAP Working Group.

**Figure 6-1. CVWD CAAP Implementation Process**





## Implementation Timeline

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The implementation timeframe, responsible departments, and associated performance metrics for the CAAP's measures and actions are shown in Table 6-1. Based on substantial evidence and CVWD-specific data, these measures have been developed to be capable of reducing a specific quantity of GHG emissions within a reasonable period of time, considering economic, environmental, legal, social, and technological factors (see Appendix B for more details on measure quantification). In order to achieve the 2030 GHG emissions reductions targets discussed in Section 4, CVWD will begin implementing the measures and actions as soon as possible to make real progress over the next decade.

The CAAP takes a phased approach to implementation:

- **Phase 1** will occur in the short-term over the next five years (**2021–2026**).
- **Phase 2** would include implementation of the mid-term measures to take place over the next ten years (**2021–2029**).
- **Phase 3** would include implementation of the longer-term measures, which are anticipated to occur after feasibility studies are complete and initial measures are implemented (**2030–2045**).

If the actions identified in the CAAP to meet the 2030 GHG emissions reduction milestone goal are not implemented, it is likely additional actions will need to be developed. The longer action is delayed, the more significant actions need to be taken to achieve the longer-term GHG emissions reduction targets. Some actions such as opting into a greener electricity package or replacing diesel with renewable diesel can be accomplished on a short timetable; while others, such as implementation of strategies to reduce emissions from wastewater treatment may require longer timelines to conduct a feasibility assessment, obtain funding, and roll-out any required infrastructure changes.

**Table 6-1. Implementation Timeline by GHG Reduction Action**

GHG Reduction Measure/ Action	Phase	Implementing Department	Implementation Metric
<b>Measure DC-1 (Direct Combustion): Phase out natural gas combustion at CVWD facilities, such that 50% of natural gas combustion equipment is replaced with electric equivalents by 2030.</b>			
Action DC1-1	1-2	Facilities & Maintenance, Engineering	Survey completed
Action DC1-2	1	Environmental Services, Finance	Funding identified
Action DC1-3	1-2	Facilities & Maintenance, Engineering	Natural gas usage reduced
<b>Measure FL-1 (Fleet): Replace vehicle fleet with zero-emission vehicles as technology allows in alignment with the Advanced Clean Fleet Rule, such that by 2030, 40% of vehicle fleet are zero emissions vehicles and by 2045 100% of the vehicle fleet are zero emission.</b>			
Action FL1-1	1	Facilities & Maintenance, Finance	Analysis completed
Action FL1-2	1	Facilities & Maintenance	Policy implemented
Action FL1-3	1	Facilities & Maintenance	Compliance documented
Action FL1-4	1-2	Facilities & Maintenance	Fuel usage reduced
Action FL1-5	1-2	Facilities & Maintenance, Finance	Grant opportunities identified; analysis completed
<b>Measure FL-2 (Fleet): Use alternative fuels to bridge the technology gap to zero emission vehicles and off-road equipment by achieving 100% replacement of #2 diesel with 100% renewable diesel by 2030.</b>			
Action FL2-1	1	Facilities & Maintenance	Assessment completed
Action FL2-2	1	Facilities & Maintenance	Board approval obtained
Action FL2-3	1	Facilities & Maintenance	Diesel usage reduced
Action FL2-4	1-2	Facilities & Maintenance, Communications & Conservation, Finance	Partnership identified; pilot conducted; grant opportunities identified
Action FL2-5	1	Facilities & Maintenance	Compliance documented



# Climate Action & Adaptation Plan

GHG Reduction Measure/ Action	Phase	Implementing Department	Implementation Metric
<b>Measure FL-3 (Fleet): Reduce vehicle miles traveled and fuel use for non-ZEV/EV fleet vehicles.</b>			
Action FL3-1	1	Facilities & Maintenance	Regular mileage and performance documented
Action FL3-2	1	Facilities & Maintenance	Maintenance documented
<b>Measure WW-1 (Wastewater): Reduce GHG process emissions associated with wastewater treatment.</b>			
Action WW1-1	2-3	Engineering, Facilities & Maintenance	Opportunities identified and implemented
Action WW1-2	2-3	Communication & Conservation, Operations	Partnership opportunities identified
<b>Measure E-1 (Electricity Procurement): Utilize low-carbon and carbon-free electricity.</b>			
Action E1-1	1	Engineering, Environmental Services, Operations	Switch to low carbon or carbon-free electricity completed
Action E1-2	1	Environmental Services	Regular analysis completed
Action E1-3	1	Engineering, Operations	Electricity usage reduced
Action E1-4	1-2	Engineering	Solar-topped parking structures installed
Action E1-5	1-2	Engineering, Operations	Opportunities identified and implemented
Action E1-6	1-2	Engineering, Operations	Opportunities identified and implemented
<b>Measure EE-1 (Energy Efficiency): Improve energy efficiency at CVWD facilities and buildings.</b>			
Action EE1-1	1	Facilities & Maintenance	Analysis completed; fossil fuel usage reduced
Action EE1-2	1-3	Engineering	Building energy usage reduced
Action EE1-3	1-2	Engineering	Board approval for budget for project implementation

GHG Reduction Measure/ Action	Phase	Implementing Department	Implementation Metric
Action EE1-4	1-2	Engineering	Board approval for policy obtained
Action EE1-5	1	Facilities & Maintenance	Building electricity usage reduced
Action EE1-6	1-3	Engineering	Building electricity usage reduced
Action EE1-7	1-3	Engineering, Operations, Facilities & Maintenance	Time of use program documentation
Action EE1-8	1-3	Engineering, Operations, Facilities & Maintenance	Energy efficiency projects implemented
<b>Measure WG-1 (Waste Generation): Increase waste diversion to achieve 75% reduction in land-filled organic waste by 2025 and zero-waste by 2045.</b>			
Action WG1-1	1	Environmental Services, Facilities & Maintenance	Waste audit conducted
Action WG1-2	1-3	Environmental Services, Facilities & Maintenance	Waste reduced
Action WG1-3	1	Environmental Services, Facilities & Maintenance	Organic waste separation program implemented
Action WG1-4	1-2	Environmental Services, Finance	Opportunities identified and implemented
Action WG1-5	1	Communications & Conservation, Environmental Services	Quarterly reports completed
<b>Measure TR-1 (Transportation): Incentivize more sustainable commutes.</b>			
Action TR1-1	1	Communications & Conservation	Annual surveys completed; programs identified and implemented
Action TR1-2	1	Human Resources	Rideshare incentives and results documented
Action TR1-3	1	Human Resources	Employee commute VMT reduced



# Climate Action & Adaptation Plan

GHG Reduction Measure/ Action	Phase	Implementing Department	Implementation Metric
Action TR1-4	2	Engineering	EV/EV infrastructure installed
Action TR1-5	1	Human Resources	Preferred parking expanded
Action TR1-6	1	Communications & Conservation	Education materials developed and disseminated
<b>Measure WC-1(Water Conservation): Increase water conservation and local water supply.</b>			
Action WC1-1	2	Communications & Conservation, Services	Program expansion documented
Action WC1-2	1	Communications & Conservation, Services	Program expansion documented; grant opportunities identified and implemented
Action WC1-3	1-2	Communications & Conservation	Analysis completed
Action WC1-4	1-2	Communications & Conservation, Facilities & Maintenance	Landscape Management Plan prepared
Action WC1-5	2	Communications & Conservation, Engineering	Policy implemented
Action WC1-6	1	Communications & Conservation, Services	Education materials developed and disseminated
Action WC1-7	2-3	Communications & Conservation, Engineering	Landscape Management Plan prepared
Action WC1-8	2	Communications & Conservation, Finance	Turf replaced
Action WC1-9	1	Communications & Conservation, Services	Program expansion documented; water conserved
Action WC1-10	1-2	Communications & Conservation, Facilities & Maintenance, Engineering, Operations	Water meters installed
Action WC1-11	3	Engineering, Operations	Opportunities identified and implemented

GHG Reduction Measure/ Action	Phase	Implementing Department	Implementation Metric
<b>Measure CS-1 (Carbon Sequestration): Investigate and implement carbon capture and sequestration opportunities.</b>			
Action CS1-1	1	Communications & Conservation, Services	Program expansion documented
Action CS1-2	2-3	Environmental Services	Analysis Completed
<b>Measure CR-1 (Construction): Reduce construction-related GHG emissions by CVWD through emissions reduction controls and/or equipment requirements.</b>			
Action CR1-1	1	Engineering	Policy adopted and implemented





## CAAP MONITORING

CVWD will monitor CAAP implementation progress. Monitoring will include evaluating the CAAP implementation metrics developed for each action against CVWD operations and activities and preparing regular GHG inventory updates to track CVWD's progress against its targets. The inventory update process will also include updates to CVWD's CAPDash software, which will be used to provide transparent and regular updates to CVWD staff, stakeholders, and Board of Directors.

Over time, new technologies, State regulations, and incentives, as well as CVWD's

operational conditions will all change and may impact CVWD's measures, actions, and implementation schedule. As part of the monitoring effort, the CAAP Working Group will regularly re-evaluate the measures and actions contained in the CAAP. Re-evaluation will especially consider CVWD's progress towards its targets, success of CAAP implementation so far, changes to technologies, State regulations, and other incentives for change. Upon re-evaluation, CVWD may choose to revise the measures and actions and update the CAAP.

### Monitoring Timeline

The CAAP implementation metrics will be monitored on an annual basis. GHG inventory updates for the energy sector will occur annually, with evaluation of other sectors every three years. The CAAP Working Group will prepare an update

on the CAAP's GHG Reduction Measures (Table 6-1) on an annual basis starting in 2022. Re-evaluation of the CAAP's measures and actions will occur approximately every five years or more frequently.

### Reporting

The CAAP Working Group will report implementation monitoring results for each action, GHG inventory update results, and

CAAP re-evaluation results to the Board of Directors on an annual basis.

## CAPDash for Monitoring and Reporting

To facilitate implementation and monitoring of the CAAP and to minimize future CVWD staff resources needed for monitoring and reporting, CVWD will manage all implementation tracking and future GHG emissions inventories in CAPDash – a cloud based GHG inventory, monitoring, and reporting tool. The CAPDash tool will serve three purposes: generating transparent

GHG inventory updates through CVWD staff's input of activity data, tracking implementation of the CAAP measures over time based on the implementation metrics identified for each action, and generating easily exportable reports for use in reporting to CVWD's Board of Directors.







# GLOSSARY

Term	Definitions
<b>AB</b>	Assembly bill
<b>Action</b>	In this document the term “action” references the act, policy, or measure that will be implemented and achieved to reduce greenhouse gases.
<b>Adaptation</b>	The changes or process of changes a community or jurisdiction undergoes to become better suited to a changing environment.
<b>Alternative energy</b>	Energy derived from nontraditional sources (e.g., compressed natural gas, solar, hydroelectric, wind)
<b>Anthropogenic</b>	Made by people or resulting from human activities
<b>Atmosphere</b>	The envelope of gases surrounding the earth. These gases include nitrogen (78.1%), oxygen (20.9%), and argon, helium, GHGs, ozone, and water vapor in trace amounts
<b>BAU</b>	Business as usual refers to the scenario in which the entities behavior and jurisdiction operations continue on as they currently are without change.
<b>CalRecycle</b>	California Department of Resources, Recycling, and Recovery



# Climate Action & Adaptation Plan

Term	Definitions
<b>CAAP</b>	Climate action and adaptation plan
<b>CARB</b>	California Air Resources Board
<b>Carbon dioxide (CO<sub>2</sub>)</b>	A gas produced by burning organic compounds containing carbon and by respiration
<b>Carbon dioxide equivalent (CO<sub>2</sub>e)</b>	A metric measure used to directly compare emissions from various GHGs based on their global warming potential conversion factor
<b>Carbon footprint</b>	The total emissions caused in a year by an individual, event, organization, or product, expressed in carbon dioxide equivalent
<b>Carbon neutrality</b>	Achieving net-zero carbon dioxide (CO <sub>2</sub> ) emissions by balancing carbon emissions with carbon removal
<b>Carbon Sequestration</b>	The long-term storage or capture of carbon dioxide and other forms of carbon from the atmosphere through biological, chemical and physical processes.
<b>CEQA</b>	California Environmental Quality Act
<b>Climate</b>	The usual condition of temperature, humidity, atmospheric pressure, wind, rainfall, and other meteorological elements in an area of the earth's surface over a long period of time (typically 30 years or more)
<b>Climate Change</b>	A change in the average conditions – such as temperature and rainfall – in a region over a long period of time
<b>Co-benefits</b>	The secondary benefits that occur due to implementation of a program, measure or policy.
<b>Decarbonization</b>	The reduction or removal of carbon dioxide
<b>Electrification</b>	The process of generating power from electricity and, in many contexts, the introduction of such power by changing over from an earlier generally fossil-fuel derived power source
<b>Emissions</b>	The release of a substance (usually a gas when referring to the subject of climate change) into the atmosphere
<b>EV</b>	Electric vehicle
<b>Fossil fuel</b>	A general term for fuel formed from decayed plants and animals that have been converted to crude oil, coal, natural gas, or heavy oils by exposure to heat and pressure in the earth's crust
<b>GHG</b>	Greenhouse gas. A gas that absorbs infrared radiation, traps heat in the atmosphere, and contributes to the greenhouse effect.
<b>Greenhouse Effect</b>	A process that occurs when gases in the Earth's atmosphere trap the Sun's heat

Term	Definitions
<b>GWP</b>	Global Warming Potential – total contribution to global warming resulting from the emission of one unit of that gas relative to one unit of the reference gas, carbon dioxide, which is assigned a value of 1
<b>ICLEI</b>	International Council for Local Environmental Initiatives
<b>IPCC</b>	United Nations Intergovernmental Panel on Climate Change – prepares comprehensive Assessment Reports about the state of scientific, technical and socio-economic knowledge on climate change, its impact and future risks, and options for reducing the rate at which climate change is taking place
<b>Methane (CH<sub>4</sub>)</b>	A hydrocarbon that is a greenhouse gas that is produced through anaerobic (without oxygen) decomposition of waste in landfills, wastewater treatment plants, animal digestion, decomposition of animal wastes, production and distribution of natural gas and petroleum, coal production, and incomplete fossil fuel combustion
<b>MT</b>	Metric Ton – common international measurement for the quantity of greenhouse gas emissions – one metric ton is equal to 2,204.6 pounds or 1.1 short tons
<b>MT CO<sub>2</sub>e</b>	Metric tons of carbon dioxide equivalent
<b>Nitrous Oxide (N<sub>2</sub>O)</b>	A powerful greenhouse gas with a high global warming potential; major sources of nitrous oxide include soil cultivation practices, especially the use of commercial and organic fertilizers, fossil fuel combustion, nitric acid production, and biomass burning
<b>PV</b>	Photovoltaic (solar energy)
<b>Qualified GHG Reduction Plan</b>	A Plan that meets the requirements of CEQA sections 15183.5 (b)
<b>Scope</b>	Categorization of GHG-generating activities based on the level of the entity's operational control of the source
<b>SB</b>	Senate bill
<b>Service population</b>	defined as residents and employees
<b>Strategy</b>	The plan of action and measure implementation designed to achieve greenhouse gas reduction in the community.
<b>U.S. EPA</b>	United States Environmental Protection Agency
<b>VMT</b>	Vehicle miles traveled
<b>Weather</b>	The state of the atmosphere over a short period of time (usually an hour or day)
<b>ZEV</b>	Zero Emission vehicle





# APPENDICES





## **APPENDIX A: GREENHOUSE GAS INVENTORY AND FORECAST**

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# CVWD Climate Action & Adaptation Plan

## Appendix A – Greenhouse Gas Inventory and Forecast

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**June 2021**



**RINCON CONSULTANTS, INC.**

Environmental Scientists | Planners | Engineers

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# CVWD Climate Action & Adaptation Plan

## Appendix A- Greenhouse Gas Inventory and Forecast

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# 1 Introduction

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This Greenhouse Gas Inventory and Forecast Report presents the data, methods, and results for a greenhouse gas (GHG) emissions inventory and forecast for the Coachella Valley Water District (CVWD). Included is an analysis of findings and trends based on CVWD's operations which support CVWD's GHG emissions reduction targets and ultimately CVWD's first Climate Action & Adaptation Plan (CAAP). This document is Appendix A to the CAAP.

The State of California has set state-wide GHG emissions reduction goals to mitigate negative climate change<sup>1</sup> impacts and transition the State to a low-carbon economy. In particular, the State has set goals to reduce state-wide GHG emissions to 1990 levels by 2020, as established by Assembly Bill (AB) 32, and 40 percent below 1990 levels by 2030, as established by Senate Bill (SB) 32. The 2020 goal set by AB 32 was achieved by the State in 2016.<sup>2</sup>

In addition, Executive Order (EO) B-55-18 establishes a state goal of carbon neutrality by 2045. The California Air Resources Board (CARB) is the agency responsible for addressing and implementing these goals. In response, many local jurisdictions, including water districts, are completing their own GHG inventories, forecasts, and climate action plans to align with SB 32 and EO B-55-18 and contribute their fair share of GHG emissions reduction.

Water and wastewater districts play a fundamental role in reducing local GHG emissions and preparing for a more resilient future. CVWD exercises direct and indirect control over its GHG emissions-generating activities (see Section 4.2 for a definition of GHG emissions by Scope). For example, CVWD can reduce or offset energy consumption with renewable energy in its buildings and facilities and reduce or mitigate consumption in its vehicle fleet. Estimating GHG emissions in an inventory enables CVWD to quantify the major sources of GHG emissions produced by its operations and programs and establish an emissions baseline for developing a forecast. The forecast allows CVWD to estimate future emissions trends and facilitates target setting for future reductions. These will be the first GHG inventory, forecast, and reduction targets established for CVWD.

The inventory conducted for CVWD includes GHG emissions from activities under the operational control of CVWD from 2016 through 2019.<sup>3</sup> Based on the inventory, Rincon developed a back-cast of CVWD's GHG emissions to 1990 as well as a forecast to 2025, 2030, 2035, 2040, and 2045.

The forecast provides an up-to-date projection of how GHG emissions are expected to change for CVWD in the future based on identified capital improvement program (CIP) projects, changes in water demand, as well as existing State and federal legislation aimed at reducing GHG emissions through 2045.

This document also presents a gap analysis, which will guide CVWD's development of GHG emissions reduction measures that meet CVWD's GHG emissions reduction targets. Like all GHG inventories and forecasts, the analysis in this document relies on the best available data and calculation methodologies currently available.

---

<sup>1</sup> The National Aeronautic and Space Administration (NASA) defines climate change as "a change in the usual weather found in a place" and "a change in the earth's climate." See <https://www.nasa.gov/audience/forstudents/k-4/stories/nasa-knows/what-is-climate-change-k4.html>

<sup>2</sup> <https://ww2.arb.ca.gov/news/climate-pollutants-fall-below-1990-levels-first-time>

<sup>3</sup> CVWD elected to conduct an inventory for 2016 through 2019 as these were the most recent years for which reliable data were available. See further discussion of this in Section 4.3)

## 2 CVWD Operations

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CVWD is a special district established by the California State Legislature and governed by a 5-member Board of Directors. CVWD was formed in 1918 to protect and conserve local water sources. Since then, CVWD has grown into a multifaceted agency that delivers irrigation and domestic (drinking) water, collects and recycles wastewater, provides regional storm water protection, replenishes the groundwater basin, and promotes water conservation. CVWD's service area covers approximately 1,000 square miles from the San Gorgonio Pass to the Salton Sea, and is the largest urban water supplier in Coachella Valley. CVWD provides drinking water to 300,000 customers, with an average daily demand of 76 million gallons per day, and wastewater service to 250,000 customers, with an average daily flow of 17 million gallons per day. Non-potable water is delivered to over 70,000 acres of primarily agricultural land and golf courses. CVWD operates a large water infrastructure system, including the following

- Two administrative campuses located in Palm Desert and Coachella
- 123-mile Coachella Canal (aqueduct that conveys Colorado River water for irrigation from the All-American Canal to the Coachella Valley)
- 135-acre canal termination and equalization reservoir known as Lake Cahuilla
- Five wastewater reclamation plants (WRPs) (WRP1, WRP2, WRP4, WRP7, and WRP10)
- 97 active wells
- 64 water distribution reservoirs
- 16 pumping plants
- 17 tributary stormwater channels spanning a total of 169 miles, as well as, the regional Whitewater River Stormwater Channel/Coachella Valley Stormwater Channel spanning 50 miles from Palm Springs to the Salton Sea
- Over 3,000 miles of pipeline, including agricultural water collection (166 miles), distribution (2,000 miles), and drainage piping
- Three groundwater replenishment facilities (Whitewater River Groundwater Replenishment Facility, Palm Desert Groundwater Replenishment Facility, and Thomas E. Levy Groundwater Replenishment Facility)

CVWD's water supplies include local groundwater from Whitewater River and the Mission Creek subbasin common water supplies, recycled water from two CVWD-owned water reclamation plants, and imported supplies from the State Water Project (SWP), through an exchange allocation with Metropolitan Water District of Southern California (MWD), and the Coachella Canal.

Water supplies are used to meet CVWD's urban and non-urban water demands and to replenish the groundwater basin. Groundwater is the principle source of domestic (drinking) water supply in the Coachella Valley and meets 100 percent of CVWD's domestic water demand. CVWD offers a number of water conservation programs, including educational and rebate programs.

## 3 Legislative Context

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The State of California has developed State-wide legislation and programs to reduce GHG emissions in California. The State of California, via CARB, has issued several guidance documents concerning the establishment of GHG emissions reduction targets for local climate action plans to comply with legislated GHG emissions reductions goals. In the first *Climate Change Scoping Plan* (hereafter referred to as the 2008 Scoping Plan), CARB encouraged local jurisdictions to adopt a reduction target for community emissions paralleling the State commitment to reduce GHG emissions (CARB 2008). In 2017, CARB published *California's 2017 Climate Change Scoping Plan* (hereafter referred to as the 2017 Scoping Plan Update) outlining the strategies the State will employ to reach the additional State targets set by Senate Bill 32 in 2016 (CARB 2017).

Publication of the next Climate Change Scoping Plan is expected to include recommendations for complying with the carbon neutrality goal established by EO B-55-18 in 2018. While currently no State plan exists to achieve the goal set by EO B-55-18, the Executive Order directs CARB to ensure future Scoping Plan updates identify and recommend measures to achieve the carbon neutrality goal. Executive Orders are binding only unto State agencies and are not binding on local water districts, however, showing progress toward this goal is considered best practice when developing a CAAP and demonstrates consistency with State goals.

### 3.1 Legislative GHG Emissions Targets

The State of California has adopted legislation and policies to address climate change, the most relevant of which are summarized below. The legislative targets discussed below are further supported by sector specific legislation discussed further in the next section.

- **Executive Order S-3-05**, signed by former Governor Schwarzenegger in **2005**, establishes statewide GHG emissions reduction goals to achieve long-term climate stabilization as follows: by 2020, reduce GHG emissions to 1990 levels and by 2050, reduce GHG emissions to 80 percent below 1990 levels. The 2050 goal was accelerated by the 2045 carbon neutral goal established by EO B-55-18, as discussed below.
- **Assembly Bill 32**, signed by former Governor Schwarzenegger in **2006**, known as the Global Warming Solutions Act of 2006, requires California's GHG emissions be reduced to 1990 levels by the year 2020 (approximately a 15 percent reduction from 2005 to 2008 levels). The 2008 Scoping Plan identifies mandatory and voluntary measures to achieve the statewide 2020 GHG emissions limit.
- **Senate Bill 32**, signed by former Governor Brown in **2016**, establishes a statewide mid-term GHG emissions reduction goal of 40 percent below 1990 levels by 2030. CARB formally adopted the 2017 Scoping Plan Update in December 2017, laying the roadmap to achieve 2030 goals and giving guidance to achieve substantial progress toward 2050 State goals.
- **Executive Order B-55-18**, signed by former Governor Brown in **2018**, expanded upon EO S-3-05 by creating a statewide GHG emissions goal of carbon neutrality by 2045. EO S-55-18 identifies CARB as the lead agency to develop a framework for implementation and progress tracking toward this goal in the next Climate Change Scoping Plan Update.

## 3.2 Legislative Reduction Programs

In line with California’s legislative goals, the State has established additional legislation and programs that will reduce GHG emissions in various sectors, such as California’s Cap-and-Trade Program, Senate Bill 100, Clean Car Standards, and the Title 24 Building Standards. Some of these legislated programs are not directly relevant to CVWD and will not affect CVWD’s forecasted emissions. For instance, the Cap-and-Trade and Title 24 are not anticipated to impact CVWD emissions because CVWD is not a land use agency and therefore does not construct new residential or commercial buildings and is not part of the Cap-and-Trade program. The Clean Car Standards are anticipated to have some impact on CVWD emissions, and the emissions relating the CVWD’s fleet will conservatively be accounted for during the measure development stage.

The legislative program considered most relevant to CVWD’s future emissions is California’s Renewables Portfolio Standards (RPS) program. Established in 2002 under SB 1078, enhanced in 2015 by SB 350, and accelerated in 2018 under SB 100, California’s RPS is one of the most ambitious renewable energy standards in the country. The RPS program requires investor-owned utilities, publicly owned utilities, electric service providers, and community choice aggregators to increase procurement from eligible renewable energy resources to 50 percent of total procurement by 2026 and 60 percent of total procurement by 2030. The RPS program further requires these entities to increase procurement from GHG emissions-free sources to 100 percent of total procurement by 2045. The RPS program was incorporated into CVWD’s GHG forecast by adjusting the electricity emission factors based on forecasted procurement for each electricity provider.

## 4 GHG Emissions Inventory

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This GHG emissions inventory is a significant step to understanding CVWD's GHG emissions and was specifically developed to serve the following purposes:

- Provide an understanding of where the highest sources of emissions in CVWD originate and where the greatest opportunities for emissions reductions exist
- Enable CVWD to understand the scale of GHG emissions from various sources and develop improved GHG emissions accounting and reporting principles
- Create a GHG emissions baseline from which CVWD can establish a forecast, reduction targets, and evaluate future progress
- Aid in the development of CVWD's CAAP

The methodology for calculating CVWD's inventory is consistent with standard reporting protocols from the World Resources Institute (WRI), World Business Council for Sustainable Development (WBCSD), and the International Council for Local Environmental Initiatives (ICLEI). These protocols serve to guide the measurement and reporting of GHG emissions in a standardized way and have been used by other water agencies to support their own inventory and CAAP development. They also include steps to evaluate the relevance, completeness, consistency, transparency, and accuracy of data used in the inventory and forecast. The following sections contain further information on the inventory approach, methods and data used, and results.

### 4.1 Greenhouse Gases

The ICLEI-Local Governments for Sustainability suggests that inventories assess GHG emissions associated with the six internationally-recognized GHGs, as outlined in Table 1 (ICLEI 2019). This inventory focuses on the three GHGs most relevant to CVWD's operations: carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), and nitrous oxide (N<sub>2</sub>O). The other gases (hydrofluorocarbons, perfluorocarbons, and sulfur hexafluorides) are emitted primarily in private sector manufacturing and electricity transmission and are therefore, omitted from this inventory. Table 1 also includes the global warming potentials (GWP) for each gas. The GWP refers to the ability of each gas to trap heat in the atmosphere.<sup>4</sup> For example, one pound of methane gas has 28 times more heat capturing potential than one pound of carbon dioxide gas. GWPs are used to equate all GHGs to CO<sub>2</sub> equivalent (CO<sub>2</sub>e), GHG emissions for CVWD's GHG inventory, forecast, and targets are reported in metric tons (MT) of CO<sub>2</sub>e, per standard practice. This inventory was prepared in conformance with International Organization for Standardization (ISO) 14064-1 and therefore, uses the latest 100-year GWP values published in the International Panel on Climate Change (IPCC) Fifth Assessment Report (IPCC 2014).<sup>5</sup>

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<sup>4</sup> According to the United States Environmental Protection Agency, the GWP was developed to allow comparisons of the global warming impacts of different gases. Specifically, it is a measure of how much energy the emissions of one ton of a gas will absorb over a given period of time, relative to the emissions of one ton of carbon dioxide (EPA 2017).

<sup>5</sup> International Organization for Standardization (ISO) published ISO 14064-1 in 2006 (revised 2018) to provide an international standard for the quantification and reporting of GHG emissions.

**Table 1 Greenhouse Gases**

Greenhouse Gas	Source of Emission	Global Warming Potential
Carbon Dioxide (CO <sub>2</sub> )	Combustion	1
Methane (CH <sub>4</sub> )	Combustion, anaerobic decomposition of organic waste (landfills, wastewater treatment plants), fuel handling	28
Nitrous Oxide (N <sub>2</sub> O)	Combustion and wastewater treatment	265
Hydrofluorocarbons	Leaking refrigerants and fire suppressants	4 - 12,400
Perfluorocarbons	Aluminum production, semiconductor manufacturing, HVAC equipment manufacturing	6,630 - 11,100
Sulfur Hexafluoride (SH <sub>6</sub> )	Transmission and distribution of power	23,500

Source: IPCC Fifth Assessment Report (IPCC 2014)

## 4.2 GHG Emissions Sources by Scope

Standard protocols for organization-focused inventories, such as for CVWD, commonly utilize a framework that categorizes GHG emissions by scope (i.e., Scope 1, Scope 2, and Scope 3), which accounts for GHG emissions based on the level of operational control that the organization has over each GHG emissions sources. The operational control methodology is well documented by established protocols, such as the Corporate Standard GHG Protocol developed by the WRI and the WBCSD, and has been utilized by other agencies to avoid double counting of GHG emissions and conservation efforts (WRI & WBCSD 2015).

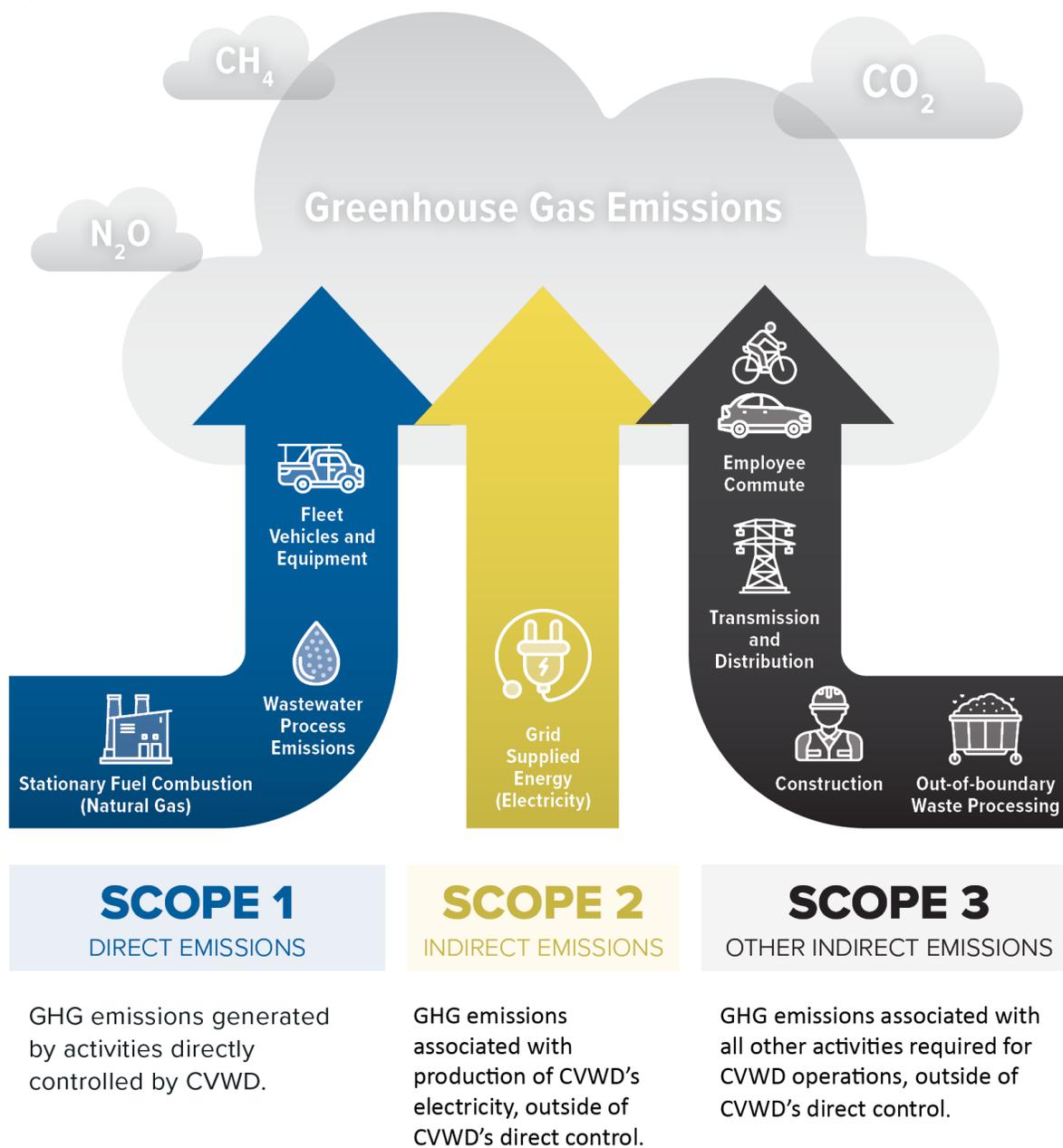
**Scope 1** is defined as direct anthropogenic GHG emissions generated from sources that are owned or directly controlled by CVWD.

**Scope 2** refers to GHG emissions that are indirectly generated due to the consumption of purchased electricity, steam, heating, or cooling.

**Scope 3** refers to all other indirect GHG emissions not covered under Scope 2 that are associated with sources that are not directly owned or controlled by CVWD but are fundamental to the organization’s operation.

A visualization of each Scope category is provided in Figure 1.

Figure 1 CVWD GHG Emissions by Scope



*(CO<sub>2</sub> = Carbon dioxide | CH<sub>4</sub> = Methane | N<sub>2</sub>O = Nitrous oxide)*

For consistency with standard accounting and reporting protocols, each of CVWD's GHG emissions sources were categorized by scope and included in the inventory:

- **Scope 1**

- Natural gas – emissions from natural gas delivered by Southern California Gas
- Vehicle fleet and equipment (on- and off-road) – vehicle fleet emissions from diesel, gasoline, compressed natural gas, and propane usage

- Generators – emissions from diesel-fueled generators<sup>6</sup>
- Wastewater – process emissions from wastewater reclamation plants (WRP1, WRP2, WRP4, WRP7, and WRP10) managed by CVWD
- **Scope 2**
  - Electricity – emissions from electricity delivered by Imperial Irrigation District (IID) and Southern California Edison (SCE)
- **Scope 3**
  - Electricity transmission and distribution (T&D) losses– transmission and distribution losses associated with delivered electricity from IID and SCE
  - Waste – emissions from waste generated by all CVWD office buildings and facilities
  - Employee commute – emissions from vehicles used by employees to commute to and from CVWD campuses or facilities
  - Construction – emissions associated with construction projects affecting CVWD facilities

### **Excluded GHG Emissions Sources**

The inventory excludes some GHG emissions sources from consideration, as they were not considered relevant for CVWD operations, or were considered captured under other sectors. Refrigerants and fire suppressants were considered to be an insignificant source of GHG emissions for CVWD and therefore, were excluded from the inventory. Industrial process emissions associated with wastewater treatment were captured under Scope 1 sources for wastewater. Product emissions (i.e., CVWD provides domestic [drinking] water and irrigation water, treats wastewater, and produces recycled water) were not broken out separately, but captured under the Scope 1 and Scope 2 sources. Because no agricultural activities exist under CVWD’s operational control, agricultural emissions (including enteric fermentation and manure management) were not considered relevant for CVWD and are therefore excluded. Forestry and other land emissions potentially associated with CVWD’s properties were also excluded, due to limited availability of applicable data and lack of standardized methods for quantifying such emissions.

## **4.3 Inventory Years**

The largest GHG emissions sources for water districts, including wastewater processing emissions and electricity emissions sources, tend to fluctuate year to year depending on the source of water and the extent of water demand and services provided. The variability in these emissions can make forecasting based on a single inventory year difficult. The inventory was therefore developed to include GHG emissions accounting for years 2016, 2017, 2018, and 2019, to capture and quantify some of this variability. The multi-year inventory, informed by an understanding of the variability drivers for each year, was then used to develop CVWD’s GHG emissions forecast.

Current defensible methodologies for setting GHG emissions targets establish a percent reduction from 1990 emissions levels consistent with the State targets in SB 32 and EO-B-55-18. Establishing a 1990 baseline GHG inventory can be challenging granted the 30-year time lag, and standard practices in record keeping. CVWD does not have sufficient data on record to establish an activity data-based inventory for the year 1990. However, to address this issue and develop targets

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<sup>6</sup> All fuel purchased and used for CVWD operations is tracked together via purchase records. Emissions from diesel usage for generators, on-road vehicles, and off-road vehicles were therefore reported as a lump sum.

consistent with the State, Rincon utilized the 2016 inventory to back-cast emissions for 1990. More details on the back-casting methods are provided in Section 4.7.

## 4.4 Activity Data and Emission factors

In general, emissions are calculated using activity data and emission factors according to the following equation:

$$\text{Activity Data} \times \text{Emissions Factor} = \text{GHG Emissions}$$

Activity data refer to the relevant measured or estimated energy use or other GHG emissions-generating process such as fuel consumption by fuel type or metered annual electricity consumption. Activity data for each year of the inventory are geographically and temporally bounded by the location (CVWD operational boundary) and year of operations (2016-2019). Emission factors are observation-based conversion factors used to equate activity data to generated emissions. Emission factors are activity-specific, and are usually expressed in terms of emissions per unit of activity data (e.g., pounds of CO<sub>2</sub>e per megawatt-hour). The data sources used to complete this inventory are summarized by scope and source in Table 2. Unless otherwise specified, data was collected for the years 2016 through 2019, within the geographical boundary of CVWD's operations. Emission factors used and their sources are detailed under the following sections.

**Table 2 Activity Data and Sources**

Scope and Source	Activity Data	Unit	Data Source
<b>Scope 1: Direct Emissions</b>			
Natural gas	Annual natural gas usage for all CVWD buildings and facilities	therms	SCG billing history
Vehicle fleet and equipment (including generators)	Annual fuel usage (diesel, gasoline, compressed natural gas, and propane)	gallons	Fuel usage reports provided by CVWD
Wastewater processes	Annual water treated Average daily BOD for WRP1, WRP2, WRP4, WRP7, and WRP10	MG mg/L	Wastewater treatment plant tracking system
<b>Scope 2: Indirect Emissions</b>			
Grid Supplied Energy (Electricity)	Annual electricity usage for all CVWD buildings and facilities	kWh	IID and SCE billing history
<b>Scope 3: Indirect Emissions</b>			
Electricity Transmission & Distribution losses	Calculated as a percentage of electricity usage	%	Environmental Protection Agency Emissions & Generation Resource Integrated Database (eGRID)
Waste	Annual waste generated by all CVWD buildings and facilities	tons	CVWD waste disposal report

Scope and Source	Activity Data	Unit	Data Source
Employee commute	Mileage by commute method	Miles	CVWD commute surveys and employee zip code data
Construction	Activities and scale associated with each construction project completed between 2016 and 2019	various	CVWD list of construction projects and billing books

kWh = kilowatt-hours; MG/L = million gallons per liter; BOD = biochemical oxygen demand; SCG = Sothern California Gas; IID = Imperial Irrigation District; SCE = Southern California Edison

## 4.5 Calculation Methods and Results

### Scope 1

#### *Natural Gas*

Emissions from natural gas were calculated by multiplying the activity data from the SCG billing history (therms of natural gas used by all CVWD buildings and facilities) by the emission factor for natural gas (Table 3). The emission factor for natural gas (MT CO<sub>2</sub>e/therm) was determined based on the Environmental Protection Agency’s (EPA) *Emission factors for Greenhouse Gas Inventories* document, published March 26, 2020 (EPA 2020).

**Table 3 GHG Emissions from Natural Gas**

Year	2016	2017	2018	2019
Activity Data (therms)	19,558	18,201	17,816	23,281
EF (MT CO <sub>2</sub> e/therm) <sup>1</sup>	0.00531	0.00531	0.00531	0.00531
<b>Emissions (MT CO<sub>2</sub>e)</b>	<b>104</b>	<b>97</b>	<b>95</b>	<b>124</b>

<sup>1</sup> EPA’s Emission Factors for Greenhouse Gas Inventories

EF = emission factor

#### *Vehicle Fleet and Equipment*

Emissions from CVWD’s vehicle fleet, portable equipment, and generators were calculated by multiplying the activity data from the fuel usage reports (gallons of diesel, gasoline, compressed natural gas, and propane) by the emission factor for each fuel type (Table 4). The emission factors for diesel, gasoline, compressed natural gas, and propane (MT CO<sub>2</sub>e/gallon) were determined based on EPA’s *Emission Factors for Greenhouse Gas Inventories* (EPA 2020).

**Table 4 GHG Emissions from Vehicle Fleet, Equipment, and Generators**

Year	2016	2017	2018	2019
<b>Diesel</b>				
Activity Data (gallons)	99,730	106,310	99,365	78,352
EF (MT CO <sub>2</sub> e/gallon) <sup>1</sup>	0.0102	0.0102	0.0102	0.0102
<b>Emissions (MT CO<sub>2</sub>e)</b>	<b>1,022</b>	<b>1,089</b>	<b>1,018</b>	<b>803</b>

Year	2016	2017	2018	2019
<b>Gasoline</b>				
Activity Data (gallons)	283,619	293,124	301,062	319,005
EF (MT CO <sub>2</sub> e/gallon) <sup>1</sup>	0.0088	0.0088	0.0088	0.0088
Emissions (MT CO <sub>2</sub> e)	2,499	2,583	2,653	2,811
<b>Propane</b>				
Activity Data (gallons)	461	514	630	674
EF (MT CO <sub>2</sub> e/gallon) <sup>1</sup>	0.0057	0.0057	0.0057	0.0057
Emissions (MT CO <sub>2</sub> e)	2.65	2.95	3.62	3.87
<b>Compressed Natural Gas</b>				
Activity Data (gallons)	73	82	55	45
EF (MT CO <sub>2</sub> e/gallon) <sup>1</sup>	0.00000728	0.00000728	0.00000728	0.00000728
Emissions (MT CO <sub>2</sub> e)	0.00	0.00	0.00	0.00
<b>Total Emissions (MT CO<sub>2</sub>e)</b>	<b>3,523</b>	<b>3,675</b>	<b>3,674</b>	<b>3,617</b>

<sup>1</sup> EPA's Emission Factors for Greenhouse Gas Inventories

EF = emission factor

### Wastewater Processes

CVWD operates five wastewater reclamation plants (WRPs), all of which operate using aerobic methods with varying influent loads and Biochemical Oxygen Demand (BOD<sub>5</sub>). To quantify emissions from the WRPs (Table 5), Rincon used the activity data from CVWD (BOD load summed over all WRPs) and followed wastewater (WW) methods from ICLEI (2019):

- WW.6 to characterize process methane emissions from wastewater treatment lagoons
- WW.12.a to characterize fugitive N<sub>2</sub>O emissions from effluent discharge to aquatic environments

**Table 5 GHG Emissions from Wastewater Reclamation Plants**

Year	2016	2017	2018	2019
Population Served	248,404	256,173	252,803	254,420
BOD load (kg/person) <sup>1</sup>	24	23	23	23
Total BOD load (kg)	5,872,104	5,952,196	5,873,894	5,808,611
FP <sup>2</sup>	77%	78%	78%	80%
Methane Emissions from Lagoons (MT CO <sub>2</sub> e) <sup>3</sup>	18,031	17,268	17,041	15,867
N <sub>2</sub> O Emissions from Effluent Discharge (MT CO <sub>2</sub> e) <sup>4</sup>	4,822	4,973	4,908	4,939
<b>Total Emissions (MT CO<sub>2</sub>e)</b>	<b>22,853</b>	<b>22,241</b>	<b>21,948</b>	<b>20,806</b>

<sup>1</sup> BOD data was evaluated for 2016 and 2019 only. BOD load per service person was calculated based on 2016 and 2019 data, found to be consistent, and averaged to produce BOD load per service person for 2017 and 2018.

<sup>2</sup> FP data was provided for 2016 and 2019 only, found to be consistent, and averaged to produce FP for 2017 and 2018

<sup>3</sup> Calculated using ICLEI Method WW.6

<sup>4</sup> Calculated using ICLEI Method WW.12.a

BOD = biochemical oxygen demand; FP = fraction of BOD removed;

## Scope 2

### *Grid Supplied Energy (Electricity)*

Emissions from electricity were calculated by multiplying the activity data from the IID and SCE billing history (kWh of electricity used by all CVWD buildings and facilities) by the emission factors for IID and SCE electricity for each year (Table 6). The emission factors for IID electricity (lbs. CO<sub>2</sub>e/MWh) in 2016, 2017, 2018, and 2019 were provided to Rincon directly by IID. The emission factors for SCE electricity (lbs. CO<sub>2</sub>e/MWh) in 2016, 2017, 2018, and 2019 were determined based on SCE's 2017 and 2019 Sustainability Reports (SCE 2018, SCE 2019).

**Table 6 GHG Emissions from Electricity**

Year	2016	2017	2018	2019
<b>IID</b>				
Electricity (kWh)	55,677,057	56,246,388	56,437,869	59,717,395
EF (lbs. CO <sub>2</sub> e/MWh) <sup>1</sup>	861.05	875.51	598.17	484.43
Electricity Emissions (MT CO <sub>2</sub> e)	21,746	22,337	15,313	13,122
<b>SCE</b>				
Electricity (kWh)	64,039,715	69,762,034	71,877,938	69,376,919
EF (lbs. CO <sub>2</sub> e/MWh) <sup>2</sup>	529.00	549.00	513.00	534.00
Electricity Emissions (MT CO <sub>2</sub> e)	15,367	17,372	16,726	16,805
<b>Total Emissions (MT CO<sub>2</sub>e)</b>	<b>37,112</b>	<b>39,710</b>	<b>32,039</b>	<b>29,927</b>

<sup>1</sup> Provided to Rincon directly by IID

<sup>2</sup> Based on Edison International 2017 and 2019 Sustainability Reports (SCE 2018, SCE 2019)

EF = emission factor; kWh = kilowatt-hour; lbs. = pounds

## Scope 3

### *Electricity T&D Losses*

Electricity T&D losses were assumed to be 4.23 percent of total electricity usage in 2016 and 2017 and 4.80 percent in 2018 and 2019, based on the EPA's Emissions & Generation Resource Integrated Database (EPA 2021). Emissions from T&D losses were calculated by multiplying the calculated activity data (kWh of electricity from T&D losses) by the electricity emission factors for each year (Table 7). Similar to electricity, emissions from T&D losses were calculated separately for SCE and IID and for each year.

**Table 7 GHG Emissions from Electricity T&D Losses**

Year	2016	2017	2018	2019
<b>IID</b>				
Electricity (kWh)	55,677,057	56,246,388	56,437,869	59,717,395
T&D loss (kWh) <sup>1</sup>	2,355,140	2,379,222	2,709,018	2,866,435
EF (lbs. CO <sub>2</sub> e/MWh) <sup>2</sup>	861.05	875.51	598.17	484.43
T&D Emissions (MT CO <sub>2</sub> e)	920	945	735	630

Year	2016	2017	2018	2019
<b>SCE Emissions</b>				
Electricity (kWh)	64,039,715	69,762,034	71,877,938	69,376,919
T&D loss (kWh) <sup>1</sup>	2,708,880	2,950,934	3,450,141	3,330,092
EF (lbs. CO <sub>2</sub> e/MWh) <sup>3</sup>	529.00	549.00	513.00	534.00
T&D Emissions (MT CO <sub>2</sub> e)	650	735	803	807
<b>Total Emissions (MT CO<sub>2</sub>e)</b>	<b>1,570</b>	<b>1,680</b>	<b>1,538</b>	<b>1,436</b>

<sup>1</sup> Based on EPA eGRID CAMX T&D loss factor of 4.23 percent in 2016 and 2017 and 4.80 percent in 2018 and 2019

<sup>2</sup> Based on Edison International 2017 and 2019 Sustainability Reports (SCE 2018, SCE 2019)

<sup>3</sup> Provided to Rincon directly by IID

EF = emission factor; T&D = transmission and distribution

## Waste

GHG emissions associated with the waste sector result from the collection and transportation of waste to landfills, the decomposition of waste at a landfill, combustion of waste, and waste processing equipment. Emissions from waste were calculated using ICLEI method solid waste (SW).4, using the default emission factor for mixed waste and assuming operation of a landfill gas collection system (ICLEI 2019). A default 10 percent oxidation rate and 75 percent landfill gas capture rate were assumed (ICLEI 2019). Emissions generated at the landfill facilities from waste processing equipment was estimated using ICLEI method SW.5, where total tonnage of waste disposed is multiplied by the default emission factor for natural gas equipment (ICLEI 2019).

Because emissions from waste are small compared to overall emissions at CVWD, only 2016 and 2019 data was evaluated. Waste emissions for 2017 and 2018 were calculated as an average of the 2016 and 2019 results.

**Table 8 GHG Emissions from Waste**

Year	2016	2017	2018	2019
<b>Landfill Emissions</b>				
Activity Data (short tons)	32.29			73.53
EF (MT CO <sub>2</sub> e/short ton)	0.06			0.06
Oxidation rate	0.1			0.1
LG collection rate	0.75			0.75
Emissions (MT CO <sub>2</sub> e) <sup>1</sup>	12.21			27.79
<b>Process Emissions</b>				
Landfill Equipment	Natural gas			Natural gas
Activity Data (short tons)	32.29			73.53
EF (MT CO <sub>2</sub> e/short ton)	0.011			0.011
Emissions (MT CO <sub>2</sub> e) <sup>2</sup>	0.36			0.81
<b>Total Emissions (MT CO<sub>2</sub>e)<sup>3</sup></b>	<b>12.56</b>	<b>20.58</b>	<b>20.58</b>	<b>28.60</b>

<sup>1</sup> Calculated using ICLEI method SW.4

<sup>2</sup> Calculated using ICLEI method SW.5

<sup>3</sup> 2017 and 2018 emissions were calculated as an average of 2016 and 2019 GHG emissions from waste

EF = emission factor; LG = landfill gas

### Employee Commute

Emissions from employee commute were calculated by multiplying the activity data (total mileage completed each year by passenger vehicle, motorcycle, and electric vehicle) by the emission factors for each respective vehicle type (MT CO<sub>2</sub>e/mile for passenger vehicles and motorcycles, and kWh/mile for electric vehicles). While the mileage driven by each vehicle type was not explicitly known, Rincon calculated mileage per vehicle type based on an estimate of number of trips completed per vehicle type per week and average commute distance per employee per week. Number of trips completed per vehicle type per week was provided by CVWD as the result of a commute survey, while average commute distance per employee per week was estimated based on the provided zip codes of all employees and the assumption that each employee commutes to the CVWD campus nearest their zip code. Rincon used the CARB Emission Factor 2017 model (EMFAC2017) to estimate an emission factor (grams of CO<sub>2</sub>e per mile) for passenger vehicles and motorcycles (CARB 2019). Rincon ran the EMFAC2017 model and calculated emission factors separately for each year inventoried.

Because employee commute was a relatively small source of emissions at CVWD, only 2016 and 2019 data was evaluated. Employee commute emissions for 2017 and 2018 were calculated as an average of the 2016 and 2019 results.

**Table 9 GHG Emissions from Employee Commute**

Year	2016	2017	2018	2019
<b>Passenger Vehicles</b>				
Passenger vehicle miles <sup>1</sup>	1,403,206.42			1,323,243.20
EF (g CO <sub>2</sub> e/mile) <sup>2</sup>	356.33			328.78
Emissions (g CO <sub>2</sub> e)	500,000,646.68			435,055,261.16
Emissions (MT CO <sub>2</sub> e)	500.00			435.06
<b>Motorcycles</b>				
Motorcycle miles <sup>1</sup>	14,215.68			10,661.76
EF (g CO <sub>2</sub> e/mile) <sup>2</sup>	235.60			234.61
Emissions (g CO <sub>2</sub> e)	3,349,215.80			2,501,362.01
Emissions (MT CO <sub>2</sub> e)	3.35			2.50
<b>Electric Vehicles</b>				
EV miles <sup>1</sup>	4,738.56			11,846.40
Electricity (kWh) <sup>3</sup>	1,445.26			3,613.15
EF (lbs. CO <sub>2</sub> e/MWh) <sup>4</sup>	529.90			480.39
Emissions (MT CO <sub>2</sub> e)	0.35			0.79
<b>Total Emissions (MT CO<sub>2</sub>e)<sup>5</sup></b>	<b>503.70</b>	<b>471.02</b>	<b>471.02</b>	<b>438.34</b>

<sup>1</sup> Calculated based on an estimate of number of trips completed per vehicle type per week (from commute survey) and average commute distance per employee per week (from employee zip codes)

<sup>2</sup> Calculated as VMT-weighted average of g CO<sub>2</sub>e/mile for passenger vehicles and motorcycles provided by EMFAC2017 output for Riverside County for calendar years 2016, 2017, 2018, and 2019

<sup>3</sup> Calculated using a conversion factor of 0.305 kWh/mile based on a report from U.S. News (U.S. News 2018)

<sup>4</sup> Based on EPA eGRID CAMX emission factor

<sup>5</sup> 2017 and 2018 emissions were calculated as an average of 2016 and 2019 GHG emissions from waste (see Section 4.3 for a discussion of this approach)

EF = emission factor; EV = electric vehicle

## Construction

Emissions from construction were calculated by multiplying the activity data (in various units) by the emission factor for each activity. Activity data was provided by CVWD for all construction projects conducted between 2016 and 2019. Emission factors were derived from various sources, including representative environmental impact reports (EIR) and the California Air Pollution Control Officers Association's (CAPCOA) California Emissions Estimator Model (CalEEMod) using the relevant project data. Table 10 includes the emission factors, calculated emissions, and calculation notes for each project type. Once total emissions were calculated over the four-year period during which the construction projects took place, an annual average emission rate was calculated by dividing the four-year total by four.

**Table 10 GHG Emissions from Construction**

Project Type	Count	Activity Data	Unit	EF (MT CO <sub>2</sub> e/unit)	Emissions (MT CO <sub>2</sub> e)	Calculation Notes
Channel repair	1	19,910	Linear feet	0.443	8,830	EF derived from representative CV Stormwater Channel Improvement EIR
Demolition	1	7.8	acres	11.318	88	EF derived from CalEEMod
Equipment replacement	2	2	projects	1,013.861	2,028	Emissions derived from representative 2017/18 and 2020/21 Non-potable water connections project Initial Studies
Facility construction	1	1	projects	841.000	841	Emissions derived from Palm Desert Groundwater Replenishment project, Phase 1 EIR
Paving	1	18,495	SF of pavement	0.000	4	EF derived from CalEEMod
Pipeline construction	25	182,402	linear feet	0.034	6,163	EF derived from representative St Anthony Mobile Home Park Water Consolidation Project Initial Study
Reservoir construction	4	23	million gallons	5.751	133	EF derived from CalEEMod
Slope construction	2	3,300	linear feet	0.409	1,349	EF derived from representative CV Stormwater Channel Improvement EIR
Small projects	4	4	projects	247.284	989	EF derived from CalEEMod
Well construction	8	18	wells	75.960	1,367	EF derived from CalEEMod
<b>4-Year Total</b>					<b>21,793</b>	
<b>Annual Average</b>					<b>5,448</b>	

EF = emission factor

## 4.6 Inventory Summary

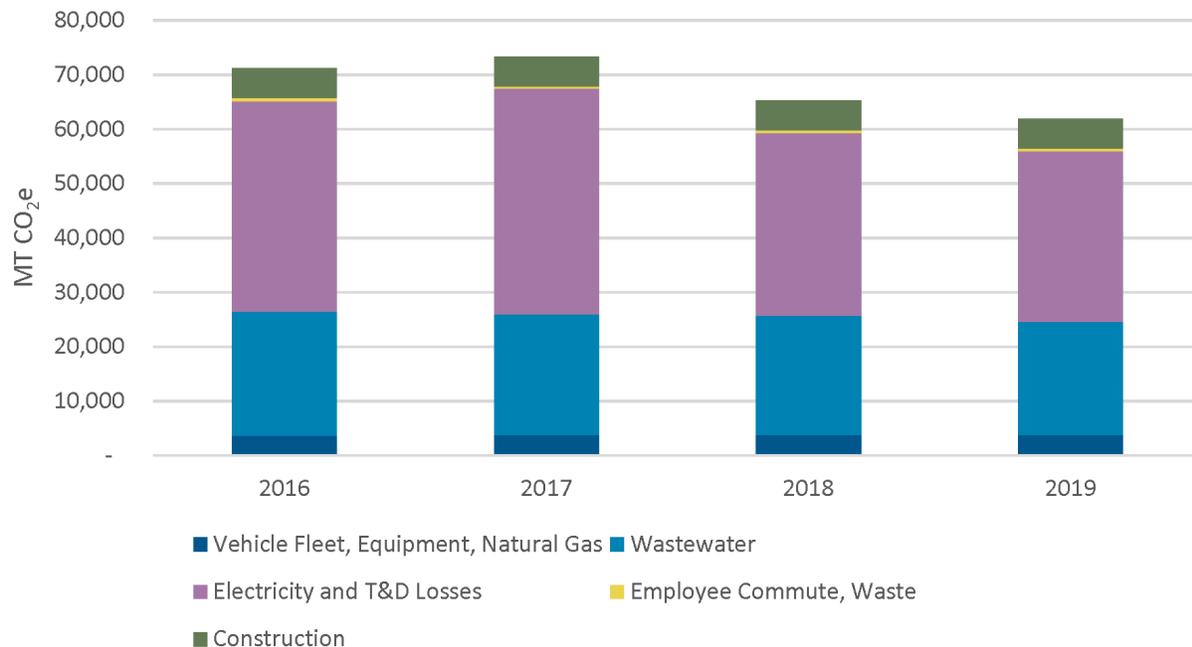
Results for all GHG emissions sectors were added together to develop total GHG emissions for each year (Table 11). For all years in the inventory, electricity and wastewater were the highest contributors to CVWD’s GHG emissions, followed by construction, employee commute, natural gas, and waste (Figure 2). By Scope, Scope 2 emissions were the highest, followed by Scope 1 and Scope 3 emissions (Figure 3).

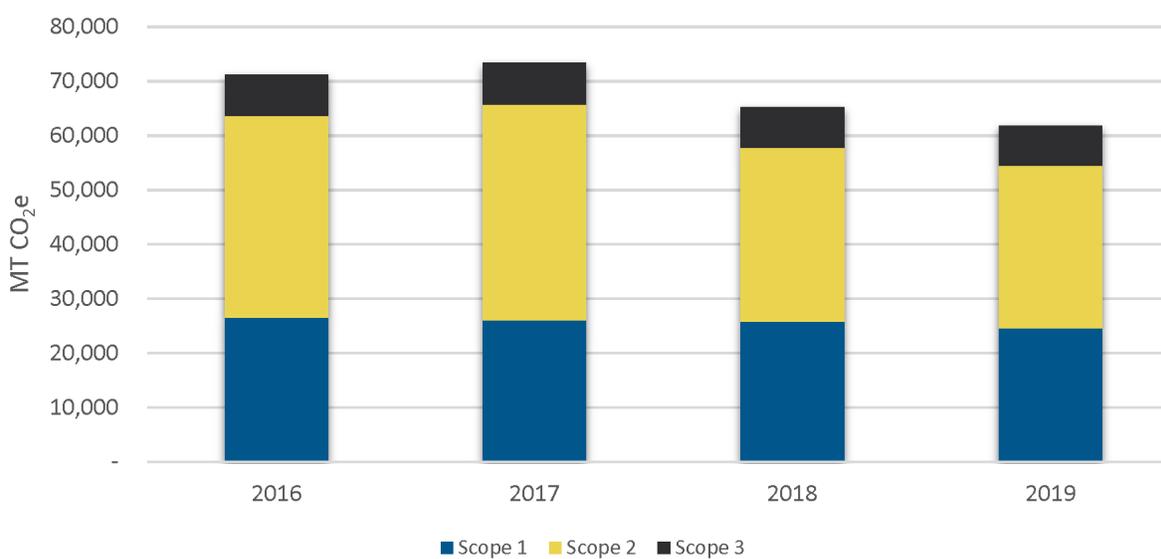
**Table 11 GHG Emissions Inventory Summary**

Emissions Source	Scope	2016	2017	2018	2019
Vehicle Fleet and Equipment	Scope 1	3,523.36	3,674.81	3,674.29	3,617.42
Natural Gas	Scope 1	103.88	96.67	94.63	123.66
Wastewater	Scope 1	22,853.29	22,241.07	21,948.49	20,805.86
Electricity	Scope 2	37,112.19	39,709.60	32,038.77	29,926.63
T&D Losses	Scope 3	1,569.85	1,679.72	1,537.86	1,436.48
Employee Commute	Scope 3	503.70	471.02	471.02	438.34
Waste	Scope 3	12.56	20.58	20.58	28.60
Construction	Scope 3	5,448.13	5,448.13	5,448.13	5,448.13
<b>Total</b>		<b>71,126.95</b>	<b>73,341.60</b>	<b>65,233.77</b>	<b>61,825.13</b>

Note: all values shown are in units of MT CO<sub>2</sub>e

**Figure 2 GHG Emissions Inventory by Source (2016-2019)**



**Figure 3 GHG Emissions Inventory by Scope (2016-2019)**

## 4.7 Back-cast to 1990

Current defensible methodologies for setting GHG emissions targets establish a percent reduction from 1990 emissions levels consistent with the State goals in SB 32 and EO-B-55-18. However, most jurisdictions do not have a 1990 inventory. To address this, methods have been developed to establish a 1990 back-cast based on inventories from later years and an assumption about how much higher or lower the inventory year emissions are relative to 1990. The primary methodology back-casts from 2005-2008 data years to 1990 under the assumption that 1990 emissions levels were about 15 percent lower than 2005-2008 emissions levels for all jurisdictions in California. In the event that a 2005-2008 inventory is not available, a secondary methodology back-casts from later inventory years to 1990. The secondary methodology assumes that the jurisdiction's emissions for their later inventory year and the State's emissions for that same year have increased or decreased approximately the same percentage relative to 1990. As CVWD does not have sufficient data to establish a 1990 or 2005-2008 inventory, the secondary methodology was adopted for developing a 1990 back-cast for CVWD.

For example, CVWD emitted 71,126.95 MT CO<sub>2</sub>e in 2016. The State emitted 287.9 million MT CO<sub>2</sub>e in 2016 compared to 311.7 million MT CO<sub>2</sub>e in 1990, which represents a 7.64 percent decrease between 1990 and 2016 (CARB 2016; CARB 2007).<sup>7</sup> This change factor was applied to CVWD's 2016 inventory emissions total to back-cast to 1990 (Table 12). Therefore, the "best available data" (i.e., the 2016 inventory) was used to determine a 1990 baseline from which to develop GHG reduction targets that are consistent with State standards. The concept of "best available data" is referenced by the Greenhouse Gas Protocol (World Resources Institute 2015).

<sup>7</sup> These State-level GHG emissions values exclude emissions from the industrial, agricultural, and high-GWP emissions sectors, for better comparison to CVWD's emissions inventory, which also excludes these sectors.

**Table 12 1990 GHG Emissions Back-cast**

<b>Emissions</b>	<b>Total</b>
State of CA 1990 Emissions (MMT CO <sub>2</sub> e)	311.7
State of CA 2016 Emissions (MMT CO <sub>2</sub> e)	287.9
1990 Change Factor (%)	7.64%
2016 CVWD Emissions (MT CO <sub>2</sub> e)	71,126.95
<b>1990 CVWD Emissions (MT CO<sub>2</sub>e)</b>	<b>76,557.88</b>

## 5 Forecast

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CVWD's GHG emissions are expected to change over time due to expected changes in water demand<sup>8</sup> and new projects. A GHG emissions forecast accounts for these projected future changes using growth rates and extrapolates from the inventory an estimate of GHG emissions in future years, while also taking into account projected GHG emissions reduction impacts from state legislation. Calculating the difference between the forecasted GHG emissions and the reduction targets determines the gap to be closed through CVWD's CAAP and its associated GHG emissions reduction measures.

This document presents two forecast scenarios: a business-as-usual (BAU) forecast scenario and an adjusted forecast scenario. The BAU forecast scenario projects the expected growth for all GHG emissions sources based on CVWD's water service changes alone.<sup>9</sup> The adjusted forecast accounts for water demand changes and additionally quantifies and incorporates State legislation that is expected to help reduce CVWD's GHG emissions through 2030 and 2045, as discussed in Section 3.2. The BAU forecast, when compared to the adjusted forecast, demonstrates the extent of State-level GHG emissions reductions. However, the adjusted forecast represents a more accurate picture of future GHG emissions because it includes State legislation that will affect future emissions. The adjusted forecast is therefore used to determine the gap between the forecast and the GHG reduction targets that will need to be bridged through actions and policies in the CAAP.

### 5.1 Forecast Years

The forecast was developed for years 2025, 2030, 2035, 2040, and 2045, consistent with currently codified GHG emissions reduction goals at the State level, or Executive Orders which are expected to be codified in the future. The 2030 forecast year is required for consistency with SB 32, the 2045 forecast year aligns with EO-B-55-18, and the 2025, 2035, and 2040 forecast years help identify a clear path and milestone of progress toward the long-term State reduction goals.

### 5.2 Activity Data and Growth Factors

Data used to develop the BAU and adjusted forecasts included activity data from the 2016 through 2019 inventory, water demand data projections from CVWD's 2020 Regional Urban Water Management Plan (RUWMP), and renewables procurement projections from the relevant electricity providers as shown in Table 13 (RUWMP 2020).

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<sup>8</sup> Expected future water demand, defined in this document as encompassing potable water demand and recycled water demand, were used to represent the future scale of all CVWD services, with the assumption that all CVWD's future services will scale approximately with water demand.

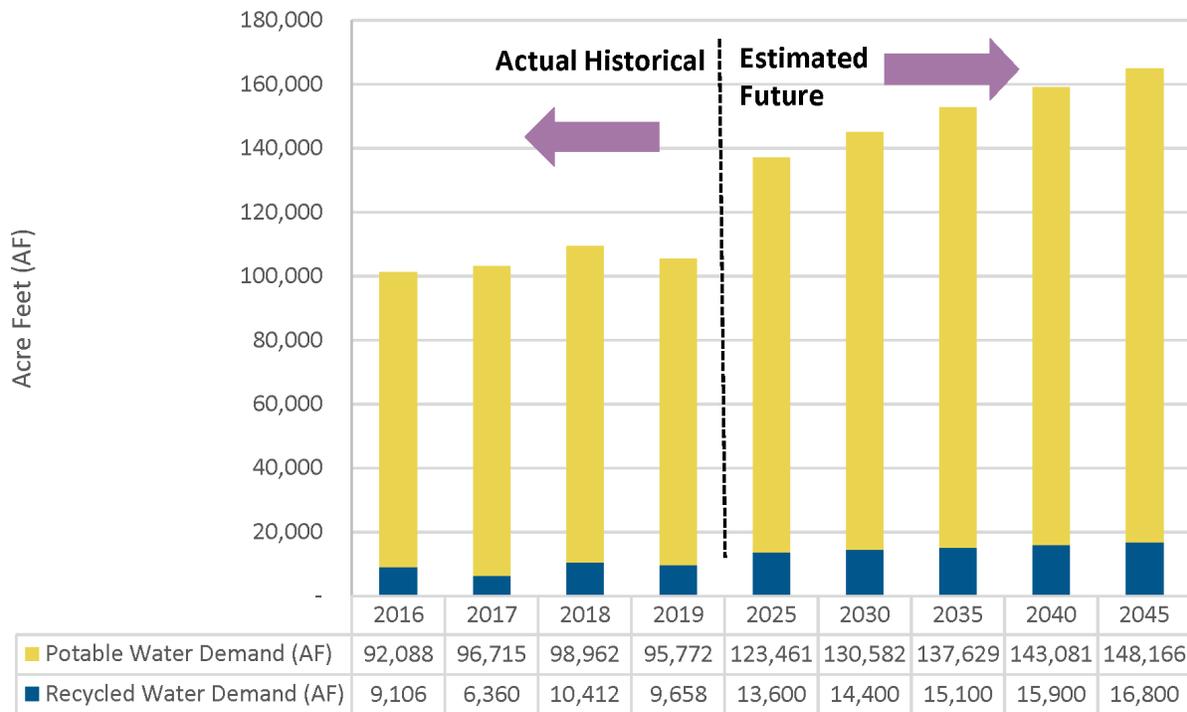
<sup>9</sup> The exception to this was construction emissions sources, which were kept constant through 2045, due to level of construction activity expected to stay relatively constant through 2045.

**Table 13 Activity Data for Forecasting**

Data	Unit	Source
Water demand	Acre-feet (AF) of water	2016-2019 data: provided directly by CVWD 2025-2045 data: RUWMP projections
Renewable Portfolio Standard energy mix changes	Percent	SB 100

The forecasts are primarily driven by the anticipated water demand magnitude for CVWD. For example, electricity usage by CVWD is expected to increase in future years consistent with growth in the service area and increased groundwater pumping, recycled water operations, and various groundwater replenishment activities. Historical and projected water demand data is shown in Figure 4.

**Figure 4 Historical and Future Water Demand**



In order to model growth in each emissions sector based on water demand projections, growth factors (e.g., electricity use per volume water demand, or kWh per AF) for each emissions sector and year were developed based on the 2016 through 2019 inventory and the water demand data for those years, then averaged across the four years (Table 14). Each growth factor was multiplied by the forecasted demand in the RUWMP to estimate future activity data values. The projected activity data was then multiplied by an emission factor to determine GHG emissions associated with the activity. While not all emissions sources (such as vehicle fleet) will scale directly with demand, this methodology provides a conservative estimate of future growth and associated CVWD emissions.

The primary exception to this methodology is the electricity and GHG emissions associated with recycled water. Water reclamation and recycling is an energy-intensive process. Per the RUWMP, CVWD plans to expand water recycling operations in future years (RUWMP 2020). This activity will

adjust CVWD's emissions profile, resulting in higher electricity usage or GHG emissions per acre-foot of water demand than currently captured by the 2016 through 2019 inventory. To account for this, Rincon developed an additional growth factor for electricity associated with recycled water (in units of kWh per AF) by dividing electricity used for water reclamation by the volume of recycled water demand. This growth factor was then multiplied by the projected recycled water demand volumes to forecast the electricity usage expected from the increase in water recycling operations. This electricity usage was added to the electricity usage already calculated for potable water demand associated with all other electricity uses, making this a conservative estimate of future emissions.

The second exception to this methodology are the GHG emissions associated with construction. Construction activity is assumed to stay relatively constant through 2045, as there is limited understanding of what future construction needs will look like in ten to 30 years. GHG emissions associated with construction were therefore kept constant through 2045, rather than scaling with water demand.

**Table 14 Growth Factors for Forecasting**

GHG Emissions Sector	Growth Factor	Units
Natural Gas	0.2059	Therms natural gas/AF potable water demand
Diesel	1.0011	Gallons diesel/AF potable water demand
Gasoline	3.1209	Gallons gasoline/AF potable water demand
Propane	0.0059	Gallons propane/AF potable water demand
Compressed Natural Gas	0.0007	Gallons CNG/AF potable water demand
Wastewater	0.2293	MT CO <sub>2</sub> e/AF potable water demand
SCE Electricity (kWh)	574.6960	kWh/AF potable water demand
SCE T&D (kWh)	32.3905	kWh/AF potable water demand
SCE Electricity for Recycled Water (kWh)	1,585.4680	kWh/AF recycled water demand
IID Electricity (kWh)	427.0276	kWh/AF potable water demand
IID T&D (kWh)	26.8698	kWh/AF potable water demand
IID Electricity for Recycled Water (kWh)	1,875.1595	kWh/AF recycled water demand
Employee Commute	0.0049	MT CO <sub>2</sub> e/AF potable water demand
Waste	7.3738	MT CO <sub>2</sub> e/AF potable water demand
Construction	N/A	MT CO <sub>2</sub> e/AF potable water demand

The following provides an overview of how each GHG emissions source was forecasted:

- **Scope 1**
  - **Natural gas** – the growth factor for natural gas was multiplied by water demand projection data for each year, then multiplied by the emission factor used in the inventory
  - **Vehicle fleet and equipment (on- and off-road)** – the growth factors for diesel, gasoline, propane, and CNG were multiplied by water demand projection data for each year, then multiplied by the corresponding emission factors used in the inventory
  - **Wastewater** – the growth factor for wastewater was multiplied by the water demand projection data for each year

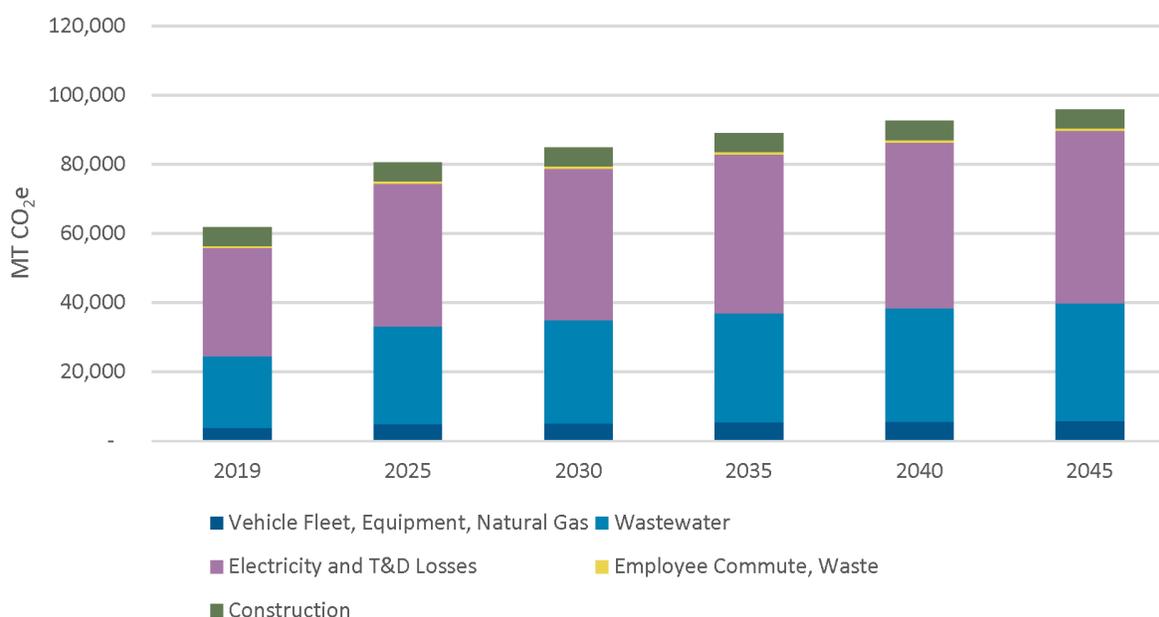
- **Scope 2**
  - **Electricity** – the growth factors for SCE and IID electricity were multiplied by the water demand projection data for each year, then multiplied by the corresponding emission factors. For the BAU forecast, Rincon used the electricity emission factor from 2019 for each year through 2045. For the adjusted forecast, Rincon used electricity emission factors adjusted according to the projected RPS for SCE and IID
    - Additional emissions associated with increased water recycling operations were calculated by multiplying the growth factors for SCE and IID electricity associated with the WRPs by the recycled water demand projection data for each year. Activity data in kWh were converted to emissions by applying the appropriate emission factors using the same approach as described above
- **Scope 3**
  - **Electricity transmission and distribution losses** – established as a linear percentage of Scope 2 electricity and projected forward for the BAU and adjusted forecasts based on the BAU and adjusted Scope 2 electricity emissions projections, respectively
  - **Waste** – the growth factor for waste was multiplied by the water demand projection data for each year
  - **Employee commute** – the growth factor for employee commute was multiplied by the water demand projection data for each year
  - **Construction** – the annual average construction emissions determined from the inventory was applied for all years through 2045

### 5.3 Business-as-usual Forecast Methods and Results

The BAU forecast provides an estimate of how GHG emissions would change in the forecast years if consumption trends continue as in 2016 through 2019, absent any new regulations or policies that would reduce GHG emissions. Under the BAU forecast, CVWD’s emissions are projected to continue increasing through 2045 (Table 15), as CVWD services expand to meet demand from population growth. This increase is the result of the overall projected increases in population driven water demand through 2040. The results of the BAU forecast are also shown in Figure 5. Under the BAU forecast scenario, electricity and wastewater remain the highest contributors to CVWD’s GHG emissions.

**Table 15 Business as Usual Forecast GHG Emissions Summary (MT CO<sub>2</sub>e)**

<b>Emissions Source</b>	<b>2025</b>	<b>2030</b>	<b>2035</b>	<b>2040</b>	<b>2045</b>
Natural Gas	135	143	151	156	162
Vehicle Fleet and Equipment	4,665	4,935	5,201	5,407	5,599
Wastewater	28,308	29,941	31,557	32,807	33,973
Electricity	39,598	41,894	44,093	46,001	47,902
T&D Losses	1,698	1,795	1,892	1,967	2,037
Employee Commute	607	642	677	704	729
Waste	26	28	29	31	32
Construction	5,448	5,448	5,448	5,448	5,448
<b>Total</b>	<b>80,351</b>	<b>84,684</b>	<b>88,898</b>	<b>92,365</b>	<b>95,720</b>

**Figure 5 Business as Usual (BAU) Forecast**

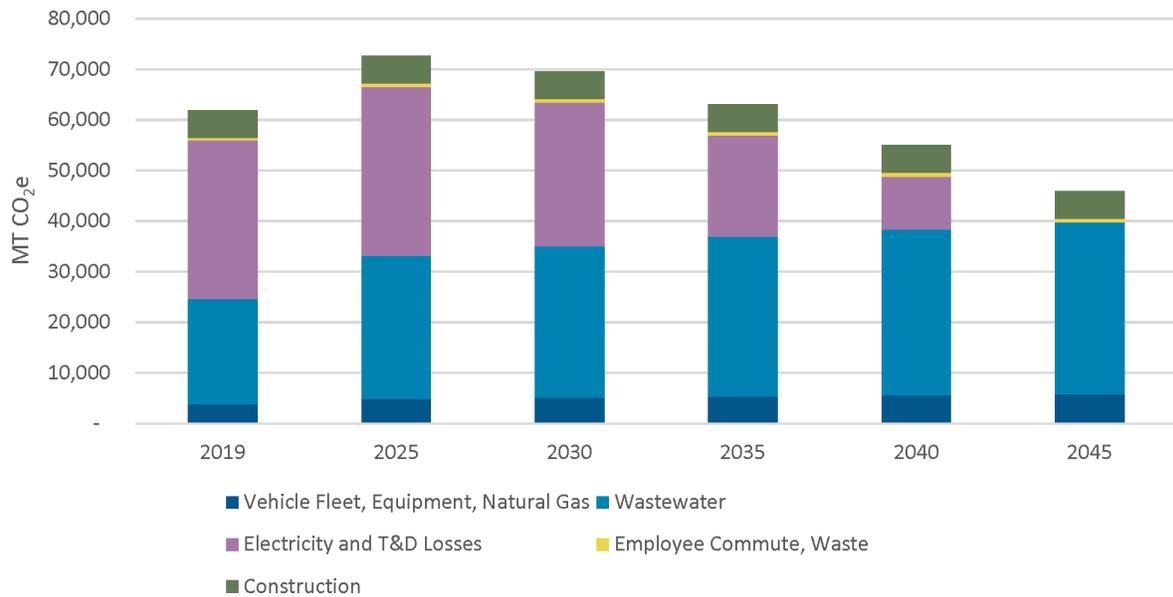
## 5.4 Adjusted Forecast Methods and Results

The adjusted forecast adjusts the BAU forecast to include the legislative actions and associated emissions reductions occurring at the State level as summarized in Section 3.2 (i.e., California’s RPS Program). The only emissions sectors that changed under the adjusted forecast are electricity and T&D losses; all other sectors remained the same in comparison to the BAU forecast. Under the adjusted scenario, GHG emissions are expected to decrease overall through 2045 due to the adjustments to electricity (Table 16). The results of the adjusted forecast are also shown in Figure 6.

**Table 16 Adjusted Forecast GHG Emissions Summary (MT CO<sub>2</sub>e)**

Emissions Source	2025	2030	2035	2040	2045
Vehicle Fleet and Equipment	4,665	4,935	5,201	5,407	5,599
Natural Gas	135	143	151	156	162
Wastewater	28,308	29,941	31,557	32,807	33,973
Electricity	32,055	25,554	17,930	9,354	0
T&D Losses	1,374	1,094	769	400	0
Employee Commute	607	642	677	704	729
Waste	26	28	29	31	32
Construction	5,448	5,448	5,448	5,448	5,448
<b>Total</b>	<b>72,484</b>	<b>67,643</b>	<b>61,611</b>	<b>54,150</b>	<b>45,781</b>

**Figure 6 Adjusted Forecast**



### California RPS Program Adjustments

Projected GHG emissions from electricity and electricity T&D losses were calculated by multiplying the growth factor for each electricity source by the corresponding water demand projection for each year, and again by the corresponding emission factor. Emission factors were calculated based on the most recent emission factor for each electricity source available, which were adjusted for future years based on the RPS requirements of SB 100, as shown in Table 17.

**Table 17 California RPS-adjusted Electricity Emission factors**

Electricity Source	2019	2025	2030	2035	2040	2045
<b>Renewables mix (%)</b>						
IID <sup>1</sup>	42.5%	52.0%	60.0%	73.3%	86.7%	100.0%
SCE <sup>2</sup>	35.1%	48.7%	60.0%	73.3%	86.7%	100.0%
<b>Emission factor (lbs. CO<sub>2</sub>e/MWh)</b>						
IID	484.43	404.01	337.95	225.30	112.65	0.00
SCE	534.00	422.25	289.83	193.22	96.61	0.00

<sup>1</sup> 2019 renewables mix and emission factor provided to Rincon directly by IID. Renewables mix projected based on SB 100 RPS requirements

<sup>2</sup> 2019 renewables mix and emission factor based on Edison International 2019 Sustainability Report (SCE 2019)

## 6 Target Setting

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Once the inventory and forecast are complete, GHG emissions reduction targets are developed consistent with State goals (i.e., SB 32 and EO B-55-18). GHG targets are developed relative to baseline emissions levels, and in consideration of future emission forecasts and the effects of ongoing and future legislative actions. Because the CAAP is not a “CEQA qualified” GHG Reduction Plan (i.e., CVWD will not use the CAAP to reduce CEQA requirements for future construction and development projects), the targets that CVWD adopts are not binding but represent CVWD’s best intentions with respect to GHG emissions reduction efforts. CVWD will adopt GHG reduction targets in order to define measurable benchmarks that will help guide CVWD’s GHG emissions reduction efforts going forward.

Setting GHG reduction targets that additionally align with CVWD’s goals will facilitate CVWD in developing its own emissions reduction trajectory. Target setting is an iterative process that should ultimately be informed by CVWD’s realistic ability to achieve GHG emissions reductions through the CAAP GHG reduction measures. As such, it is considered best practice to re-evaluate the targets on a periodic basis (every five years is recommended) and adjusted as more data and information become available to CVWD.

Target pathways can be set in units of absolute emissions (total metric tons of carbon dioxide equivalents, MT CO<sub>2</sub>e per year) or efficiency metrics (MT CO<sub>2</sub>e per person in service territory or per capita). Based on this, four potential target pathways are discussed below:

- **SB 32 Then Carbon Neutral Target:** achieve the minimum reductions required by SB 32 by 2030 (40 percent below 1990 levels) and carbon neutrality in 2045.
  - **Absolute Pathway:** reduce absolute emissions to 40 percent below absolute emission level and to zero in 2045. This would require minimal reductions through 2030 and then relatively steep reductions from 2030 to 2045, regardless of service population changes.
  - **Efficiency Pathway:** reduce per capita emissions to 40 percent below per capita emission level in 1990 and to zero in 2045.
- **Linear to Carbon Neutral Target:** move linearly from current emission levels to carbon neutrality in 2045. This pathway is also compliant with the 2030 State goal.
  - **Absolute Pathway:** linearly reduce absolute emissions to zero in 2045. This would require consistent reductions from 2020 through 2045, regardless of service population changes.
  - **Efficiency Pathway:** linearly reduce per capita emissions to zero in 2045.

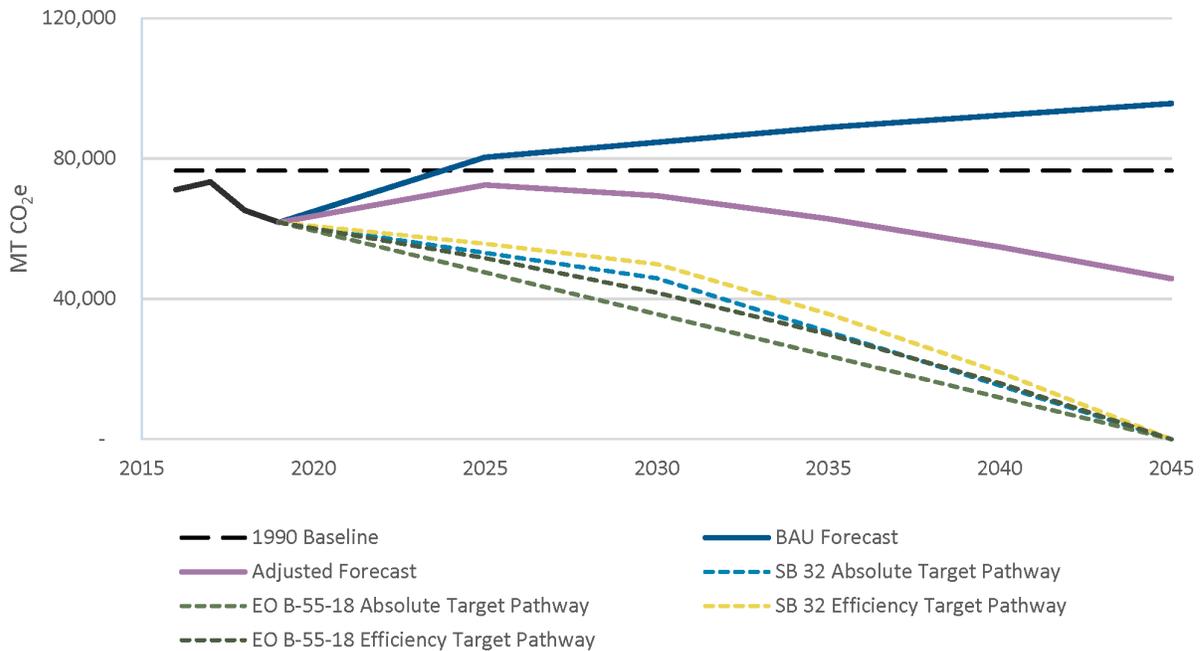
For a complete numerical comparison of each target pathway, the forecasted emissions and each potential target pathway for the years 2020, 2025, 2030, 2040 and 2045 are provided in Table 18, and represented visually in Figure 7.

**Table 18 GHG Emissions Reductions Target Pathways (MT CO<sub>2</sub>e)**

	2025	2030	2035	2040	2045
Water Demand (AF)	137,061	144,982	152,729	158,981	164,966
Service Population	292,077	315,202	338,274	360,813	383,300
<b>Absolute Emissions (MT CO<sub>2</sub>e)</b>					
Adjusted Forecast	72,484	67,643	61,611	54,150	45,781
SB 32 Absolute Target Pathway	53,158	45,935	30,623	15,312	0
EO B-55-18 Absolute Target Pathway	47,558	35,668	23,779	11,889	0
SB 32 Efficiency Target Pathway <sup>1</sup>	55,753	49,927	35,721	19,050	0
EO B-55-18 Efficiency Target Pathway	51,647	41,802	29,908	15,950	0
<b>Per Capita Emissions (MT CO<sub>2</sub>e)</b>					
Adjusted Forecast	0.25	0.21	0.18	0.15	0.12
SB 32 Absolute Target Pathway	0.18	0.15	0.09	0.04	0.00
EO B-55-18 Absolute Target Pathway	0.16	0.11	0.07	0.03	0.00
SB 32 Efficiency Target Pathway <sup>1</sup>	0.19	0.16	0.11	0.05	0.00
EO B-55-18 Efficiency Target Pathway	0.18	0.13	0.09	0.04	0.00

<sup>1</sup> The SB 32 efficiency target for 2030 was calculated as a 40 percent reduction from 1990 per capita emissions (calculated as total 1990 emissions divided by the 2016 service population, as provided by CVWD).

**Figure 7 Target Pathways**



The most stringent but steady pathway CVWD could choose would be the EO B-55-18 Absolute Target Pathway, which would require CVWD to steadily reduce emissions to zero by 2045, regardless of changes to its service population and water demand. The most flexible pathway CVWD could choose through 2030 would be the SB 32 Efficiency Target Pathway, which would allow flexibility in emissions decreases due to projected increases in service population and water

demand, but with the tradeoff that emissions reductions would need to be even more steep after 2030 in order to achieve carbon neutrality by 2045. Both the SB 32 Absolute Target Pathway and EO B-55-18 Efficiency Target Pathway offset the tradeoffs of the other two target pathway options. Rincon recommends CVWD adopt the EO-B-55-18 Efficiency Target Pathway, which offsets the tradeoffs, and would additionally protect CVWD from unanticipated increases in service population and water demand.

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## **APPENDIX B: REGULATORY CONTEXT**

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# Regulatory Context

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As the impacts of climate change are becoming clearer, strategies to address climate change are emerging at all levels of government. This section provides an overview of the regulatory context at the international, state, and local levels relative to CVWD's actions toward reducing greenhouse gas (GHG) emissions.

## International Climate Action Guidance

### 1992 United Nations Framework Convention on Climate Change

The primary international regulatory framework for GHG reduction is the United Nations Framework Convention on Climate Change (UNFCCC). The UNFCCC is an international treaty adopted in 1992 with the objective of stabilizing atmospheric GHG concentrations to prevent disruptive anthropogenic climate change. The framework established non-binding limits on global GHG emissions and specified a process for negotiating future international climate-related agreements.<sup>1</sup>

### 1997 Kyoto Protocol

The Kyoto Protocol is an international treaty that was adopted in 1997 to extend and operationalize the UNFCCC. The protocol commits industrialized nations to reduce GHG emissions per country-specific targets, recognizing that they hold responsibility for existing atmospheric GHG levels. The Kyoto Protocol involves two commitment periods during which emissions reductions are to occur, the first of which took place between 2008-2012. The second commitment period set new targets and other changes but has not been entered into force (meaning it has not gone into effect).<sup>2</sup>

### 2015 The Paris Agreement

The Paris Agreement is the first universal, legally binding global climate agreement that was adopted in 2015 and has been ratified by 191 countries worldwide.<sup>3</sup> The Paris Agreement establishes a roadmap to keep the world under 2 degrees Celsius (°C) of warming with a goal of limiting an increase of temperature to 1.5°C. The Paris Agreement does not dictate one specific reduction target, instead relying on individual countries to set nationally determined contributions (NDCs) or reductions based on gross domestic product and other factors. According to the International Panel on Climate Change (IPCC), limiting global warming to 1.5°C will require global emissions to reduce through 2030 and hit carbon neutrality by mid-century.<sup>4</sup>

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<sup>1</sup> United Nations Framework Convention on Climate Change (UNFCCC). United Nations Framework Convention on Climate Change. [https://unfccc.int/files/essential\\_background/background\\_publications\\_htmlpdf/application/pdf/conveng.pdf](https://unfccc.int/files/essential_background/background_publications_htmlpdf/application/pdf/conveng.pdf)

<sup>2</sup> UNFCCC. What is the Kyoto Protocol? [https://unfccc.int/kyoto\\_protocol](https://unfccc.int/kyoto_protocol)

<sup>3</sup> UNFCCC. Paris Agreement - Status of Ratification. <https://unfccc.int/process/the-paris-agreement/status-of-ratification>

<sup>4</sup> IPCC. Global Warming of 1.5 C. <https://www.ipcc.ch/sr15/>

## California Regulations and State GHG Targets

California remains a global leader in the effort to reduce GHG emissions and combat climate change through its mitigation and adaptation strategies. By the early 2000's, California was passing climate change bills including Senate Bill (SB) 1078 and Executive Order (EO) S-3-05 which began to require state agencies and utilities to address climate change. With the passage of Assembly Bill (AB) 32 in 2006, California became the first state in the nation to mandate GHG emission reductions across its entire economy. To support AB 32, California has enacted legislation, regulations, and executive orders (EO) that put it on course to achieve robust emission reductions and address the impacts of a changing climate. The following is a summary of executive and legislative actions most relevant to the Climate Action and Adaptation Plan (CAAP).

### **2002 Senate Bill 1078**

In 2002, Senate Bill (SB) 1078 established the California Renewables Portfolio Standards (RPS) Program which requires that 20 percent of retail electricity sales be composed of renewable energy sources by 2017 and was accelerated in 2006 by SB 107,<sup>5</sup> which requires that 20 percent of retail electricity sales be composed of renewable energy sources by 2010, instead of 2017. EO S-14-08 was signed in 2008 to further streamline California's renewable energy project approval process and increase the state's RPS to the most aggressive in the nation requiring 33 percent renewable power by 2020.<sup>6</sup> SB 350, discussed further below, further accelerated the program which mandated a 50% RPS by 2030.

### **2002 Assembly Bill 1493**

In 2002, AB 1493, also known as the Pavley Regulations, directed the California Air Resources Board (CARB) to establish regulations to reduce GHG emissions from passenger vehicles to the maximum and most cost-effective extent feasible. CARB approved the first set of regulations to reduce GHG emissions from passenger vehicles in 2004, with the regulations initially taking effect with the 2009 model year.

### **2005 Executive Order S-3-05**

EO S-3-05 was signed in 2005, establishing statewide GHG emissions reduction targets for the years 2020 and 2050. The EO calls for the reduction of GHG emissions in California to 2000 levels by 2010, 1990 levels by 2020, and 80 percent below 1990 levels by 2050. The 2050 emission reductions target would put the state's emissions in line with the worldwide reductions needed to reach long-term climate stabilization as concluded by the IPCC 2007 *Fourth Assessment Report*.

### **2006 Assembly Bill 32**

California's major initiative for reducing GHG emissions is outlined in AB 32, the "California Global Warming Solutions Act of 2006," which was signed into law in 2006. AB 32 codifies the statewide goal of reducing GHG emissions to 1990 levels by 2020 and requires CARB to prepare a Scoping Plan that outlines the main state strategies for reducing GHG emissions to meet the 2020 deadline. In

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<sup>5</sup> California Public Utilities Commission. 2021. Renewables Portfolio Standard (RPS) Program. <https://www.cpuc.ca.gov/General.aspx?id=6442463710>

<sup>6</sup> Executive Order S-14-08. <http://www.climatestrategies.us/library/library/view/292>

addition, AB 32 requires CARB to adopt regulations to require reporting and verification of statewide GHG emissions.

Based on this guidance, CARB approved a 1990 statewide GHG baseline and 2020 emissions limit of 427 million metric tons of CO<sub>2</sub> equivalent (MMT CO<sub>2</sub>e). The Scoping Plan was approved by CARB on December 11, 2008 and included measures to address GHG emission reduction strategies related to energy efficiency, water use, and recycling and solid waste, among other measures. Many of the GHG reduction measures included in the Scoping Plan (e.g., Low Carbon Fuel Standard, Advanced Clean Car standards,<sup>7</sup> and Cap-and-Trade) have been adopted since approval of the Scoping Plan.

In May 2014, CARB approved the first update to the AB 32 Scoping Plan. The 2014 Scoping Plan update defined CARB's climate change priorities for the next five years and set the groundwork to reach post-2020 statewide goals. The update highlighted California's progress toward meeting the "near-term" 2020 GHG emission reduction goals defined in the original Scoping Plan. It also evaluated how to align the state's longer-term GHG reduction strategies with other state policy priorities, including those for water, waste, natural resources, clean energy, transportation, and land use (CARB 2014).

### **2007 Executive Order S-1-07**

Also known as the Low Carbon Fuel Standard, EO S-1-07, issued in 2007, established a statewide goal that requires transportation fuel providers to reduce the carbon intensity of California's transportation fuels by at least 10 percent by 2020. EO S-1-07 was readopted and amended in 2015 to require a 20 percent reduction in carbon intensity by 2030, the most stringent requirement in the nation. The new requirement aligns with California's overall 2030 target of reducing climate changing emissions 40 percent below 1990 levels by 2030, which was set by SB 32 and signed by the governor in 2016.

### **2007 Senate Bill 97**

Signed in August 2007, SB 97 acknowledges that climate change is an environmental issue that requires analysis in California Environmental Quality Act (CEQA) documents. In March 2010, the California Natural Resources Agency adopted amendments to the State CEQA Guidelines for the feasible mitigation of GHG emissions or the effects of GHG emissions. The adopted guidelines give lead agencies the discretion to set quantitative or qualitative thresholds for the assessment and mitigation of GHG and climate change impacts.

### **2008 Senate Bill 375**

SB 375, signed in August 2008, enhances the state's ability to reach AB 32 goals by directing CARB to develop regional GHG emission reduction targets to be achieved from passenger vehicles by 2020 and 2035. In addition, SB 375 directs each of the state's 18 major Metropolitan Planning Organizations (MPOs), to prepare a Sustainable Communities Strategy" that contains a growth strategy to meet these emission targets for inclusion in the MPO's Regional Transportation Plan.

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<sup>7</sup> On September 19, 2019, the National Highway Traffic Safety Agency and the U.S. Environmental Protection Agency issued a final action entitled the One National Program on Federal Preemption of State Fuel Economy Standards Rule. This action finalizes Part I of the Safer, Affordable, Fuel-Efficient (SAFE) Vehicles Rule. This rule states that federal law preempts State and local tailpipe GHG emissions standards as well as zero emission vehicle (ZEV) mandates. The SAFE Rule withdraws the Clean Air Act waiver it granted to California in January 2013 as it relates to California's GHG and zero emission vehicle programs.

In March 2018, CARB adopted updated regional targets for reducing GHG emissions from 2005 levels by 2020 and 2035. Each region was assigned a target for 2020 and 2035.<sup>8</sup> CVWD's operations span several of these regions.

### **2009 California Green Building Code**

The California Green Building Standards Code (CALGreen) is Part 11 of the California Building Standards Code or Title 24 and is the first statewide "green" building code in the nation. The purpose of CALGreen is to improve public health, safety, and general welfare by enhancing the design and construction of buildings. Enhancements include higher energy efficiency, better air quality, and improved daylighting. The first CALGreen Code was adopted in 2009 and has been updated in 2013, 2016, and 2019. The CALGreen Code will have subsequent, and continually more stringent, updates every three years.

### **2009 Senate Bill X7-7**

In 2009, SB X7-7, also known as the Water Conservation Act, was signed, requiring all water suppliers to increase water use efficiency. This legislation sets an overall goal of reducing per capita urban water use by 20 percent by 2020.

### **2011 Senate Bill 2X**

In 2011, SB 2X was signed, requiring California energy providers to buy (or generate) 33 percent of their electricity from renewable energy sources by 2020.

### **2012 Assembly Bill 341**

AB 341 directed the California Department of Resources Recycling and Recovery (CalRecycle) to develop and adopt regulations for mandatory commercial recycling. As of July 2012, businesses are required to recycle, and jurisdictions must implement a program that includes education, outreach, and monitoring. AB 341 also set a statewide goal of 75 percent waste diversion from landfill by the year 2020.

### **2014 Assembly Bill 32 Scoping Plan Update**

In 2014, CARB approved the first update to the Scoping Plan. This update defines CARB's climate change priorities and sets the groundwork to reach the post-2020 targets set forth in EO S-3-05. The update highlights California's progress toward meeting the near-term 2020 GHG emissions reduction target, defined in the original Scoping Plan. It also evaluates how to align California's longer-term GHG reduction strategies with other statewide policy priorities, such as water, waste, natural resources, clean energy, transportation, and land use.

### **2014 Assembly Bill 1826**

AB 1826 was signed in 2014 to increase the recycling of organic material. GHG emissions produced by the decomposition of these materials in landfills were identified as a significant source of emissions contributing to climate change. Therefore, reducing organic waste and increasing composting and mulching are goals set out by the AB 32 Scoping Plan. AB 1826 specifically requires

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<sup>8</sup> [https://ww2.arb.ca.gov/sites/default/files/2020-06/SB375\\_Final\\_Targets\\_2018.pdf](https://ww2.arb.ca.gov/sites/default/files/2020-06/SB375_Final_Targets_2018.pdf)

jurisdictions to establish organic waste recycling programs by 2016, and phases in mandatory commercial organic waste recycling over time.

### **2015 Senate Bill 350**

SB 350, the Clean Energy and Pollution Reduction Act of 2015, has two objectives: to increase the procurement of electricity from renewable sources from 33 percent to 50 percent by 2030 and to double the energy efficiency of electricity and natural gas end users through energy efficiency and conservation.

### **2015 Executive Order B-30-15**

EO B-30-15 was signed in 2015, establishing an interim GHG emissions reduction target to reduce emissions to 40 percent below 1990 levels by 2030. The EO also calls for another update to the CARB Scoping Plan to provide a pathway to achieve this goal.

### **2016 Senate Bill 32**

In September 2016, the governor signed SB 32 into law, extending AB 32 by requiring the state to further reduce GHGs to 40 percent below 1990 levels by 2030 (the other provisions of AB 32 remain unchanged).

### **2016 Senate Bill 1383**

Adopted in September 2016, SB 1383 requires CARB to approve and begin implementing a comprehensive strategy to reduce emissions of short-lived climate pollutants. SB 1383 requires achievement of the following reduction targets by 2030:

- Methane – 40 percent below 2013 levels
- Hydrofluorocarbons – 40 percent below 2013 levels
- Anthropogenic black carbon – 50 percent below 2013 levels

SB 1383 also requires CalRecycle, in consultation with CARB, to adopt regulations that achieve specified targets for reducing organic waste in landfills. SB 1383 further requires 20% of edible food disposed of at the time to be recovered by 2025.

### **2017 Scoping Plan Update**

In December 2017, CARB adopted the 2017 Scoping Plan, which provides a framework for achieving the 2030 goal set by SB 32. The 2017 Scoping Plan relies on the continuation and expansion of existing policies and regulations, such as the Cap-and-Trade Program, as well as implementation of recently approved legislation, such as SB 350 and SB 1383.

The 2017 Scoping Plan also puts an increased emphasis on innovation, adoption of existing technology, and strategic investment to support its strategies. As with the 2014 Scoping Plan Update, the 2017 Scoping Plan does not provide project-level thresholds for land use development. Instead, it recommends that local governments adopt policies and locally appropriate quantitative thresholds consistent with statewide per capita goals of six metric tons (MT) CO<sub>2</sub>e by 2030 and two MT CO<sub>2</sub>e by 2050 (CARB 2017). As stated in the 2017 Scoping Plan, these goals may be appropriate for plan-level analyses (i.e., city, county, subregional, or regional level), but not for specific individual projects because they include all emissions sectors in the state (CARB 2017).

## **2018 Senate Bill 100**

Adopted in September 2018, SB 100 supports the reduction of GHG emissions from the electricity sector by accelerating the state's RPS Program, which was last updated by SB 350 in 2015. SB 100 requires electricity providers to increase procurement from eligible renewable energy resources to 33 percent of total retail sales by 2020, 60 percent by 2030, and 100 percent by 2045.

## **2018 Executive Order B-55-18**

In September 2018, the governor issued Executive Order B-55-18, which established a new statewide goal of achieving carbon neutrality by 2045 and maintaining net negative emissions thereafter. This goal is in addition to the existing statewide GHG reduction targets established by SB 375, SB 32, SB 1383, and SB 100.

## **2020 Executive Order N-79-20**

In September 2020, the governor issued Executive Order N-79-20, which established a new statewide goal that 100 percent of in-state sales of new passenger cars and trucks will be zero-emissions by 2035 and that 100 percent of medium- and heavy-duty vehicles in the State be zero-emissions by 2045 for all operations where feasible. The EO further sets goal for the State to transition to 100 percent zero-emission off-road vehicles and equipment by 2035 where feasible. The EO also calls for the establishment of regulations and strategies by the California Air Resources Board to provide a pathway to achieve this goal.

## **Advanced Clean Fleet**

The California Air Resources Board is currently developing a medium and heavy-duty zero-emission fleet regulation with a goal of all California truck and bus fleets being zero-emission by 2045. The final rulemaking is anticipated to be completed and the regulation adopted in December 2021 with implementation beginning in 2023. Under the rule public fleets, including special districts, 50% of 2024-2026 model year vehicles added to the fleet must be ZEVs and 100% of 2027 and newer model years must be ZEVs. Compliance reporting would be required annually and within 30 days of adding vehicles to the fleet.

## **Advanced Clean Trucks Regulation**

The Advanced Clean Trucks Regulation was approved on June 25, 2020. The regulation establishes a zero-emissions vehicle sales requirement for trucks or on-road vehicles over 8,500 lbs gross vehicle weight and set a one-time reporting requirement for large entities and fleets. Under the regulation, manufacturers who certify Class 2b-8 chassis or complete vehicles with combustion engines are required to sell zero-emission trucks as an increasing percentage of their annual California sales from 2024 to 2035. By 2035, zero-emission truck/chassis sales need to be 55% of Class 2b – 3 truck sales, 75% of Class 4 – 8 straight truck sales, and 40% of truck tractor sales. Additionally, the regulation established a one-time reporting requirement for large entities and fleets where fleet owners, with 50 or more trucks, are required to report about their existing fleet operations by March 15, 2021.



**APPENDIX C:  
MEASURE  
SUBSTANTIAL  
EVIDENCE AND  
REDUCTION  
QUANTIFICATION  
METHODOLOGY**



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# 1 Introduction

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Coachella Valley Water District (CVWD) has developed a Climate Action and Adaptation Plan (CAAP) to identify greenhouse gas (GHG) reduction and adaptation opportunities and improve project eligibility for State/Federal grant and loan application packages to support CVWD's Capital Improvement Programs and address climate change. As part of the CAAP, CVWD has developed a GHG emissions inventory and established GHG emission reduction targets that are in alignment with the state's GHG reduction goals established by Senate Bill (SB) 32 and Executive Order (EO) B-55-18. SB 32 establishes a statewide goal of reducing GHG emission to 40% below 1990 levels, while EO-B-55-18 identifies the long-term goal of statewide carbon neutrality by 2045. The CAAP also forecasts GHG emissions associated with CVWD operations and projected water demand. While this CAAP is not intended to serve as a qualified GHG Reduction Plan per the California Environmental Quality Act (CEQA) requirements of Section 15183.5(b), this CAAP represents CVWD's entry point into climate action planning and can be built upon during the next iterations of the CAAP.

As part of the CAAP, CVWD has identified voluntary GHG reduction and adaptation measures that have been designed to reduce GHG emissions and make substantial progress towards state's SB 32 GHG emissions reduction goals and the state's long-term GHG reduction goal of carbon neutrality (EO B-55-18). Together, these measures will reduce the gap between CVWD's forecasted GHG emissions and its GHG emissions reduction targets. The measures were selected based on their consistency with current CVWD programs and initiatives, cost effectiveness, and their ability to result in measurable GHG emissions reduction and increased resilience.

The GHG reduction and adaptation measures selected for this CAAP are designed to help reduce CVWD's GHG emissions while also improving CVWD's resiliency in light of a changing climate. Each measure outlined in the CAAP primarily focuses on the GHG emissions over which CVWD has direct operational control and on sources (e.g., emissions from construction equipment or employee commute) that generate the highest current GHG emissions. The measures are made up of action items that if implemented have quantified GHG reduction potential and clear progress tracking metrics and performance standards. Rincon worked closely with CVWD staff to craft and refine comprehensive, realistic, and achievable measures that if implemented have the potential to reduce GHG emissions in a measurable way. The quantification in this report is intended to illustrate one of several viable paths to pursue as the measures and actions of the CAAP are implemented at full scale. The GHG reductions were calculated using published evidence provided through adequately controlled third party investigations, studies, and articles carried out by qualified experts that establish the effectiveness of the measures and actions included in the CAAP. The measures and actions were developed to make substantial progress towards CVWD's 2030 target. This appendix details the data, methodology, and evidence utilized to estimate the GHG emissions reduction potential that may be achieved with full implementation of the measures and actions in this CAAP.

## 1.1 CVWD Greenhouse Gas Emission Reductions from Measures and Actions

This section presents an analysis of the GHG emissions reductions possible through implementation of the measures discussed herein. CVWD has organized the GHG reduction measures around three emission scopes: either direct (Scope 1) or indirect (Scope 2 and Scope 3) emissions and, twelve core measures that will systematically reduce GHG emissions across all three emission scopes.<sup>1</sup> The CAAP takes a phased approach to implementation. Phase 1 measures are ready for implementation over the next five years based on their cost, available technology, and certainty about future conditions. Phase 2 measures are those planned for implementation in five to ten years where more time for planning, technology advancements, or different financial conditions, such as the next phase of CIP planning, is needed before they can be implemented. Phase 3 measures are considered longer-term measures, that are anticipated to occur after feasibility studies are complete and initial measures or actions are completed.

The GHG emissions reduction from the specific actions are calculated individually and then are combined to determine the total GHG emissions reduction that can be achieved by the overall measure. Some measures and actions provide minimal or non-quantifiable GHG emissions reduction; however, they support the implementation and sustainability of the measure through internal education, funding, evaluating feasibility, and increasing resilience to the impacts of climate. These measures and actions are considered “supportive,” as they do not directly result in measurable GHG emissions reduction; however, they support the overall goals of the CAAP. In addition, some measures require a series of steps or actions to be implemented or completed, prior to quantifiable GHG reductions being achieved. Other measures may require more study before implementation. These measures are thus characterized as a Phase 2 or Phase 3 and do not contribute to meeting the 2030 target. In other cases, where the quantifiable GHG reductions are dependent on the implementation of preceding measures, additional research (e.g., conduct a feasibility study) or obtaining funding, the measures and actions are listed as supportive to avoid overestimation of GHG emission reductions. Future CAAP updates will include quantification of GHG emissions reduction associated with such measures as the preceding actions are achieved. The following sections detail the methodology and assumptions used to quantify the GHG emissions reduction.

The analysis and emissions reduction calculations for each of the measures in the CAAP are outlined in the following pages and include:

- Description of the basis for GHG emissions reduction behind the measure
- Description of the methodology and assumptions for calculating GHG emissions reduction for applicable measures and actions, including reference to data sources
- Calculation of the GHG emissions reduction
- Summary table of the impact that the specific measure has on the overall 2030 GHG profile of CVWD’s operations in 2030 and 2045

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<sup>1</sup> The GHG Protocol, which is discussed in detail in *Section 3.0, GHG Emissions Inventory and Forecast*, segregates GHG emission sources into three scopes based on varying levels of control: **Scope 1 – Direct Emissions** from the activities that are directly under an organization’s control, such as on-site fuel combustion from boilers, use of fleet vehicles and air-conditioning leaks; **Scope 2 – Indirect Emissions** from purchased electricity - emissions are created during the production of the electricity that is eventually used by the organization; and, **Scope 3 – All Other Indirect Emissions** from activities of the organization, occurring from sources that it does not own or control, including emissions associated with business travel, procurement, waste and water.

GHG emissions reduction calculations use conservative values to avoid over-representing the GHG emissions reduction potential for any individual measure or action. Special care has been taken to avoid double counting GHG emissions reduction for measures and actions and categorizing them as supportive measures was used when double counting could be an issue. A summary of the potential GHG emissions reduction from each of the measures and actions by 2030 and 2045 is provided in Table 1. The actual amount of GHG emissions reduced through implementation will be dependent on the degree of implementation of each measure and the combination of measures implemented. The 2030 and 2045 GHG emissions reductions quantified in this CAAP are not yet enough to meet the CVWD’s 2030 and 2045 targets. However, as the current measures and actions are implemented, CVWD will gain more information, new technologies will emerge, and current pilot projects and programs are anticipated to scale such that the gap between CVWD’s target and GHG emissions forecast shrink. Furthermore, the State is expected to continue providing updated regulations and support through 2045.

**Table 1 Summary of GHG Emissions Reduction from CAAP Measures and Actions**

Phase	Reduction Measure/Action	Emission Reductions Potential (MT CO <sub>2</sub> e) 2030	Emission Reductions Potential (MT CO <sub>2</sub> e) 2045
<b>Measure DC1: Phase out natural gas at CVWD facilities, such that 50% of natural gas combustion equipment is replaced with electric equivalents by 2030.</b>			
1-2	<b>DC1-1</b> Conduct a survey of natural gas and propane consuming devices in offices, control buildings, and other CVWD structures. By 2025 establish a schedule to replace non-emergency use fossil-fuel-consuming equipment with electric-powered equivalents based on operational lifespan estimates.		Supportive
1	<b>DC1-2</b> Explore rebate, grant, or partnership opportunities to fund the replacement of fossil-fuel consuming equipment like HVAC and hot water heaters with electric powered equivalents like heat pumps.		Supportive
1-2	<b>DC1-3</b> Based on feasibility and the replacement schedule, replace 50% of non-emergency fossil-fuel-consuming equipment with electrically powered equivalents in existing office and CVWD buildings by 2030. Additionally, with obtainment of funding establish goal to replace 75% of equipment by 2045.	55	122
<b>Measure FL1: Replace vehicle fleet with zero-emission vehicles as technology allows in alignment with the Advanced Clean Fleet Rule, such that by 2030, 40% of the vehicle fleet are zero emissions vehicles, and by 2045, 100% of the vehicle fleet are zero emission.</b>			
1	<b>FL1-1</b> As part of vehicle fleet replacement process, incorporate a return on investment analysis in the criteria to evaluate ZEV/EV options.		Supportive
1	<b>FL1-2</b> Adopt an ZEV/EV First Policy for fleet vehicles so that ZEV/EVs are purchased when replacements are needed unless technological, operational, or cost effectiveness issues are identified in alignment with Executive Order B-48-18 and SB 350 transportation electrification goals. Revise policy requirements when the Advanced Clean Fleet regulation is formally adopted and implementation of Rule begins in 2023.		Supportive

Phase	Reduction Measure/Action	Emission Reductions Potential (MT CO <sub>2</sub> e) 2030	Emission Reductions Potential (MT CO <sub>2</sub> e) 2045
1	<b>FL1-3</b> Pursuant to the Advanced Clean Trucks regulation adopted June 2020, comply with the Large Entity On-Time Reporting Requirement.		
			Supportive
1-2	<b>FL1-4</b> Convert 40% of the CVWD fleet to vehicles and equipment to be powered by electricity, fuel cells, and/or other ZE technologies by 2030 and aim to convert 100% of CVWD fleet to ZEV by 2045 in alignment the Advanced Clean Fleets Rule (Rule recommendation to Board December 2021; implementation begins 2023).	761	4,080
1-2	<b>FL1-5</b> Investigate grant opportunities; local, State, and federal incentives; and/or partnerships to purchase new EVs and install EV charging and/or ZEV infrastructure at facilities for fleet and public use. Conduct a return on investment analysis that assess cost savings from incentives for early replacement of fleet vehicles with ZEV/EV versus the traditional replacement schedule.		
			Supportive
<b>Measure FL2: Use alternative fuels to bridge the technology gap to zero emission vehicles and off-road equipment by achieving 100% replacement of #2 diesel with 100% renewable diesel by 2030</b>			
1	<b>FL2-1</b> Prepare an assessment that determines the quantity of renewable diesel needed, any costs incurred from the transition, and identifies a reliable source of renewable diesel.		
			Supportive
1	<b>FL2-2</b> Present findings from the assessment of transitioning from diesel to renewable diesel (Action F2-1) to Internal Stakeholders on the assessment of transitioning from diesel to renewable diesel.		
			Supportive
1	<b>FL2-3</b> Transition current diesel tanks at CVWD-owned fueling depots such that 50% of diesel-powered fleet vehicles and equipment can utilize renewable diesel by 2023 and 100% by 2027.	1,066	1,210
1-2	<b>FL2-4</b> Partner with heavy-duty EV companies to conduct pilot studies and facilitate advancements in technology for vehicle classes which do not currently have viable options. Investigate grant opportunities for such projects and partnerships.		
			Supportive
1	<b>FL2-5</b> Ensure any on-road diesel-fueled medium heavy-duty and heavy heavy-duty engines in CVWD's vehicles fleet are in compliance with the Fleet Rule for Public Agencies and Utilities Fleet.		
			Supportive
<b>Measure FL3: Reduce vehicle miles travelled and fuel use for non-ZEV/EV fleet vehicles</b>			
1	<b>FL3-1</b> Upgrade current GPS systems in vehicle fleet to improve mileage tracking, track idle time, and track performance. Adjust vehicle dispatch planning and reduce idle time as necessary to reduce VMT and improve vehicle operating conditions.	300	0
1	<b>FL3-2</b> Continue to perform preventative maintenance on vehicle fleets to improve performance, including the procurement of low rolling resistance tires, using	117	0

Phase	Reduction Measure/Action	Emission Reductions Potential (MT CO <sub>2</sub> e) 2030	Emission Reductions Potential (MT CO <sub>2</sub> e) 2045
	the correct tire air pressure, and regularly replacing air filters which will improve fuel efficiency.		
<b>Measure WW1: Reduce GHG process emissions associated with wastewater treatment</b>			
2-3	<b>WW1-2</b> Investigate opportunities associated with design features of the CVWD Master Plan for wastewater treatment facilities to reduce emissions and/or capture methane. For example, as part of proposed Capital Improvement Program (CIP) project to install two new anaerobic digesters, consider conducting a pilot study for methane capture and conversion to biofuel under the LCFS Program.		Supportive
2-3	<b>WW1-2</b> Investigate potential partnerships with agencies or entities looking to obtain biogas for fuel production that would fund equipment costs.		Supportive
<b>Measure E1: Utilize Low-Carbon and Carbon Free Electricity</b>			
1	<b>E1-1</b> Conduct an annual return on investment analysis of green electricity packages available from current electricity providers, SCE and IID, as well as from joining Desert Community Energy (DCE). Return on investment analysis should include an evaluation of electricity accounts that can be switched, estimated cost for the switch, as well as benefits from achieving greater GHG emissions reduction as it relates to grant funding opportunities associated with the CAAP. <i>Exceed the renewable electricity standard set by Senate Bill 100 for electricity purchases by opting into a green rate package with SCE and IID.</i> <sup>1</sup>	4,155	0.0
1	<b>E1-2</b> Continue to analyze time-of-use emissions factors and costs to better model GHG emissions and costs for future projects. Include analysis as part of annual CAAP progress monitoring.		Supportive
1	<b>E1-3</b> When operationally feasible, schedule times of high pumping to coincide with times of high renewable energy availability and low demand to reduce GHG emissions and smooth demand curve. Establish a goal to shift 10% of pumping times to mid-day.	330	0
1-2	<b>E1-4</b> Complete the installation of solar-topped parking structures and battery storage system to cover 100% of CVWD Palm Desert Campus energy consumption needs by 2030.	1.6	0.0
1-2	<b>E1-5</b> Investigate opportunities and partnerships with fuel providers within the LCFS program associated with generating low-carbon intensity (CI) electricity from wastewater treatment plants to generate LCFS credits or power for water reclamation plant electricity needs associated with the Palm Desert Campus (i.e., WRP 10).		Supportive
1-2	<b>E1-6</b> Investigate opportunities to reduce energy costs, improve resilience, and reduce electricity GHG emissions through additional on-site solar and		Supportive

Phase	Reduction Measure/Action	Emission Reductions Potential (MT CO <sub>2</sub> e) 2030	Emission Reductions Potential (MT CO <sub>2</sub> e) 2045
	battery storage to support CVWD operational energy use and/or investigate the cost effectiveness to enter a Power Purchase Agreement		
<b>Measure EE1: Improve energy efficiency at CVWD facilities and buildings</b>			
1	<b>EE1-1</b> As part of the Asset Management program, identify aging equipment due for replacement throughout CVWD facilities and identify energy efficient alternatives to use for the replacement (e.g., EnergyStar certifications). Include a return on an investment analysis as part of the replacement process that evaluates the capital investment for an energy efficient alternative piece of equipment, cost savings associated with improved energy efficiency, and identifies any grants or rebates associated with such equipment replacement.		Supportive
1-3	<b>EE1-2</b> Continue to conduct energy audits annually and implement top energy recommendations. As part of CAAP monitoring, track energy improvements due to implementation of energy audit recommendations annually.		Supportive
1-2	<b>EE1-3</b> Based on the recommendations from <i>Coachella Valley Water District WRP Energy Optimization Evaluation</i> , implement the top Energy Efficiency Measures (EEM) at WRP 4, WRP 7 and WRP 10 with a Benefit-to-Cost Ratio Greater than 1.0 by 2030. The identified EEM are aligned with the Sanitation Master Plan and include energy optimization such as aeration improvements, treatment optimization, improved site and building lighting, and addition of solar panels to the WRPs.	2,132	0
1-2	<b>EE1-4</b> Develop a policy that would require any new CVWD building to achieve a minimum level of LEED Gold certification or LEED equivalent to improve energy efficiency and reduce cost based on high return on investment greater than 20%.		Supportive
1	<b>EE1-5</b> Continue to utilize automated lighting controls for indoor/outdoor lighting for CVWD campuses pursuant to the current CEC Building Energy Efficiency Standards (Title 24, Part 6 and 11)		Supportive
1-3	<b>EE1-6</b> Pursuant to the CEC 2019 Building Energy Efficiency Standards (Title 24, Part 6 and 11), require all new construction and building upgrades utilize light emitting diode (LED) lighting technology only. Establish goal to convert all interior and exterior lighting at 50% of CVWD facilities to LED technologies by 2027 and 100% by 2035.	833	0
1-3	<b>EE1-7</b> Continue CVWD's time of use program that identifies and established permanent shifts of high-electricity use to times when renewable energy is plentiful through educational programs on energy and thermal storage, load timing/controls, pre-		Supportive

Phase	Reduction Measure/Action	Emission Reductions Potential (MT CO <sub>2</sub> e) 2030	Emission Reductions Potential (MT CO <sub>2</sub> e) 2045
	cooling/pre-heating, and other time-energy demand measures.		
1-3	<b>EE1-8</b> Continue to identify opportunities to develop and profile notable energy efficiency projects. Track energy reduction from implementation of energy efficiency projects and prepare a report detailing successes for internal stakeholders by 2030.		Supportive
<b>Measure WG1: Increase waste diversion to achieve 75% reduction in landfilled organic waste by 2025 and zero-waste by 2045</b>			
1	<b>WG1-1</b> Conduct a waste audit by 2023 to determine what percentage of the waste stream is organic compared with the waste stream in 2014 and therefore, subject to SB 1383.		Supportive
1-3	<b>WG1-2</b> Expand CVWD's current waste management by developing net-zero waste policies and programs at all facilities to reduce landfilled organic waste by 75% by 2025 from 2014 levels and achieve zero landfilled waste by 2045 in alignment with AB 341 and SB 1383.	10	32
1	<b>WG1-3</b> Continue to implement organic waste diversion strategies where green and wood waste is separated from other waste streams, and sent to the Greenleaf Biomass Power Plant in Mecca or other biomass/renewable energy center.		Supportive
1-2	<b>WG1-4</b> Investigate funding opportunities to develop an organics program and deploy organic waste bins at all CVWD facilities such that organics generated from CVWD operations is collected and diverted from the landfill by 2025.		Supportive
1	<b>WG1-5</b> Pursuant to AB 901, report the quantity and destination of disposed biosolids from wastewater treatment plants to CalRecycle quarterly.		Supportive
<b>Measure TR1: Incentivize more sustainable commutes.</b>			
1	<b>TR1-1</b> Continue to conduct annual SCAQMD transportation surveys to monitor CVWD employees needs and motivation for travelling by single occupancy vehicles versus alternatives. Based on survey results, expand or promote programs and incentives that have proven successful strategies in reducing employee VMT.		Supportive
1	<b>TR1-2</b> Continue to offer rideshare incentives to employees who carpool. Consider offering other incentives to employees to use an alternative mode of transportation to commute (e.g. public transportation, bikes).		Supportive
1	<b>TR1-3</b> Allow all employees located at CVWD Palm Desert and Coachella Campuses to utilize flexible 9/80 schedule through 2030 to reduce travel time, VMT, and GHG emissions.	17	12

Phase	Reduction Measure/Action	Emission Reductions Potential (MT CO <sub>2</sub> e) 2030	Emission Reductions Potential (MT CO <sub>2</sub> e) 2045
	<b>TR1-4</b> Conduct a ZEV/EV Feasibility Study by 2026 to investigate funding opportunities or partnerships to install ZEV/EV infrastructure at CVWD facilities and to determine the number and locations most effective for ZEV/EV infrastructure installation. Discuss with SCE their current pilot programs to install infrastructure at workplaces and evaluate future opportunities for CVWD to host pilot program.		Supportive
2	<b>TR1-5</b> Based on funding and ZEV/EV Feasibility Study, install ZEV and/or EV infrastructure to support at least a 15% transition to ZEVs/EVs by 2030 and 30% by 2045.	39	84
1	<b>TR1-6</b> Expand provided preferred parking for EV/ZEVs to incentivize use of ZEVs/EVs by employees.		Supportive
1	<b>TR1-7</b> Promote employee use of carbon-free and low carbon transportation by providing educational materials (e.g. flyers in break rooms, info on transportation survey, info on websites) on the benefits of commute options including public transportation, EV/ZEV options, and vanpools.		Supportive
<b>Measure WC1: Increase Water Conservation and Local Water Supply</b>			
2	<b>WC1-1</b> Expand programs which educate customers on water conservation initiatives through workshops and speaking engagements. In coordination with retail water suppliers, host regular workshops and classes on water conservation, including providing information on drought-tolerant landscaping, available rebates for water retrofits, and water efficiency strategies in new buildings. Continue to offer workshops and classes even when drought conditions are not present. Develop outreach materials for water conservation.		Supportive
1	<b>WC1-2</b> Continue to work with Agricultural Water Advisory Group to teach farm owners, managers, and irrigators concepts in irrigation water and salinity management as well as promote new technology to help the conservation effort. Apply for grant-funded agricultural rebate programs to assist those in the agriculture industry to reduce water use.		Supportive
1-2	<b>WC1-3</b> Analyze current water use reduction programs to identify which programs have the highest adoption rate and water use reduction impacts. Expand those programs which are found to be most effective.		Supportive
1-2	<b>WC1-4</b> Prepare a formal landscape management plan for CVWD that consolidates and expands upon the goals and policies for landscaping at CVWD property. The Plan should identify whether and where there are resource-consumptive landscapes on CVWD property that can be changed out to more water-conserving, slower growth plants that require less maintenance. Continue to implement potable water		Supportive

Phase	Reduction Measure/Action	Emission Reductions Potential (MT CO <sub>2</sub> e) 2030	Emission Reductions Potential (MT CO <sub>2</sub> e) 2045
	conservation strategies in landscape design and maintenance (such as replacing water intensive areas with drought-resilient native plants [Bermuda grass], using low-flow water fixtures, installing sophisticated irrigation software to control water, investing in systems to monitor pipe leakage, and limiting turf development).		
2	<b>WC1-5</b> Require new or redeveloped CVWD developments to be low water use through landscaping with drought tolerant plants, permeable paving, green infrastructure, and incorporating other low-impact development design features to allow for increased infiltration, even in heavy rains.		Supportive
1	<b>WC1-6</b> Continue to promote water conservation through xeriscaping through xeriscape demonstration gardens and educational material.		Supportive
2-3	<b>WC1-7</b> Complete and implement Irrigation Master Plan that establishes goals and a timeline for improved water conservation related to irrigation. The Plan should identify the opportunities for replacement of groundwater use for irrigation with recycled water use, including a cost assessment and prioritization of opportunities.		Supportive
2	<b>WC1-8</b> Seek additional grant funding to expand the Golf Course Conservation program with a goal to remove/replace an additional 115,000 square feet of turf by 2030.		Supportive
1	<b>WC1-9</b> Continue to implement and expand on successful water conservation rebate programs (e.g., Water audits program for large water users, Residential smart controller rebate program, Commercial irrigation upgrade program, Commercial landscape rebate program, Residential landscape conversion rebate program, Commercial pre-rinse nozzle rebate program, Commercial water broom rebate program, Residential hot water recirculating pump rebate program, Commercial water efficient toilet rebate program, Residential ultra-low flush toilet replacement rebate program, Residential high efficiency washing machine rebate program) in alignment with the current Statewide water conservation goals.		Supportive
1-2	<b>WC1-10</b> Develop and adopt a schedule for installation of water meters in existing buildings and irrigation zones to establish a water consumption baseline at CVWD owned properties with the Facilities Group. Reduce CVWD water consumption per capita at facilities in alignment with the current statewide goals.		Supportive
3	<b>WC1-11</b> Investigate new advance technology systems to increase District's recycled and ground-water recovery systems to maintain local water supply (e.g.,		Supportive

Phase	Reduction Measure/Action	Emission Reductions Potential (MT CO <sub>2</sub> e) 2030	Emission Reductions Potential (MT CO <sub>2</sub> e) 2045
	Mid-Valley Pipeline Project). Invest in such technology as it becomes feasible and cost-effective.		
<b>Measure CS1: Investigate and implement carbon sequestration opportunities.</b>			
1	<b>CS1-1</b> As part of the currently CVWD published Landscape Manual, include information regarding flora and fauna CO <sub>2</sub> sequestration potential to promote the incorporation of landscape plants that are both low water and CO <sub>2</sub> sequestering. Consider vegetative options with higher CO <sub>2</sub> sequestration potential for CVWD facilities landscaping.		Supportive
2-3	<b>CS1-2</b> Research/evaluate the carbon sequestration potential of the CVWD Constructed Habitat Project currently in design. Develop partnerships with appropriate agencies, such as the wildlife agency, to investigate potential carbon sequestration projects to collaborate on.		Supportive
<b>Measure CR1: Reduce construction-related GHG emissions through construction fleet requirements</b>			
1	<b>CR1-1</b> In alignment with California’ Regulation for In-Use Off-Road Diesel-Fueled Fleets, adopt a policy requiring that construction fleets average fleet index are equal to or are less than the annual fleet average target and prioritizes Tier 3 off-road diesel-powered construction equipment greater than 50 hp when equipment is available and feasible. In addition, prioritize use of construction equipment that is outfitted with BACT devices certified by CARB, and emissions control devices used by the contractor shall achieve emissions reductions that are no less than what could be achieved by a Level 3 diesel emissions control strategy for a similar-sized engine as defined by CARB regulations by 2023.		Supportive
	CVWD Forecasted Emissions	69,425	45,781
	CVWD Targets	49,927	0
	Emissions Gap	19,499	45,781
	Total Reductions from Measure Implementation	9,816	5,848
	Remaining Gap After Measure Implementation=	9,683	39,933
Notes: MT CO <sub>2</sub> e = metric tons of carbon dioxide equivalent; ZEV/EV = zero emission vehicle/ electric vehicle			

In order to define measurable benchmarks that that will align CVWD’s GHG emissions reduction efforts with the state’s goal for 2030 (40 percent below 1990 levels) and 2045 (carbon neutrality), CVWD must understand how their future emissions will be impacted from changes in their infrastructure and the demand from their service area. Therefore, CVWD’s future GHG emissions were forecasted based on anticipated service population growth, operational changes, hydrology, and climate. Forecasted emissions calculations and details can be found in Appendix A of this CAAP. Many of the State’s regulations may not directly impact CVWD, therefore, reduction adjustments from such legislation were not quantified as part of the forecast scenarios. The one exception is SB 100, which requires that all retail energy sold in California be 100 percent carbon-free by 2045 and

has had and will likely continue to have a substantial impact on CVWD’s GHG emissions into the future and was accounted for in the forecasted emissions scenarios.

The combined operational reduction from the measures and actions, if implemented entirely, have been calculated to result in a potential reduction of 9,816 MT CO<sub>2</sub>e by 2030 and 5,848 MT CO<sub>2</sub>e by 2045 based on the assumed level of implementation. Under the forecasted scenario, CVWD would fall short of the 2030 interim target by 9,683 MT CO<sub>2</sub>e. However, through increasing the level of implementation of Measure E1, reduction provided by the GHG reduction measures have the potential to not only fully reduce the emissions gap but exceed CVWD’s emission target by approximately 12,000 MT CO<sub>2</sub>e.<sup>2</sup> CVWD’s targets represent the best intentions with respect to GHG emissions reduction efforts. While the measures and actions identified in this CAAP will not fully close the gap between CVWD’s forecasted emissions and its GHG emission targets, implementation of the measures will lead to significant progress in reducing GHG emissions and provide a foundation for aligning with State goals. Future CAAP updates will outline new measures to further close the gap between CVWD’s forecasted emissions and its GHG emission targets with increased focus on the ultimate target of carbon neutrality.<sup>3</sup> Although the CAAP does not provide the GHG emissions reductions to achieve carbon neutrality by 2045, it provides evidence-based actions CVWD can take towards attaining this target. It also illustrates that reaching carbon neutrality will require significant additional effort and support from the state and federal governments. The GHG emissions forecast scenarios, targets, and emissions reduction attained from the measures are provided in Table 2.

**Table 2 GHG Emissions Forecasts, Reduction Targets and Impact of Reduction Measures**

GHG Emissions Scenario	2030 (MT CO <sub>2</sub> e)	2045 (MT CO <sub>2</sub> e) <sup>3</sup>
<i>Legislative Adjusted Scenario</i> Forecast <sup>1</sup>	69,425	45,781
Targets (SB 32 and Carbon Neutrality) <sup>1,2</sup>	49,927	0
Emissions Gap	19,499	45,781
Reductions from Measures	9,816	5,848
GHG Emissions after Reductions from Measures	59,610	39,933
<b>Remaining Gap to Meet Targets</b>	<b>9,683</b>	<b>39,933<sup>2</sup></b>
<b>Percent Reduction Below Baseline (2016)</b>	<b>22%</b>	<b>48%</b>

Notes: MT CO<sub>2</sub>e = metric tons of carbon dioxide equivalent

<sup>1</sup> See Appendix A for the methodology and details for establishing the forecast scenarios and the reduction targets. Only SB 100 legislation is incorporated.

<sup>2</sup> The SB 32 efficiency target for 2030 was calculated as a 40 percent reduction from 1990 per capita emissions (calculated as total 1990 emissions divided by the 2016 service population, as provided by CVWD).

<sup>3</sup> The emissions reductions required to meet the 2045 goal will be addressed in future iterations of the CAAP through new and potentially unknown technologies.

<sup>2</sup> Elevating Measure E1 implementation to include a switch to 100% carbon-free electricity rather than the 50% greener retail packages has the potential to result in GHG emission reduction of 29,709 MT CO<sub>2</sub>e in 2030.

<sup>3</sup> Consistent with AEP Climate Change Committee recommendations, SB 32 is considered an interim target toward meeting the 2045 State goal. Consistency with SB 32 is considered to be contributing substantial progress toward meeting the State’s long-term 2045 goals.

## 2 Greenhouse Gas Emissions Reduction

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The following section provides the substantial evidence and calculation details for measures and actions that are quantifiable.

### 2.1 Assumptions

Achievable GHG emissions reduction were quantified using a number of assumptions and developed emission factors. Emission factors, assumptions, and references used in the quantification of multiple measures are detailed here and referenced in each quantifiable measure as appropriate in the following sections.

#### 2.1.1 Rounding of Values

As part of this document, activity data, emission factors and other calculation factors are shown within tables to provide transparency to the calculations used to quantify GHG reduction potential. Although such values are presented within this document as rounded values, the data is not rounded during the intermediary calculation steps. As such, replication of calculations presented using the rounded values may not exactly match the total GHG reduction potentials reported and some summed values in the tables may not add up exactly.

#### 2.1.2 Electricity Emission Factors

CVWD acquires electricity from two retail providers, Southern California Edison (SCE) and Imperial Irrigation District (IID). To calculate GHG emissions from electricity consumption, the sum total of kilowatt hours (kWh) derived from a specific source is totaled and multiplied by the corresponding annual GHG emissions factor. The emission factors for IID electricity (lbs. CO<sub>2</sub>e/MWh) in 2016, 2017, 2018, and 2019 were provided to Rincon directly by IID. The emission factors for SCE electricity (lbs. CO<sub>2</sub>e/MWh) in 2016, 2017, 2018, and 2019 were determined based on SCE's 2017 and 2019 Sustainability Reports.<sup>4,5</sup> Due to the State renewable goals and associated legislation, electricity emission factors are anticipated to decrease over time. SCE and IID emission factors were assumed to achieve the Renewable Portfolio Standards (RPS) targets established by SB 100 such that in 2030, electricity will be 60 percent renewable and by 2045 electricity will be 100 percent carbon-free.<sup>6</sup> Based on the 2019 power content label for SCE and IID, in 2019 IID and SCE obtained 42.5%, and 35.1% of their electricity from renewable sources, respectively.<sup>7,8</sup> Assuming a linear trend, SCE and IID emission factors between 2019 and 2045 were interpolated based on the percent change in composition of the electricity that was renewable. Table 3 presents the SCE and IID emission factors and percent of renewable electricity for 2019, 2030 and 2045 that were used to interpolate annual electricity emission factor for the interim years. Based on the current split in electricity received by CVWD, where 55 percent of power is from SCE and 45 percent is from IID, a weighted emission factor was developed. For the purposes of quantifying the potential GHG emission reductions by the

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<sup>4</sup> <https://www.edison.com/content/dam/eix/documents/sustainability/eix-2017-sustainability-report.pdf>

<sup>5</sup> <https://www.edison.com/content/dam/eix/documents/sustainability/eix-2019-sustainability-report.pdf>

<sup>6</sup> SB 100 established a landmark policy requiring renewable energy and zero-carbon resources supply 100% of electric retail sales to end-use customers by 2045. SB 100 also sets in interim target of 60% renewable or carbon-free electricity by 2030.

<sup>7</sup> <https://www.iid.com/energy/renewable-energy/power-content-label>

<sup>8</sup> [https://www.sce.com/sites/default/files/inline-files/SCE\\_2019PowerContentLabel.pdf](https://www.sce.com/sites/default/files/inline-files/SCE_2019PowerContentLabel.pdf)

below described measures, it was assumed that the allocation of energy received from each retail provider would remain consistent over time.

**Table 3 Electricity Emission Factors**

Electricity Source <sup>1</sup>	2019	2030	2045
<b>IID (retail)</b>			
Standard Percent Renewable Sources <sup>1,2</sup>	42.5%	60%	100%
Standard Emission Factor (MT CO <sub>2</sub> e/MWh) <sup>3</sup>	0.220	0.153	0.0
50% Green Energy Program Percent Renewable Sources <sup>4</sup>	50%	69%	100%
50% Green Energy Program Emission Factor (MT CO <sub>2</sub> e/MWh) <sup>5</sup>	0.203	0.139	0.0
<b>SCE (retail)</b>			
Standard Percent Renewable Sources <sup>1,2</sup>	35.1%	60%	100%
Standard Emission Factor (MT CO <sub>2</sub> e/MWh) <sup>3</sup>	0.242	0.149	0.0
50% Green Rate Percent Renewable Sources <sup>4</sup>	67.5%	80%	100%
50% Green Rate Emission Factor (MT CO <sub>2</sub> e/MWh) <sup>5</sup>	0.164	0.120	0.0
<b>Weighted Emission Factors<sup>6</sup></b>			
Emission Factor (MT CO <sub>2</sub> e/MWh)	0.232	0.151	0.0
50% Green Rate Emission Factor (MT CO <sub>2</sub> e/MWh)	0.181	0.129	0.0

Notes: MT CO<sub>2</sub>e = metric tons of carbon dioxide equivalent; MWh = megawatt-hour; RPS = Renewable Portfolio Standard

<sup>1</sup> Renewable sources are considered hydro, biomass, wind, solar and geo-thermal sources. Carbon-neutral includes the listed renewables as well as nuclear sources.

<sup>2</sup> Standard package IID and SCE forecasted portfolios are based on RPS targets of 60% renewable sources by 2030 and carbon-neutral by 2045.

<sup>3</sup> Emission factors in 2030 for SCE and IID were calculated based on the 2019 emission factors and 2019 renewable portfolio for each retail provider where in 2019 IID and SCE obtained 42.5%, and 35.1%, respectively, of electricity from renewable sources. As such, to meet SB 100 requirements IID and SCE would increase their portfolio of renewably sourced electricity by 17.5% and 24.9%, respectively. It was assumed that the 2030 emission factors would decrease to the same degree.

<sup>4</sup> Renewable electricity composition in 2030 for IID's 50% Green Energy Program and SCE's 50% Green Rate Program is based on composition of carbon-free sources that currently exist in those programs and an assumed linear trend to 100% carbon neutral by 2045. In 2019, SCE's 50% Green Rate option provided 67.5% eligible renewable energy ([https://www.sce.com/sites/default/files/inline-files/SCE\\_2019PowerContentLabel.pdf](https://www.sce.com/sites/default/files/inline-files/SCE_2019PowerContentLabel.pdf)) and IID's 50% Green Energy Program option provided 50% eligible renewable energy (<https://www.iid.com/energy/renewable-energy/power-content-label>).

<sup>5</sup> Emission factors for the IID 50% Green Energy Program and SCE 50% Green Rate were calculated based on the 2019 standard rate emission factor and the percent difference between the renewable portfolio of the standard rate package versus the renewable portfolio package for the 50% greener packages as described in note 4.

<sup>6</sup> Approximately 45% of CVWD's overall electricity comes from IID and 55% from SCE. A weighted emission factor for CVWD was developed assuming this ratio remained consistent over time.

Both SCE and IID offer cleaner energy options where a higher percentage of the electricity sourced is renewable or carbon-free than the standard rate option. In 2019, SCE's 50 percent Green Rate option provided 67.5 percent eligible renewable energy and IID's 50 percent Green Energy Program option provided 50 percent eligible renewable energy.<sup>8,9</sup> Renewable electricity composition and the corresponding emission factor in 2030 for IID's 50 percent Green Energy Program and SCE's 50 percent Green Rate Program is based on composition of renewable sources that currently exist in those programs and an assumed linear trend to 100 percent carbon-free by 2045. As such, by 2030 SCE's 50 percent Green Rate Program is anticipated to be approximately 80 percent renewable sources, 20 percent greater than the SB 100 required 60 percent, and IID's 50 percent Green Energy

<sup>9</sup> <https://www.iid.com/home/showpublisheddocument/17257/636747759993730000>

Program is anticipated to be 69 percent renewable, 9 percent greater than the SB 100 required 60 percent. Emission factors for SCE and IID were assumed to directly correlate with the changes in percent of renewable sources. As such, it was assumed that emission factors for SCE and IID would decrease from the calculated 2030 standard package emission factor by approximately 20 percent and 9 percent, respectively.

For measures or actions that are associated with electrification, the level of GHG emissions savings that is achievable is dependent on the power mix of the provided electricity. Changes in assumptions regarding power mix of purchased electricity, such as upgrading to electricity that is 100 percent carbon -free, will significantly change the electricity emission factor. As such, GHG emission reductions quantified in the following section are subject to change if the assumptions regarding electricity procurement change.

## 2.2 Scope 1: Direct Combustion

### **Measure DC1: Phase out natural gas at CVWD facilities, such that 50% of natural gas combustion equipment is replaced with electric equivalents by 2030.**

Natural gas and other fossil fuels combusted in CVWD's buildings and facilities emit approximately 100 MT of CO<sub>2e</sub> per year. While natural gas and other fossil fuels are not the most substantial source of emissions, natural gas-powered equipment can be replaced with renewable fuel alternatives such as electric options over time as the equipment reaches the end of its useful life. Many electric counterpart appliances, such as heat pumps, are more efficient than those powered by natural gas. California adopted SB 100 in 2018, making electrification an important strategy for reducing GHG emissions. SB 100 requires that all retail energy sold in California be 100 percent carbon-free by 2045; therefore, electrifying a fossil fuel source means that piece of equipment will also be carbon-free by 2045. In addition to GHG emissions reduction, removing natural gas from facilities would also improve indoor and local outdoor air quality by reducing atmospheric particulate matter less than 2.5 micrograms in size (PM<sub>2.5</sub>).<sup>10</sup>

#### *Methodology and Assumptions*

#### **ACTION DC1-1: CONDUCT A SURVEY OF NATURAL GAS AND PROPANE CONSUMING DEVICES IN OFFICES, CONTROL BUILDINGS, AND OTHER CVWD STRUCTURES. BY 2025 ESTABLISH A SCHEDULE TO REPLACE NON-EMERGENCY USE FOSSIL-FUEL-CONSUMING EQUIPMENT WITH ELECTRIC-POWERED EQUIVALENTS BASED ON OPERATIONAL LIFESPAN ESTIMATES. (SUPPORTIVE)**

Action DC1-1 would incrementally support the measure through ensuring that all natural gas and other fossil fuel consuming equipment are identified. Also, identifying cost-effective equipment replacements improves the feasibility of the strategy and allows for equipment replacements to be prioritized and planned for so when equipment fails, a replacement is already identified. Further, strategic planning such as the establishment of a replacement schedule and budget helps ensure successful implementation of Measure DC- 1.

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<sup>10</sup> <https://www.nrdc.org/experts/pierre-delforge/gas-appliances-pollute-indoor-and-outdoor-air-study-shows>

**ACTION DC1-2: EXPLORE REBATE, GRANT, OR PARTNERSHIP OPPORTUNITIES TO FUND THE REPLACEMENT OF FOSSIL-FUEL CONSUMING EQUIPMENT LIKE HVAC AND HOT WATER HEATERS WITH ELECTRIC POWERED EQUIVALENTS LIKE HEAT PUMP. (SUPPORTIVE)**

Action DC1-2 would incrementally support the measure through aiding in the funding mechanism for equipment replacements. In addition to active replacement of stationary combustion equipment fueled by natural gas, this supporting measure would further the phasing out of natural gas use at CVWD facilities for future projects.

**ACTION DC1-3: BASED ON FEASIBILITY AND THE REPLACEMENT SCHEDULE, REPLACE 50% OF NON-EMERGENCY FOSSIL-FUEL-CONSUMING EQUIPMENT WITH ELECTRICALLY POWERED EQUIVALENTS IN EXISTING OFFICE AND CVWD BUILDINGS BY 2030. ADDITIONALLY, WITH OBTAINMENT OF FUNDING ESTABLISH GOAL TO REPLACE 75% OF EQUIPMENT BY 2045.**

Direct GHG emissions reduction for this strategy are dependent on the active removal of fossil fuel combustion. Therefore, for the purposes of this calculation, it is assumed that through the implementation of this action, CVWD will aim to replace 50 percent of natural gas consuming equipment by 2030 and 75 percent by 2045 through electrification of current equipment. The emissions reduction calculation assumes that equipment replacement will begin starting in 2022.

Natural gas consumption reduced in the target year (i.e., 2030 and 2045) was calculated as the forecasted natural gas consumption multiplied by the percent equipment replacement goal. For this calculation, it was assumed the replacement of natural gas consuming equipment would occur in a linear trend starting in 2022 to the target year (i.e., 2030 and 2045) with the goal of 50 percent of natural gas consuming equipment would be replaced by 2030 and 75 percent by 2045. The reductions of natural gas consumption by the target date are multiplied by the U.S. EPA emission factor of 0.00531 MT CO<sub>2</sub>e/Therms to determine the natural gas emissions avoided by the target year, i.e., 2030 and 2045, respectively.

Space heating is the largest energy use in buildings and is dominated by non-electric fuels.<sup>11</sup> According to the United States Energy Information Administration (EIA) *2020 Annual Energy Outlook*, electric heat pumps for commercial space heating and cooling are two to five times more efficient than natural gas fueled equipment.<sup>12</sup> Emissions reduction related to this increased efficiency are accounted for by conservatively assuming replacement of natural gas fueled equipment with electric equipment will be three times more efficient than natural gas fueled equipment. Since electric appliances are approximately three times more efficient over similar natural gas burning equipment and appliances,<sup>13</sup> the use of electric equipment instead of natural gas would result in improved energy efficiency and a reduction in overall energy consumption for replaced natural gas equipment; however, achievable emissions reduction would be minimized assuming full implementation of Measure E-1, specifically the switch of retail accounts to the 50% Green Rate option for retail electricity sources by 2022. Therefore, it was assumed that natural gas sources would be replaced by electric equipment that is 300 percent more efficient and that Measure E-1 would be implemented by 2022 further reducing electricity emissions post-2022. The

<sup>11</sup> Deason, Jeff, et al. 2018. Electrification of buildings and Industry in the United States. pp.10. [https://pdfs.semanticscholar.org/27f0/d125d5316ee10565560545c0fc17d6c447a8.pdf?\\_ga=2.3238896.1101123906.1590438648-1004765093.1590438648](https://pdfs.semanticscholar.org/27f0/d125d5316ee10565560545c0fc17d6c447a8.pdf?_ga=2.3238896.1101123906.1590438648-1004765093.1590438648). Accessed May 25<sup>th</sup>, 2020.

<sup>12</sup> EIA. 2020. Annual Energy Outlook. Table 22. Commercial Sector Energy Consumption, Floorspace, Equipment Efficiency, and Distributed Generation. <https://www.eia.gov/outlooks/aeo/data/browser/#/?id=32-AEO2020&cases=ref2020&sourcekey=0>. Accessed May 25<sup>th</sup>, 2020.

<sup>13</sup> Dennis, Keith. 2015. Environmentally Beneficial Electrification: Electricity as the End-Use Option. *The Electricity Journal*. 28(9). pp. 100-112. <https://doi.org/10.1016/j.tej.2015.09.019>

electricity consumption would generate GHG emissions that would offset some of the reduction in natural gas emissions from electrification. The calculations and assumptions used to estimate emissions reduction from Action DC1-3 are provided in Table 4.

**Table 4 Action DC1-3 GHG Emissions Reduction Calculations**

Calculation Factor	2030	2045
Equipment Replacement Goal <sup>1</sup>	50%	75%
Forecasted NG Consumption (Therms) <sup>2</sup>	26,890	30,511
Natural Gas Consumption Reductions (Therm) <sup>3</sup>	13,445	22,883
Natural Gas Emission Factor (MT CO <sub>2</sub> e/Therm) <sup>4</sup>	0.00531	0.00531
Natural Gas GHG Emissions Avoided (MT CO <sub>2</sub> e)	71	122
Increase in Electricity Consumption (MWh) <sup>5,6</sup>	131	223
Weighted Electricity Emission Factor Assuming Implementation of Measure E-1 (MT CO <sub>2</sub> e/MWh) <sup>7,8</sup>	0.129	0.0
Additional GHG Emissions from Increased Electricity Consumption (MT CO <sub>2</sub> e)	17	0.0
<b>Avoided GHG Emissions (MT CO<sub>2</sub>e)<sup>9</sup></b>	<b>55</b>	<b>122</b>

Notes: MT CO<sub>2</sub>e = metric tons of carbon dioxide equivalent; MMBtu = one million British thermal units; kWh =kilowatt-hour; RPS = Renewable Portfolio Standard

Values have been rounded and may not add up exactly.

<sup>1</sup> It was assumed that the replacement of natural gas consuming equipment would occur in a linear trend starting in 2022 to the target year (i.e., 2030 and 2045) where 50% of natural gas consuming equipment would be replaced by 2030 and 75% by 2045.

<sup>2</sup> Annual natural gas consumption is forecasted through future years based on CVWD data reported for the 2016 - 2019 inventory, provided in Appendix A.

<sup>3</sup> Total natural gas reduction is calculated as the equipment replacement goal multiplied by the overall forecasted natural gas consumption in the target years (i.e., 2030 and 2045).

<sup>4</sup> Emission factors obtained from U.S. EPA Emission Factors for Greenhouse Gas Inventories, Table 1. <https://www.epa.gov/sites/production/files/2020-04/documents/ghg-emission-factors-hub.pdf>

<sup>5</sup> Natural gas consumption converted to electricity using the conversions: 1 MMBtu = 0.10 therm; 1 Therm = 29.3001 kWh. <https://dothemath.ucsd.edu/useful-energy-relations/>

<sup>6</sup> The resulting increase in electricity consumption estimates a three times increase in efficiency due to the improved efficiency of electric heat pumps and other electrical equipment of natural gas. Dennis, Keith. 2015. Environmentally Beneficial Electrification: Electricity as the End-Use Option. *The Electricity Journal*. 28(9). pp. 100-112. <https://doi.org/10.1016/j.tej.2015.09.019>

<sup>7</sup> Due to RPS, retail electricity emission factors (i.e., IID and SCE), will reduce over time. As described in *Section 2.1, Assumptions*, annual electricity emission factors for IID and SCE are interpolated based on the 2018 emission factor and percent of renewable sources and the 2030 emission factor that would result with the required 60% renewable sources. The presented emission factor is the weighted average retail electricity emission factors based on the average contribution of overall electricity by IID and SCE to CVWD electricity consumption with implementation of Measure E-1 where SCE and IID accounts would be switched to 50% Green Rate by 2022.

<sup>8</sup> Between 2016 and 2019, IID provided on average 45% of CVWD’s overall electricity while SCE provided on average 55% of the overall electricity.

<sup>9</sup> GHG Emission Reductions are calculated by subtracting the Additional GHG Emissions from Increased Electricity Consumption from the Natural Gas GHG Emissions Avoided.

## Results

The actions associated with Measure DC1 would result in a potential reduction of approximately 55 MT CO<sub>2</sub>e by 2030, and approximately 122 MT CO<sub>2</sub>e by 2045 as shown in Table 5.

**Table 5 GHG Emissions Reduction Associated with Measure DC1**

Actions	Emission Reductions Potential (MT CO <sub>2</sub> e)	Emission Reductions Potential (MT CO <sub>2</sub> e)
	2030	2045

<b>DC1-1</b> Conduct a survey of natural gas and propane consuming devices in offices, control buildings, and other CVWD structures. By 2025 establish a schedule to replace non-emergency use fossil-fuel-consuming equipment with electric-powered equivalents based on operational lifespan estimates.		Supportive
<b>DC1-2</b> Explore rebate, grant, or partnership opportunities to fund the replacement of fossil-fuel consuming equipment like HVAC and hot water heaters with electric powered equivalents like heat pumps.		Supportive
<b>DC1-3</b> Based on feasibility and the replacement schedule, replace 50% of non-emergency fossil-fuel-consuming equipment with electrically powered equivalents in existing office and CVWD buildings by 2030. Additionally, with obtainment of funding establish goal to replace 75% of equipment by 2045.	55	122
<b>Total Emissions Reduction Potential</b>	<b>55</b>	<b>122</b>

Notes: MT CO<sub>2</sub>e = metric tons of carbon dioxide equivalent

**Measure FL1: Replace vehicle fleet with zero-emission vehicles as technology allows in alignment with the Advanced Clean Fleet Rule, such that by 2030, 40% of vehicle fleet are zero emissions vehicles and by 2045, 100% of the vehicle fleet are zero emission.**

A significant focus of California’s climate policy is the decarbonization of the transportation sector through implementation of ZEV technology where feasible and the use of cleaner fuels for combustion everywhere else. In support of this effort, CARB has developed a suite of regulations establishing requirements for vehicle manufacturers, fuel producers and suppliers, transit agencies, fleets, off-road equipment manufacturers, and other transportation emission generators (such as locomotives, ocean-going vessels, harbor craft etc.). Additionally, significant funding has been approved for building out the zero-emissions infrastructure necessary to support the transition to a zero-emission/cleaner fuel market. CVWD’s fleet emits on average 3,600 MT of CO<sub>2</sub>e per year (5 percent of CVWD’s total GHG emissions). As a special district, CVWD will be required to comply with the requirements of the Advanced Clean Fleet Rule once adopted and implementation beginning in 2023, including meeting the ZEV targets as a percent of the total fleet in alignment with the ZEV Target Phase-In Schedule. As part of the compliance obligation, CVWD will be required to report on the fleet annually and when a new vehicle is added to the fleet either as a replacement or addition.

Fully electrifying or otherwise decarbonizing CVWD’s fleet and powering it with carbon-free electricity or other zero emission technology would allow for this emission source to achieve carbon neutrality, thereby complying with California’s Advanced Clean Fleet requirements and aligning with the State’s overall climate policy goals for the transportation sector. Electric passenger vehicles are quickly reaching cost parity with internal combustion vehicles and can even provide cost savings over the lifetime of the vehicle.<sup>14, 15</sup> While there are already commercially available ZEV passenger cars and trucks, the recent EO N-79-20<sup>16</sup> and supporting regulations such as the Clean Miles

<sup>14</sup> Raustad, R. *Electric Vehicle Life Cycle Cost Analysis*, Electric Vehicle Transportation Center. <https://rosap.nrl.bts.gov>

<sup>15</sup> <http://energy.mit.edu/news/study-low-emissions-vehicles-less-expensive-overall/>

<sup>16</sup> Executive Order (EO) N-75-20 mandates that 100% of in-state sales of new passenger vehicles are zero-emission by 2035, 100 percent of medium and heavy duty vehicles in the State are ZEV by 2045 for all operations where feasible, and a transition to 100 percent ZE off-road vehicles and equipment in the State be made by 2035 where feasible.

Standard, Advanced Clean Cars II Program, and Advanced Clean Fleets Rule, have accelerated ZEV technology for medium-duty, heavy-duty, and off-road equipment. Further, to support early adoption and promote infrastructure development, there are incentives available for vehicle replacement as well as credits available for charging or hydrogen station owners under the LCFS regulation that can offset the cost of fuel and ZEV vehicle replacements. Currently the most promising ZEV are electric vehicles (EV); however, CVWD will continue to consider new technologies as they become available and may shift to alternative ZEV in the future.

The conversion to an ZEV fleet requires not just replacement of current fleet vehicles with EV or ZEV options, but also the development of supporting infrastructure. The measures making up Measure FL1 provide a roadmap for CVWD to develop a fleet replacement program and infrastructure development to support the ZEV fleet.

### *Methodology and Assumptions*

#### **ACTION FL1-1: AS PART OF VEHICLE FLEET REPLACEMENT PROCESS, INCORPORATE A RETURN ON INVESTMENT ANALYSIS IN THE CRITERIA TO EVALUATE ZEV/EV OPTIONS. (SUPPORTIVE)**

Action FL1-1, incorporating a return on investment analysis to evaluate vehicle replacement with ZEV/EV options, provides the first step necessary to effectively plan and follow-through with fleet conversion to ZEV/EVs. When evaluating fleet vehicles for replacement, CVWD currently reviews lifetime cost, vehicle miles, utilization, and compliance requirements. Including a return on investment analysis in the current vehicle replacement assessment will help CVWD to establish a realistic and feasible vehicle replacement schedule that capitalizes on available ZEV/EV technology and is cost effective. The return on investment analysis conducted under Action FL1-1 will also evaluate the infrastructure needed to accommodate a ZEV/EV fleet and identify whether charging or fueling stations would need to be installed and where to meet operational needs and provide the greatest return on investment.

#### **ACTION FL1-2: ADOPT AN ZEV/EV FIRST POLICY FOR FLEET VEHICLES SO THAT ZEV/EVs ARE PURCHASED WHEN REPLACEMENTS ARE NEEDED UNLESS TECHNOLOGICAL, OPERATIONAL, OR COST EFFECTIVENESS ISSUES ARE IDENTIFIED IN ALIGNMENT WITH THE ADVANCED CLEAN FLEET RULE AND EXECUTIVE ORDER B-48-18 AND SB 350 TRANSPORTATION ELECTRIFICATION GOALS. REVISE POLICY REQUIREMENTS WHEN THE ADVANCED CLEAN FLEET REGULATION IS FORMALLY ADOPTED AND IMPLEMENTATION OF RULE BEGINS IN 2023. (SUPPORTIVE)**

Action FL1-2, adopt an ZEV/EV first policy for fleet vehicles, provides the policy change enforcing the implementation of fleet conversion which will be required with the adoption of the Advanced Clean Fleet Rule which supports SB 350 and EO B-48-18 transportation electrification goals.<sup>17</sup> Although specific requirements of fleets subject to the Advanced Clean Fleet Rule are not yet finalized, the final rulemaking is anticipated to be completed and the regulation adopted in December 2021 with implementation beginning in 2023. Under the rule public fleets, including special districts, 50% of 2024-2026 model year vehicles added to the fleet must be ZEVs and 100% of 2027 and newer model years must be ZEVs. Compliance reporting would be required annually and within 30 days of adding vehicles to the fleet. The purpose of the policy is to prioritize the purchase of ZEVs/EVs at the time

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<sup>17</sup> SB 350 directed State agencies to identify how to increase the transition to zero-emission transportation options and infrastructure. EO B-48-18 directs state entities to work with private sector and all appropriate levels of government to put at least 5 million ZEVs on California roads by 2030 and to spur the construction/installation of 200 hydrogen fueling stations and 250,000 ZEV charging stations by 2025.

of replacement of existing vehicles, as feasible. This action would also support infrastructure development to accommodate ZEV/EV fleet vehicles.

**ACTION FL1-3: PURSUANT TO THE ADVANCED CLEAN TRUCKS REGULATION ADOPTED JUNE 2020, COMPLY WITH THE LARGE ENTITY ON-TIME REPORTING REQUIREMENT. (SUPPORTIVE)**

The Advanced Clean Trucks Program, approved in June of 2020, established a manufacturers ZEV sales requirement and had a one-time reporting requirement for large entities and fleets. Large entities that operate or dispatch vehicles with a gross vehicle weight rating (GVWR) greater than 8500 lbs and meet the regulation’s criteria were required to report applicable fleet information by April 1, 2021. This one-time reporting requirement is being used by CARB for the rulemaking of the Advanced Clean Fleet Rule. CVWD submitted the one-time reporting requirement for its fleet in compliance with the Advanced Clean Trucks regulation. This measure is identified as supportive of the overall FL1 Measure to convert CVWD’s fleet to ZEVs.

**ACTION FL1-4: CONVERT 40% OF THE CVWD FLEET TO VEHICLES AND EQUIPMENT TO BE POWERED BY ELECTRICITY, FUEL CELLS, AND/OR OTHER ZE TECHNOLOGIES BY 2030 AND AIM TO CONVERT 100% OF CVWD FLEET TO ZEV BY 2045 IN ALIGNMENT THE ADVANCED CLEAN FLEETS RULE (RULE RECOMMENDATION TO BOARD DECEMBER 2021; IMPLEMENTATION BEGINS 2023).**

GHG emissions reduction potential for this strategy are dependent on the active transition of internal combustion vehicles in the fleet to a zero-emissions vehicle. On average, approximately 5 percent of CVWD’s fleet vehicles are replaced annually.<sup>18</sup> Therefore, for the purposes of this calculation, it is assumed that through the implementation of this action, CVWD will aim to replace 40 percent of the fleet by 2030 and 100 percent by 2045 with a ZEV alternative.

As discussed in the following Measure FL-2, CVWD is committed to using renewable diesel instead of traditional diesel for all diesel fueled equipment and vehicles. As such, to avoid double counting potential GHG emissions reduction achieved in CVWD’s fleet with FL-2 GHG emissions related to diesel use in CVWD’s fleet have been excluded from fuel use included in the calculation for Action FL1-4.

Fleet fuel consumption reduced in the target year (i.e., 2030 and 2045) was calculated as the forecasted fleet fuel consumption excluding diesel in gasoline gallons equivalents (GGE) multiplied by the percent fleet replacement goal.<sup>19</sup> For this calculation, it was assumed the replacement of fleet vehicles would occur in a linear trend starting in 2022 to the target year (i.e., 2030 and 2045) with the goal of 40 percent of the fleet replaced with ZEVs by 2030 and 100 percent by 2045. It was assumed that the percent of fleet vehicle replacement directly corresponds with the percent reduction in fleet fuel use. As such, with 40% fleet and fleet fuel replacement by 2030 and 100% replacement by 2045, fuel consumption is reduced by 163,260 GGE excluding diesel in 2030, and 463,111 GGE in 2045. Annual avoided emissions were calculated by multiplying the annually reduced fuel consumption in GGE by the fleet emission factor excluding diesel. The fleet emission factor was calculated as the annual forecasted fleet emissions divided by the forecasted annual fleet fuel consumption in the target year, excluding diesel. Forecasted fleet emissions were calculated based on the EPA emission factors for mobile combustion of fuel.<sup>20</sup> Any replacement of vehicles

<sup>18</sup> Annual vehicle fleet replacement is approximately 5% based on spend, i.e. the dollar value of the fleet.

<sup>19</sup> Fuel consumption in vehicle fleet (including equipment) converted to gasoline gallon equivalents (GGE) using the following conversion factors: 1 gallon diesel = 1.155 GGE; 1 gallon propane (LPG) = 0.758 GGE; 1 gallon CNG @3600 (industry standard) = 0.287 GGE; 1 GGE = 1 kwh/0.031 (<https://epact.energy.gov/fuel-conversion-factors>)

<sup>20</sup> Emission Factors for Greenhouse Gas Inventories (EPA, 2020) (<https://www.epa.gov/sites/production/files/2020-04/documents/ghg-emission-factors-hub.pdf>)

with EVs would also generate emissions; however, these emissions would be minimized assuming full implementation of Measure E-1, specifically the switch of retail accounts to the 50% Green Rate option for retail electricity sources by 2022. Because electric vehicles are the most common ZEV option currently on the market, it was assumed for the purposes of this calculation that internal combustion vehicles will be replaced with an EV. With the increase of other ZEV options, such as hydrogen fueled vehicles, entering the marketplace it is likely that CVWD will in the future opt to incorporate other ZEV options along with EVs which has the potential to further reduce emissions. Therefore, it was conservatively assumed that fleet vehicles (excluding diesel fueled) would be replaced by an electric option and that Measure E-1 would be implemented by 2022 further reducing electricity emissions post-2022. The electricity consumption would generate GHG emissions that would offset some of the reduction mobile combustion emissions from fleet vehicles. The calculations and assumptions used to estimate emission reductions from Action FL1-4 are provided in Table 6.

**Table 6 Action FL1-4 GHG Emissions Reduction Calculations**

Calculation Factor	2030	2045
Fleet Replacement Goal <sup>1</sup>	40%	100%
Forecasted Fleet Fuel Consumption excluding Diesel (GGE) <sup>2,3</sup>	408,150	463,111
Reduction in Fleet Fuel Consumption (GGE) <sup>3,4</sup>	163,260	463,111
Fleet Emission Factor (MT CO <sub>2</sub> e/GGE) <sup>5</sup>	0.00881	0.00881
Fleet GHG Emissions Avoided (MT CO <sub>2</sub> e)	1,438	4,080
Increase in Electricity Consumption (MWh) <sup>6</sup>	5,266	14,939
Weighted Electricity Emission Factor Assuming Implementation of Measure E-1 (MT CO <sub>2</sub> e/MWh) <sup>7,8</sup>	0.129	0.0
Additional GHG Emissions from Increased Electricity Consumption (MT CO <sub>2</sub> e)	677	0.0
<b>Avoided GHG Emissions (MT CO<sub>2</sub>e)<sup>9</sup></b>	<b>761</b>	<b>4,080</b>

Notes: MT CO<sub>2</sub>e = metric tons of carbon dioxide equivalent; MMBtu = one million British thermal units; kWh =kilowatt-hour; RPS = Renewable Portfolio Standard

Values have been rounded and may not add up exactly.

<sup>1</sup> It was assumed that the replacement of fleet vehicles would occur in a linear trend starting in 2022 to the target year (i.e., 2030 and 2045) where 40% of fleet vehicles would be replaced by 2030 and 100% by 2045.

<sup>2</sup> Annual fleet fuel consumption is forecasted through future years based on CVWD data reported for the 2016 - 2019 inventory, provided in Appendix A. To avoid double counting with emission reduction potential achieved with the implementation of Measure FL2, diesel fuel consumption by the fleet is excluded in this calculation.

<sup>3</sup> Fuel consumption in vehicle fleet (including equipment) converted to gasoline gallon equivalents (GGE) using the following conversion factors: 1 gallon diesel = 1.155 GGE; 1 gallon propane (LPG) = 0.758 GGE; 1 gallon CNG @3600 (industry standard) = 0.287 GGE; 1 GGE = 1 kwh/0.031 (<https://epact.energy.gov/fuel-conversion-factors>)

<sup>4</sup> The reduction in fleet fuel consumption is calculated as the fleet replacement goal multiplied by the forecasted fleet fuel consumption, excluding diesel, in the target years (i.e., 2030 and 2045).

<sup>5</sup> A fleet emission factor (MT CO<sub>2</sub>e/GGE) was developed based on the forecasted fleet emissions excluding diesel, divided by the forecasted fleet fuel consumption in GGE excluding diesel. The mobile combustion emission factors by fuel type were obtained from U.S. EPA Emission Factors for Greenhouse Gas Inventories (Table 1. <https://www.epa.gov/sites/production/files/2020-04/documents/ghg-emission-factors-hub.pdf>). Because the distribution of fuel type use in the fleet is assumed to stay consistent over time without measure implementation, the fleet emission factor without diesel is 0.0081 MT CO<sub>2</sub>e/GGE.

<sup>6</sup> The reduction in fleet fuel consumption was converted to electricity consumption using the conversions: 1 GGE = 1 kwh/0.031 (<https://epact.energy.gov/fuel-conversion-factors>)

<sup>7</sup> Due to RPS, retail electricity emission factors (i.e., IID and SCE), will reduce over time. As described in *Section 2.1, Assumptions*, annual electricity emission factors for IID and SCE are interpolated based on the 2018 emission factor and percent of renewable sources and the 2030 emission factor that would result with the required 60% renewable sources. The presented emission factor is the weighted

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average retail electricity emission factors based on the average contribution of overall electricity by IID and SCE to CVWD electricity consumption with implementation of Measure E-1 where SCE and IID accounts would be switched to 50% Green Rate by 2022.

<sup>8</sup> Between 2016 and 2019, IID provided on average 45% of CVWD's overall electricity while SCE provided on average 55% of the overall electricity.

<sup>9</sup> GHG Emission Reductions are calculated by subtracting the Additional GHG Emissions from Increased Electricity Consumption from the Fleet GHG Emissions Avoided. Fleet conversion to other ZEVs other than EVs may result in a further avoided GHG emissions.

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**ACTION FL1-5: INVESTIGATE GRANT OPPORTUNITIES; LOCAL, STATE, AND FEDERAL INCENTIVES; AND/OR PARTNERSHIPS TO PURCHASE NEW EVs AND INSTALL EV CHARGING AND/OR ZEV INFRASTRUCTURE AT FACILITIES FOR FLEET AND PUBLIC USE. CONDUCT A RETURN ON INVESTMENT ANALYSIS THAT ASSESS COST SAVINGS FROM INCENTIVES FOR EARLY REPLACEMENT OF FLEET VEHICLES WITH ZEV/EV VERSUS THE TRADITIONAL REPLACEMENT SCHEDULE. (SUPPORTIVE)**

Action FL1-5, installation of EV charging and/or ZEV infrastructure at facilities, will be necessary to support the conversion of CVWD's fleet to ZEVs under the Advanced Clean Fleets Rule. Several state directives have been signed to accelerate and incentivize the installation of ZEV charging and refueling stations to increase the transition to zero-emission transportation options. In support of SB 350, California Air Resources Board (CARB), the Energy Commission, and California Public Utilities Commission (CPUC) is supporting transportation electrification through directing electrical utilities to invest in EV infrastructure. EO B-48-18 directs state entities to work with private sector and government to increase the installation of hydrogen fueling stations and electric charging stations. Additionally, the LCFS regulation incentivizes the development of ZEV infrastructure through the availability of credits for fuel supply equipment owners and fleets. For early adopters there are currently a number of incentives, credits or opportunities for partnering with ZEV companies who will install and maintain ZEV fueling/charging stations that may offset the cost of ZEV infrastructure installation and increase the return on investment. In addition, programs such as those established by AB 118<sup>21</sup> and credit opportunities through LCFS, provide opportunities for early hydrogen infrastructure development that may not exist once there are enough stations and the Advanced Clean Fleet Rule requires a 100 percent ZEV fleet.

However, because the timeline for fleet conversion is dependent on the Advanced Clean Fleet Rule and the strategy for fleet conversion supporting infrastructure won't be identified until after a return of investment analysis, the GHG emission reduction potential from Measure FL1-5 are not yet known and therefore, have not been quantified as part of this CAAP. This measure is identified as supportive.

### *Results*

The actions associated with Measure FL1 would result in a potential reduction of approximately 761 MT CO<sub>2</sub>e by 2030, and approximately 4,080 MT CO<sub>2</sub>e by 2045 as shown in Table 7. Replacement of fleet vehicles with ZEV options rather than EVs may result in additional reductions based on the technology selected.

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<sup>21</sup> Assembly Bill 118 established the Clean Transportation Program that annually invests up to \$100 million for the development and deployment of advanced transportation and fuel technologies including hydrogen refueling infrastructure and electric vehicle charging. The program was extended through January 1, 2024. (<https://www.energy.ca.gov/programs-and-topics/programs/clean-transportation-program>)

**Table 7 GHG Emissions Reduction Associated with Measure FL1**

Actions	Emission Reductions Potential (MT CO <sub>2</sub> e) 2030	Emission Reductions Potential (MT CO <sub>2</sub> e) 2045
<b>FL1-1</b> As part of vehicle fleet replacement process, incorporate a return on investment analysis in the criteria to evaluate ZEV/EV options.		Supportive
<b>FL1-2</b> Adopt an ZEV/EV First Policy for fleet vehicles so that ZEV/EVs are purchased when replacements are needed unless technological, operational, or cost effectiveness issues are identified in alignment with Executive Order B-48-18 and SB 350 transportation electrification goals. Revise policy requirements when the Advanced Clean Fleet regulation is formally adopted and implementation of Rule begins in 2023.		Supportive
<b>FL1-3</b> Pursuant to the Advanced Clean Trucks regulation adopted June 2020, comply with the Large Entity On-Time Reporting Requirement.		Supportive
<b>FL1-4</b> Convert 40% of the CVWD fleet to vehicles and equipment to be powered by electricity, fuel cells, and/or other ZE technologies by 2030 and aim to convert 100% of CVWD fleet to ZEV by 2045 in alignment the Advanced Clean Fleets Rule (Rule recommendation to Board December 2021; implementation begins 2023).	761	4,080
<b>FL1-5</b> Investigate grant opportunities; local, State, and federal incentives; and/or partnerships to purchase new EVs and install EV charging and/or ZEV infrastructure at facilities for fleet and public use. Conduct a return on investment analysis that assess cost savings from incentives for early replacement of fleet vehicles with ZEV/EV versus the traditional replacement schedule.		Supportive
<b>Total Emissions Reduction Potential</b>	<b>761</b>	<b>4,080</b>

Notes: MT CO<sub>2</sub>e = metric tons of carbon dioxide equivalent

**Measure FL2: Use alternative fuels to bridge the technology gap to zero emission vehicles and off-road equipment by achieving 100% replacement of #2 diesel with 100% renewable diesel by 2030**

CVWD currently uses a combination of gasoline, diesel, and compressed natural gas to fuel its fleet. Under the Advanced Clean Fleet regulation, CVWD will be required to ultimately convert the fleet to ZEVs. While zero-emission heavy-duty vehicles are being developed, using low-carbon intensity fuels like renewable diesel in its older vehicles and equipment would not require equipment alterations and can help reduce GHG emissions over the short-term. The LCFS regulation is driving the market to increase the availability and decrease the cost of alternative fuels that may offer a return on investment benefit to switch to alternative fuels now in equipment and fleet vehicles that do not need technology changes. The use of alternative fuels allows for additional time to fully vet and/or pilot the new zero-emission technology before infrastructure investments are made, which could help improve the return on investment.

## *Methodology and Assumptions*

### **ACTION FL2-1: PREPARE AN ASSESSMENT THAT DETERMINES THE QUANTITY OF RENEWABLE DIESEL NEEDED, ANY COSTS INCURRED FROM THE TRANSITION, AND IDENTIFIES A RELIABLE SOURCE OF RENEWABLE DIESEL. (SUPPORTIVE)**

CVWD operates a variety of stationary and mobile equipment currently powered by diesel fuel. Replacing the existing diesel fuel with renewable diesel as a short-term measure would reduce emissions with no change in existing infrastructure.<sup>22</sup> Currently, large scale renewable diesel is utilized by the United States military and is also used by a variety of city, state, and private fleets.<sup>23</sup> CVWD has already conducted a feasibility and cost analysis, identifying a source for lower carbon fuels such as renewable diesel that can be utilized in existing vehicles and equipment with no changes in technology necessary and minimal change in cost. Action FL2-1 will incrementally support Measure FL2 by identifying the amount of renewable diesel needed and the co-benefits from switching, such as reduced maintenance for vehicles using renewable diesel over traditional diesel. Further, identifying and establishing a contract with a reliable source of renewable diesel will be necessary for the permanent transition of the identified vehicles and equipment to renewable diesel.

### **ACTION FL2-2: PRESENT FINDINGS FROM THE ASSESSMENT OF TRANSITIONING FROM DIESEL TO RENEWABLE DIESEL (ACTION F2-1) TO INTERNAL STAKEHOLDERS. (SUPPORTIVE)**

CVWD vehicles and equipment generally fuel at CVWD-owned fueling depots. By contracting with fuel suppliers to replace diesel with biodiesel/renewable diesel at these facilities, CVWD can reduce GHG emissions and easily track the amount of low carbon fuels being utilized in the fleet. Presenting the findings from the diesel transition assessment conducted in Action FL2-1 can help to generate further support for fuel transition initiatives and further support Measure FL2.

### **ACTION FL2-3: TRANSITION CURRENT DIESEL TANKS AT CVWD-OWNED FUELING DEPOTS SUCH THAT 50% OF DIESEL-POWERED FLEET VEHICLES AND EQUIPMENT CAN UTILIZE RENEWABLE DIESEL BY 2023 AND 100% BY 2027.**

Renewable diesel can be used interchangeably in a traditional diesel-powered engine and typically does not result in any negative operational impacts.<sup>24</sup> Because the carbon dioxide emissions associated with biodiesel/renewable diesel fuels are biogenic, those emissions do not contribute to long-term increases in GHG emissions in the atmosphere.<sup>25</sup> Only the nitrous oxide (N<sub>2</sub>O) and methane (CH<sub>4</sub>) emissions increase net GHG emissions in the atmosphere, leading to a significantly lower GHG emission factor for those fuels. Furthermore, renewable diesel fuel is operationally similar to regular diesel and is readily available.<sup>26</sup> CVWD has already identified a source for renewable diesel and determined that no modification would be necessary for any of the CVWD fleet vehicles or equipment that currently use diesel.

Direct GHG emissions reduction for Measure FL2 are dependent on the full conversion of CVWD's diesel-fuel use in on-road vehicles and off-road equipment to renewable diesel. With

<sup>22</sup> <https://www.government-fleet.com/156621/what-you-need-to-know-about-renewable-diesel>

<sup>23</sup> <https://www.caranddriver.com/research/a31883731/biodiesel-vs-diesel/>

<sup>24</sup> <https://www.government-fleet.com/156621/what-you-need-to-know-about-renewable-diesel>

<sup>25</sup> <https://climatechange.ucdavis.edu/climate-change-definitions/biogenic-carbon/>

<sup>26</sup> <https://www.government-fleet.com/156621/what-you-need-to-know-about-renewable-diesel>

implementation of this action, CVWD commits to convert its diesel fleet to 50% renewable diesel by 2025 and 100% by 2027.

The identified source of 100% renewable diesel that CVWD plans to use is considered a drop-in replacement to diesel and therefore, is assumed to have the same energy content as fossil derived diesel.<sup>27</sup> As such, a one to one replacement in gallons of diesel with renewable diesel was utilized in this calculation. GHG emissions reduction potential is calculated as the emissions generated from combustion of the forecasted diesel consumption in fleet vehicles at the target year (i.e., 2030 and 2045) less the emissions generated from the combustion of the same amount of renewable diesel combusted. Forecasted activity data is detailed in Appendix A. The EPA GHG emission factor for mobile combustion was used for determining emissions generated from diesel combustion in the fleet.<sup>20</sup> According to the product information of the renewable diesel source, 2.3 tons of CO<sub>2</sub>e would be generated per 1,000 gallons of renewable diesel combusted.<sup>28</sup> The calculations and assumptions used to estimate GHG emissions reduction from Action FL2-3 are provided in Table 8.

**Table 8 Action FL2-3 GHG Emissions Reduction Calculations**

Calculation Factor	2030	2045
Diesel Replacement Goal	100%	100%
Forecasted Diesel Consumption in Fleet (gallons) <sup>1</sup>	130,725	148,328
Diesel Fuel [mobile] Emission Factor (MT CO <sub>2</sub> e/gallon) <sup>2</sup>	0.0102	0.0102
Avoided Emissions from Diesel-fueled Fleet (MT CO <sub>2</sub> e)	1,339	1,519
Renewable Diesel Emission Factor (MT CO <sub>2</sub> e/gallon) <sup>3</sup>	0.00209	0.00209
Renewable Diesel Fuel GHG Emissions (MT CO <sub>2</sub> e)	273	309
<b>Avoided GHG Emissions (MT CO<sub>2</sub>e)<sup>4</sup></b>	<b>1,066</b>	<b>1,210</b>

Notes: MT CO<sub>2</sub>e = metric tons of carbon dioxide equivalent; mpg = miles per gallon; VMT = vehicle miles travelled  
 Values have been rounded and may not add up exactly.

<sup>1</sup> Diesel consumption in the fleet was forecasted based on CVWD projections for growth in service population and associated service. See Appendix A for details.

<sup>2</sup> Emission factors obtained from United States Environmental Protection Agency Emission Factors for Greenhouse Gas Inventories, Table 1 <https://www.epa.gov/sites/production/files/2020-04/documents/ghg-emission-factors-hub.pdf>

<sup>3</sup> Emission factor obtained from Nest My Renewable Diesel, the identified source of renewable diesel. The emission factor of 2.3 tons of CO<sub>2</sub>e/1,000 gallons was converted to metric tons. <https://www.neste.us/neste-my-renewable-diesel/product-information/greenhouse-gas-calculator>

<sup>4</sup> GHG emissions reduction are calculated by subtracting the GHG Emissions from Renewable Diesel consumption from the Avoided Emissions from Diesel consumption.

**ACTION FL2-4: PARTNER WITH HEAVY-DUTY EV COMPANIES TO CONDUCT PILOT STUDIES AND FACILITATE ADVANCEMENTS IN TECHNOLOGY FOR VEHICLE CLASSES WHICH DO NOT CURRENTLY HAVE VIABLE OPTIONS. INVESTIGATE GRANT OPPORTUNITIES FOR SUCH PROJECTS AND PARTNERSHIPS. (SUPPORTIVE)**

A portion of CVWD’s fleet consists of heavy-duty vehicles that do not currently have a viable and cost effective ZEV option to use as a replacement. Partnering with heavy-duty ZEV companies to conduct a pilot study of new heavy-duty ZEV vehicles through Measure FL2-4 will incrementally support Measure FL2 by serving as a bridge until technology for heavy-duty on-road equipment has advanced to offer ZEV options that are feasible to use for CVWD operations. Further it offers an

<sup>27</sup> <https://www.neste.us/neste-my-renewable-diesel/product-information>

<sup>28</sup> <https://www.neste.us/neste-my-renewable-diesel/product-information/greenhouse-gas-calculator>

opportunity to fully vet and/or pilot the new zero-emission technology before infrastructure investments are made, which could help improve the return on investment.

**ACTION FL2-5: ENSURE ANY ON-ROAD DIESEL-FUELED MEDIUM HEAVY-DUTY AND HEAVY HEAVY-DUTY ENGINES IN CVWD'S VEHICLES FLEET ARE IN COMPLIANCE WITH THE FLEET RULE FOR PUBLIC AGENCIES AND UTILITIES FLEET. (SUPPORTIVE)**

Although renewable diesel is considered to be a “cleaner” fuel that produces less air pollutants than the combustion of fossil derived diesel; CVWD is subject to the Fleet Rule for Public Agencies and will be required to remain compliant with the rule regardless of the fuel used in the fleet. This action incrementally supports Measure FL2 by ensuring compliance of the fleet with the Fleet Rule.

*Results*

As shown in Table 8, the 100 percent conversion to renewable diesel in CVWD’s diesel fleet vehicles would result in a reduction of GHG emissions annually. As such, Measure FL2 would result in a reduction of approximately 1,066 MT CO<sub>2</sub>e in 2030, and approximately 1,210 MT CO<sub>2</sub>e in 2045 due to implementation of Action FL2-4. Table 9 summarizes the actions associated with Measure FL2 and overall GHG emissions reduction.

**Table 9 GHG Emissions Reduction Associated with Measure FL2**

Actions	Emission Reductions Potential (MT CO <sub>2</sub> e)	
	2030	2045
<b>FL2-1</b> Prepare an assessment that determines the quantity of renewable diesel needed, any costs incurred from the transition, and identifies a reliable source of renewable diesel.		Supportive
<b>FL2-2</b> Present findings from the assessment of transitioning from diesel to renewable diesel (Action F2-1) to Internal Stakeholders on the assessment of transitioning from diesel to renewable diesel.		Supportive
<b>FL2-3</b> Transition current diesel tanks at CVWD-owned fueling depots such that 50% of diesel-powered fleet vehicles and equipment can utilize renewable diesel by 2023 and 100% by 2027.	1,066	1,210
<b>FL2-4</b> Partner with heavy-duty EV companies to conduct pilot studies and facilitate advancements in technology for vehicle classes which do not currently have viable options. Investigate grant opportunities for such projects and partnerships.		Supportive
<b>FL2-5</b> Ensure any on-road diesel-fueled medium heavy-duty and heavy heavy-duty engines in CVWD’s vehicles fleet are in compliance with the Fleet Rule for Public Agencies and Utilities Fleet.		Supportive
<b>Total Emissions Reduction Potential</b>	<b>1,066</b>	<b>1,210</b>

Notes: MT CO<sub>2</sub>e = metric tons of carbon dioxide equivalent

**Measure FL3: Reduce vehicle miles travelled and fuel use for non-ZEV/EV fleet vehicles**

The GHG reduction potential that will be achieved due to the use of alternative fuels such as renewable diesel over biodiesel, and the overall transition to a ZEV fleet, as mandated by the Advanced Clean Fleet Rule, can be further maximized by prioritizing use of ZEVs for longer distance travel. Reducing VMT and fuel use of non-ZEV fleet vehicles would limit GHG emissions from mobile combustion of traditional fossil fuel. The use of advanced GPS systems in fleet vehicles that data

such as mileage, vehicle performance, and idling time can allow for vehicle activities and dispatch to be adjusted real-time thereby increasing vehicle efficiency and reducing GHG emissions. Additionally, preventative maintenance of fleet vehicles optimizes vehicles operating conditions thereby reducing emissions.

*Methodology and Assumptions*

**ACTION FL3-1: UPGRADE CURRENT GPS SYSTEMS IN VEHICLE FLEET TO IMPROVE MILEAGE TRACKING, TRACK IDLE TIME, AND TRACK PERFORMANCE. ADJUST VEHICLE DISPATCH PLANNING AND REDUCE IDLE TIME AS NECESSARY TO REDUCE VMT AND IMPROVE VEHICLE OPERATING CONDITIONS.**

CVWD’s fleet vehicles are currently equipped with an older GPS system that gathers data approximately every 2 minutes. However, CVWD is currently in the planning stages to upgrade the GPS system for all fleet vehicles to a more technologically advanced GPS system that gathers data continuously allowing for real-time adjustments to be made to reduce idle time, improve fuel economy and plan more efficient routes. As CVWD is already planning to replace the current GPS system with a new system, it was assumed for the purposes of this calculation that with implementation of this action that all fleet vehicles would have the new GPS system installed by 2023.

As discussed in Measure FL-2, CVWD is committed to using renewable diesel instead of traditional diesel for all diesel fueled equipment and vehicles by 2027. Based on the average annual percent of CVWD’s fleet replacement and Measure FL-1, it was further assumed that by 2030 40% of CVWD’s fleet would be replaced with ZEVs. As such, to avoid double counting of potential GHG emission reductions achieved in CVWD’s fleet with Measure FL-1 and Measure FL-2 implementation, the impact of using telematics for fleet vehicles was only applied to non-ZEV vehicles and it was assumed that diesel use in vehicles was replaced with renewable diesel on the time schedule established in Measure FL-2.

Studies have found that fleet vehicle fuel efficiency can be improved by approximately 9% with the use of telematics, such as GPS systems.<sup>29</sup> This is attributed to real time tracking allowing for fleet managers to identify areas of improvement such as reduction in idle time, improve equipment utilization, optimizing driving speeds and routes. Emission reductions accounted for this increase in efficiency by assuming a 9.3% reduction in fuel consumption in non-ZEV fleet vehicles. Fleet fuel consumption was then multiplied by the fleet fuel emission factor which accounts for the use of renewable diesel in replacement of traditional diesel. The calculations and assumptions used to estimate emission reductions from Action FL3-1 are provided in Table 10.

**Table 10 Action FL3-1 GHG Emissions Reduction Calculations**

Calculation Factor	2030	2045
Forecasted Fuel Consumption in Fleet after Measure FL-1 Implementation (GGE) <sup>1,2</sup>	335,482	0
Reduction in Fleet Fuel Consumption (GGE) <sup>3</sup>	31,200	0
Fleet Emission Factor after Measure FL-1 and Measure FL-2 Implementation (MT CO <sub>2</sub> e/GGE) <sup>4</sup>	0.0096	0.00
<b>Avoided GHG Emissions (MT CO<sub>2</sub>e)<sup>5</sup></b>	<b>300</b>	<b>0.0</b>

<sup>29</sup> <https://www.greenfleetmagazine.com/155607/efficiency-sustainability-gained-through-telematics>

Notes: MT CO<sub>2</sub>e = metric tons of carbon dioxide equivalent; VMT = vehicle miles travelled; GGE= gasoline gallons equivalents

Values have been rounded and may not add up exactly.

<sup>1</sup> Fuel consumption in the fleet was forecasted based on CVWD projections for growth in service population and associated service. See Appendix A for details. Fuel consumption was adjusted to account for Measure FL-1 implementation assuming fleet would be 40% ZEV by 2030 and 100% ZEV by 2045.

<sup>2</sup> Fuel consumption in vehicle fleet (including equipment) converted to gasoline gallon equivalents (GGE) using the following conversion factors: 1 gallon diesel = 1.155 GGE; 1 gallon propane (LPG) = 0.758 GGE; 1 gallon CNG @3600 (industry standard) = 0.287 GGE; 1 GGE = 1 kwh/0.031 (<https://epact.energy.gov/fuel-conversion-factors>)

<sup>3</sup> Assumed a 9.3% reduction in fuel consumption due to use of telematics in fleet vehicles (<https://www.greenfleetmagazine.com/155607/efficiency-sustainability-gained-through-telematics>)

<sup>4</sup> A fleet emission factor (MT CO<sub>2</sub>e/GGE) was developed based on the forecasted fleet emissions assuming Measure FL-1 implementation of a increasingly ZEV fleet and assuming diesel usage is replaced with renewable diesel with implementation of Measure FL-2, divided by the forecasted fleet fuel consumption in GGE with Measure FL-1 and Measure FL-2 implemented. The mobile combustion emission factors by fuel type were obtained from U.S. EPA Emission Factors for Greenhouse Gas Inventories (Table 1. <https://www.epa.gov/sites/production/files/2020-04/documents/ghg-emission-factors-hub.pdf>).

<sup>5</sup> GHG emissions reduction are calculated by multiplying the reduced fuel consumption by the fleet emission factor.

### **ACTION FL3-2: CONTINUE TO PERFORM PREVENTATIVE MAINTENANCE ON VEHICLE FLEETS TO IMPROVE PERFORMANCE, INCLUDING THE PROCUREMENT OF LOW ROLLING RESISTANCE TIRES, USING THE CORRECT TIRE AIR PRESSURE, AND REGULARLY REPLACING AIR FILTERS WHICH WILL IMPROVE FUEL EFFICIENCY.**

CVWD performs preventative maintenance on fleet vehicles to ensure vehicles are operating optimally. This includes actions such as, but not limited to ensuring tires are filled to proper tire pressure, regularly replacing air filters, and procuring low rolling resistance tires. According to a study conducted by the EPA, regularly conducted preventative maintenance improves fuel efficiency of vehicles by 3 to 4%.<sup>30</sup> CVWD's is committed to maintaining their fleet and ensuring that the fleet operates the most efficiently. As such, for the purposes of this calculation it was assumed that preventative maintenance will be conducted on all fleet vehicles and that such preventative maintenance will reduce fuel consumption by approximately 4% due to improved fuel efficiency.

To avoid double counting of emission reductions, improvements in fuel efficiency of only non-ZEV vehicles was assessed based on the implementation schedule of Measure FL-1. Because Action FL3-1 and Action FL3-2 improve fuel efficiency by different means, it was assumed that improvements in fuel efficiency due to Action FL3-2 would be additive to Action FL3-1.<sup>31</sup> Therefore, a 4% improvement in fuel efficiency was applied to fleet fuel consumption after implementation of Action FL-2. Fleet fuel consumption after implementation of Action FL3-1 and FL3-2 was then multiplied by the fleet fuel emission factor which accounts for the use of renewable diesel in replacement of traditional diesel. The calculations and assumptions used to estimate emission reductions from Action FL3-2 are provided in Table 11.

**Table 11 Action FL3-2 GHG Emissions Reduction Calculations**

Calculation Factor	2030	2045
Forecasted Fuel Consumption in Fleet after Measure FL-1 Implementation and Action FL3-1 (GGE) <sup>1,2</sup>	304,282	0
Reduction in Fleet Fuel Consumption (GGE) <sup>3</sup>	12,171	0
Fleet Emission Factor after Measure FL-1 and Measure FL-2 Implementation (MT CO <sub>2</sub> e/GGE) <sup>4</sup>	0.0096	0.00
<b>Avoided GHG Emissions (MT CO<sub>2</sub>e)<sup>5</sup></b>	<b>117</b>	<b>0.0</b>

<sup>30</sup> <https://archive.epa.gov/sectors/web/pdf/construction-sector-report.pdf>

<sup>31</sup> Action FL3-1 reduces fuel consumption due to improvements in fleet operations (i.e. idling reduction, reduced mileage, improved driving speed, improved vehicle utilization), while Action FL3-2 increases fuel efficiency due to individual vehicle optimization.

Notes: MT CO<sub>2</sub>e = metric tons of carbon dioxide equivalent; VMT = vehicle miles travelled; GGE= gasoline gallons equivalents  
 Values have been rounded and may not add up exactly.

<sup>1</sup> Fuel consumption in the fleet was forecasted based on CVWD projections for growth in service population and associated service. See Appendix A for details. Fuel consumption was adjusted to account for Measure FL-1 implementation assuming fleet would be 40% ZEV by 2030 and 100% ZEV by 2045 and to account for a 9.3% reduction in fuel consumption due to implementation of Action FL3-1.

<sup>2</sup> Fuel consumption in vehicle fleet (including equipment) converted to gasoline gallon equivalents (GGE) using the following conversion factors: 1 gallon diesel = 1.155 GGE; 1 gallon propane (LPG) = 0.758 GGE; 1 gallon CNG @3600 (industry standard) = 0.287 GGE; 1 GGE = 1 kwh/0.031 (<https://epact.energy.gov/fuel-conversion-factors>)

<sup>3</sup> Assumed a 4% reduction in fuel consumption due to preventative maintenance in fleet vehicles (<https://archive.epa.gov/sectors/web/pdf/construction-sector-report.pdf>)

<sup>4</sup> A fleet emission factor (MT CO<sub>2</sub>e/GGE) was developed based on the forecasted fleet emissions assuming Measure FL-1 implementation of an increasingly ZEV fleet and assuming diesel usage is replaced with renewable diesel with implementation of Measure FL-2, divided by the forecasted fleet fuel consumption in GGE with Measure FL-1 and Measure FL-2 implemented. The mobile combustion emission factors by fuel type were obtained from U.S. EPA Emission Factors for Greenhouse Gas Inventories (Table 1. <https://www.epa.gov/sites/production/files/2020-04/documents/ghg-emission-factors-hub.pdf>).

<sup>5</sup> GHG emissions reduction are calculated by multiplying the reduced fuel consumption by the fleet emission factor.

## Results

As shown in Table 10, the use of advanced telematics in fleet vehicles via implementation of Action FL3-1 could result in a reduction of approximately 300 MT CO<sub>2</sub>e in 2030. Table 11 details how preventative maintenance of all fleet vehicles through Action FL3-2 would reduce GHG emissions by an additional 117 MT CO<sub>2</sub>e in 2030. As such, Measure FL3 would result in a reduction of approximately 417 MT CO<sub>2</sub>e in 2030 with implementation of Measure FL-1, the fleet is anticipated to be 100% ZEV by 2045 and therefore, no emission reductions are assumed in 2045 due to the implementation of Measure FL3. Table 12 summarizes the actions associated with Measure FL3 and overall GHG emissions reduction.

**Table 12 GHG Emissions Reduction Associated with Measure FL3**

Actions	Emission Reductions Potential (MT CO <sub>2</sub> e)	Emission Reductions Potential (MT CO <sub>2</sub> e)
	2030	2045
<b>FL3-1</b> Upgrade current GPS systems in vehicle fleet to improve mileage tracking, track idle time, and track performance. Adjust vehicle dispatch planning and reduce idle time as necessary to reduce VMT and improve vehicle operating conditions.	300	0
<b>FL3-2</b> Continue to perform preventative maintenance on vehicle fleets to improve performance, including the procurement of low rolling resistance tires, using the correct tire air pressure, and regularly replacing air filters which will improve fuel efficiency.	117	0
<b>Total Emissions Reduction Potential</b>	<b>417</b>	<b>0</b>

Notes: MT CO<sub>2</sub>e = metric tons of carbon dioxide equivalent

## Measure WW1: Reduce GHG process emissions associated with wastewater treatment

Wastewater treatment process emissions are CVWD’s second largest GHG emissions source due to the release of methane. As other measures are implemented such that the fleet and buildings are decarbonized and electricity becomes more carbon-free, wastewater emissions will become CVWD’s predominant emission source and will need to be addressed to align with the states carbon neutrality goals. Because technology for reducing methane emissions from wastewater treatment plants can be expensive and requires advanced planning, this measure is focused on preliminary feasibility analysis and investigating funding opportunities for future implementation. Technology is

advancing and stimulus programs such as LCFS may provide cost-effective opportunities to convert captured methane to biofuel for electricity generation or vehicle fleet use. It is anticipated that wastewater emissions will become a major focus of California for production of RNG and reducing GHG emissions in the future.

### *Methodology and Assumptions*

**ACTION WW1-1: INVESTIGATE OPPORTUNITIES ASSOCIATED WITH THE CVWD MASTER PLAN FOR WASTEWATER TREATMENT FACILITIES TO REDUCE EMISSIONS AND/OR CAPTURE METHANE. FOR EXAMPLE, AS PART OF PROPOSED CAPITAL IMPROVEMENT PROGRAM (CIP) PROJECT TO INSTALL TWO NEW ANAEROBIC DIGESTERS, CONDUCT A PILOT STUDY FOR METHANE CAPTURE AND CONVERSION TO BIOFUEL UNDER THE LCFS PROGRAM. (SUPPORTIVE)**

As part of the *Sanitation Master Plan 2020 Update*<sup>32</sup>, various capital improvement projects (CIP) are intended to improve the wastewater treatment process and efficiency through upgrades to the facility. Action WW1-1 would support the measure by identifying potential GHG emissions reduction opportunities associated with planned or proposed wastewater treatment CIPs. Such strategic planning not only helps implementation of GHG emissions reduction actions, but also may present additional cost-saving or cost-offsetting opportunities. For example, one upgrade project in the Sanitation master Plan involves the installation of new anaerobic digesters. Capturing generated methane from anaerobic digesters can be utilized as a biofuel and has the potential to generate credits for a monetary value through the LCFS program.

**ACTION WW1-2: INVESTIGATE POTENTIAL PARTNERSHIPS WITH AGENCIES OR ENTITIES LOOKING TO OBTAIN BIOGAS FOR FUEL PRODUCTION THAT WOULD FUND EQUIPMENT COSTS. (SUPPORTIVE)**

Action WW1-2 would support the measure through aiding in the funding mechanism for opportunities to capture and utilize the generated methane from the water reclamation plants. Establishing partnerships with agencies or companies interested in biomethane may help with offsetting cost for the necessary equipment and/or ensure a market for the generated biomethane.

### *Results*

The measures associated with Measure WW1 were not quantified as the actual means to implementation will not be known until after initial investigations are completed and funding is obtained as shown in Table 13. However, implementation of Measure WW1 actions would lay the groundwork for future incorporation of GHG emission reduction projects or technology into wastewater treatment process upgrades and aligns with the *Sanitation Master Plan 2020 Update*.

**Table 13 GHG Emissions Reduction Associated with Measure WW1**

Actions	Emission Reductions Potential (MT CO <sub>2</sub> e) 2030	Emission Reductions Potential (MT CO <sub>2</sub> e) 2045
<b>WW1-2</b> Investigate opportunities associated with design features of the CVWD Master Plan for wastewater treatment facilities to reduce emissions and/or capture methane. For example, as part of proposed Capital Improvement Program (CIP) project to install two new anaerobic digesters, conduct a pilot study for methane capture and conversion to biofuel under the LCFS Program.		Supportive

<sup>32</sup> <https://www.cvwd.org/ArchiveCenter/ViewFile/Item/820>

<b>WW1-2</b> Investigate potential partnerships with agencies or entities looking to obtain biogas for fuel production that would fund equipment costs.	Supportive
<b>Total Emissions Reduction Potential</b>	<b>Supportive</b>
Notes: MT CO <sub>2</sub> e = metric tons of carbon dioxide equivalent	

## 2.3 Scope 2: Electricity Consumption

### Measure E1: Utilize Low-Carbon and Carbon-free Electricity

About half of CVWD’s GHG emissions result from the use of electricity to power its pumps, treatment plants, and facilities.<sup>33</sup> As such, half of CVWD’s GHG emissions could be reduced by switching to electricity that is generated from renewable or carbon-free sources. CVWD only acquires electricity from retail sources, where approximately 55 percent of acquired electricity is purchased from Southern California Edison (SCE) and 45 percent from Imperial Irrigation District (IID). With the adoption of SB 100 in 2018, all of California’s retail power is required to be carbon-free by 2045. However, opting into a more renewable or “greener” electricity tier through current electricity providers now would be the single most effective GHG emission reduction strategy CVWD could take. Further, switching to low-carbon or carbon-free electricity will make other measures more impactful.

Because electricity consumption is the largest source of CVWD’s GHG, Measure E1 involves several different types of actions that support the planning phase of this process, implementation of operation-wide changes in electricity purchases and consumption, as well as execution of specific projects that would reduce GHG emissions associated with electricity usage through installation of onsite renewables. Measures that are supportive to the planning phase of this process are not considered to result in quantifiable GHG emissions reduction, but support the efforts to achieve carbon-free electricity.

#### *Methodology and Assumptions*

**ACTION E1-1: CONDUCT AN ANNUAL RETURN ON INVESTMENT ANALYSIS OF GREEN ELECTRICITY PACKAGES AVAILABLE FROM CURRENT ELECTRICITY PROVIDERS, SCE AND IID, AS WELL AS FROM JOINING DESERT COMMUNITY ENERGY (DCE). RETURN ON INVESTMENT ANALYSIS SHOULD INCLUDE AN EVALUATION OF ELECTRICITY ACCOUNTS THAT CAN BE SWITCHED, ESTIMATED COST FOR THE SWITCH, AS WELL AS BENEFITS FROM ACHIEVING GREATER GHG EMISSIONS REDUCTION AS IT RELATES TO GRANT FUNDING OPPORTUNITIES ASSOCIATED WITH THE CAAP. EXCEED THE RENEWABLE ELECTRICITY STANDARD SET BY SENATE BILL 100 FOR ELECTRICITY PURCHASES BY OPTING INTO A GREEN RATE PACKAGE WITH SCE AND IID.**

CVWD can reduce its retail electricity emissions by purchasing low carbon electricity through green tariff options (lower carbon electricity options provided by the utility or a Community Choice Aggregation, CCA) and potentially reduce the cost of electricity simultaneously. Most retail providers offer a portfolio of green energy options, each with a guaranteed percentage of green energy.<sup>34</sup>

<sup>33</sup> The use of electricity generates emissions when it is generated by non-renewable sources such as natural gas.

<sup>34</sup> Annual renewable electricity composition is based on composition of carbon-free sources for SCE and IID retail power that currently exist and an assumed linear trend to 100% carbon neutral by 2045. SCE and IID offer a 50% and 100% renewables option. In 2019, SCE’s

The emissions reduction impact of Action E1-1 results from the increased renewable and carbon-free electricity supplied to CVWD from switching its retail accounts to green tariff options offered by their electricity providers. The calculations and assumptions used to estimate emission reductions from Action E1-1 are provided in Table 14. The avoided emissions are calculated as the difference between emissions generated from current annual retail electricity consumption versus that same electricity purchased using an example green tariff option for electricity. For the purposes of this calculation, it was assumed that CVWD would switch SCE electricity accounts to the 50% Green Rate option and switch IID electricity accounts to the 50% Green Energy Program option. Based on the amount of eligible renewable electricity sources that make up the standard retail electricity versus the green tariff option, by 2030, the emission factor for the SCE 50% Green Rate electricity is anticipated to be approximately 20 percent lower than SCE standard retail electricity and the emission factor for the IID 50% Green Energy electricity is anticipated to be approximately 9 percent lower than IID standard retail electricity. As such, with implementation of Action E1-1 using the 50 percent Green Rate and Green Energy programs a reduction of 4,155 MT CO<sub>2</sub>e by 2030 could be achieved. Additional reductions could be achieved by switching to an even lower carbon option like 100% carbon free or 100% renewable options could achieve an even greater reduction of 28,431 MT CO<sub>2</sub>e by 2030. Note that this action would provide GHG emissions reduction up to the point that all of California's retail electricity is provided from renewable sources, which is anticipated to occur prior to 2045. As such, no reduction would be achieved in 2045 as retail electricity will be 100 percent carbon-free.

**Table 14 Action E1-1 GHG Emissions Reduction Calculations**

Calculation Factor	2030	2045
Forecasted Retail Power Purchased (kWh) <sup>1</sup>	188,378,446	215,340,295
Forecasted Retail Power Purchased (MWh)	188,378	215,340
Average Retail GHG Emission Factor (MT CO <sub>2</sub> e/MWh) <sup>2,3</sup>	0.151	0.0
GHG Emissions Generated using Retail Electricity (MT CO <sub>2</sub> e) <sup>5</sup>	28,431	0.0
Average Green Rate Electricity Emission Factor (MT CO <sub>2</sub> e/MWh) <sup>3,4</sup>	0.129	0.0
GHG Emissions Generated using 50% Green Retail Electricity (MT CO <sub>2</sub> e) <sup>5</sup>	24,276	0.0
<b>Avoided GHG Emissions (MT CO<sub>2</sub>e)<sup>6</sup></b>	<b>4,155</b>	<b>0.0</b>

Notes: MT CO<sub>2</sub>e = metric tons of carbon dioxide equivalent; kWh = kilowatt-hour; MWh = megawatt-hour; 1,000 kWh = 1 MWh  
Values have been rounded and may not add up exactly.

<sup>1</sup> The amount of electricity consumed in 2030 and 2045 was forecasted based on the amount of electricity purchased in 2016 through 2019 and scaled based on the anticipated increase in water delivery in 2030 and 2045 as detailed in the 2020 RUWMP.

<sup>2</sup> Due to RPS, retail electricity emission factors (i.e., IID, SCE), will reduce over time. Per SB 100, retail electricity providers, including both SCE and IID would be required to obtain 60% of electricity from renewable sources. Emission factors in 2030 for SCE and IID were calculated based on the 2019 emission factors and 2019 renewable portfolio for each retail provider where in 2019 IID and SCE obtained 42.5%, and 35.1%, respectively, of electricity from renewable sources. As such, to meet SB 100 requirements IID and SCE would increase their portfolio of renewably sourced electricity by 17.5% and 24.9%, respectively. It was assumed that the 2030 emission factors would decrease to the same degree.

<sup>3</sup> Based on electricity purchases from 2016 through 2019, approximately 55% of all CVWD electricity purchased was from SCE and 45% was from IID. For the purposes of this calculation it was assumed that the contribution by SCE and IID to total electricity purchased would remain constant. The average emission factor is weighted based on the percent of total electricity purchased that came from SCE vs IID.

Green Rate option provided 67.5% or 100% eligible renewable energy compared with the standard SCE retail electricity which was 35.1% eligible renewable energy ([https://www.sce.com/sites/default/files/inline-files/SCE\\_2019PowerContentLabel.pdf](https://www.sce.com/sites/default/files/inline-files/SCE_2019PowerContentLabel.pdf)). In 2019, IID's Green Energy Program option provided 50% or 100% eligible renewable energy compared with the standard IID retail electricity which was 42.6% eligible renewable energy (<https://www.iid.com/energy/renewable-energy/power-content-label>).

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<sup>4</sup> Renewable electricity composition in 2030 for IID's 50% Green Energy Program and SCE's 50% Green Rate Program is based on composition of carbon-free sources that currently exist in those programs and an assumed linear trend to 100% carbon neutral by 2045. In 2019, SCE's 50% Green Rate option provided 67.5% eligible renewable energy ([https://www.sce.com/sites/default/files/inline-files/SCE\\_2019PowerContentLabel.pdf](https://www.sce.com/sites/default/files/inline-files/SCE_2019PowerContentLabel.pdf)) and IID's 50% Green Energy Program option provided 50% eligible renewable energy (<https://www.iid.com/energy/renewable-energy/power-content-label>). As such, by 2030 SCE's 50% Green Rate Program is anticipated to be approximately 80% renewable sources, 20% greater than the required 60%, and IID's 50% Green Energy Program is anticipated to be 69% renewable, 9% greater than the required 60%. For the purposes of this calculation it was assumed that emission factors for SCE and IID would decrease from the calculated 2030 standard package emission factor by approximately 20% and 9%, respectively.

<sup>5</sup> GHG emissions generated using either retail or green tariff power is calculated by multiplying the average emission factor by the amount of retail power that is anticipated to be purchased in 2030 and 2045.

<sup>6</sup> Action E1-1 GHG emissions reduction are calculated as the difference between the emissions generated using the standard retail power package versus emissions generated using the 50% green power packages.

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### **ACTION E1-2: CONTINUE TO ANALYZE TIME-OF-USE EMISSIONS FACTORS AND COSTS TO BETTER MODEL GHG EMISSIONS AND COSTS FOR FUTURE PROJECTS. INCLUDE ANALYSIS AS PART OF ANNUAL CAAP PROGRESS MONITORING. (SUPPORTIVE)**

Under Action E1-2, CVWD will continue to investigate the technical and cost-related feasibility of time-of-use measures including the impact to pumps and other infrastructure, the current time-of-use trends, and the cost and GHG reduction implications. This supports the prioritization of operational changes where it may not be feasible to obtain carbon-free electricity and assists in future planning of projects.

### **ACTION E1-3: WHEN OPERATIONALLY FEASIBLE, SCHEDULE TIMES OF HIGH PUMPING TO COINCIDE WITH TIMES OF HIGH RENEWABLE ENERGY AVAILABILITY AND LOW DEMAND TO REDUCE GHG EMISSIONS AND SMOOTH DEMAND CURVE. ESTABLISH A GOAL TO SHIFT 10% OF PUMPING TIMES TO MID-DAY.**

Approximately half of CVWD's Scope 2 GHG emissions are tied to the consumption of electricity needed for pumping water at booster stations and from groundwater wells. Time-of-use strategies, which entail changing the time of day operations are occurring to off-peak hours when there is a higher amount of renewables sourcing the grid can reduce GHG emissions from electricity consumption and potentially reduce cost of electricity simultaneously.

The emissions reduction impact of Action E1-3 results from shifting some amount of pumping operations to a time of day when grid electricity is from more carbon-free sources and demand is lower. Under Action E1-3, CVWD would aim to shift 10 percent of pumping operations to mid-day, i.e. low grid times. Based on annual electricity data between 2016 and 2019, on average approximately 9 percent of total electricity consumed by CVWD is for pumping at booster stations and 39 percent for well pumping. For the purposes of this calculation it was assumed that the percent of total electricity consumption for pumping operations would remain constant over time and was applied to forecasted electricity consumption. Future electricity consumption was forecasted based on anticipated growth in CVWD operations primarily related to increased water delivery. Avoided GHG emissions annually is based on the difference in emission factors between the low grid times, that pumping operations could be shifted too, and average grid times which are representative of current pumping operations that do not use time-of-use strategies. The CAISO electricity emission factor at low grid times was found to be approximately 28 percent lower than the daily average emission factor.<sup>35</sup> The difference in low-grid and average-grid emission factors in MT CO<sub>2</sub>e is multiplied by the amount of electricity anticipated for pumping operations. The amount of avoided emissions would be minimized assuming full implementation of Actions E1-1, specifically the switch of retail accounts to the 50% or 100% Green Rate options for retail electricity sources.

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<sup>35</sup> Variation in daily electricity emission factors due to incorporation of renewable energy during the day is based on CAISO daily emissions and electricity tracking. (Source: <http://www.caiso.com/TodaysOutlook/Pages/emissions.aspx>)

Therefore, it was assumed that Actions E1-1 would be implemented further reducing electricity emissions associated with pumping. This results in a reduction of approximately 330 MT CO<sub>2</sub>e by 2030 due to implementation of Action E1-3 and incorporation of Action E1-1. Note that between the achievable emissions reduction will incrementally reduce between 2030 and 2045 as provided electricity becomes more carbon-free. Retail electricity is anticipated to be carbon-free some time prior to 2045 due to SB 100 and as such no reduction would be achieved in 2045.. The calculations and assumptions used to estimate emission reductions from Action E1-1 are provided in Table 15.

**Table 15 Action E1-3 GHG Emissions Reduction Calculations**

Calculation Factor	2030	2045
Forecasted Electricity Consumption (MWh) <sup>1</sup>	188,378	215,340
Percent of Total Electricity for Pumping Operations <sup>2</sup>	48%	48%
Electricity Usage for Pumping Operations (MWh) <sup>2</sup>	90,452	103,398
Target Percent Shift in Pumping Operations with Implementation of Action E1-3	10%	10%
Shifted Pumping Operations Electricity Usage (MWh) <sup>3</sup>	9,045	10,340
Average Electricity Emission Factor Assuming Implementation of Action E1-1 (MT CO <sub>2</sub> e/MWh) <sup>4,5</sup>	0.129	0.0
Difference Between Lowest and Average Emission Factor Assuming Implementation of Action E1-1 (MT CO <sub>2</sub> e/MWh) <sup>6</sup>	0.092	0.0
<b>Avoided GHG Emissions (MT CO<sub>2</sub>e)<sup>7</sup></b>	<b>330</b>	<b>0</b>

Notes: MT CO<sub>2</sub>e = metric tons of carbon dioxide equivalent; kWh = kilowatt-hour, MWh = Megawatt hour

Values have been rounded and may not add up exactly.

<sup>1</sup> The amount of electricity consumed in 2030 and 2045 was forecasted based on the amount of electricity purchased in 2016 through 2019 and scaled based on the anticipated increase in water delivery in 2030 and 2045 as detailed in the 2020 RUWMP. Calculations are detailed in Appendix A.

<sup>2</sup> Electricity usage for pumping operations is based on CVWD historical data for pumping at booster stations and wells obtained from utility data that included electricity consumption by end-use between 2016 and 2019. For the purposes of this calculation, it is assumed that percent of electricity consumed for pumping operations remains constant over time.

<sup>3</sup> The amount of electricity assumed to be shifted under Action E1-3 is determined as the forecasted amount of electricity for pumping operations multiplied by the target percentage to shift under Action E1-3.

<sup>4</sup> Due to RPS, retail electricity emission factors (i.e., IID and SCE), will reduce over time. As described in *Section 2.1, Assumptions*, annual electricity emission factors for IID and SCE are interpolated based on the 2018 emission factor and percent of renewable sources and the 2030 emission factor that would result with the required 60% renewable sources. The presented emission factor is the weighted average retail electricity emission factors based on the average contribution of overall electricity by IID and SCE to CVWD electricity consumption with implementation of Measure E-1 where SCE and IID accounts would be switched to 50% Green Rate by 2022.

<sup>5</sup> Between 2016 and 2019, IID provided on average 45% of CVWD's overall electricity while SCE provided on average 55% of the overall electricity.

<sup>6</sup> The electricity emission factor at low grid times was found to be approximately 28 percent lower than the daily average emission factor due to incorporation of renewable energy during the day. This is based on CAISO daily emissions and electricity tracking (Source: <http://www.caiso.com/TodaysOutlook/Pages/emissions.aspx>)

<sup>7</sup> Avoided GHG emissions is calculated as the shifted annual electricity consumption from pumping with implementation of Action E1-3 goal multiplied by the difference between the low and average grid emission factors.

#### **ACTION E1-4: COMPLETE THE INSTALLATION OF SOLAR-TOPPED PARKING STRUCTURES AND BATTERY STORAGE SYSTEM TO COVER 100% OF CVWD PALM DESERT CAMPUS ENERGY CONSUMPTION NEEDS BY 2030.**

CVWD has undertaken a Capital Improvement Project to install solar-topped parking structures and battery storage system at the CVWD Palm Desert Campus to cover 100% of all of the Campus's energy needs. On average, the Palm Desert Campus consumed approximately 13,142 kWh

annually between 2016 and 2019. Future growth in CVWD operations is primarily related to increased water delivery services and is not anticipated to affect current operations at the Palm Desert Campus. Therefore, for the purposes of this calculation it was assumed that energy consumption at the Desert Palm Campus would remain constant over time.

Avoided GHG emissions annually is based on the difference of emission factors between the retail electricity and 100 percent on-site renewable electricity (i.e. emission factor of 0 MT CO<sub>2</sub>e). The Desert Palm Campus electricity is received from SCE. The reduction in emissions from this project would be minimized assuming full implementation of Action E1-1 specifically the switch of SCE retail accounts to the 50% Green Rate account. Therefore, it was assumed that Action E1-1 would be implemented by the completion of this project further reducing electricity emissions. This results in a GHG emission reduction of approximately 1.6 MT CO<sub>2</sub>e by 2030 due to implementation of Action E1-4 and incorporation of Action E1-1. Note that no reduction would be achieved in 2045 as retail electricity will be 100 percent carbon-free. The calculations and assumptions used to estimate emission reductions from Action E1-4 are provided in Table 16.

**Table 16 Action E1-4 GHG Emissions Reduction Calculations**

Calculation Factor	2030	2045
Annual Energy Consumption at Desert Palm Campus (kWh) <sup>1</sup>	13,142	13,142
Annual Energy Consumption at Desert Palm Campus (MWh)	13.14	13.14
Average SCE Electricity Emission Factor Assuming Implementation of Action E1-1 (MT CO <sub>2</sub> e/MWh) <sup>2</sup>	0.120	0.0
<b>Avoided GHG Emissions (MT CO<sub>2</sub>e)<sup>3</sup></b>	<b>1.6</b>	<b>0.0</b>

Notes: MT CO<sub>2</sub>e = metric tons of carbon dioxide equivalent; MWh = megawatt-hour; kWh = kilowatt-hour; 1,000 kWh = 1 MWh  
 Values have been rounded and may not add up exactly.

<sup>1</sup> Average annual electricity usage at Desert Palm Campus based on years 2016 through 2019. Assumed to remain constant over time.

<sup>2</sup> Desert Palm Campus receives electricity from SCE. Renewable electricity composition in 2030 for SCE's 50% Green Rate Program is based on composition of carbon-free sources that currently exist in those programs and an assumed linear trend to 100% carbon neutral by 2045. In 2019, SCE's 50% Green Rate option provided 67.5% eligible renewable energy ([https://www.sce.com/sites/default/files/inline-files/SCE\\_2019PowerContentLabel.pdf](https://www.sce.com/sites/default/files/inline-files/SCE_2019PowerContentLabel.pdf)). As such, 2030 SCE's 50% Green Rate Program is anticipated to be approximately 80% renewable sources, 20% greater than the SB 100 required 60%. For the purposes of this calculation it was assumed that emission factors for SCE would decrease from the calculated 2030 standard package emission factor by approximately 20%. By 2045, 100 percent of all electricity should be obtained from renewable sources per SB 100 and therefore the emission factors is 0.

<sup>3</sup> Avoided GHG emissions in 2030 is calculated as the annual electricity consumption at Desert Palm Campus multiplied by the SCE 50% Green Rate emission factor calculated as described in note 2.

**ACTION E1-5: INVESTIGATE OPPORTUNITIES AND PARTNERSHIPS FOR GENERATING LOW-CARBON INTENSITY (CI) ELECTRICITY FROM WASTEWATER TREATMENT PLANTS TO GENERATE LCFS CREDITS OR POWER FOR WATER RECLAMATION PLANT ELECTRICITY NEEDS ASSOCIATED WITH THE PALM DESERT CAMPUS (I.E., WRP 10). (SUPPORTIVE)**

Electricity use at the water reclamation plants (WRPs) currently accounts for approximately 24 percent of total electricity consumed by CVWD operations. Under Action E1-5, CVWD would investigate opportunities to generate or obtain low-CI electricity for the WRP operations. There may be opportunities within the LCFS program to generate LCFS credits or other rebate programs to offset cost of technology to generate on-site low-CI electricity. This supports the prioritization of cost-effect operations while capitalizing on available incentives to reduce GHG emissions from electricity use.

**ACTION E1-6: INVESTIGATE OPPORTUNITIES TO REDUCE ENERGY COSTS, IMPROVE RESILIENCE, AND REDUCE ELECTRICITY GHG EMISSIONS THROUGH ADDITIONAL ON-SITE SOLAR AND BATTERY STORAGE TO SUPPORT CVWD OPERATIONAL ENERGY USE AND/OR INVESTIGATE THE COST EFFECTIVENESS TO ENTER A POWER PURCHASE AGREEMENT. (SUPPORTIVE)**

The single largest source of GHG emissions associated with CVWD’s operations is related to electricity consumption. Action E1-6 supports the goal to obtain carbon-free electricity through various strategies if it is not cost-effective or feasible to switch all retail electricity accounts to the available carbon-free packages. Further, increasing on-site solar and battery storage will also improve the resilience of CVWDs electricity needs.

*Results*

Table 17 summarizes the actions associated with Measure E1 and potential GHG emissions reduction. Because this electricity consumption is the largest source of emissions for CVWD operations, Measure E1 involves several different types of actions that support the planning phase of this process, including implementation of operation-wide changes in electricity purchases and consumption, as well as execution of specific projects. Action E1-1, E1-3, and E1-4 would result in a reduction of approximately 4,486 MT CO<sub>2</sub>e by 2030. Additional reductions could be achieved through implementation of Action E1-1 by switching to an even lower carbon option like 100% carbon free or 100% renewable options, where a reduction of up to 28,431 MT CO<sub>2</sub>e could be achieved by 2030. Note that no reduction would be achieved in 2045 as retail electricity will be 100 percent carbon-free.

**Table 17 GHG Emissions Reduction Associated with Measure E1**

Actions	Emission Reductions Potential (MT CO <sub>2</sub> e) 2030	Emission Reductions Potential (MT CO <sub>2</sub> e) 2045
<b>E1-1</b> Conduct an annual return on investment analysis of green electricity packages available from current electricity providers, SCE and IID, as well as from joining Desert Community Energy (DCE). Return on investment analysis should include an evaluation of electricity accounts that can be switched, estimated cost for the switch, as well as benefits from achieving greater GHG emissions reduction as it relates to grant funding opportunities associated with the CAAP. Exceed the renewable electricity standard set by Senate Bill 100 for electricity purchases by opting into a green rate package with SCE and IID. <sup>1</sup>	4,155	0.0
<b>E1-2</b> Continue to analyze time-of-use emissions factors and costs to better model GHG emissions and costs for future projects. Include analysis as part of annual CAAP progress monitoring.		Supportive
<b>E1-3</b> When operationally feasible, schedule times of high pumping to coincide with times of high renewable energy availability and low demand to reduce GHG emissions and smooth demand curve. Establish a goal to shift 10% of pumping times to mid-day.	330	0
<b>E1-4</b> Complete the installation of solar-topped parking structures and battery storage system to cover 100% of CVWD Palm Desert Campus energy consumption needs by 2030.	1.6	0.0



to be quantifiable the assets need to first be identified; therefore, there this action is considered supportive of Measure EE1.

**ACTION EE1-2: CONTINUE TO CONDUCT ENERGY AUDITS ANNUALLY AND IMPLEMENT TOP ENERGY RECOMMENDATIONS. AS PART OF CAAP MONITORING, TRACK ENERGY IMPROVEMENTS DUE TO IMPLEMENTATION OF ENERGY AUDIT RECOMMENDATIONS ANNUALLY. (SUPPORTIVE)**

CVWD currently conducts energy audits to improve energy efficiency and optimize operations as well as to identify potential new areas for energy efficiency improvements. Under Action EE1-2, implementation of energy audits and the resulting reduction in energy usage will also be tracked. By tracking the effectiveness of energy efficiency projects or actions once implemented, CVWD can gain a better understanding of what actions are most impactful to reduce CVWD's energy use and associated costs.

**ACTION EE1-3: BASED ON THE RECOMMENDATIONS FROM COACHELLA VALLEY WATER DISTRICT WATER RECLAMATION PLANT (WRP) ENERGY OPTIMIZATION EVALUATION, IMPLEMENT THE TOP ENERGY EFFICIENCY MEASURES (EEM) AT WRP 4, WRP 7 AND WRP 10 WITH A BENEFIT-TO-COST RATIO GREATER THAN 1.0 BY 2030. THE IDENTIFIED EEM ARE ALIGNED WITH THE SANITATION MASTER PLAN AND INCLUDE ENERGY OPTIMIZATION SUCH AS AERATION IMPROVEMENTS, TREATMENT OPTIMIZATION, IMPROVED SITE AND BUILDING LIGHTING, AND ADDITION OF SOLAR PANELS TO THE WRPs.**

One of CVWD's continuing strategic initiatives is to optimize energy usage at its facilities to promote community sustainability and increase operational optimization. In April of 2021, CVWD conducted a cost-benefit analysis to validate energy efficiency measures for CVWD's water reclamation plants (WRPs) 4, 7 and 10 previously identified as Capital Improvement Projects (CIP) in *the Sanitation Master Plan Update 2020*.<sup>36</sup> Based on the evaluation, energy efficiency measures or projects that had payback periods less than the anticipated useful life of the project were recommended. Implementation of these recommended measures, under Action EE1-3 of this CAAP, would reduce CVWD's GHG emissions from reduced electricity consumption.

As part of the *CVWD WRP Energy Optimization Evaluation Memorandum* prepared by CVWD, annual energy savings at WRP 4, 7 and 10 from implementation of CIP number 4-4, 7-2, and 10-4, respectively, were calculated based on the 2018 operating year. Based on the estimated annual energy savings and total electricity consumed in 2018, implementation of CIP number 4-4, 7-2, and 10-4 would result in an annual energy savings of approximately 8.8% of total electricity consumption. For the purposes of this calculation, it was assumed that an 8.8% energy savings would remain constant over time with implementation of Action EE1-3 and was applied to total forecasted electricity consumption. The amount of avoided emissions would be minimized assuming full implementation of Measure E1, Actions E1-1, specifically the switch of retail accounts to the 50% Green Rate options for retail electricity sources. Therefore, it was assumed that Actions E1-1 would be implemented further reducing electricity emissions associated with lightening. The calculations and assumptions used to estimate emission reductions from Action EE1-3 are provided in Table 18. As shown, implementation of Action EE1-3 has the potential to result in a reduction of approximately 2,132 MT CO<sub>2</sub>e by 2030. Note that this action would provide GHG emissions reduction up to the point that all of California's retail electricity is provided from renewable sources, which is anticipated to occur prior to 2045. As such, no reduction would be achieved in 2045 as retail electricity will be 100 percent carbon-free.

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<sup>36</sup> <https://www.cvwd.org/492/Sanitation-Master-Plan-Update-2020>

**Table 18 Action EE1-3 GHG Emissions Reduction Calculations**

Calculation Factor	2030	2045
Forecasted Electricity Consumption (MWh) <sup>1</sup>	188,378	215,340
Efficiency Improvement (%) <sup>2</sup>	8.8%	8.8%
Reduced Electricity (MWh) <sup>3</sup>	16,575	18,947
Average Electricity Emission Factor Assuming Implementation of Action E1-1 (MT CO <sub>2</sub> e/MWh) <sup>4,5</sup>	0.129	0.0
<b>Avoided GHG Emissions (MT CO<sub>2</sub>e)<sup>6</sup></b>	<b>2,132</b>	<b>0</b>

Notes: MT CO<sub>2</sub>e = metric tons of carbon dioxide equivalent; kWh = kilowatt-hour; MWh = megawatt-hour  
 Values have been rounded and may not add up exactly.

<sup>1</sup> The amount of electricity consumed in 2030 and 2045 was forecasted based on the amount of electricity purchased in 2016 through 2019 and scaled based on the anticipated increase in water delivery in 2030 and 2045 as detailed in the 2020 RUWMP.

<sup>2</sup> Based on the calculated annual energy savings with implementation of Sanitation Master Plan CIP number 4-4 for WRP 4, 7-2 for WRP 7, and 10-4 for WRP 10 and annual electricity usage in operating year 2018. (CVWD WRP Energy Optimization Evaluation, April 29, 2021)

<sup>3</sup> Reduced electricity is based on 8.8% percent of current electricity usage being reduced by 2030 through 2045 for implementation of Action EE1-3.

<sup>4</sup> Due to RPS, retail electricity emission factors (i.e., IID and SCE), will reduce over time. As described in Section 2.1, Assumptions, annual electricity emission factors for IID and SCE are interpolated based on the 2018 emission factor and percent of renewable sources and the 2030 emission factor that would result with the required 60% renewable sources. The presented emission factor is the weighted average retail electricity emission factors based on the average contribution of overall electricity by IID and SCE to CVWD electricity consumption with implementation of Measure E-1 where SCE and IID accounts would be switched to 50% Green Rate by 2022.

<sup>5</sup> Between 2016 and 2019, IID provided on average 45% of CVWD’s overall electricity while SCE provided on average 55% of the overall electricity.

<sup>6</sup> Avoided GHG emissions is calculated as the Reduced Electricity multiplied by the weighted electricity emission factor with incorporation of Measure E1, Action E1-1 as described in note 5 and 6.

**ACTION EE1-4: DEVELOP A POLICY THAT WOULD REQUIRE ANY NEW CVWD BUILDING TO ACHIEVE A MINIMUM LEVEL OF LEED GOLD CERTIFICATION OR LEED GOLD EQUIVALENT TO IMPROVE ENERGY EFFICIENCY AND REDUCE COST BASED ON HIGH RETURN ON INVESTMENT GREATER THAN 20%. (SUPPORTIVE)**

Action EE1-4 incrementally supports Measure EE1, by ensuring that any new buildings or facilities will be energy efficient. Requiring new buildings and facilities to meet LEED standards will reduce the long-term cost of operating the buildings while improving energy efficiency for new structures. Since this is applicable only to new buildings that aren’t being constructed yet this action is not quantifiable.

**ACTION EE1-5: CONTINUE TO UTILIZE AUTOMATED LIGHTING CONTROLS FOR INDOOR/OUTDOOR LIGHTING FOR CVWD CAMPUSES PURSUANT TO THE CURRENT CEC BUILDING ENERGY EFFICIENCY STANDARDS (TITLE 24, PART 6 AND 11). (SUPPORTIVE)**

Action EE1-5 supports energy efficiency in the lighting of CVWD buildings and facilities as automated lighting controls help to reduce the amount of excess energy used and improve the efficiency of use. CVWD currently utilizes automated lighting controls pursuant to existing CEC Building Energy Efficiency standards, therefore quantification of this action would risk double counting of GHG emissions already avoided. However, continuing to implement this action is supportive of Measure EE1 as a whole.

**ACTION EE1-6: PURSUANT TO THE CEC 2019 BUILDING ENERGY EFFICIENCY STANDARDS (TITLE 24, PART 6 AND 11), REQUIRE ALL NEW CONSTRUCTION AND BUILDING UPGRADES UTILIZE LIGHT EMITTING**

**DIODE (LED) LIGHTING TECHNOLOGY ONLY. ESTABLISH GOAL TO CONVERT ALL INTERIOR AND EXTERIOR LIGHTING AT 50% OF CVWD FACILITIES TO LED TECHNOLOGIES BY 2027 AND 100% BY 2035.**

Conversion of interior and exterior lighting to more energy efficiency light bulbs throughout CVWD's facilities has the potential to reduce cost and reduce GHG emissions generated from electricity use. According to the United States Department of Energy, ENERGY STAR-qualified LEDs use only 20 to 25 percent of the energy of traditional incandescent bulbs while high-efficiency incandescent bulbs could use between 80 and 30 percent of the energy of the traditional incandescent bulbs they replace.<sup>37</sup> For the purposes of this calculation, it is estimated approximately 10 percent of CVWD's electricity use is due to lighting, that the percent of total electricity use for lighting would remain constant over time, and that lighting improvements are on average 50 percent more efficient than previous lighting.<sup>38</sup>

The emission reduction impact of Action EE1-6 is based on 50 percent of lighting electricity being improved by 50 percent by 2027, and by 100 percent by 2035. Avoided emissions are calculated as the amount of annually reduced electricity from lighting multiplied by the annual retail emission factor. The calculations and assumptions used to estimate emission reductions from Action EE1-6 are provided in Table 19. Emissions reductions are based on CVWD achieving a 50 percent implementation (50% of buildings have been retrofit with LEDs) of Action EE1-6 by 2027 and achieving a 100 percent implementation by 2035. CVWD has already begun this process and therefore, the phase in of this measure was assumed to start in 2022. The amount of avoided emissions would be minimized assuming full implementation of Measure E1, Actions E1-1, specifically the switch of retail accounts to the 50% Green Rate options for retail electricity sources. Therefore, it was assumed that Actions E1-1 would be implemented further reducing electricity emissions associated with lightening. This results in a reduction of approximately 833 MT CO<sub>2</sub>e by 2030 due to implementation of Action EE1-6. Note that this action would provide GHG emissions reduction up to the point that all of California's retail electricity is provided from renewable sources, which is anticipated to occur prior to 2045. As such, no reduction would be achieved in 2045 as retail electricity will be 100 percent carbon-free.

**Table 19 Action EE1-6 GHG Emissions Reduction Calculations**

Calculation Factor	2030	2045
Forecasted Electricity Consumption (MWh) <sup>1</sup>	188,378	215,340
Annual Lighting Electricity Consumption (MWh) <sup>2</sup>	18,838	21,534
Annualized Average % of Facility Upgraded <sup>3</sup>	69%	100%
Efficiency Improvement (%) <sup>4</sup>	50%	50%
Reduced Electricity (MWh) <sup>5</sup>	6,476	10,767
Average Electricity Emission Factor Assuming Implementation of Action E1-1 (MT CO <sub>2</sub> e/MWh) <sup>6,7</sup>	0.129	0.0
<b>Avoided GHG Emissions (MT CO<sub>2</sub>e)<sup>7</sup></b>	<b>833</b>	<b>0</b>

Notes: MT CO<sub>2</sub>e = metric tons of carbon dioxide equivalent; kWh = kilowatt-hour; MWh = megawatt-hour

Values have been rounded and may not add up exactly.

<sup>37</sup> <https://www.energy.gov/energysaver/save-electricity-and-fuel/lighting-choices-save-you-money/how-energy-efficient-light>

<sup>38</sup> Lighting conservatively assumed to make up 10% of total energy use based on CalEEMod defaults for warehouses, where lighting makes up 6-50% of total electricity use (CalEEMod). Additionally, U.S. EPA suggests that lighting makes up 35-45% of building energy use for water treatment systems (<https://www.epa.gov/sites/production/files/2015-04/documents/epa816f13004.pdf>), however because not all energy uses for Metropolitan are related to building energy use, the lighting demand of overall electricity demand is likely lower.

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<sup>1</sup> The amount of electricity consumed in 2030 and 2045 was forecasted based on the amount of electricity purchased in 2016 through 2019 and scaled based on the anticipated increase in water delivery in 2030 and 2045 as detailed in the 2020 RUWMP.

<sup>2</sup> Lighting conservatively assumed to make up 10% of total energy use based on CalEEMod defaults for warehouses, where lighting makes up 6-50% of total electricity use (CalEEMod).

<sup>3</sup> Percent upgrade based on a linear increase in retrofit buildings of 50% by 2027 and 100% in 2035.

<sup>4</sup> Assumed that lighting improvements are half LED and half high efficiency bulbs resulting in approximately 50 percent reduction in energy usage (<https://www.energy.gov/energysaver/save-electricity-and-fuel/lighting-choices-save-you-money/how-energy-efficient-light>).

<sup>5</sup> Reduced electricity is based on 69 percent of current electricity usage for lighting being improved by 50 percent by 2030 and 100 percent of current electricity usage for lighting being improved by 50 percent starting in 2035 through 2045.

<sup>6</sup> Due to RPS, retail electricity emission factors (i.e., IID and SCE), will reduce over time. As described in *Section 2.1, Assumptions*, annual electricity emission factors for IID and SCE are interpolated based on the 2018 emission factor and percent of renewable sources and the 2030 emission factor that would result with the required 60% renewable sources. The presented emission factor is the weighted average retail electricity emission factors based on the average contribution of overall electricity by IID and SCE to CVWD electricity consumption with implementation of Measure E-1 where SCE and IID accounts would be switched to 50% Green Rate by 2022.

<sup>7</sup> Between 2016 and 2019, IID provided on average 45% of CVWD's overall electricity while SCE provided on average 55% of the overall electricity.

<sup>8</sup> Avoided GHG emissions is calculated as the Reduced Electricity multiplied by the weighted electricity emission factor with incorporation of Action E1-1 as described in note 6 and 7.

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**ACTION EE1-7: CONTINUE CVWD'S TIME OF USE PROGRAM THAT IDENTIFIES AND ESTABLISHED PERMANENT SHIFTS OF HIGH-ELECTRICITY USE TO TIMES WHEN RENEWABLE ENERGY IS PLENTIFUL THROUGH EDUCATIONAL PROGRAMS ON ENERGY AND THERMAL STORAGE, LOAD TIMING/CONTROLS, PRE-COOLING/PRE-HEATING, AND OTHER TIME-ENERGY DEMAND MEASURES. (SUPPORTIVE)**

CVWD currently has a time-of-use program utilized to lower energy use and cost. Under Action EE1-7, CVWD will continue to implement this program but also consider time-of-use adjustments that would have a GHG emission reduction impact when renewable energy is plentiful. As CVWD's greatest source of emissions is currently associated with electricity usage, continuing to identify opportunities to make permanent shifts in high-electricity operations can have a significant impact on GHG emissions. Because specific time-of-use shifts have not been identified, this action is not considered quantifiable at this time. With identification of specific opportunities to employ time-of-use, this action could result in measurable GHG emission reductions.

**ACTION EE1-8: CONTINUE TO IDENTIFY OPPORTUNITIES TO DEVELOP AND PROFILE NOTABLE ENERGY EFFICIENCY PROJECTS. TRACK ENERGY REDUCTION FROM IMPLEMENTATION OF ENERGY EFFICIENCY PROJECTS AND PREPARE A REPORT DETAILING SUCCESSES FOR INTERNAL STAKEHOLDERS BY 2030. (SUPPORTIVE).**

This action is considered supportive of Measure EE1 as it provides education to internal stakeholders and the public on successful energy efficiency projects conducted at CVWD. This has the potential to garner further interest and support for future energy efficiency projects.

*Results*

As shown below in Table 20, Measure EE1 has the potential to reduce GHG emissions by approximately 2,965 MT CO<sub>2</sub>e by 2030. As previously discussed, the potential reduction of GHG emission achieved by Measure EE1 are dependent on the level of implementation of the quantifiable actions (i.e. Action EE1-3 and EE1-6) and level of implementation of Measure E1. It was assumed that as part of Measure E-1 implementation CVWD will switch retail accounts from the standard package to the SCE Green Rate option and to the IID Green Energy Program option. These green packages provide electricity from at least 50 percent renewable sources and therefore have a lower emission rate than the standard electricity packages. The calculated emissions reduction

potential from implementation of Measure EE-1 account for the green rate package emission factors. This calculation will be updated in future CAAP updates to account for changes in electricity emission factors and any changes in CVWD's implementation of Measure E-1. the green rate packages.. Regardless of emissions reduction from implementation of Measure EE-1, reducing electricity demand has the potential to reduce costs and need for carbon-free electricity.

**Table 20 GHG Emissions Reduction Associated with Measure EE1**

Actions	Emission Reductions Potential (MT CO <sub>2</sub> e) 2030	Emission Reductions Potential (MT CO <sub>2</sub> e) 2045
<p><b>EE1-1</b> As part of the Asset Management program, identify aging equipment due for replacement throughout CVWD facilities and identify energy efficient alternatives to use for the replacement (e.g., EnergyStar certifications). Include a return on an investment analysis as part of the replacement process that evaluates the capital investment for an energy efficient alternative piece of equipment, cost savings associated with improved energy efficiency, and identifies any grants or rebates associated with such equipment replacement.</p>		Supportive
<p><b>EE1-2</b> Continue to conduct energy audits annually and implement top energy recommendations. As part of CAAP monitoring, track energy improvements due to implementation of energy audit recommendations annually.</p>		Supportive
<p><b>EE1-3</b> Based on the recommendations from <i>Coachella Valley Water District WRP Energy Optimization Evaluation</i>, implement the top Energy Efficiency Measures (EEM) at WRP 4, WRP 7 and WRP 10 with a Benefit-to-Cost Ratio Greater than 1.0 by 2030. The identified EEM are aligned with the Sanitation Master Plan and include energy optimization such as aeration improvements, treatment optimization, improved site and building lighting, and addition of solar panels to the WRPs.</p>	2,132	0
<p><b>EE1-4</b> Develop a policy that would require any new CVWD building to achieve a minimum level of LEED Gold certification or LEED equivalent to improve energy efficiency and reduce cost based on high return on investment greater than 20%.</p>		Supportive
<p><b>EE1-5</b> Continue to utilize automated lighting controls for indoor/outdoor lighting for CVWD campuses pursuant to the current CEC Building Energy Efficiency Standards (Title 24, Part 6 and 11).</p>		Supportive
<p><b>EE1-6</b> Pursuant to the CEC 2019 Building Energy Efficiency Standards (Title 24, Part 6 and 11), require all new construction and building upgrades utilize light emitting diode (LED) lighting technology only. Establish goal to convert all interior and exterior lighting at 50% of CVWD facilities to LED technologies by 2027 and 100% by 2035.</p>	833	0
<p><b>EE1-7</b> Continue CVWD's time of use program that identifies and established permanent shifts of high-electricity use to times when renewable energy is plentiful through educational programs on energy and thermal storage, load timing/controls, pre-cooling/pre-heating, and other time-energy demand measures.</p>		Supportive
<p><b>EE1-8</b> Continue to identify opportunities to develop and profile notable energy efficiency projects. Track energy reduction from implementation of energy efficiency projects and prepare a report detailing successes for internal stakeholders by 2030.</p>		Supportive
<p><b>Total Emissions Reduction Potential</b></p>	2,965	0.0
<p>Notes: MT CO<sub>2</sub>e = metric tons of carbon dioxide equivalent</p>		

## 2.4 Scope 3: Indirect Emissions and Sequestration

### **Measure WG1: Increase waste diversion to achieve 75% reduction in landfilled organic waste by 2025 and zero-waste by 2045**

Organic materials are the focus of the recent California legislation SB 1383 (Short-Lived Climate Pollutants: Organic Waste Reductions). This state law has the immediate goal of reducing organic waste sent to landfill and the ultimate objective of reducing statewide methane emissions. Specifically, it sets a statewide goal for the reduction in organic waste to landfills – 50 percent by 2020 and 75 percent by 2025 – in addition to the recovery of 20 percent of edible food waste for human consumption. SB 1383 will require local governments to provide organics collection to all generators and require all generators to subscribe. It also has specific mandates for container systems, education and outreach programs, monitoring and contamination reporting, and enforcement of regulations. Full SB 1383 implementation will begin in 2022, allowing some time for jurisdictions to plan and prepare for achieving compliance.<sup>39</sup> CVWD does not dispose of biosolids at landfills in California; therefore, SB 1383 has a limited impact on CVWD other than requiring that CVWD achieve a 75 percent diversion of organics by 2025, using 2014 levels as the baseline. While SB 1383 does require this reduction from CVWD, SB 1383 was not included in the CVWD’s GHG emissions forecast. Therefore, this plan includes measures that will allow CVWD to support this goal and reduce its own GHG emissions in alignment with SB 1383.

Waste generation at CVWD facilities accounts for less than one percent of total GHG emissions from CVWD operations. A majority of the GHG emissions resulting from waste sent to the landfill are caused by decomposition of organic material under anaerobic conditions. The remainder of the emissions come from inorganic wastes, such as plastic, which have both upstream and downstream emissions. Although CVWD currently generates very little waste annually, under Measure WG1 CVWD will align with SB 1383 and AB 341 to develop and implement a waste diversion plan to reduce organic waste sent to the landfill by 75 percent using 2014 levels as a baseline and strive to achieve zero-waste sent to landfills by 2045.

#### *Methodology and Assumptions*

#### **ACTION WG1-1: CONDUCT A WASTE AUDIT BY 2023 TO DETERMINE WHAT PERCENTAGE OF THE WASTE STREAM IS ORGANIC COMPARED WITH THE WASTE STREAM IN 2014 AND THEREFORE, SUBJECT TO SB 1383. (SUPPORTIVE)**

Conducting a waste audit to characterize CVWD’s generated waste will allow CVWD to be more strategic with follow-up actions or programs. Waste characterization under Action WG1-1 will incrementally support Measure WG1 by helping CVWD to identify what specific waste types to target for diversion under various programs and to establish diversion goals by waste type that will align with State regulations.

#### **ACTION WG1-2: EXPAND CVWD’S CURRENT WASTE MANAGEMENT BY DEVELOPING NET-ZERO WASTE POLICIES AND PROGRAMS AT ALL FACILITIES TO REDUCE LANDFILLED ORGANIC WASTE BY 75% BY 2025**

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<sup>39</sup> California Air Resources Board. 2017. Short-Lived Climate Pollution Reduction Strategy.

### **FROM 2014 LEVELS AND ACHIEVE ZERO LANDFILLED WASTE BY 2045 IN ALIGNMENT WITH AB 341 AND SB 1383.**

Action WG1-2, the implementation of net zero waste policies and programs at all CVWD facilities, generates all the emissions reduction associated with Measure WG1 by reducing landfilled waste to net-zero by 2045.

Direct GHG emissions reductions from this strategy are dependent on the active diversion of waste from the landfill. Therefore, for the purposes of this calculation, it is assumed that through the adoption of the CAAP, CVWD would aim to reach net-zero waste by 2045. Because a majority of future growth in CVWD operations is related to increases in water deliveries, CVWD waste generation emissions were forecasted to future years by applying a growth factor based on water deliveries. See Appendix A for inventory and forecast calculation details. 2019 baseline waste emissions were calculated by applying the default emission factor for municipal solid waste (MSW and default factors for landfill operations (i.e., oxidation rate, landfill gas collection rate, landfill equipment). It was assumed that the type of waste generated and the landfill currently used would remain constant over time. Therefore, emission reduction calculations assume a linear reduction of waste emissions starting in 2023 with 100 percent reduction achieved by 2045. Linear interpolation between 2023 and 2045 shows that this correlates with a reduction of waste emissions by approximately 36 percent by 2030. The calculations and assumptions used to estimate potential emissions reduction from Action WG1-2 are provided in Table 21.

**Table 21 Action WG1-2 GHG Emissions Reduction Calculations**

<b>Calculation Factor</b>	<b>2030</b>	<b>2045</b>
Annual Waste Growth Factor (MT CO <sub>2</sub> e/AF) <sup>1</sup>	0.0002	0.0002
Forecasted Waste Emissions (MT CO <sub>2</sub> e) <sup>2</sup>	28	32
Percent Reduction in Waste Emissions <sup>3</sup>	36.4%	100%
<b>Avoided GHG Emissions (MT CO<sub>2</sub>e)<sup>7</sup></b>	<b>10</b>	<b>32</b>

Notes: MT CO<sub>2</sub>e = metric tons of carbon dioxide equivalent; AF = acre foot

Values have been rounded and may not add up exactly.

<sup>1</sup> Baseline waste emissions were calculated for inventory years 2016 through 2019. Based on the amount of water delivered each year, an average waste growth factor in waste emissions per acre foot of water delivered was developed and used to estimate future waste emissions given anticipated water deliveries.

<sup>2</sup> Waste emissions were forecasted by multiplying the annual waste growth factor by the anticipated water deliveries reported in the 2020 RWUMP.

<sup>3</sup> Based on the linear interpolation of waste reduction from 0 percent in 2023 to 100 percent by 2045 and assuming a direct correlation with generated waste emissions.

<sup>4</sup> Potential GHG emissions avoided from waste diversion from landfills is calculated as the percent of waste reduction multiplied by the forecasted waste emissions in the target year (i.e. 2030, and 2045).

### **ACTION WG1-3: CONTINUE TO IMPLEMENT ORGANIC WASTE DIVERSION STRATEGIES WHERE GREEN AND WOOD WASTE IS SEPARATED FROM OTHER WASTE STREAMS, AND SENT TO THE GREENLEAF BIOMASS POWER PLANT IN MECCA OR OTHER BIOMASS/RENEWABLE ENERGY CENTER. (SUPPORTIVE)**

Continuing Action WG1-3 will incrementally support Measure WG1, by reducing landfilled organic waste. Further, separating wood and green wastes from the waste streams allows for this waste to become productive and be used to create power.

**ACTION WG1-4: INVESTIGATE FUNDING OPPORTUNITIES TO DEVELOP AN ORGANICS PROGRAM AND DEPLOY ORGANIC WASTE BINS AT ALL CVWD FACILITIES SUCH THAT ORGANICS GENERATED FROM CVWD OPERATIONS IS COLLECTED AND DIVERTED FROM THE LANDFILL BY 2025. (SUPPORTIVE)**

Identifying funding opportunities will support future programs to help reduce waste in the community and bring down waste related emissions. Such programs may include composting at waste facilities, which can be used for compost application related to carbon farming. This action supports innovative strategies for diverting waste from the landfill by 2025 in congruence with SB 1383. Further this action supports the CAAP’s long-term planning efforts, as well as developing partnerships that will allow CVWD to reach a zero waste goal by 2045 while supporting local communities.

**ACTION WG1-5: PURSUANT TO AB 901, REPORT THE QUANTITY AND DESTINATION OF DISPOSED BIOSOLIDS FROM WASTEWATER TREATMENT PLANTS TO CALRECYCLE QUARTERLY. (SUPPORTIVE)**

As a biosolid generator, CVWD is subject to the requirements of AB 901, which require each wastewater treatment facility managing biosolids to report to CalRecycle the quantity and destination of biosolids that are disposed of, sold or transferred inside or outside the state every quarter. This action continues a reporting process to CalRecycle and ensures CVWD is in compliance with current laws while supporting Measure WG1.

*Results*

Table 22 summarizes the actions associated with Measure WG1 and potential GHG emissions reduction. Action WG1-2 would result in a potential reduction of approximately 10 MT CO<sub>2</sub>e by 2030 and approximately 32 MT CO<sub>2</sub>e by 2045 with the achievement of net-zero waste by 2045.

**Table 22 GHG Emissions Reduction Associated with Measure WG1**

Actions	Emission Reductions Potential (MT CO <sub>2</sub> e) 2030	Emission Reductions Potential (MT CO <sub>2</sub> e) 2045
<b>WG1-1</b> Conduct a waste audit by 2023 to determine what percentage of the waste stream is organic compared with the waste stream in 2014 and therefore, subject to SB 1383.		Supportive
<b>WG1-2</b> Expand CVWD’s current waste management by developing net-zero waste policies and programs at all facilities to reduce landfilled organic waste by 75% by 2025 from 2014 levels and achieve zero landfilled waste by 2045 in alignment with AB 341 and SB 1383.	10	32
<b>WG1-3</b> Continue to implement organic waste diversion strategies where green and wood waste is separated from other waste streams, and sent to the Greenleaf Biomass Power Plant in Mecca or other biomass/renewable energy center.		Supportive
<b>WG1-4</b> Investigate funding opportunities to develop an organics program and deploy organic waste bins at all CVWD facilities such that organics generated from CVWD operations is collected and diverted from the landfill by 2025.		Supportive
<b>WG1-5</b> Pursuant to AB 901, report the quantity and destination of disposed biosolids from wastewater treatment plants to CalRecycle quarterly.		Supportive
<b>Total Emissions Reduction Potential</b>	<b>10</b>	<b>32</b>

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Notes: MT CO<sub>2</sub>e = metric tons of carbon dioxide equivalent

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## Measure TR1: Incentivize Sustainable Commutes

CVWD does not have direct control over how its employees travel to and from their jobs. However, Measures TR1 focuses on initiatives that promote and facilitate alternative commute strategies including use of active and shared/subsidized transit, as well as ZEVs. GHG emissions reduction quantification was based on measures that improve infrastructure, facilitate ZEV commuting, and operational policy changes that would reduce employee vehicle miles travelled (VMT) on an annual basis. The following section details the actions relating to Measure TR1 as well as the methodologies and assumptions used for the GHG emissions reduction calculations associated with the quantifiable measures which include Action TR1-3 and Action TR1-5.

### *Methodology and Assumptions*

#### **ACTION TR1 -1: CONTINUE TO CONDUCT ANNUAL SCAQMD TRANSPORTATION SURVEYS TO MONITOR CVWD EMPLOYEES NEEDS AND MOTIVATION FOR TRAVELLING BY SINGLE OCCUPANCY VEHICLES VERSUS ALTERNATIVES. BASED ON SURVEY RESULTS, EXPAND OR PROMOTE PROGRAMS AND INCENTIVES THAT HAVE PROVEN SUCCESSFUL STRATEGIES IN REDUCING EMPLOYEE VMT. (SUPPORTIVE)**

This supports CVWD's compliancy with SCAQMD Rule 2022. Additionally, data from the surveys can help inform policy and program creation at CVWD for commuters to strategically. This is considered a supportive action that will inform new actions as well as additional actions under this measure to assess employee needs for traveling by single occupancy vehicles.

#### **ACTION TR1 -2: CONTINUE TO OFFER RIDESHARE INCENTIVES TO EMPLOYEES WHO CARPOOL. CONSIDER OFFERING OTHER INCENTIVES TO EMPLOYEES TO USE AN ALTERNATIVE MODE OF TRANSPORTATION TO COMMUTE (E.G. PUBLIC TRANSPORTATION, BIKES). (SUPPORTIVE)**

Supporting alternative modes of transit is important to making employee commutes more sustainable. This action continues existing incentives and encourages evaluating additional alternative transportation incentives.

#### **ACTION TR1 -3: CONTINUE TO ALLOW ALL EMPLOYEES LOCATED AT CVWD PALM DESERT AND COACHELLA CAMPUSES TO UTILIZE FLEXIBLE 9/80 SCHEDULE THROUGH 2030 TO REDUCE TRAVEL TIME, VMT, AND GHG EMISSIONS.**

GHG emissions reduction associated with implementation of Action TR1-6 are calculated as the emissions avoided from the reduction in commuter VMT from vehicles with internal combustion engines. CVWD's 2019 commuter survey included data on the mode of transport and number of trips each employee engages in weekly. Based on the employees home zip code, the number of one-way miles travelled by each employee to commute to work was estimated. Annual commuter VMT for a particular mode of transport was calculated as the average commuter trip distance multiplied by the number of weekly trips multiplied by 50 weeks to account for a two week vacation. For the purposes of this calculation, the total VMT reported in the 2019 commuter survey was used as the baseline and assumed to remain constant over time. Further, commuter trips associated with walking or bicycling were excluded as only modes of transport that generate GHG emissions were considered. In 2019, there was an estimated 1,323,243 miles travelled by commuters via an internal combustion engine (ICE) vehicle, 10,662 miles traveled by motorcycle, and 11,846 miles travelled by

a ZEV, which totals to approximately 1,345,751 miles travelled by a mode of transport generating GHG emissions.

CVWD currently allows a flexible schedule for all employees however this was not accounted for in the inventory or forecast as the number of employees utilizing a flexible schedule may fluctuate over time. Under Action TR1-3, CVWD will continue to offer and encourage employees to utilize a 9/80 flexible schedule. CVWD has indicated that a majority of staff utilize the 9/80 schedule. Therefore, for the purposes of this calculation it is assumed that CVWD would maintain a 9/80 schedule for at least 85 percent of all staff now through 2045. Studies have found that the percent reduction in VMT associated with flexible work schedules is based on the type of flexible work schedule and employee participation.<sup>40</sup> For a 9/80 schedule, the adjustment factor, or slope of the linear trend between employee participation and corresponding reduction in VMT is 0.07. As such, with 85 percent employee participation, VMT could be reduced by approximately 6 percent annually, which equates to a reduction in VMT of approximately 80,072 miles annually. Annual avoided emissions were calculated by multiplying the annually reduced VMT by the annual commuter emission factor with implementation of Action TR1-4. The annual commuter emission factor was calculated as the total estimated emissions from commuting divided by the total commuter miles travelled assuming implementation of Action TR1-4. Emissions factors derived from the EMFAC2017 model were used to estimate GHG emissions from personal vehicle commutes and CAMX electricity emission factors were used to calculate emissions from the transition to EV vehicles. Annual emission factors were interpolated between 2019 and the forecasted commuter emissions in 2030 and 2045, where the emission factor was 0.000329 MT CO<sub>2</sub>e/commuter mile in 2019, 0.00021 MT CO<sub>2</sub>e/commuter mile in 2030, and 0.00015 MT CO<sub>2</sub>e/commuter mile in 2045. Emission factors decrease due to improved vehicle emissions and from the incorporation of Action TR1-4 where ICE vehicles are transitioned to ZEVs or EVs. Total emissions from employee commute in 2019 and forecasted in 2030 and 2045 were calculated using annual mileage travelled by mode multiplied by the associated emission factor.<sup>41</sup>

The calculations and assumptions used to estimate emissions reduction from Action TR1-3 are provided in Table 23. The avoided emissions are calculated as the annual avoided VMT multiplied by the annual commuter emission factor. This results in a reduction of 17 MT CO<sub>2</sub>e by 2030 and 12 MT CO<sub>2</sub>e by 2045.

**Table 23 Action TR1-3 GHG Emissions Reduction Calculations**

Calculation Factor	2030	2045
Annual Commuter VMT <sup>1</sup>	1,345,751	1,345,751
Participation (%)	85%	85%
% VMT Reduced <sup>2</sup>	6%	6%
Annual Commuter VMT Reduced	80,072	80,072
Commuter GHG Emission Factor with Implementation of Action TR1-4 (MT CO <sub>2</sub> e/commuter mile) <sup>3</sup>	0.000211	0.000147
<b>GHG Emissions Avoided (MT CO<sub>2</sub>e)<sup>4</sup></b>	<b>17</b>	<b>12</b>

<sup>40</sup> CAPCOA TRT-6 <http://www.aqmd.gov/docs/default-source/ceqa/handbook/capcoa-quantifying-greenhouse-gas-mitigation-measures.pdf>

<sup>41</sup> The employee commute emission factor was calculated as the total commuter emissions divided by the annual commuter VMT where 2019 data served as the baseline for the inventory and future forecasted years were scaled based on the 2019 inventory. For data details see Appendix A – GHG Inventory and Forecast, of Coachella Valley Water District Climate Action and Adaptation Plan

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Notes: MT CO<sub>2</sub>e = metric tons of carbon dioxide equivalent; VMT = vehicle miles travelled; EV = electric vehicle; ZEV = zero-emission vehicle; ICE = internal combustion engine

Values have been rounded and may not add up exactly.

<sup>1</sup> CVWD 2019 commuter survey provided the number of trips travelled per week including mode of transport. Annual commuter VMT was estimated as the number of commuter trips by mode of transport multiplied by the average mileage per commuter trip multiplied by 50 weeks per year to account for a 2 week vacation. Average commute distance per employee was estimated based on the provided zip codes of all employees and the assumption that each employee commutes to the CVWD campus nearest their zip code.

<sup>2</sup> Percent VMT reduction is based on the linear trend between employee participation and % reduction in commuter VMT for a 9-day/80-hour work week (CAPCOA TRT-6). As a 2045 target was not set in the measure, it is assumed that the trends stay constant post 2030. <http://www.aqmd.gov/docs/default-source/ceqa/handbook/capcoa-quantifying-greenhouse-gas-mitigation-measures.pdf>

<sup>3</sup> A commuter emission factor (MT CO<sub>2</sub>e/commuter mile) was developed based on the total emissions from commuting and total commuter miles travelled. This commuter emission factor was calculated for CVWD's 2019 inventory and forecasted out for 2030 and 2045 to account for changes in emission factors by mode (i.e., single occupancy vehicles, EV penetration). For Action TR1-3 calculations it was assumed that Action TR1-4 was implemented to account for further adjustments to the commuter emission factor due to increased use of EV/ZEVs as a replacement to ICE commuter vehicles.

<sup>4</sup> Avoided GHG emissions is calculated as the reduced VMT multiplied by the commuter emission factor.

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**ACTION TR1-4: CONDUCT A ZEV/EV FEASIBILITY STUDY BY 2026 TO INVESTIGATE FUNDING OPPORTUNITIES OR PARTNERSHIPS TO INSTALL ZEV/EV INFRASTRUCTURE AT CVWD FACILITIES AND TO DETERMINE THE NUMBER AND LOCATIONS MOST EFFECTIVE FOR ZEV/EV INFRASTRUCTURE INSTALLATION. DISCUSS WITH SCE THEIR CURRENT PILOT PROGRAMS TO INSTALL INFRASTRUCTURE AT WORKPLACES AND EVALUATE FUTURE OPPORTUNITIES FOR CVWD TO HOST PILOT PROGRAM. (SUPPORTIVE)**

In order to achieve a zero-emission transportation sector, California has several policies and programs designed to provide incentives, rebates, or credit generating opportunities for both ZEV drivers and the deployment of ZEV infrastructure. There may be opportunities for CVWD to develop partnerships, receive rebates, or generate credits for installing ZEV infrastructure at CVWD campuses for employees and public visitors. This has the potential to reduce GHG emissions from CVWD employees' commutes as well as potentially offset the cost of ZEV infrastructure deployment. Some policies will scale back rebates or incentives as the market reaches self-sustainability, as such early adopters have greater access to incentives. Under this action, CVWD would evaluate incentives, credit generating opportunities, partnerships, and the return on investment to provide ZEV infrastructure for employees and visitors which would further encourage employees to drive personal ZEVs and maximize emissions reduction potential from Measure TR1.

**ACTION TR1-5: BASED ON FUNDING AND ZEV/EV FEASIBILITY STUDY, INSTALL ZEV AND/OR EV INFRASTRUCTURE TO SUPPORT AT LEAST A 15% TRANSITION TO ZEVs/EVs BY 2030 AND 30% BY 2045.**

CVWD does not have direct control over how its employees travel to and from their jobs. However, by providing EV charging or ZEV fueling infrastructure, CVWD can encourage employees to drive personal EVs or ZEVs, and shift how some individuals commute to work. One recognized hurdle for the use of EVs is range. By allowing employees to charge their vehicles during work, CVWD encourages the use of EVs. Estimates indicate that approximately 98 percent of EV charging occurs either at home or at work with 40 percent of charging events happening at work.<sup>42</sup> Based on current passenger vehicle registration and California's zero-emission vehicle market development strategy, including the Zero-Emission Vehicle Regulation, N-79-20, and Executive Order B-48-18, it is anticipated that by 2030 at least 15 percent of passenger vehicles on the road in California will be ZEVs.<sup>43</sup> As such, it is reasonable to assume the CVWD employees will follow a similar trend. The

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<sup>42</sup> <https://avt.inl.gov/sites/default/files/pdf/arra/PluggedInSummaryReport.pdf>

<sup>43</sup> <https://www.energy.ca.gov/data-reports/energy-almanac/transportation-energy/summary-california-vehicle-and-transportation#:~:text=Data%2C%20Facts%2C%20%26%20Statistics%20Vehicles%20%28As%20of%2010%2F1%2F2015%29,29%2C830%2C797%20Total%20registered%20light-duty%20cars%20in%20California%3A%2016%2C101%2C262>

number of employee commuting trips utilizing an ICE car to drive alone, or carpool is tracked in CVWD's 2019 commuter survey which tracks the number of employees commuting to work by car. According to the 2019 survey, on a weekly basis there are approximately 1,117 commuter trips conducted using an ICE vehicle. Based on the assumption that employees commute 50 weeks out of the year, including a 2 week vacation, and that the trip length of an employee's commute is on average 23.7 miles, in 2019 approximately 1,323,243 commuter miles were traveled in an ICE vehicle. It was assumed that under Action TR1-5, that EVs would be the predominant ZEV option that employees would transition to based on current market availability.

GHG emissions reduction from this measure are calculated as the difference in emissions generated from those employees commuting via an ICE vehicle fueled by fossil fuels and the emissions generated indirectly from electricity use to charge the EVs. Electricity consumptions for EV charging was calculated as the number of commuter miles transitioned from ICE vehicles to EVs multiplied by the equivalent electricity fuel efficiency. Equivalent electricity consumption needed to accommodate the switch is based on the average EV efficiency (34 kwh/100miles).<sup>44</sup> For the purposes of this calculation it is assumed that employees would charge vehicles at work to cover the commuting needs. As such, emissions generated from EV charging were calculated as the annual electricity consumption needed to accommodate all commuter VMT that transitioned to EVs with implementation of Action TR1-5 multiplied by the annual weighted electricity emission factor for the target year (i.e. 2030 and 2045). The weighted electricity emission factor was further adjusted to account for implementation of Measure E1, Action E1-1, specifically the switch of retail accounts to a 50 percent renewable energy options for all retail electricity sources. Incorporation of Action E1-1 would further reduce electricity emissions generated from EV charging. This results in a generation of approximately 8 MT CO<sub>2</sub>e in 2030 and 0 MT CO<sub>2</sub>e in 2045 due to electricity use from EV charging associated with the implementation of Action TR1-5.

The GHG emissions that would be avoided by the commuter population transitioning to EVs is based on the assumption that approximately 15 percent and 30 percent of VMT generated annually from traditional ICE vehicles would be avoided by 2030 and 2045, respectively. Annual commuter VMT from ICE vehicles is based on CVWD's 2019 commuter survey. As shown in Table 24, it was estimated that approximately 198,486 miles and 396,973 miles travelled by ICE-vehicles would be replaced by EVs if 15 percent and 30 percent, respectively, of commuters transitioned to EVs given 1,323,243 annual commuter miles. GHG emissions generated from ICE-vehicles was calculated as the annual VMT multiplied by the annual running emission factor for ICE-vehicles obtained from EMFAC2017.<sup>45</sup> Emission factors are weighted based on the percent of fuel type used per category of vehicle class (i.e., passenger vehicle). Because vehicle emissions are improving overtime, the annual emission factor applied to the annual vehicle miles travelled was interpolated between average vehicle emission factors in 2019 and anticipated in 2030 and 2045 using EMFAC2017 data.<sup>46</sup> The calculations and assumptions used to estimate emissions reduction from Action TR1-5 are provided in Table 24. As shown, with the implementation of Measure E1 and the transition of 15 percent and 30 percent of commuting from ICE-vehicles to EV, the GHG emissions avoided in 2030 would be approximately 40 MT CO<sub>2</sub>e and 84 MT CO<sub>2</sub>e by 2045.

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<sup>44</sup> <https://ecocostsavings.com/average-electric-car-kwh-per-mile/#:~:text=The%20average%20electric%20car%20kWh%20per%20100%20miles,100%20miles%20and%200.346kWh%20to%20travel%201%20mile.>

<sup>45</sup> <https://arb.ca.gov/emfac/2017/>

<sup>46</sup> Annual emission factors were interpolated between 0.00033 MT CO<sub>2</sub>e/mile in 2019 and 0.00024 MT CO<sub>2</sub>e/mile in 2030 and 0.00021 MT CO<sub>2</sub>e/mile in 2045.

**Table 24 Action TR1-5 GHG Emissions Reduction Calculations**

Calculation Factor	2030	2045
ICE Commuter VMT <sup>1</sup>	1,323,243	1,323,243
% of Commuters that Switch to EV Use <sup>2</sup>	15%	30%
ICE-vehicle VMT Replaced with EVs (VMT) <sup>3</sup>	198,486	396,973
Average Weighted ICE Emission Factor (MT CO <sub>2</sub> e/mile) <sup>4</sup>	0.00024	0.00021
Annual Emissions from ICE-vehicle VMT if not replace with EVs (MT CO <sub>2</sub> e)	48	84
Annual Electricity Demand (kWh/year) <sup>5</sup>	67,485	134,971
Annual Electricity Demand (MWh)	67	135
Average Electricity Emission Factor Assuming Implementation of Action E1-1 (MT CO <sub>2</sub> e/MWh) <sup>6,7</sup>	0.129	0.0
Emissions from EV Charging (MT CO <sub>2</sub> e) <sup>8</sup>	9	0
<b>GHG Emissions Avoided (MT CO<sub>2</sub>e)<sup>9</sup></b>	<b>39</b>	<b>84</b>

Notes: MT CO<sub>2</sub>e = metric tons of carbon dioxide equivalent; VMT = vehicle miles travelled; MWh = megawatt-hour; kWh = kilowatt-hour; ICE = internal combustion engine; EV = electric vehicle

Values have been rounded and may not add up exactly.

<sup>1</sup> CVWD 2019 commuter survey provided the number of trips travelled per week including mode of transport. Annual commuter VMT was estimated as the number of commuter trips by mode of transport multiplied by the average mileage per commuter trip multiplied by 50 weeks per year to account for a 2 week vacation. Average commute distance per employee was estimated based on the provided zip codes of all employees and the assumption that each employee commutes to the CVWD campus nearest their zip code.

<sup>2</sup> Assumed 15% of total commuter VMT would be replaced with EVs with implementation of Action TR1-4 by 2030 and 30% by 2045. These percentages of EV adoption are in alignment with anticipated state trends.

<sup>3</sup> Assumed 15% and 30% of total commuter VMT would be replaced with EVs with implementation of TR1-4.

<sup>4</sup> Annual emission factors were obtained from EMFAC2017 for 2019, 2030 and 2045. Emission factors were weighted based on fuel type per vehicle class (i.e., passenger vehicles).

<sup>5</sup> Equivalent electricity consumption needed to accommodate the switch is based on the average EV efficiency (34 kWh/100miles).

<sup>6</sup> Due to RPS, retail electricity emission factors (i.e., IID and SCE), will reduce over time. As described in *Section 2.1, Assumptions*, annual electricity emission factors for IID and SCE are interpolated based on the 2018 emission factor and percent of renewable sources and the 2030 emission factor that would result with the required 60% renewable sources. The presented emission factor is the weighted average retail electricity emission factors based on the average contribution of overall electricity by IID and SCE to CVWD electricity consumption with implementation of Measure E-1 where SCE and IID accounts would be switched to 50% Green Rate by 2022.

<sup>7</sup> Between 2016 and 2019, IID provided on average 45% of CVWD's overall electricity while SCE provided on average 55% of the overall electricity.

<sup>8</sup> Emissions associated with charging of EV chargers is calculated as the electricity demand in the target year multiplied by the average weighted electricity emission factor assuming implementation of Measure E1.

<sup>9</sup> Avoided emissions are calculated by subtracting the Emissions from EV charging from the Emissions from ICE-vehicle VMT.

### **ACTION TR1-6: EXPAND PROVIDED PREFERRED PARKING FOR EV/ZEVs TO INCENTIVIZE USE OF ZEVs/EVs BY EMPLOYEES. (SUPPORTIVE)**

This action supports Measure TR1 by expanding opportunity for zero emission vehicles and other electric vehicles to have parking spaces designated for these types of vehicles only. The impact of this incentive on rate of ZEV adoption is unknown; therefore, is not consider quantifiable.

### **ACTION TR1-7: PROMOTE EMPLOYEE USE OF CARBON-FREE AND LOW CARBON TRANSPORTATION BY PROVIDING EDUCATIONAL MATERIALS (E.G. FLYERS IN BREAK ROOMS, INFO ON TRANSPORTATION SURVEY, INFO ON WEBSITES) ON THE BENEFITS OF COMMUTE OPTIONS INCLUDING PUBLIC TRANSPORTATION, EV/ZEV OPTIONS, AND VANPOOLS. (SUPPORTIVE)**

Providing education to staff on the use of new programs and policies is a fundamental component of achieving significant and impactful change. The educational material should provide clear

information on the various commute options available to CVWD employees including public transportation, ZEV/EV options, and vanpools as well as the benefits to each option. Action TR1-7 supports Measure TR1 by providing education to motivate commuters to utilize less GHG emitting commuter options. However, the impacts of education on employee’s commuter behavior is not quantifiable, therefore, potential GHG reductions from Action TR1-6 was not quantified and the action is considered supportive.

*Results*

Table 25 summarizes the actions associated with Measure TR1 and potential GHG emissions reduction. Action TR1-3 and Action TR1-5 have the potential to reduce GHG emissions by approximately 56 MT CO<sub>2</sub>e by 2030 and 95 MT CO<sub>2</sub>e by 2045.

**Table 25 GHG Emissions Reduction Associated with Measure TR1**

Actions	Emission Reductions Potential (MT CO <sub>2</sub> e) 2030	Emission Reductions Potential (MT CO <sub>2</sub> e) 2045
<b>TR1-1</b> Continue to conduct annual SCAQMD transportation surveys to monitor CVWD employees needs and motivation for travelling by single occupancy vehicles versus alternatives. Based on survey results, expand or promote programs and incentives that have proven successful strategies in reducing employee VMT.		Supportive
<b>TR1-2</b> Continue to offer rideshare incentives to employees who carpool. Consider offering other incentives to employees to use an alternative mode of transportation to commute (e.g. public transportation, bikes).		Supportive
<b>TR1-3</b> Allow all employees located at CVWD Palm Desert and Coachella Campuses to utilize flexible 9/80 schedule through 2030 to reduce travel time, VMT, and GHG emissions.	17	12
<b>TR1-4</b> Conduct a ZEV/EV Feasibility Study by 2026 to investigate funding opportunities or partnerships to install ZEV/EV infrastructure at CVWD facilities and to determine the number and locations most effective for ZEV/EV infrastructure installation. Discuss with SCE their current pilot programs to install infrastructure at workplaces and evaluate future opportunities for CVWD to host pilot program.		Supportive
<b>TR1-5</b> Based on funding and ZEV/EV Feasibility Study, install ZEV and/or EV infrastructure to support at least a 15% transition to ZEVs/EVs by 2030 and 30% by 2045.	39	84
<b>TR1-6</b> Expand provided preferred parking for EV/ZEVs to incentivize use of ZEVs/EVs by employees.		Supportive
<b>TR1-7</b> Promote employee use of carbon-free and low carbon transportation by providing educational materials (e.g. flyers in break rooms, info on transportation survey, info on websites) on the benefits of commute options including public transportation, EV/ZEV options, and vanpools.		Supportive
<b>Total Emissions Reduction Potential</b>	<b>56</b>	<b>95</b>

Notes: MT CO<sub>2</sub>e = metric tons of carbon dioxide equivalent; ZEV = zero emission vehicle; EV = electric vehicle

## Measure WC1: Increase Water Conservation and Local Water Supply

As discussed, most of CVWD's emissions are a result of pumping, treatment, and delivery of water to its customers. Water conservation strategies that reduce per capita water consumption indirectly reduce energy emissions used to supply water and provide a co-benefit of protecting one of California's scarcest resources, water.

CVWD has a long history of incentivizing water conservation, which has resulted in measurable reductions in retail water usage (and CVWD's GHG emissions). CVWD has had a number of successful water conservation programs such as turf reduction on golf courses, providing rebates for water efficient appliances, practicing xeriscaping, and developing education programs for specific customer groups such as the Agricultural Water Advisory Group. CVWD achieved a 20 percent reduction in per capita water use as required by the Water Conservation Act of 2009, and plans to continue and expand its water conservation efforts to align with future water conservation policies. As a water supplier, CVWD is subject to the requirements of the various State policies, regulations, and requirements imposed on water suppliers. CVWD complies with regulatory requirements and actively engages in water conservation efforts. Reduced per capita water consumption allows CVWD to meet the water demands of a growing population and reduce operational emissions.

Measure WC1 involves several different types of measures for water conservation including measures that promote water conservation by consumers, implementation of water conservation programs and initiatives, and implementation of water efficient practices and technologies. Many of the actions are built on existing water conservation actions that CVWD practices. Measure WC1 is currently made up of supportive actions and is not quantified as the continued water conservation efforts are dependent on receiving adequate funding and future water conservation goals will not be established until updates to the Water Conservation Act are adopted. GHG emission reductions achieved through implementation of Measure WC1 are anticipated to be quantified in future iterations of the CAAP

### *Methodology and Assumptions*

**ACTION WC1-1: EXPAND PROGRAMS WHICH EDUCATE CUSTOMERS ON WATER CONSERVATION INITIATIVES THROUGH WORKSHOPS AND SPEAKING ENGAGEMENTS. IN COORDINATION WITH RETAIL WATER SUPPLIERS, HOST REGULAR WORKSHOPS AND CLASSES ON WATER CONSERVATION, INCLUDING PROVIDING INFORMATION ON DROUGHT-TOLERANT LANDSCAPING, AVAILABLE REBATES FOR WATER RETROFITS, AND WATER EFFICIENCY STRATEGIES IN NEW BUILDINGS. CONTINUE TO OFFER WORKSHOPS AND CLASSES EVEN WHEN DROUGHT CONDITIONS ARE NOT PRESENT. DEVELOP OUTREACH MATERIALS FOR WATER CONSERVATION. (SUPPORTIVE)**

This action incrementally supports Measure WC1 by providing educational programs throughout the service area to educate customers on water conservation initiatives and strategies. Such educational programs can encourage end user behavioral changes that promote water conservation. However, the impacts of education on customers' behavior is not quantifiable, therefore, the measure is considered supportive.

**ACTION WC1-2: CONTINUE TO WORK WITH AGRICULTURAL WATER ADVISORY GROUP TO TEACH FARM OWNERS, MANAGERS, AND IRRIGATORS CONCEPTS IN IRRIGATION WATER AND SALINITY MANAGEMENT AS WELL AS PROMOTE NEW TECHNOLOGY TO HELP THE CONSERVATION EFFORT. APPLY FOR GRANT-**

**FUNDED AGRICULTURAL REBATE PROGRAMS TO ASSIST THOSE IN THE AGRICULTURE INDUSTRY TO REDUCE WATER USE. (SUPPORTIVE)**

This action supports Measure WC1 by providing educational and logistical support to the Agricultural Water Advisory Group to teach water conservation concepts. As CVWD supplies a significant amount of water for irrigation and other agricultural purposes, this action helps to meet the goals of Measure WC1 by promoting water conservation in agricultural practices. Further with obtaining grant funding, CVWD can offer rebate programs to directly assist in reducing water use for agricultural purposes having a measurable impact on GHG emissions. This action is not currently considered quantifiable, however may be quantifiable in the future after grant funding has been secured.

**ACTION WC1-3: ANALYZE CURRENT WATER USE REDUCTION PROGRAMS TO IDENTIFY WHICH PROGRAMS HAVE THE HIGHEST ADOPTION RATE AND WATER USE REDUCTION IMPACTS. EXPAND THOSE PROGRAMS WHICH ARE FOUND TO BE MOST EFFECTIVE. (SUPPORTIVE)**

This action builds on Action WC1-1 by providing the information needed to expand effective water use reduction programs. This action ensures that water conservation efforts will continue to evolve and improve strategically. Improvements in water conservation programs or technologies can indirectly reduce GHG emissions associated with water management. Because it is unclear to the extent that evaluating existing programs and initiatives or piloting new programs will improve water conservation, Action WC1-3 is not quantified and is considered supportive.

**ACTION WC1-4: PREPARE A FORMAL LANDSCAPE MANAGEMENT PLAN FOR CVWD THAT CONSOLIDATES AND EXPANDS UPON THE GOALS AND POLICIES FOR LANDSCAPING AT CVWD PROPERTY. THE PLAN SHOULD IDENTIFY WHETHER AND WHERE THERE ARE RESOURCE-CONSUMPTIVE LANDSCAPES ON CVWD PROPERTY THAT CAN BE CHANGED OUT TO MORE WATER-CONSERVING, SLOWER GROWTH PLANTS THAT REQUIRE LESS MAINTENANCE. CONTINUE TO IMPLEMENT POTABLE WATER CONSERVATION STRATEGIES IN LANDSCAPE DESIGN AND MAINTENANCE (SUCH AS REPLACING WATER INTENSIVE AREAS WITH DROUGHT-RESILIENT NATIVE PLANTS [BERMUDA GRASS], USING LOW-FLOW WATER FIXTURES, INSTALLING SOPHISTICATED IRRIGATION SOFTWARE TO CONTROL WATER, INVESTING IN SYSTEMS TO MONITOR PIPE LEAKAGE, AND LIMITING TURF DEVELOPMENT). (SUPPORTIVE)**

Under Action WC1-4, CVWD will ensure that existing or new water-intensive landscaping will replace or use, respectively, more drought-resilient species to practice water conservation. This action shows CVWD's commitment to serve as an example of water conservation practices that can be employed. As this action involves the development of the policy and plan, there is no direct quantifiable GHG emission reductions associated with this action.

**ACTION WC1-5: REQUIRE NEW OR REDEVELOPED CVWD DEVELOPMENTS TO BE LOW WATER USE THROUGH LANDSCAPING WITH DROUGHT TOLERANT PLANTS, PERMEABLE PAVING, GREEN INFRASTRUCTURE, AND INCORPORATING OTHER LOW-IMPACT DEVELOPMENT DESIGN FEATURES TO ALLOW FOR INCREASED INFILTRATION, EVEN IN HEAVY RAINS. (SUPPORTIVE)**

This action builds on Action WC1-5 by requiring that any new or redeveloped CVWD landscapes be consistent with the developed landscape management plan and employ water conservation efforts. As it is unclear what amount of landscaping may be replaced, this action is not considered quantifiable.

**ACTION WC1-6: CONTINUE TO PROMOTE WATER CONSERVATION THROUGH XERISCAPING THROUGH XERISCAPE DEMONSTRATION GARDENS AND EDUCATIONAL MATERIAL. (SUPPORTIVE)**

This supports Measure WC1, by continuing a water conservation program that educates the community about Xeriscaping. Xeriscaping is a design of landscaping that is intended to require little to no irrigation of the plants used. Because it is unclear to the extent that educational programs will improve water conservation throughout the community, Action WC1-6 is not quantified and is considered supportive.

**ACTION WC1-7: COMPLETE AND IMPLEMENT IRRIGATION MASTER PLAN THAT ESTABLISHES GOALS AND A TIMELINE FOR IMPROVED WATER CONSERVATION RELATED TO IRRIGATION. THE PLAN SHOULD IDENTIFY THE OPPORTUNITIES FOR REPLACEMENT OF GROUNDWATER USE FOR IRRIGATION WITH RECYCLED WATER USE, INCLUDING A COST ASSESSMENT AND PRIORITIZATION OF OPPORTUNITIES. (SUPPORTIVE)**

This action directly supports Measure WC1. By replacing the use of groundwater for irrigation with recycled water will work toward increasing the water supply available for the community during drought times. It is not yet clear to what extent that groundwater for irrigation may be replaced with recycled water, therefore this action is considered supportive at this time and not quantified.

**ACTION WC1-8: SEEK ADDITIONAL GRANT FUNDING TO EXPAND THE GOLF COURSE CONSERVATION PROGRAM WITH A GOAL TO REMOVE/REPLACE AN ADDITIONAL 115,000 SQUARE FEET OF TURF BY 2030. (SUPPORTIVE)**

CVWD has previously removed and replaced turf using grant funding under the Golf Course Conservation Program. GHG emissions reduction associated with implementation of Action WC1-8 are based on the amount of water saved due to turf conversion and the associated reduction in energy needed for supplying that amount of water. However, because this program is dependent on grant funding, until funding is received CVWD will not be able to conduct further turf conversions. Therefore, this action is currently not considered quantifiable. With receipt of funding the impact of turf conversion on GHG emission reductions will be quantified.

**ACTION WC1-9: CONTINUE TO IMPLEMENT AND EXPAND ON SUCCESSFUL WATER CONSERVATION REBATE PROGRAMS (E.G., WATER AUDITS PROGRAM FOR LARGE WATER USERS, RESIDENTIAL SMART CONTROLLER REBATE PROGRAM, COMMERCIAL IRRIGATION UPGRADE PROGRAM, COMMERCIAL LANDSCAPE REBATE PROGRAM, RESIDENTIAL LANDSCAPE CONVERSION REBATE PROGRAM, COMMERCIAL PRE-RINSE NOZZLE REBATE PROGRAM, COMMERCIAL WATER BROOM REBATE PROGRAM, RESIDENTIAL HOT WATER RECIRCULATING PUMP REBATE PROGRAM, COMMERCIAL WATER EFFICIENT TOILET REBATE PROGRAM, RESIDENTIAL ULTRA-LOW FLUSH TOILET REPLACEMENT REBATE PROGRAM, RESIDENTIAL HIGH EFFICIENCY WASHING MACHINE REBATE PROGRAM) IN ALIGNMENT WITH THE CURRENT STATEWIDE WATER CONSERVATION GOALS. (SUPPORTIVE)**

This action is considered supportive of the Measure WC1. Continued implementation of effective water reduction programs through rebates will maintain lower water uses and benefit from the additional educational programs that will be implemented through other actions in this measure. New statewide water conservation goals are currently in development. Once established, CVWD will update the rebate program and the associated per capita water reduction goals in alignment with the statewide goals at which point this action will be quantifiable.

**ACTION WC1-10: DEVELOP AND ADOPT A SCHEDULE FOR INSTALLATION OF WATER METERS IN EXISTING BUILDINGS AND IRRIGATION ZONES TO ESTABLISH A WATER CONSUMPTION BASELINE AT CVWD OWNED**

**PROPERTIES WITH THE FACILITIES GROUP. REDUCE CVWD WATER CONSUMPTION PER CAPITA AT FACILITIES IN ALIGNMENT WITH THE CURRENT STATEWIDE GOALS. (SUPPORTIVE)**

This action builds on Actions WC1-4 and WC1-5. By installing water meters at existing CVWD facilities and irrigation zones, CVWD can better understand their current water uses and establish goals for operational reductions. This action show CVWD’s commitment to serve as an example of water conservation practices that can be employed. New statewide water conservation goals are currently in development. Once established, CVWD will develop water consumption reduction goals in alignment with the statewide goals at which point this action will be quantifiable.

**ACTION WC1-11: INVESTIGATE NEW ADVANCE TECHNOLOGY SYSTEMS TO INCREASE DISTRICT’S RECYCLED AND GROUND-WATER RECOVERY SYSTEMS TO MAINTAIN LOCAL WATER SUPPLY (E.G., MID-VALLEY PIPELINE PROJECT). INVEST IN SUCH TECHNOLOGY AS IT BECOMES FEASIBLE AND COST-EFFECTIVE. (SUPPORTIVE)**

This action is considered supportive of Measure WC1. Exploring new technologies for increase recycled water capacity and facilitating groundwater recharge and recovery will increase the water supply and improve resiliency of the local water supply.

*Results*

Table 26 summarizes the actions associated with Measure WC1. The measures are collectively supportive and are aimed at increasing water conservation in CVWD’s own operations as well as through building on existing CVWD efforts. Measure WC1 is currently made up of supportive actions and is not quantified as the continued water conservation efforts are dependent on receiving adequate funding and future water conservation goals will not be established until updates to the Water Conservation Act are adopted. GHG emission reductions achieved through implementation of Measure WC1 are anticipated to be quantified in future iterations of the CAAP

**Table 26 GHG Emissions Reduction Associated with Measure WC1**

Actions	Emission Reductions Potential (MT CO <sub>2</sub> e) 2030	Emission Reductions Potential (MT CO <sub>2</sub> e) 2045
<b>WC1-1</b> Expand programs which educate customers on water conservation initiatives through workshops and speaking engagements. In coordination with retail water suppliers, host regular workshops and classes on water conservation, including providing information on drought-tolerant landscaping, available rebates for water retrofits, and water efficiency strategies in new buildings. Continue to offer workshops and classes even when drought conditions are not present. Develop outreach materials for water conservation.		Supportive
<b>WC1-2</b> Continue to work with Agricultural Water Advisory Group to teach farm owners, managers, and irrigators concepts in irrigation water and salinity management as well as promote new technology to help the conservation effort. Apply for grant-funded agricultural rebate programs to assist those in the agriculture industry to reduce water use.		Supportive
<b>WC1-3</b> Analyze current water use reduction programs to identify which programs have the highest adoption rate and water use reduction impacts. Expand those programs which are found to be most effective.		Supportive

<b>WC1-4</b> Prepare a formal landscape management plan for CVWD that consolidates and expands upon the goals and policies for landscaping at CVWD property. The Plan should identify whether and where there are resource-consumptive landscapes on CVWD property that can be changed out to more water-conserving, slower growth plants that require less maintenance. Continue to implement potable water conservation strategies in landscape design and maintenance (such as replacing water intensive areas with drought-resilient native plants [Bermuda grass], using low-flow water fixtures, installing sophisticated irrigation software to control water, investing in systems to monitor pipe leakage, and limiting turf development).	Supportive
<b>WC1-5</b> Require new or redeveloped CVWD developments to be low water use through landscaping with drought tolerant plants, permeable paving, green infrastructure, and incorporating other low-impact development design features to allow for increased infiltration, even in heavy rains.	Supportive
<b>WC1-6</b> Continue to promote water conservation through xeriscaping through xeriscape demonstration gardens and educational material.	Supportive
<b>WC1-7</b> Complete and implement Irrigation Master Plan that establishes goals and a timeline for improved water conservation related to irrigation. The Plan should identify the opportunities for replacement of groundwater use for irrigation with recycled water use, including a cost assessment and prioritization of opportunities.	Supportive
<b>WC1-8</b> Seek additional grant funding to expand the Golf Course Conservation program with a goal to remove/replace an additional 115,000 square feet of turf by 2030.	Supportive
<b>WC1-9</b> Continue to implement and expand on successful water conservation rebate programs (e.g., Water audits program for large water users, Residential smart controller rebate program, Commercial irrigation upgrade program, Commercial landscape rebate program, Residential landscape conversion rebate program, Commercial pre-rinse nozzle rebate program, Commercial water broom rebate program, Residential hot water recirculating pump rebate program, Commercial water efficient toilet rebate program, Residential ultra-low flush toilet replacement rebate program, Residential high efficiency washing machine rebate program) in alignment with the current Statewide water conservation goals.	Supportive
<b>WC1-10</b> Develop and adopt a schedule for installation of water meters in existing buildings and irrigation zones to establish a water consumption baseline at CVWD owned properties with the Facilities Group. Reduce CVWD water consumption per capita at facilities in alignment with the current statewide goals.	Supportive
<b>WC1-11</b> Investigate new advance technology systems to increase District's recycled and ground-water recovery systems to maintain local water supply (e.g., Mid-Valley Pipeline Project). Invest in such technology as it becomes feasible and cost-effective.	Supportive
<b>Total Emissions Reduction Potential</b>	<b>Supportive</b>

Notes: MT CO<sub>2</sub>e = metric tons of carbon dioxide equivalent; ZEV = zero emission vehicle; EV = electric vehicle

## Measure CS1: Investigate and Implement Carbon Capture and Sequestration Opportunities

Carbon capture and storage refers to the process of capturing CO<sub>2</sub> emissions from the atmosphere or an industrial process, transporting it, and storing it in deep geological formations, the ocean, or

minerals. Carbon sequestration programs will be an important tool to mitigate some of CVWD's emissions particularly in the development of future GHG reduction strategies). There currently are no regulations or policies requiring CVWD to invest in carbon capture or sequestration. However, as noted in the 2017 California Scoping Plan and California Natural and Working Lands Implementation Plan, the State recognizes the importance that carbon capture and sequestration as strategy that will become increasingly important as we reduce GHG emissions from current operations and sectors. Additionally, there are potential credit generation opportunities based on CARB's "Carbon Capture and Sequestration protocol" adopted in 2018 as well as through other voluntary and federal carbon markets. As such, it is important to plan in advance for potential implementation of sequestration programs that can be used as mitigation.

Although no reductions were quantified for this measure, Measure CS1 looks at future opportunities for negative emissions through carbon capture and storage and/or carbon sequestration on natural and working lands (e.g., rangeland, forests, woodlands, wetlands and coastal areas, grasslands, shrubland, farmland, riparian areas, and urban green space). Direct GHG emissions reduction for this measure are dependent on the carbon capture or sequestration opportunities available and the extent to which these opportunities actively remove CO<sub>2</sub>e from the atmosphere. As such, the actions making up Measure CS1 focus on conducting research to understand opportunities and conducting pilot studies to evaluate the benefit.

#### *Methodology and Assumptions*

**ACTION CS1 – 1: AS PART OF THE CURRENTLY CVWD PUBLISHED LANDSCAPE MANUAL, INCLUDE INFORMATION REGARDING FLORA AND FAUNA CO<sub>2</sub> SEQUESTRATION POTENTIAL TO PROMOTE THE INCORPORATION OF LANDSCAPE PLANTS THAT ARE BOTH LOW WATER AND CO<sub>2</sub> SEQUESTERING. CONSIDER VEGETATIVE OPTIONS WITH HIGHER CO<sub>2</sub> SEQUESTRATION POTENTIAL FOR CVWD FACILITIES LANDSCAPING. (SUPPORTIVE)**

By considering vegetative options for both their CO<sub>2</sub> storing potential and low water needs this action supports both Measure WC1 and Measure CS1. Further, incorporation of such information into CVWD's Landscape Manual provides educational information for CVWD customers and may help promote more strategic landscaping within CVWD's service area. However, the impacts of education on customers' behavior is not quantifiable, therefore, the measure is considered supportive.

**ACTION CS1 – 2: RESEARCH/EVALUATE THE CARBON SEQUESTRATION POTENTIAL OF THE CVWD CONSTRUCTED HABITAT PROJECT CURRENTLY IN DESIGN. DEVELOP PARTNERSHIPS WITH APPROPRIATE AGENCIES, SUCH AS THE WILDLIFE AGENCY, TO INVESTIGATE POTENTIAL CARBON SEQUESTRATION PROJECTS TO COLLABORATE ON. (SUPPORTIVE)**

This action directly supports Measure CS1 by evaluating the carbon sequestration potential of a currently in design habitat project and allows for advanced planning. Since the research and evaluation has not be conducted yet, this action is not yet quantifiable.

#### *Results*

Table 27 summarizes the actions associated with Measure CS1 and potential GHG emissions reduction. The measures are collectively supportive and are aimed at increasing carbon sequestration through CVWD habitat projects and promoting strategic landscaping to improve carbon sequestration potential in CVWD's service area.

**Table 27 GHG Emissions Reduction Associated with Measure CS1**

Actions	Emission Reductions Potential (MT CO <sub>2</sub> e) 2030	Emission Reductions Potential (MT CO <sub>2</sub> e) 2045
<b>CS1-1</b> As part of the currently CVWD published Landscape Manual, include information regarding flora and fauna CO <sub>2</sub> sequestration potential to promote the incorporation of landscape plants that are both low water and CO <sub>2</sub> sequestering. Consider vegetative options with higher CO <sub>2</sub> sequestration potential for CVWD facilities landscaping.		Supportive
<b>CS1-2</b> Research/evaluate the carbon sequestration potential of the CVWD Constructed Habitat Project currently in design. Develop partnerships with appropriate agencies, such as the wildlife agency, to investigate potential carbon sequestration projects to collaborate on.		Supportive
<b>Total Emissions Reduction Potential</b>		<b>Supportive</b>

Notes: MT CO<sub>2</sub>e = metric tons of carbon dioxide equivalent; ZEV = zero emission vehicle; EV = electric vehicle

### **Measure CR1: Reduce construction-related GHG emissions through construction fleet requirements**

Emissions from construction activities are estimated to contribute up to 8 percent of CVWD's overall GHG emission profile. Depending on the approved funding and Capital Investment Projects underway, emissions from construction can vary. Further, CVWD does not have direct control over construction emissions other than the contracting particular fleets for a project. However, by ensuring CVWD is only contracting with construction fleets that are in compliance with current regulations, construction emissions will decrease over time as construction fleets in compliance will have to meet established phase-in schedules for newer engines. State goals to transition to zero-emissions off-road equipment will further reduce emissions as technology improves for such types of equipment.

#### *Methodology and Assumptions*

**ACTION CR1 – 1: IN ALIGNMENT WITH CALIFORNIA' REGULATION FOR IN-USE OFF-ROAD DIESEL-FUELED FLEETS, ADOPT A POLICY REQUIRING THAT CONSTRUCTION FLEETS AVERAGE FLEET INDEX ARE EQUAL TO OR ARE LESS THAN THE ANNUAL FLEET AVERAGE TARGET AND PRIORITIZES TIER 3 OFF-ROAD DIESEL-POWERED CONSTRUCTION EQUIPMENT GREATER THAN 50 HP WHEN EQUIPMENT IS AVAILABLE AND FEASIBLE. IN ADDITION, PRIORITIZE USE OF CONSTRUCTION EQUIPMENT THAT IS OUTFITTED WITH BACT DEVICES CERTIFIED BY CARB, AND EMISSIONS CONTROL DEVICES USED BY THE CONTRACTOR SHALL ACHIEVE EMISSIONS REDUCTIONS THAT ARE NO LESS THAN WHAT COULD BE ACHIEVED BY A LEVEL 3 DIESEL EMISSIONS CONTROL STRATEGY FOR A SIMILAR-SIZED ENGINE AS DEFINED BY CARB REGULATIONS BY 2023. (SUPPORTIVE)**

Under Action CR1-1, CVWD would adopt a policy that is in alignment with state guidelines regarding emissions from construction where construction fleets that CVWD contracts with will be required to comply with the Off-Road Diesel Regulation. The Off-Road Diesel Regulation restricts adding off-road equipment with less than a Tier 3 engine to the fleet after 2023 and requires fleets to reduce their emissions by retiring, replacing, or repowering older engines, or installing Verified Diesel Emission Control Strategies (VDECS) to achieve the fleet average target. Additionally, fleets must meet average emission level comparable to current diesel engine emission standards by 2028. With

EO N-75-20, technology for off-road vehicles is anticipated to continue to advance, providing cost-effective options for off-road equipment. This action is considered supportive by construction fleet emissions being mitigated to the extent feasible. Because CVWD does not have operational control over construction contractor’s equipment fleet, this action is not considered quantifiable.

*Results*

Table 28 summarizes the actions associated with Measure CR1 and potential GHG emissions reduction. The action under this measure is considered supportive of Measure CR1 by ensuring that construction fleets contracting with CVWD are compliant with the state regulations and emissions from construction fleets are reduced to the level feasible without placing undue burden on CVWD to find construction contractors with specialized fleet equipment.

**Table 28 GHG Emissions Reduction Associated with Measure CR1**

Actions	Emission Reductions Potential (MT CO <sub>2</sub> e) 2030	Emission Reductions Potential (MT CO <sub>2</sub> e) 2045
<b>CR1-1</b> In alignment with California’ Regulation for In-Use Off-Road Diesel-Fueled Fleets, adopt a policy requiring that construction fleets average fleet index are equal to or are less than the annual fleet average target and prioritizes Tier 3 off-road diesel-powered construction equipment greater than 50 hp when equipment is available and feasible. In addition, prioritize use of construction equipment that is outfitted with BACT devices certified by CARB, and emissions control devices used by the contractor shall achieve emissions reductions that are no less than what could be achieved by a Level 3 diesel emissions control strategy for a similar-sized engine as defined by CARB regulations by 2023.		Supportive
<b>Total Emissions Reduction Potential</b>		<b>Supportive</b>

### 3 Conclusion

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As the CAAP is not intended to be a “CEQA qualified” GHG Reduction Plan, the targets that CVWD adopts are not binding but represent CVWD’s best intentions with respect to GHG emissions reduction efforts. As such, while the measures and actions identified in this CAAP will not fully close the gap between CVWD’s forecasted emissions and its GHG emission targets, implementation of the measures lead to significant progress in reducing GHG emissions and provide a foundation for aligning with State goals. Future CAAP updates will build on existing measures herein as well as outline new measures to further close the gap between CVWD’s forecasted emissions and its GHG emission targets with increased focus on the ultimate long-term 2045 goal of carbon neutrality.

As the current measures and actions are implemented, CVWD will gain more information, new technologies will emerge, funding opportunities will be identified, and current pilot projects and programs are anticipated to scale up in size to increase the GHG reduction potential. Furthermore, the State is expected to continue to update regulations and provide support once the 2030 target is achieved. To monitor progress over time, CVWD will conduct annual implementation monitoring of the GHG emission reduction measures and report on progress. CVWD will also annually update the energy sector data for the GHG inventory, with an evaluation of other sectors every three years. The process for monitoring and quantifying measure implementation status relies on key target metrics identified for each of the measures and actions. The CAAP implementation metrics will be monitored on an annual basis starting in 2022 while the CAAP’s measures and actions will be reevaluated and updated as needed every five years or more frequently.

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