California Department of Water Resources

Climate Action Plan Phase 1
Greenhouse Gas Emissions Reduction Plan
Update 2020

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Abbreviations and Acronyms

2012 Plan	Greenhouse Gas Emissions Reduction Plan adopted by DWR in 2012
AB	Assembly Bill
BMP	Best Management Practices
CAISO	California Independent System Operator
CARB	California Air Resources Board
CCAR	California Climate Action Registry
CCR	California Code of Regulations
CEC	California Energy Commission
CEQA	California Environmental Quality Act
CPUC	California Public Utilities Commission
CO_2	Carbon Dioxide
CO_2e	Carbon Dioxide Equivalents
CVP	Central Valley Project
GHG	Greenhouse Gas
DWR	California Department of Water Resources
ECM	Enterprise Content Management
EE	Energy Efficiency
eGRID	Emissions & Generation Resource Integrated Database
EIR	Environmental Impact Report
EO	Executive Order
EPA	United States Environmental Protection Agency
EPP	Environmentally Preferable Purchasing
FSOR	Final Statement of Reasons (CEQA Guideline Amendments)
HVAC	Heating Ventilation and Air Conditioning
IPCC	Intergovernmental Panel on Climate Change
LEC	Lodi Energy Center
LED	Light Emitting Diode
LEED	Leadership in Energy and Environmental Design
LPG	Liquid Petroleum Gas
MAF	Million Acre-Feet
$mtCO_2e$	Metric Tons of Carbon Dioxide Equivalent
MWh	Megawatts Hour
NAAQS	National Ambient Air Quality Standards
O&M	Operations and Maintenance
PARO	SWP Power and Risk Office

REPP	Renewable Energy Procurement Plan
RG4	DWR's share of Unit #4 of the Reid Gardner Power Station
RPS	Renewables Portfolio Standard
SB	Senate Bill
SF_6	Sulfur Hexafluoride
SMUD	Sacramento Municipal Utility District
SRFCP	Sacramento River Flood Control Project
SWP	State Water Project
TCR	The Climate Registry
Update 2020	Greenhouse Gas Emissions Reduction Plan Update 2020
ZNE	Zero Net Energy

Photo 1 California Aqueduct

Summary

The California Department of Water Resources' (DWR) greenhouse gas (GHG) emissions in 1990 were nearly 3.5 million metric tons, roughly the equivalent of a 400 MW coal-fired powerplant or 700,000 passenger cars (EPA Greenhouse Gas Emissions Typical Passenger Vehicle). Typically, most of DWR's emissions are associated with energy purchased to move water through the State Water Project (SWP), which DWR owns, operates, and maintains.

In 2012, DWR developed the Greenhouse Gas Emissions Reduction Plan (2012 Plan) as the first phase of its Climate Action Plan to guide decision-making related to energy use and GHG emissions. As it committed to in 2012, DWR has developed this Greenhouse Gas Emissions Reduction Plan Update 2020 (Update 2020) to review its GHG reductions since the 2012 Plan and to update strategies for further reduction consistent with legislative changes, including the GHG emissions reduction targets established in Senate Bill (SB) 32 (2016), SB 100 (2018), Executive Order B-18-12 (2012), Executive Order B-30-15 (2015), and Executive Order B-55-18 (2018). Since the 2012 Plan was adopted, California's wholesale electricity market has also seen a significant increase in renewable resources. To reflect this change and to align with industry practice in emission reporting, Update 2020 incorporates updated emission factors to determine emissions from unspecified market resources.

DWR's near-term goal in the 2012 Plan was to reduce its emissions to 50 percent below 1990 emissions level by 2020. DWR achieved this goal five years early and received a Climate Leadership Award for this accomplishment in 2018. For Update 2020, DWR lays out the following mid-term and long-term GHG emissions reduction goals to guide decision-making beyond 2020:

- Mid-term Goal — By 2030, reduce GHG emissions to at least 60 percent below the 1990 level.
- Long-term Goal — By 2045, supply 100 percent of electricity load with zero-carbon resources and achieve carbon neutrality.

To meet these GHG emissions reduction goals, DWR has implemented or plans to implement the following measures:

- Replace energy from Reid Gardner Power Station Unit #4 (RG4) with less GHG-intensive resources.
- Increase efficiency of SWP pumps and generators through replacement and refurbishment.
- Increase the use of renewable energy to operate the SWP.
- Develop renewable energy projects on DWR's property.
- Replace low-emission energy from Lodi Energy Center (LEC) with zero carbon energy.
- Sequester carbon through environmental restoration activities.
- Increase the use of zero carbon energy to operate the SWP.
- Implement construction Best Management Practices (BMP) and comply with regulations.
- Reduce sulfur hexafluoride (SF_6) emission.
- Purchase renewable energy from local utilities' retail energy programs.
- Purchase carbon offsets.
- Implement business practices to reduce energy consumption.
- Improve building and equipment energy efficiencies.

Besides GHG emission reduction measures, other important factors that affect DWR's GHG emissions include hydrologic conditions, water demands, regulatory constraints, and electricity market characteristics. Therefore, the GHG emission estimates included in Update 2020 are based on available information and are subject to change. Although GHG emissions will vary from year to year, DWR expects to exceed its Mid-term Goal, as shown in Table 1, by implementing GHG-reduction measures. DWR also anticipates meeting its Long-term Goal and will provide additional details in the next plan update to reflect evolving technologies and ongoing changes in regulatory policies and their implementation.

Table 1 Historical and Projected Annual GHG Emission

Emission Status	2014–2018 Average	2030	2045
GHG Emission ($mtCO_2e$)	668,758	488,993	0
Reduction from 1990 Level	76%	82%	100%

DWR will monitor the implementation of the GHG-reduction measures and commits to another update of the Greenhouse Gas Emissions Reduction Plan in 2030. If results of the monitoring activities indicate that DWR will not meet its GHG-reduction goals, DWR may add additional measures or take other actions. To help keep its plan on track, DWR will continue to report its GHG emissions to The Climate Registry (TCR), which is an organization that designs and operates GHG-reporting programs. In 2019, DWR received the highest level of recognition from TCR for complete reporting, transparency, emission reduction goal achievement and GHG emission and compliance management.

In addition to providing the plan for meeting GHG emissions reduction targets, Update 2020 will also be used for DWR's California Environmental Quality Act (CEQA) analysis of future DWR projects' potential contribution to the cumulative impact of increased GHG concentrations in the atmosphere. A CEQA Initial Study and negative declaration analyzing the environmental effects of the 2012 Plan was adopted in 2012. For the purposes of Update 2020, DWR prepared an addendum to the negative declaration pursuant to CEQA Guidelines Sections 15162(b) and 15164(b). In the addendum, DWR evaluated the changes to the 2012 Plan under Update 2020 and changes in surrounding circumstances (including legislative, regulatory, and market changes) and concluded that these changes would not cause any new significant environmental impacts that would require preparation of a subsequent negative declaration or an environmental impact report.

Photo 2 Sacramento-San Joaquin Delta

I. Introduction

DWR's mission is to manage the water resources of California, in cooperation with other agencies, to benefit the state's people and to protect, restore, and enhance the natural and human environment. DWR pursues its mission through a wide array of activities including managing, operating, and maintaining the SWP; maintaining levees throughout the Central Valley of California; reviewing, awarding, and managing grants and local assistance programs; planning, constructing, and managing a wide range of water supply, flood control, and environmental restoration projects throughout the state; and regulating the safety of dams within DWR's authority.

These activities can result in the release of GHGs that are linked to anthropogenic climate change. Consequently, DWR developed a Climate Action Plan to guide how it addresses climate change for the programs, projects, and activities over which it has authority. Phase 1 of the Climate Action Plan is DWR's emissions reduction plan, which was initially completed in 2012; Update 2020 is the first update of this 2012 Plan. Phase 2 is DWR's framework and guidance for consistent incorporation and alignment of analysis for climate change impacts, and Phase 3 is DWR's climate change vulnerability assessment and adaptation plan. Consistent with the Climate Action Plan, DWR is also firmly committed to its Sustainability Policy, which is presented in Appendix A.

Update 2020 provides historical and projected GHG emissions from DWR's activities, delineates GHG emissions reduction goals, sets forth DWR's measures to achieve its GHG emissions reduction goals, and commits DWR to regularly monitoring and, if necessary, amending the plan to achieve those goals.

Photo 3 Citrus Growing in Penryn

II. Purpose and Goals

Update 2020 documents DWR's GHG reductions since the 2012 Plan and updates the plan to further reduce GHG emissions consistent with the State's GHG emissions reduction targets as follows:

- Mid-term Goal: By 2030, reduce GHG emissions to at least 60 percent below the 1990 level.
- Long-term Goal: By 2045, supply 100 percent of electricity load with zero-carbon resources and achieve carbon neutrality.

DWR's Mid-term Goal exceeds the statewide emissions reduction target of 40 percent below the 1990 level by 2030, which was established in Senate Bill 32 (2016). DWR's Long-term Goal is consistent with the emissions reduction goals and policies established in Senate Bill 100 (2018) and Executive Order B-55-18 (2018). By achieving carbon neutrality by 2045, DWR will also exceed the statewide goal of reducing emissions by at least 80 percent below the 1990 level by 2050, which was established in Executive Order S-3-05 (2005). Please refer to Chapter IV and Appendix B for a summary of key federal and State statutes, regulations, and policies that informed the analysis, goals, and strategies included in this Update 2020.

Update 2020 also analyzes forecasted GHG emissions and GHG emissions reductions associated with most future DWR projects and activities. DWR will use this analysis under CEQA to streamline cumulative impacts analyses in later project-specific environmental documents, consistent with CEQA Guidelines Sections 15064(h)(3), 15064.4(b)(3), 15130(d), and 15183.5.

Although Update 2020 describes DWR's measures to reduce GHG emissions, it is not intended to constrain or influence the timing, type, or amount of water deliveries made by DWR or any other water supplier. Update 2020 also does not conflict with or reduce, but rather complements, efforts by DWR to continually increase water use efficiency throughout the state. While Update 2020 will lead to reductions in GHG emissions associated with water delivered through the SWP, it in no way reduces the necessary efforts by local authorities, water agencies, and land use agencies to increase water-use efficiency and reduce the GHG emissions associated with water-use activities under their jurisdiction or authority.

Photo 4 Salmon in the Feather River

III. Scope

Update 2020 analyzes past and projected department-wide activities that emit GHG and provides measures to reduce these emissions. These activities are associated with facilities that DWR operates and maintains, including DWR's headquarters in Sacramento, five field divisions, four regional offices, two flood maintenance yards, and flood protection facilities (DWR owns few flood facilities but is legally obligated to maintain approximately 300 miles of levee, 1200 miles of channel, and various structures). These activities include (1) operation of the SWP, which involves GHG emissions associated with the electricity that is used to operate the SWP, regardless of the location of that electricity source; (2) typical construction; (3) maintenance on DWR-owned or operated facilities; and (4) business practices. Update 2020 also analyzes and addresses a small group of specific types of activities performed by the Central Valley Flood Protection Board for which DWR serves as the construction manager.

While Update 2020 analyzes and addresses emissions generated as a result of typical construction activities, it does not analyze future extraordinary activities, which are described and addressed in Chapter V.

Update 2020 also does not analyze activities that DWR funds through its various grant and local assistance programs or activities that DWR regulates as part of its dam safety function. In addition, Update 2020 does not analyze the United States Bureau of Reclamation's operations of the Central Valley Project (CVP) facilities. While operation of CVP and SWP facilities is coordinated, DWR does not have authority over the CVP operations. Further, Update 2020 does not include activities of the California Water Commission or the Central Valley Flood Protection Board, except as identified above.

Photo 5 Sandhill Cranes in Lodi

IV. GHG Regulatory and Administrative Actions

Nationally and in California, several laws, regulations, and administrative actions have been adopted that address GHG emissions. A summary of the key State and federal laws, regulations, and policies related to GHG emissions is provided in Appendix B. Nevertheless, for the purposes of Update 2020, the State statutes, regulations, and administrative actions described below (in chronological order) are particularly important because they help form Update 2020's GHG emissions reduction goals. This chapter also includes a brief summary of the State requirements for analysis of GHG emissions and mitigation of the effects of GHG emissions pursuant to CEQA.

Executive Order S-3-05

In 2005, Governor Arnold Schwarzenegger issued Executive Order (EO) S-3-05, which made California the first state to formally establish GHG emissions reduction goals.

EO S-3-05 included the following GHG emissions reduction targets:

- By 2010, reduce GHG emissions to 2000 levels.
- By 2020, reduce GHG emissions to 1990 levels.
- By 2050, reduce GHG emissions to 80 percent below 1990 levels.

The Global Warming Solutions Act of 2006

In 2006, California passed the California Global Warming Solutions Act (also known as Assembly Bill 32 [AB 32], codified in Health & Safety Code, Division 25.5, Section 38500, et seq.). AB 32 adopted as law the 2020 GHG emissions reduction target established in EO S-3-05 to reduce GHG emissions to 1990 levels by 2020. AB 32 also identified the California Air Resources Board (CARB) as the State agency responsible for the design and implementation of emissions limits, regulations, and other measures to meet the target.

In December 2007, CARB approved the 2020 emissions limit (1990 level) of 427 million metric tons of carbon dioxide equivalent ($mtCO_2e$) of GHG. And in 2008, CARB adopted the initial AB 32 Climate Change Scoping Plan (Scoping Plan) which outlined regulations, market mechanisms, and other actions that would be undertaken to meet the 2020 emissions target and to put the state on a path to meet the long-term 2050 goal of reducing GHG emissions to 80 percent below 1990 levels. The measures in the initial Scoping Plan are now in place, including revised mandatory reporting regulations, which took effect on January 1, 2012, and cap and trade regulations, which took effect on January 1, 2012, with enforceable compliance obligations beginning in 2013.

CARB approved the First Update to the Scoping Plan on May 22, 2014. On December 14, 2017, CARB approved the 2017 Final Scoping Plan Update, which outlines CARB's current strategies for achieving a 40 percent reduction in GHG emissions from 1990 levels by 2030 pursuant to SB 32 (see below). The key programs on which the 2017 Scoping Plan Update builds include continuation of the cap-and-trade program, implementation of the Low Carbon Fuel Standard, powering the state with cleaner renewable energy, increasing energy efficiency, implementing strategies to reduce methane emissions from agricultural and other wastes, developing more reliable water supplies, and supporting projects that increase water sector energy efficiency and reduce GHG emissions through reduced water and energy use. The 2017 Scoping Plan Update also comprehensively addresses, for the first time, the GHG emissions from natural and working lands of California, including the agriculture and forestry sectors.

Update 2020 is responsive to AB 32's directive that State agencies reduce emissions from activities under their own jurisdiction and incorporates the Scoping Plan strategies that are applicable to DWR's activities and operations.

Executive Order B-18-12

In April 2012, Governor Jerry Brown signed EO B-18-12, which contains the following main directives:

- State agencies are to take actions to reduce entity-wide GHG emissions by at least 10 percent by 2015 and 20 percent by 2020, as measured against a 2010 baseline.

- All new State buildings and major renovations beginning design after 2025 are to be constructed as Zero Net Energy (ZNE) facilities with an interim target for 50 percent of new facilities beginning design after October 23, 2017, to be ZNE.
- State agencies to take measures toward achieving ZNE for 50 percent of the square footage of existing State-owned building area by 2025.
- State agencies to continue taking measures to reduce grid-based energy purchases for State-owned buildings by at least 20 percent by 2018, as compared with a 2003 baseline, and reduce other non-building, grid-based retail energy purchases by 20 percent by 2018, as compared with a 2003 baseline.

Executive Order B-30-15

In April 2015, Governor Brown signed EO B-30-15, which established a new interim GHG reduction target of 40 percent below 1990 levels by 2030 in order to meet the target of reducing GHG emissions to 80 percent below 1990 levels by 2050, previously established in EO S-3-05.

The Global Warming Solutions Act of 2016

In 2016, California passed the California Global Warming Solutions Act of 2016 (also known as Senate Bill 32 [SB 32], codified in Health & Safety Code Section 38566). SB 32 affirmed the importance of addressing climate change by codifying into statute the GHG emissions reduction target of at least 40 percent below 1990 levels by 2030 contained in Governor Brown's EO B-30-15. The 2030 target reflects the same science that informs the agreement reached in Paris by the 2015 Conference of Parties to the United Nations Framework Convention on Climate Change, aimed at keeping the global temperature increase below 2 degrees Celsius by the end of century.

The 100% Clean Energy Act of 2018

In September 2018, Governor Brown signed the 100% Clean Energy Act of 2018 (also known as Senate Bill 100 [SB 100], codified in Public Utilities Code Sections 399.11, 399.15, 399.30 & 454.53) that puts California on the path to eliminating fossil fuels from its energy sector. Among other things, SB 100 established, as a policy of the State, that eligible renewable energy resources and zero-carbon resources supply 100 percent of retail sales of electricity to California end-use customers and 100 percent of electricity

procured to serve all State agencies by December 31, 2045. Note that regulatory agencies have not fully developed regulations to implement this policy. For the purposes of this Update 2020, DWR assumes that all hydropower resources would be considered zero-carbon resources under SB 100. DWR will revise Update 2020 if it is inconsistent with the ultimately adopted regulations.

Executive Order B-55-18

At the SB 100 signing ceremony in September 2018, Governor Brown also issued EO B-55-18, directing California to achieve carbon neutrality as soon as possible, not later than 2045, and announcing a goal of achieving and maintaining net negative emissions thereafter.

CEQA and CEQA Guidelines

CEQA (Public Resources Code Section 21000 et seq.) is the State's comprehensive environmental law that requires public agencies to inform decision makers and the public about the potential environmental impacts of proposed projects and to reduce those environmental impacts to the extent feasible. By enacting Senate Bill 97 (SB 97) in 2007, California's lawmakers expressly recognized the need to analyze GHG emissions as a part of the CEQA process. The Natural Resources Agency added Section 15064.4 to the CEQA Guidelines in 2010 as part of a package of amendments addressing GHG emissions, as directed by SB 97. In late 2018, the California Natural Resources Agency finalized amendments to the CEQA Guidelines, including changes to CEQA Guidelines Section 15064.4.

CEQA requires the lead agency to make a good-faith effort, based to the extent possible on scientific and factual data, to describe, calculate, or estimate the amount of GHG emissions resulting from a project (CEQA Guidelines Section 15064.4(a)). In determining the significance of a project's impacts, the lead agency may consider a project's consistency with the State's long-term climate goals or strategies, provided that substantial evidence supports the agency's analysis of how those goals or strategies address the project's incremental contribution to climate change (CEQA Guidelines Section 15064.4(b)(3)).

The CEQA Guidelines also reflect the view that the effects of GHG emissions resulting from individual projects are best addressed and mitigated at a

more comprehensive level. To that end, CEQA authorizes lead agencies to adopt a plan addressing a wide range of activities that emit GHGs and to rely on such a plan for streamlined CEQA review of later projects' cumulative impacts (see CEQA Guidelines Sections 15064(h)(3), 15064.4(b)(3), 15130(d), & 15183.5). As stated in the following California Natural Resources Agency's Final Statement of Reasons for Regulatory Action, Amendments to the State CEQA Guidelines Addressing Analysis and Mitigation of Greenhouse Gas Emissions Pursuant to SB 97 (December 2009) (FSOR):

> [Lead agencies] may … adopt greenhouse gas reduction plans to govern their own activities. Provided that such plans contain specific requirements with respect to resources that are within the agency's jurisdiction to avoid or substantially lessen the agency's contributions to GHG emissions, both from its own projects and from private projects it has approved or will approve, such plans may be appropriately relied on in a cumulative impacts analysis. … Thus, greenhouse gas reduction plans, satisfying such criteria would satisfy the criteria in existing subdivision 15064(h)(3). (FSOR, p.15).

The use of Update 2020 in complying with the CEQA requirements for DWR's future projects is addressed in Chapter X.

Photo 6 Sacramento

Photo 7 Silverwood Lake

V. GHG Quantification

A. General methodology

To establish its GHG emissions, DWR combines the GHG emissions from its activities, which generally fall into four categories: operations, construction, maintenance, and business practices. To facilitate accounting, emissions from maintenance and business practices are combined because they are determined using some of the same data sources.

As summarized in Table 2, prior to 2007, DWR estimates (1) operations emissions based on electricity purchased to operate the SWP and other available operational data and (2) construction emissions based on a database of construction projects. For maintenance, estimating emissions prior to 2007 is impractical and subject to high margins of error; consequently, DWR assumes that annual maintenance emissions prior to 2007 were similar to the average annual emission between 2007 and 2009 as reported to the California Climate Action Registry (CCAR). This is a conservative assumption because the number of facilities and activities have increased since 2007.

Since 2007, DWR has been reporting emissions from its operations, construction, maintenance, and business practices activities to CCAR and to TCR, which succeeded CCAR in 2010.

Table 2 Emissions Calculation Methodologies

Emission Source	Methodology
Operations	Prior to 2007: Estimate based on electricity use and other available operational data. 2007–current: CCAR / TCR Reporting Protocols.
Construction	Prior to 2007: Estimate based on analysis of historical records for construction projects. 2007–current: Project review and analysis.
Maintenance & Business Practices	Prior to 2007: Assumed to be at 2007–2009 average level. 2007–current: CCAR / TCR Reporting Protocols.

B. Operations Emissions

Overview

The SWP includes 34 storage reservoirs, 20 pumping plants, four pumping-generating plants, five hydroelectric power plants, and about 700 miles of aqueducts and pipelines. SWP deliveries provide water to nearly 27 million Californians and about 750,000 acres of irrigated farmland. DWR has contracts with 29 water contractors to deliver water up to a maximum amount of approximately 4.2 million acre-feet (MAF) per year plus Article 21 (or "surplus" water) when extra water is available (contract amounts, also called Table A amounts, are not guaranteed to be delivered. The actual deliveries are subject to conditions such as hydrology, regulations, demand, and facility capacity). DWR also facilitates water transfers, which take place when a water right holder decides to transfer some or all its water to another party, either permanently or for a specified duration of time, by moving or "wheeling" water through SWP facilities when excess capacity exists. Over the 20-year period from 1999 through 2018, the SWP has delivered an average of about 2.7 MAF of water per year, including all contract deliveries, surplus water, and transfer water.

Delivery of water through the SWP system involves consumption and generation of electricity; however, DWR does not directly use all the electricity it generates to operate the SWP. Historically, about two-thirds of DWR's generated electricity is sold into the California Independent System Operator (CAISO) electricity market to supply energy during peak demand periods. Conversely, DWR schedules its pump load to the maximum extent possible during off-peak demand periods. This optimized operation helps to smooth out daytime and nighttime demands for electricity throughout the CAISO grid and reduces overall GHG emissions from electricity generation supplied to the CAISO grid. Thus, even in years like 1995 and 1998, when hydrologic conditions allowed the SWP to generate more power than it used, DWR still purchased significant amounts of power from other generation sources. For 2014–2018, annual GHG emissions associated with power used to operate the SWP constitute about 60 percent to 94 percent of all emissions from DWR activities, resulting in annual emissions between 0.37 million and 1 million $mtCO_2e$. Without the Oroville Dam spillway repair, these emissions constitute about 88 percent to 97 percent of all emissions from DWR activities.

Operations Emissions Calculation

As shown in Figure 1, DWR's 2020 power portfolio is projected to consist of approximately 50 percent zero-carbon large hydroelectric generation (generation from facilities larger than 30 MW), with the remainder consisting of renewables, unspecified market purchases, and natural gas. Table 3 lists the emissions factors used to calculate GHG emissions for these resources and for the contracted energy from RG4, which was a part of the SWP power portfolio until 2013.

Figure 1 SWP Resources Projected for 2020

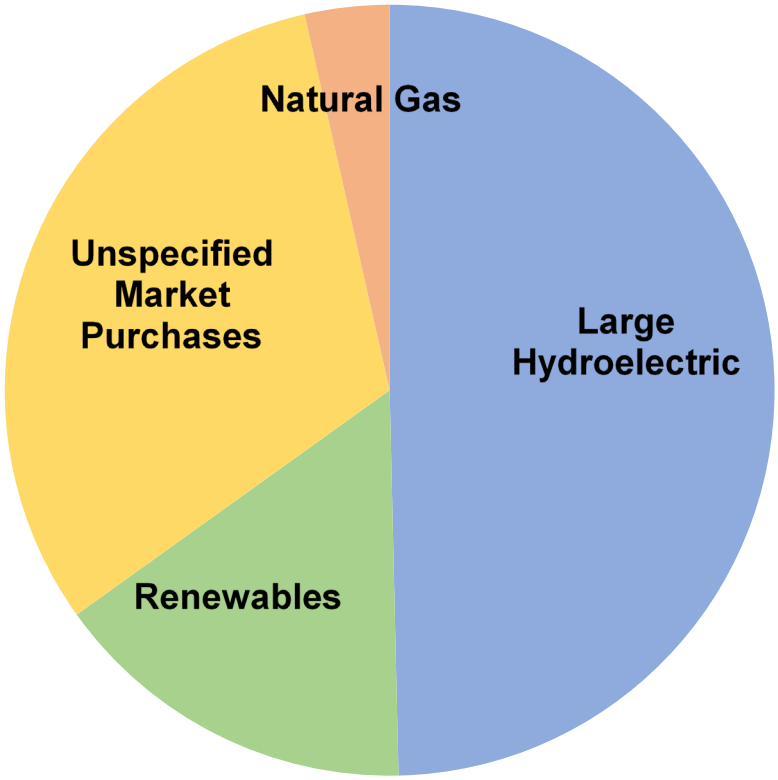


Table 3 Emissions Rates for Resources in the SWP Power Portfolio

Generation Resource	GHG Emissions Rate	Emissions Factor Reference
Large hydroelectric* generation owned by DWR or provided to DWR by contract.	0 $mtCO_2e$ / MWh	CARB regulations for AB 32 Mandatory Reporting of GHG Emissions.
Small hydroelectric** generation and other renewable generation owned by DWR or provided to DWR by contract.	0 $mtCO_2e$ / MWh	CARB regulations for AB 32 Mandatory Reporting of GHG Emissions.
Coal-fired generation from RG4 provided by contract (contract terminated in 2013).	1.1 $mtCO_2e$ / MWh	Published by CARB.
Gas-fired generation from LEC provided by contract.	Natural gas emission factor.	TCR general reporting protocol.
Generation from unspecified sources provided through contracts or through the CAISO markets prior to 2010.	0.437 $mtCO_2e$ / MWh	CARB regulations for AB 32 Mandatory Reporting of GHG Emissions plus 2% transmission loss factor.
Generation from unspecified sources provided through contracts or through the CAISO markets since 2010.	eGRID emissions factor.	TCR general reporting protocol.

Note:

*Generators greater than 30 MW

**Generators less than 30 MW

To estimate emissions associated with generation from unspecified sources prior to 2010, the 2012 Plan and Update 2020 both use the emission factor from the Mandatory GHG Emissions Reporting regulations (17 CCR Section 95111 et ceq.) for energy imports. This emission factor is based on gas-fired generation under the assumption that low or zero-carbon resources are not available for sale in the electricity market. That being said, this emission factor no longer reflects California's wholesale electricity market, which has undergone significant changes since 2012, including an increase in renewable resources and expansion of energy efficiency improvements.

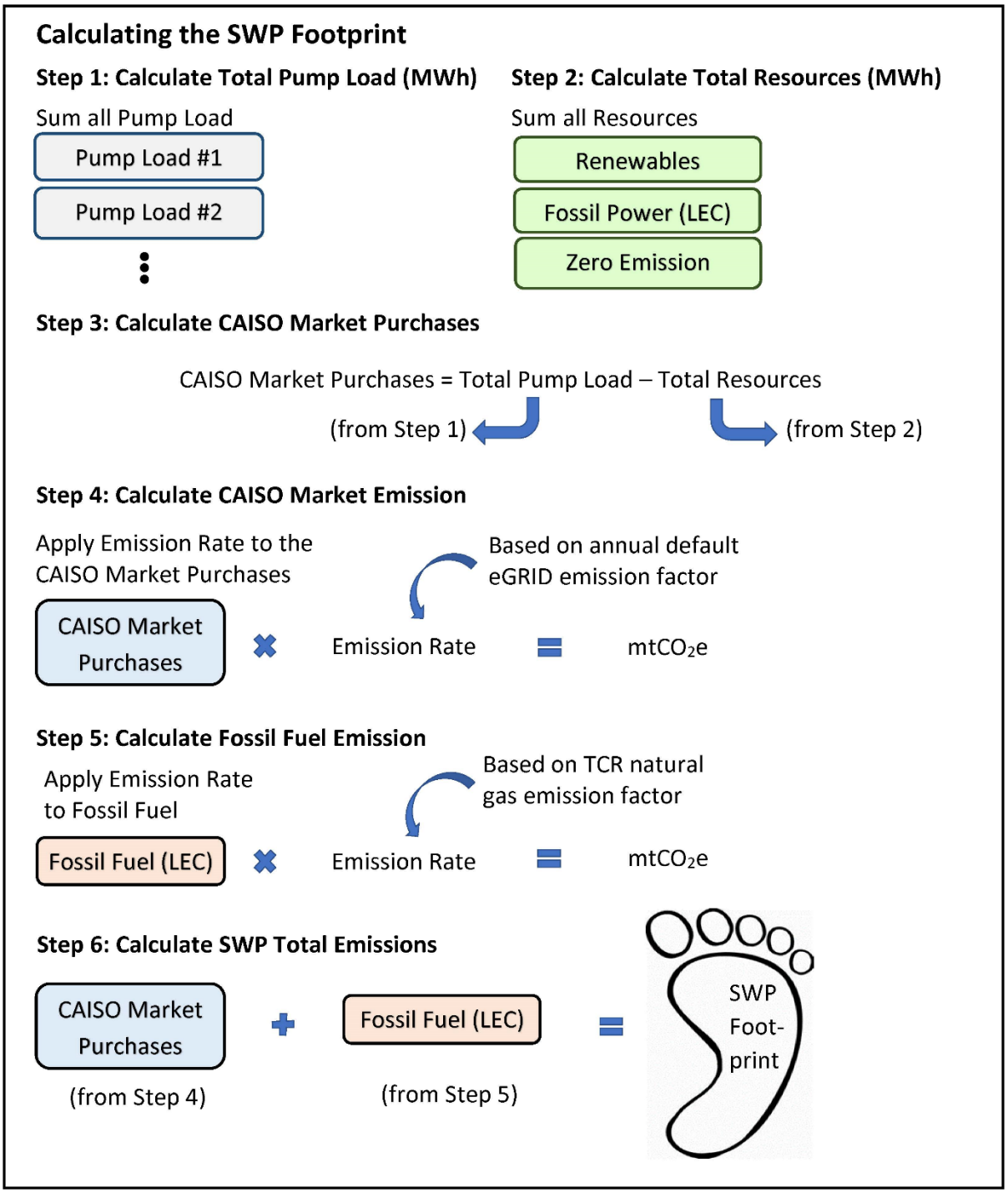
As renewable energy development increased, the GHG emission factor for energy on California's electric grid became substantially lower compared with when DWR adopted the 2012 Plan. In addition, CAISO started an

Energy Imbalance Market in 2014 that is designed to, among other improvements, bring more renewable energy to the grid by facilitating participation from loads and resources outside of California. Consequently, to estimate emission associated with generation from unspecified sources since 2010, Update 2020 uses the United States Environmental Protection Agency's (EPA) Emissions & Generation Resource Integrated Database (eGRID) (EPA Emissions Generation Resource Integrated Database Egrid) emissions factor, which reflects a mix of resources supplying energy to the grid and is consistent with TCR's reporting protocol.

Photo 8 Devil Canyon Powerplant

Figure 2 illustrates how DWR calculates operations emissions by determining the resources used to meet SWP pump loads and applying the applicable emission factor to each resource. This methodology, which is consistent with TCR reporting protocol, accounts for the discrepancy between resources and pumping requirements, which occurs because (1) the operation of SWP generators and pumps often do not coincide on an hourly or seasonal basis and (2) DWR forecasts its energy needs months or even years in advance and purchases needed energy based on those forecasts. This discrepancy is balanced through sales to or purchases from the electricity market.

Figure 2 Calculating the SWP Footprint



Historical Operations Emissions and Variability

Unlike other utilities that may experience a steadily increasing load as the population they serve grows, DWR's pump load does not exhibit a strong or consistent long-term growth trend because the amount of water that can be delivered through the SWP is hydrologically and contractually limited and subject to institutional constraints. Nevertheless, SWP operations and the resulting GHG emissions exhibit substantial year-to-year variation caused by fluctuations of factors such as the amount of energy consumed and the composition of the resource portfolio.

The first factor, amount of energy consumed, is related to how much water is delivered and to where that water is delivered. The amount of water delivered depends on multiple factors such as hydrologic conditions, environmental regulation, amount of water in storage at the beginning of the year, and water delivery requests. In general, as the amount of delivered water increases, the amount of energy required to move that water also increases; however, little or no energy is required to deliver water to some locations while others require substantial energy. For example, water deliveries to the northern Sacramento Valley arrive by gravity with little or no pumping while water deliveries to the southern end of the state require substantial energy to lift the water from sea level at the Sacramento-San Joaquin Delta to nearly 3,500 feet above sea level at Tehachapi Pass. Consequently, while the amount of water delivered is the largest factor in determining the amount of energy needed, the location of water delivery also contributes significantly to the overall demand for energy.

The second factor, composition of the power resources portfolio, results from resources that have different emission per unit of energy: DWR has historically used a wide range of resources in its portfolio, with emission rates ranging from 0 $mtCO_2e$ / MWh to 1.1 $mtCO_2e$ / MWh. In addition, hydrologic variability directly affects the amount of zero-carbon energy generated by hydroelectric resources.

The relationships among hydrologic conditions, electricity generation, pump load, and water deliveries are complex and produce a variety of resulting emission levels. For example, in very wet years, DWR generates additional electricity as water is released through hydroelectric generating units; however, in wet years, DWR also delivers more water which requires more

pumping. In dry years, less water is released and less energy is generated, forcing DWR to turn to other electricity generation sources for energy. Nevertheless, DWR typically delivers less water in dry years and, therefore, requires less energy to operate the SWP.

Because emissions from operation of the SWP fluctuate from year to year, DWR has defined its 1990 operations emissions as the average of emissions during the five years around 1990 (1988–1992). Note that emissions in 1990 were higher than all other years around 1990; therefore, the 5-year average results in DWR using a lower level of emissions to establish its GHG emissions baseline, which in turn results in greater required reductions in future emissions to meet the emission goals.

C. Construction Emissions

Overview

DWR's construction activities fluctuate widely from year to year. For the purposes of Update 2020, construction projects are defined as construction, maintenance, or refurbishment work performed on DWR's facilities by an outside contractor; emissions from work performed by DWR staff are analyzed and addressed under maintenance emissions. Construction projects also do not include large projects that far exceed the level of construction activity of typical DWR projects (Extraordinary Construction Projects). Analysis of past DWR construction activities indicates that Extraordinary Construction Projects have occurred only periodically over the past 50 years, and few have been constructed in the past 20 years. They include projects such as Oroville Dam (1957–67), other original facilities of the SWP (1960–74), Coastal Branch Extension to the California Aqueduct (1991–1997), and Oroville Dam spillway repair (2017–2018).

Because future Extraordinary Construction Projects could have a significant impact on the level of emissions generated by DWR and because the implementation of these projects is infrequent and difficult to predict, Update 2020 does not analyze the construction emissions from such future projects, and they will not be eligible to use Update 2020 to streamline the cumulative impacts analysis under CEQA for construction-related emissions. For these types of projects, DWR would have to analyze the cumulative GHG emissions on a project-specific basis for CEQA purposes. Note that DWR does track and

report emissions from the implemented Extraordinary Construction Projects and accounts for GHG emissions associated with such implemented projects in assessing DWR's progress toward achieving the goals set forth in this Update 2020.

The following construction emissions thresholds have been developed to distinguish between typical construction projects and Extraordinary Construction Projects: a construction project will be considered an Extraordinary Construction Project and the GHG impacts from the construction activities will not be eligible to rely on Update 2020 for streamlined CEQA review if:

- The project emits more than 25,000 $mtCO_2e$ in total during the construction phase of the project, or
- The project emits more than 12,500 $mtCO_2e$ in any single year of construction.

These thresholds represent a level of GHG emissions that by themselves could potentially adversely affect DWR's ability to achieve its GHG emissions reduction goals. Note that these construction emissions thresholds are not established as thresholds of significance for CEQA purposes and should not be considered to constitute a determination by DWR that these thresholds are generally applicable as thresholds of significance for CEQA purposes. The 25,000 $mtCO_2e$ level of emissions is used because it represents the total level of emissions released from all DWR typical construction operations in an average year. Thus, the emissions from a project exceeding this threshold would be equivalent to an entire year's worth of typical construction emissions. Note that a project of this magnitude would likely span multiple years of construction and thus would contribute emissions over several years. The 12,500 $mtCO_2e$ emissions level for a single year of construction is used because it represents a level of emissions equivalent to half of an entire average year of DWR construction emissions. A project exceeding either of these thresholds would represent construction activities exceeding the typical level of construction activity performed by DWR and, therefore, exceeding the level of cumulative effects analysis for construction-related emissions reflected in Update 2020. Nevertheless, future projects exceeding the Extraordinary Construction Project threshold for their construction-related emissions could still rely on the analysis in Update 2020 to streamline later project-specific cumulative impacts analyses for such

projects' operation and maintenance emissions under CEQA, provided that these projects meet all other consistency requirements of Update 2020.

Construction Emissions Calculations

For Update 2020, DWR analyzes and addresses all activities that it performs or causes to be performed; thus, all construction emissions are included in DWR's emissions inventory for Update 2020. This convention ensures that the analysis provided in Update 2020 includes the potential impacts from future construction projects that may rely on the analysis in this Update 2020 to streamline future project-specific environmental review under CEQA.

Although limited historical data have been maintained on construction activities relating to GHG emissions, DWR does maintain a database of its construction projects including monetary value, construction duration, year of construction, and short project description. Over 550 projects are listed in the database between 1990 and 2010, and they fall into one of eleven general project types listed below in Table 4.

Photo 9 Oroville Dam Spillway

Table 4 DWR Construction Project Types

Type	Description
Building	Includes a wide range of building construction, repair, and retro-fit activities involving minimal heavy equipment.
Earthwork	Involves work with predominantly heavy equipment.
Furnish and Install	Involves projects that do not include any equipment besides limited use of cranes or small equipment to place and install products; emissions predominantly come from transportation.
Maintenance 1	Includes a wide range of maintenance activities, such as painting, sealing, cleaning, and cathodic protection, that require limited use of smaller heavy-duty equipment or other high emissions machinery.
Maintenance 2	Includes a wide range of maintenance activities, such as pump and motor rebuilding, that do not require the use of high emissions equipment.
Maintenance 3	Includes a wide range of maintenance activities, such as dredging and sediment removal, that typically require the use of heavy equipment.
Other	Includes a wide range of other miscellaneous projects that would not require the use of high emissions equipment or machinery.
Pipeline	Involves significant amounts of earthwork, but also involves large amounts of time constructing and placing piping or other linear construction materials.
Pumping Plant	Involves some earthwork, but also involves large amounts of time constructing structures and other appurtenances.
Roads	Includes all road and bridge projects.
Storage Basin	Involves large amounts of earthwork, paving, and dewatering, typically using very large equipment.

In the 2012 Plan, to estimate the magnitude of historical construction emissions, a small but representative sample of construction projects completed between 1999 and 2006 was selected from the database to provide data on a cross-section of typical DWR construction projects. Although these estimates are based on multiple assumptions and limited data, DWR considers these estimates to be an adequate (and the only available) approximation of the magnitude and trend of pre-2008 historical GHG emissions from DWR construction activities. As such, for Update 2020, DWR will continue to rely on this methodology for estimating pre-2008 historical construction emissions.

Since 2008, analysis of construction emissions from ongoing and proposed future projects is done as part of DWR's CEQA analysis and documentation for each project, which is much more detailed and accurate. Tracking of future construction emissions will continue to rely on the detailed project-specific methodology currently being used for CEQA purposes. A review of projects carried out between 2012 and 2018 confirms that this analysis is still valid for calculating emissions from construction projects. DWR's construction emissions from 2012 to 2018 ranged between 10,000 to 28,000 $mtCO_2e$, except for 2017 and 2018 when the emissions were higher because of the Oroville Dam spillway repair.

As described in the next section, emissions from future construction projects should decrease as a result of the overall improvements in construction equipment efficiency, higher concrete emission standards, more stringent environmental regulations, and DWR's improved construction specifications. These improved practices and the resulting emissions reductions are not quantifiable based on available historical data; however, by 2012, construction emissions levels had fallen approximately 16 percent since 1990 as a result of decreased activity and the fact that construction equipment and practices have significantly improved since then. Consequently, actual emissions levels should remain well below 1990 levels even if construction activities were to increase substantially in the coming years. If future data proves this assumption to be inaccurate, DWR will re-evaluate its analysis and consider additional GHG emissions reduction measures to ensure that the emissions reduction goals are met.

Historical Construction Emissions and Trends

Annual construction emissions in the early 1990s are estimated to be about 28,000 $mtCO_2e$. This emission level fluctuated significantly throughout the 1990s and then decreased substantially after 2000, predominantly as the result of reductions in overall construction activity. Emission levels between 2000 and 2013 were relatively stable and, for the most part, had remained less than 26,000 $mtCO_2e$ per year. After 2013, emissions further decreased to about 16,000 $mtCO_2e$ per year until the Oroville Dam spillway repairs in 2017 and 2018.

This analysis is based on construction activities and does not capture reductions in emissions that may have been realized over the past 30 years

resulting from improvements in equipment efficiency, more stringent environmental restrictions, and improvements to DWR's standard specifications for construction contracts. These improvements have likely contributed to reducing emissions from construction activities and are described below:

Equipment Efficiency

Analysis of CARB's OFFROAD2007 database of emissions from off-road vehicles in California indicates that there has been a slight increase in overall efficiency of construction equipment since 1990. In addition, large and powerful equipment is more readily available, resulting in the more efficient completion of large earthwork projects. Based on analysis conducted for the 2012 Plan, earthwork projects constitute approximately 25 percent of DWR's projects and more than 50 percent of emissions from construction activities. Pipeline and storage basin projects are estimated to contribute 10 percent and 11 percent, respectively, to DWR's construction emissions and involve substantial amounts of work with large earthwork equipment. Update 2020 assumes that these percentages have remained the same and that modest increases in the efficiency of earthwork equipment since 1990 have likely reduced the actual emissions from DWR construction activities, though the actual rate of reduction is not quantifiable with available data.

Environmental Regulations

Environmental regulations also have become much more stringent in both California and the United States over the last 30 years. California Low Carbon Fuel Standards require 20 percent reduction in carbon intensity of diesel and gasoline fuels by 2030 (17 CCR Section 95480 et seq.).

Environmental regulations, such as the federal Clean Air Act, targeting ambient air quality improvements and reductions of sulfur content in fuels likely have had

secondary benefits of reducing GHG emissions. In addition, the CEQA environmental impacts checklist became much more extensive between 1990 and 2010, resulting in identification and mitigation of more impacts over time.

These additional considerations have led DWR to use more efficient equipment, alter the means and methods of how projects are constructed, and improve the overall design of projects to minimize air quality issues. While these improvements have not historically been made for the purpose of reducing GHG emissions, many of the construction practice and design improvements have resulted in ancillary reductions in GHG emissions.

DWR Standard Contract Specifications

DWR has substantially improved its standard contract specifications since 1990. In 2002, DWR developed standard specifications for contractors to follow during project construction. These specifications are designed in part to protect environmental resources, including air quality, at the project site. The specifications require DWR's contractors to meet all State and federal statutes, rules, regulations, and policies enacted to protect the environmental resources and ensure that any significant environmental impacts of projects are identified and adequately mitigated. As part of this mitigation, contractors must develop and submit detailed plans, including an Air Quality Control Plan, a Traffic and Noise Abatement Plan, and a Fire Prevention and Control Plan.

In addition, the specifications require preventative maintenance measures to protect air quality and reduce emissions. These measures include performing maintenance in accordance with manufacturer's recommendations, ensuring the proper use of mufflers and filters, and defining and implementing maintenance schedules for each piece of construction equipment. The specifications also include the following best available

control technology measures: (1) install high-pressure injectors, (2) use renewable diesel fuel, (3) use Caterpillar pre-chamber diesel engines or equivalent, (4) replace fossil fuel-powered equipment with electric equipment, (5) replace gasoline or diesel-powered vehicle with electric vehicles, (6) replace gasoline-powered equipment with catalytic converters, and (7) reduce construction activities during Stage 2 alerts issued by local air pollution control districts where required.

Other air quality measures include scheduling truck trips to reduce peak emissions, limiting the length of the construction workday, phasing of construction activities to minimize the amount of construction equipment operating during any given time period, and encouraging employees to participate in a ride share program.

Because most construction emissions result from gasoline, diesel, and concrete use, construction emissions will likely be reduced by at least 20 percent by 2030 compared with the 2014–2018 period because of expected improved equipment efficiencies, fuel standards (17 CCR Section 95480 et seq.), new cement manufacturing technologies, and DWR standard contract specifications.

D. Maintenance and Business Practices Emissions

Overview

DWR's maintenance activities can be divided into two broad categories: (1) maintenance of flood protection facilities and (2) maintenance of SWP facilities. For the purposes of Update 2020, maintenance activities include those performed by DWR staff or California Conservation Corps personnel to maintain proper operation and function of facilities under DWR's jurisdiction and excludes activities performed by private companies under contract to DWR, which are analyzed and addressed in the construction emissions section of Update 2020. This distinction is made to facilitate accounting for emissions from these activities. To further facilitate accounting, emissions

from business practices and maintenance are combined because they are determined using some of the same data sources.

DWR's total emissions from maintenance of flood protection facilities, maintenance of SWP facilities, and business practices are determined using internal accounting of gasoline and natural gas purchases for fleet vehicles, metered electricity purchases, and metered natural gas purchases. These emissions typically constitute less than 3 percent of DWR's total emissions. Nevertheless, DWR will take appropriate steps to ensure that these emissions are minimized to the extent possible**.**

Although the addition of new facilities to DWR's jurisdiction has increased maintenance activities and associated emissions, changes in practice and equipment have reduced maintenance emissions. For example, wide implementation of remote monitoring and operational systems, also known as Supervisory Control and Data Acquisition systems, have eliminated the need for trips to remote sites to monitor or operate equipment. In some cases, 24/7 manned operation of facilities has been eliminated and replaced with remote monitoring and operation.

In addition, between 2017 and 2018 DWR replaced twenty 40-year-old diesel engine generators that provide emergency power supplies to critical facilities. All the new generators meet or exceed applicable EPA Mobile Off-Highway Standards, which were not in place when the original generators were manufactured. Fifteen of the twenty new generators run on liquid petroleum gas (LPG), which releases 14 percent fewer CO_2 emissions than diesel (U.S. Energy Information Administration 2011). These LPG generators also do not require as much maintenance or the periodic burning of unused fuel, thus avoiding additional emissions. The reduction in emissions from replacement of these units is difficult to estimate because DWR does not have detailed records for fuel consumption or emissions from the original generators; however, this is an example of how improvements in equipment and procedures have likely offset any increase in maintenance emissions from addition of new facilities.

DWR also continues to investigate further equipment improvements and will likely replace nearly 100 diesel engine generators over the next several years, with approximately five generators in key locations scheduled to be replaced in 2020. To the extent possible, new generators will run on LPG,

and all new generators will meet Tier 3 or higher EPA Mobile Off-Highway Standards.

Lastly, all DWR projects are required to reduce maintenance emissions to the extent possible and, when appropriate, adopt applicable BMP for construction and maintenance activities (Appendix D).

Flood Protection Maintenance

DWR is responsible for maintaining and operating specific channels, levees, and structures associated with the Sacramento River Flood Control Project (SRFCP) where no local maintaining agency exists or where the local maintaining agency has failed to adequately perform maintenance.

The three main categories of flood protection maintenance activities are routine maintenance, small erosion repairs, and sediment removal. Most flood maintenance activities performed by DWR are considered routine maintenance to (1) allow for the proper inspection of the levees during high water events, (2) maintain the functional and structural integrity of the flood control features within the SRFCP, (3) ensure that the design capacity of flood control system is maintained, and (4) help minimize the risk of potential flooding.

Routine Maintenance

DWR's Sacramento and Sutter maintenance yards perform routine maintenance, which includes removing debris, sediment, vegetation, rubbish, downed trees, and other material that could obstruct the natural flow of water; controlling weeds, grasses, emergent vegetation, and woody vegetation on levees and within channels; repairing gates, barricades, and small structures; making repairs to control erosion and stabilize banks; repairing culverts; conducting minor geotechnical sampling; and performing other work necessary to maintain the functional and structural integrity of the SRFCP.

Equipment used for routine maintenance activities includes trucks, dump trucks, backhoes, bulldozers, skip loaders, excavators, wood chippers, and mowers. In addition to

maintenance activities that require equipment, DWR also conducts controlled burns to reduce vegetation on levees in selected areas. DWR estimates that approximately 2,000 acres of levees are burned each year to reduce vegetation.

Small Erosion Repairs

DWR conducts several small erosion repair projects each year. These projects target specific areas of levees where erosion has begun to compromise the integrity of the levee. Small erosion repair projects typically involve one to two weeks of construction activity (not including revegetation work). Equipment used for small erosion repairs includes bulldozers, pick-up trucks, dump trucks, water trucks, barges with cranes, cement mixers with boom pumps, and excavators.

Sediment Removal

Sediment build-up in channels and in front of flood protection facilities is another area of maintenance. DWR's maintenance yards perform smaller sediment removal projects, which generally do not exceed the removal of 50,000 cubic yards of material. Equipment used for sediment removal projects generally includes bulldozers, excavators, backhoes, loaders, scrapers, graders, dump trucks, bobcats, rollers, water trucks, and pick-up trucks. Larger sediment removal activities occur periodically but are performed by private companies under contract to DWR and are analyzed and addressed under the Construction Emissions section of Update 2020.

In addition to these maintenance activities, DWR also produces a small amount of GHG emissions from the trucks used to transport staff while they conduct periodic inspections and surveys and collect data on the facilities. These activities include inspection of levees during high-water events, inspections of bridges and flood control structures, inspections and surveying of channels to identify areas that may be deficient and/or impeding or

restricting water flow, and environmental surveys (e.g., wetland delineations, bird surveys, environmental assessments).

SWP Maintenance

In coordination with Operations & Maintenance (O&M) headquarters in Sacramento, DWR's Oroville, Delta, San Luis, San Joaquin, and Southern field offices each maintain the SWP facilities within its region. SWP facilities include dams, reservoirs, conveyance channels, check sites, weirs, pumping and generating plants, siphons, pipelines, channel turnouts (connections or appurtenances), and the lands that surround these facilities.

SWP maintenance activities include four main categories: (1) landscaping and weed control, (2) annual equipment and facilities inspection and maintenance, (3) additional routine activities performed as needed, and (4) weir operations and maintenance. Each of these groups of activities is described in greater detail below.

Landscaping and Weed Control

The following activities are performed to maintain landscaping and control weeds: (1) spraying of chemical vegetation killers and (2) mechanical removal of debris, brush, and overgrowth along right of way, turnouts, conveyance structures, spoil banks, reservoir and forebay shorelines, weir approaches, snow survey sites, dam toe drains, and fence lines. CARB's guidance does not cover biomass emissions, and the burning of biomass, such as vegetation from levees, is not included in DWR's emissions inventory.

Annual Equipment and Facilities Inspection and Maintenance

The following equipment is inspected and maintained annually: standby generators, cranes, safety equipment, relays, sensors, remote communication and operation equipment, landscape irrigation systems, log booms, discharge valves, radial gates, stop logs, surge tanks, flumes, and siphon housings. In addition, electrical equipment, including switch gear (e.g., circuit breakers),

transformers, and electrical transmission switch yards, is cleaned and maintained.

The following facilities are inspected annually and repaired and maintained as needed: generating plants, pumping plants, bridges, roadways, culverts and conveyance structures, spillway gates, check sites, radial gates, barricades and small structures, forebay and afterbay sites, dam sites, facility lighting and signage, stilling wells, fish screens, and weirs.

Additional Routine Activities Performed as Needed

The following activities are routinely performed throughout the SWP system as needed: remote site emergency repairs and trouble calls; motor, pump, turbine, valve, and gate refurbishment; improvements to dock facilities; installation of barge anchors along conveyance and water storage structures; fence repairs; erosion control and repair including placement of riprap; road and parking area repair and maintenance; fabrication of miscellaneous metal covers and grates; building painting; and landscape replacement and improvements.

Weir and Control Structure Operation and Maintenance

DWR uses several types of weirs in various locations to raise water levels in channels, control outflow, and measure flows. Weirs are periodically installed and removed throughout the system. In addition, some weirs require the installation and removal of weir boards to raise and lower the level of the weir. Some weirs also require DWR crews to periodically remove sediment from upstream areas around weirs.

Equipment

Equipment used by the field offices to complete these activities includes trucks, dump trucks, backhoes, excavators, mowers, cranes, vacuum trucks (trucks with

suction booms and holding tanks), water trucks, spray rig trucks, skid-steer loaders, front-end loaders, trenchers, specialized road construction equipment, generators, compressors, boats, tractors, small bulldozers, forklifts, boom and scissor lifts, portable welders, and small hand tools.

Business Practice

Business practice emissions include all emissions attributable to DWR's day-to-day administrative and personnel operations including the lighting, heating, and cooling of buildings used by DWR in field offices and maintenance yards (including leased building space for which DWR pays energy bills) and business travel by DWR employees using DWR-owned vehicles.

Photo 10 Harvey O. Banks Pumping Plant

Photo 11 **Mojave Siphon Powerplant**

VI. GHG Emissions Reduction Measures

The measures that DWR has implemented or plans to implement to meet or exceed its GHG emissions reduction goals are summarized in Table 5 and further described in the subsequent sections. DWR developed these measures by drawing on the measures outlined in the Scoping Plan, other GHG emissions reduction guidance resources, and DWR's own internal auditing of its procedures. But the extent to which DWR implements each individual measure and the timing of implementation may vary depending on market conditions, available technology, and other factors.

The GHG emissions reduction measures include specific actions (SA), project level (PL), and conditional measures (CM). SA are measures that will be implemented as individual projects or a series of stand-alone projects. These projects will affect ongoing and future DWR activities by changing the way DWR operates. PL are measures that must be incorporated into future projects that will rely on the analysis in Update 2020 for streamlining of cumulative impacts analyses of later project-specific environmental documents under CEQA. CM are measures that may or may not be incorporated into future projects and depend on the characteristics of the specific project and its ability to incorporate the measure. Emissions reductions from CM measures have not been included in DWR's projections of future GHG emissions reductions. This distinction is made to simplify the determination of whether future projects are consistent with Update 2020. A future project needs only show that it has incorporated the PL measures and that the project does not conflict with DWR's ability to implement any of its SA measures.

Where possible, DWR has estimated the GHG emission reduction for each measure and will track this in future plan updates to determine the achievement of expected reduction. The annual emission reductions achieved since the 2012 Plan are estimated using a five-year running average, which is a conservative estimate because emission reductions generally have increased each year. Although the emission reduction of most measures is sustained through 2045, the emission reduction amount may increase or decrease depending on how it is estimated. For example, OP-1

reduced emission by replacing a high emission resource with unspecified resources from the grid; therefore, as emissions from unspecified resources become lower in the future because of the availability of cleaner resources, the estimated future emission reduction will become greater. But other measures, such as OP-7, reduce emission by replacing energy from unspecified resources from the grid with zero-carbon resources; therefore, as the unspecified energy market moves toward zero carbon, the estimated emission reductions from the measures also decrease toward zero.

As further explained in the next section, some measures are not quantified because they are either difficult to measure, no longer monitored, or are subject to regulatory and technological changes and would be more accurately addressed in future plan updates.

Photo 12 A.D. Edmonston Pumping Plant

Table 5 Historical and Projected Annual GHG Emissions Reduction ($mtCO_2e$)

Measure	Description	2014–2018 Average	2030	2045
OP-1 Reid Gardner Power Station (SA)	Replace energy from RG4 with less GHG intensive resources.	Not quantified.	Not quantified.	Not quantified.
OP-2 Unit Efficiency Improvements (SA)	Increase efficiency of SWP pumps and generators.	33,710	11,349	3,378
OP-3 Renewable Energy Procurement Plan (SA)	Increase the use of renewable energy to operate the SWP.	83,329	171,633	187,313
OP-4 On-Site Renewable Resources (SA)	Develop renewable energy projects on DWR's property.	Included in OP-3.	Not quantified.	Not quantified.
OP-5 Lodi Energy Center (SA)	Replace LEC with zero carbon resources.	Not quantified.	Not quantified.	Not quantified.
OP-6 Carbon Sequestration (SA)	Sequester carbon through environmental restoration activities.	18,400	31,000	Not quantified.
OP-7 Zero Carbon Energy (SA)	Increase the use of zero carbon energy to operate the SWP.	1,257	831	247
CO-1 Construction BMPs and Regulations (PL)	Implement BMPs and comply with regulations.	11,813	15,090	28,200
MA-1 SF_6 (SA)	Reduce SF_6 emission from switchgear.	264	321	1,936
MA-2 Utility Retail Renewable Program (SA)	Purchase retail energy from local utility's renewable program.	22	13	4
MA-3 Carbon Offset (CM)	Purchase carbon offsets.	2,580	Not quantified.	Not quantified.
MA-4 DWR Sustainability Initiatives (SA)	Implement business practices to reduce energy consumption.	Not quantified.	Not quantified.	Not quantified.
MA-5 Retail Energy Reduction (SA)	Improve building and equipment energy efficiency.	154	Not quantified.	Not quantified.

A. Operations Emissions Reduction Measures

Operating the SWP involves balancing a broad range of demands and constraints to determine how much water is delivered, to where, and when. Update 2020 and the GHG emissions reductions measures detailed below are not intended to influence these factors and instead are intended to focus on reducing the emission rate for energy generation used to operate the SWP and improving the efficiency of SWP pumping and generating facilities. Because DWR does not anticipate large increases in energy needed to operate the SWP, reducing DWR's emission rate will result in significant overall emissions reductions.

OP-1 Reid Gardner Power Station (SA)

From 1979 to 2013, DWR contracted for up to 235 MW from Unit #4 of the coal-fired Reid Gardner Power Station in Moapa, Nevada[1]. Compared with other SWP electricity generation sources, electricity from RG4 produced disproportionally high amounts of GHG, typically over 1.5 million $mtCO_2e$ per year (30 percent–50 percent of total DWR operations emissions).

Since the RG4 contract expired in July 2013, DWR has replaced it with less GHG-intensive market resources, which resulted in a net GHG emissions reduction of approximately 800,000 $mtCO_2e$ per year. This emission reduction is expected to increase to over 900,000 $mtCO_2e$ by 2030 and over 1,000,000 $mtCO_2e$ by 2045 as market resources become increasingly less GHG-intensive compared with generation from RG4. Furthermore, the Reid Gardner Power Station closed in 2017, so the reduction to global GHG emissions is considered permanent. The reduction is not shown in Table 5 because this measure was completed in 2013 when the contract for generation from RG4 expired and monitoring ended.

[1] While emissions from RG4 occurred in Nevada, these emissions were accounted for under DWR's CCAR and TCR emissions inventories. And because power from RG4 was imported into California, CARB also accounted for the associated emissions in the California emissions inventory.

OP-2 Unit Efficiency Improvements (SA)

DWR will continue to implement a comprehensive plan to increase the energy efficiency of pumping and generating units throughout the SWP system, which would reduce energy use per unit of water delivered and increase clean energy generation per unit of water flow through turbines. This includes evaluating the performance of SWP pumps and electricity generating turbines to identify opportunities for increasing the efficiency of each individual unit.

Through state-of-the-art design, construction, and refurbishment methods, DWR strives to maintain and improve the first-in-class energy efficiency of each hydroelectric and pumping unit in the SWP system. As the rotating and stationary components of both pumps and generators wear during operation, clearances increase and result in a reduction in efficiency. Both annual maintenance and systematic refurbishment efforts help to assure that energy efficiency is maintained at maximum levels throughout the lifetime of the equipment.

DWR completed energy efficiency improvements on six generating units at the Edward Hyatt Powerplant and four pump units at the A.D. Edmonston Pumping Plant in 2011. This effort increased the efficiency in each unit by as much as 6.5 percent, with several units reaching the 95 percent efficiency level. The combined energy savings of these improvements resulted in a reduction of 33,710 $mtCO_2e$ per year (California Department of Water Resources 2010).

Edward Hyatt Powerplant Unit #1 is currently being refurbished, for the second time, adding a new turbine runner and thrust bearing that will increase efficiency, reliability, and operational availability, thus providing increased levels of energy generation. This unit previously experienced significant turbine blade cracking and downthrust issues that led to operational restrictions. The combined energy savings of these improvements will result in a reduction of 2,719 $mtCO_2e$ per year by 2021.

Restoration of the Thermalito Pumping-Generating Plant following fire damage has been underway since 2013, with the first unit coming online in August 2019. The project included a runner replacement for one Kaplan turbine unit and the refurbishment of three Francis turbine units. The new

Kaplan runner has a guaranteed efficiency of 93 percent, an increase of 6.12 percent over the original unit, which will result in energy savings and a corresponding reduction of 971 $mtCO_2e$ per year by 2021. The three refurbished units will have their efficiency return to original equipment manufacturer levels; however, the GHG reduction associated with this refurbishment is not included in Table 5 based on the assumption that the cycle of performance degradation and return to original condition will continue in the future.

DWR also expects to implement several additional energy efficiency projects prior to 2030, including replacement of up to seven additional pumps at the A.D. Edmonston Pumping Plant. These new pumps would reduce energy use of pumping operations by 71,414 MWh per year, resulting in an emissions reduction of around 11,349 $mtCO_2e$ / year by 2030.

The GHG emissions reduction shown under OP-2 includes only energy efficiency improvements to which DWR has already committed. Thus, this is a conservative estimate of the efficiency improvements that will be made between now and 2045.

OP-3 Renewable Energy Procurement Plan (SA)

The Renewable Energy Procurement Plan (REPP) is DWR's plan for incrementally reducing SWP GHG emissions by increasing the use of renewable energy and reducing the use of energy from thermal and unspecified sources to operate the SWP. These renewable energy purchases are in addition to energy purchased to make up for the expiration of the RG4 contract in measure OP-1. Electricity resources purchased under the REPP will meet State policy on renewable energy resources as generally defined by law and the California Energy Commission's *Renewable Resource Eligibility Guidebook*.

DWR structured the REPP to be more than adequate to meet the Mid-term Goal for 2030 while incrementally increasing procurement as the renewable energy market matures so that total operations emission is zero by 2045. Based on the average loads and resources from 2000 to 2018 and on forecasted power requirements, Table 6 shows progressively increasing renewable energy purchases such that the energy purchased each year adds to the previous year's total, i.e., Year 1 = 36 GWh, Year 2 = 36 GWh + 36

GWh from Year 1 = 72 GWh, Year 3 = 36 GWh + 72 GWh from Year 2 = 108 GWh, etc.

Actual procurement may occur in larger or smaller tranches and may not exactly follow the timing indicated in Table 6 because of market availability and the level of resources needed to meet GHG emissions reduction goals. Further, long-range projections indicate that DWR may not need to procure all 3,960 GWh of electricity per year to meet its Long-term Goal in 2045. DWR will monitor emissions trends and modify the schedule for procurement of renewable energy as necessary to meet its Mid-term and Long-term Goals.

Table 6 DWR Renewable Energy Procurement Plan

Period	Renewable Energy Annual Incremental Procurement Rate	End of Period Procurement Target Rate	End of Period Estimated Emissions Reduction Rate
2011–2020	36 GWh/Year	360 GWh/Year	83,999 $mtCO_2e$ /Year
2021–2025	72 GWh/Year	720 GWh/Year	141,211 $mtCO_2e$ /Year
2026–2030	72 GWh/Year	1,080 GWh/Year	171,633 $mtCO_2e$ /Year
2031–2035	108 GWh/Year	1,620 GWh/Year	197,176 $mtCO_2e$ /Year
2036–2040	180 GWh/Year	2,520 GWh/Year	212,958 $mtCO_2e$ /Year
2041–2045	288 GWh/Year	3,960 GWh/Year	187,313 $mtCO_2e$ /Year

Note: GHG reduction rate increases as renewable procurements increasingly replace market resources. But because market resources are projected to be cleaner in the future, the difference between renewable resources and market resources becomes smaller, and the REPP's emission reduction rate eventually decreases.

Since implementation of its REPP, DWR has executed contracts to procure renewable energy from sources including solar, hydroelectric, geothermal, and landfill gas. By the end of 2018, DWR has already met its 2020 REPP target, which was set in the 2012 Plan. Consistent with the REPP, Figure 3 shows the estimated average annual renewable energy from contracts that DWR has executed as well as pending and future contracts that DWR plans to execute. Note that the timing and amount of pending and future procurements are estimated.

Figure 3 DWR's Renewable Energy Procurements for 2010–2045

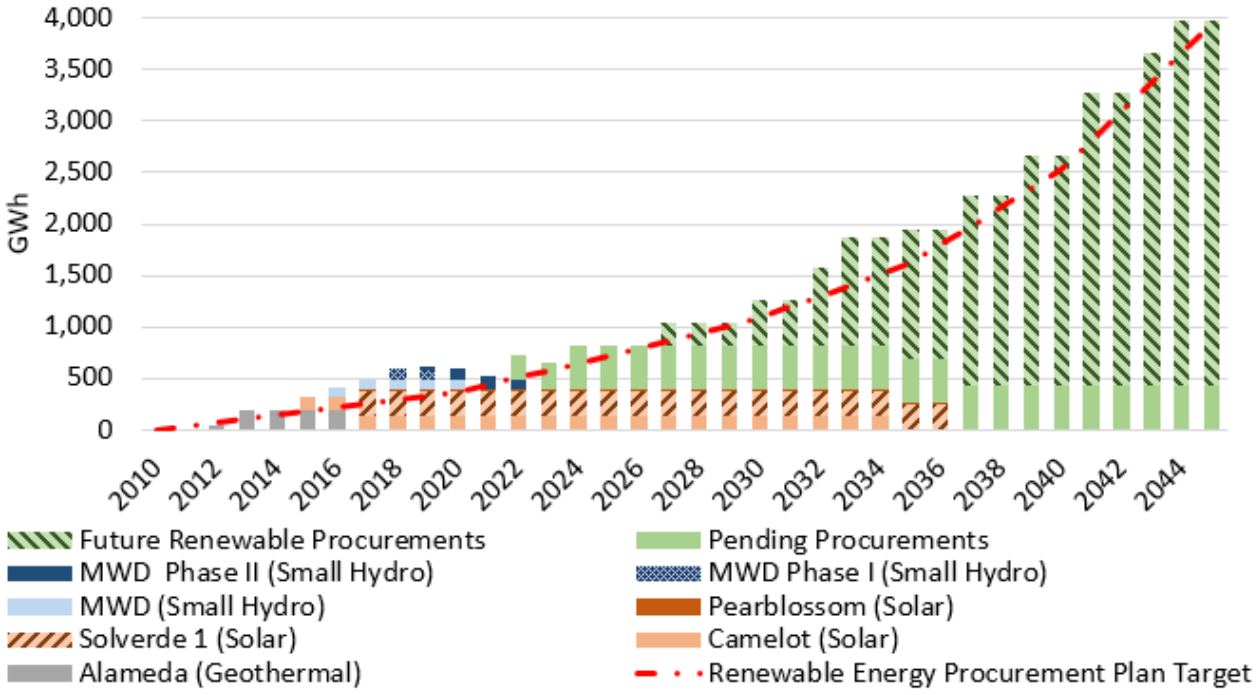


Photo 13 Pearblossom Solar Facility

OP-4 On Site Renewable Energy Resources (SA)

In addition to purchasing renewable energy under the REPP, DWR is exploring ways to reduce its grid-based energy purchases, both at the retail and wholesale level, by developing renewable energy projects on DWR-owned property. Opportunities for renewable energy development on DWR's property will be subject to space availability, safety, and environmental considerations and will be subordinate to DWR's primary purpose of water delivery and flood control. Even with these restrictions, DWR is optimistic about opportunities to install on-site renewable energy projects while preserving DWR's ability to safely operate and maintain its facilities.

On the retail level, DWR's activities include investigating on-site solar projects that interconnect with DWR's energy loads at facilities such as administration buildings, flood maintenance yards, O&M shops, and visitor centers. For example, DWR incorporated solar carports in its Southern Field Division's O&M center, which was built to Leadership in Energy and Environmental Design (LEED) standards. DWR has also identified several other locations with the potential for approximately 1–2 MW of solar projects and intends to more fully explore this measure in future plan updates.

Photo 14 Southern Field Division O&M Center

On the wholesale level, DWR continues to study the value of interconnecting renewable energy projects on DWR's property similar to the successful development of the 9.5 MW Pearblossom Solar Facility, which is located adjacent to DWR's Pearblossom Pumping Plant. DWR has been purchasing the generation from Pearblossom Solar Facility since the end of 2016 through a power purchase agreement, which is accounted for in measure OP-3.

OP-5 Lodi Energy Center (SA)

DWR has a 33.5 percent ownership interest in LEC, which began supplying up to 304,000 MWh of electricity to DWR in 2012 and up to 500,000 MWh thereafter. LEC is a high-efficiency, combined-cycle, natural gas-fired power plant located in Lodi, California. At the time of its installation, LEC was a state-of-the-art plant with low GHG emissions; however, as more renewable energy became available in the California wholesale energy market, LEC's GHG emission factor became higher than that of unspecified sources in the energy market. Consequently, to meet its Long-term Goal, DWR plans to divest its share of LEC by the end of 2040 and replace it with renewable energy as part of measure OP-3.

Note that LEC features fast ramp-up and ramp-down capabilities that can support and back-up intermittent renewable energy supplies on the California electricity grid. Therefore, resources like LEC are currently crucial to maintaining electric grid reliability until energy storage or other technologies are mature.

OP-6 Carbon Sequestration (SA)

Research by DWR and other institutions (Drexler 2011; Deverel et al 2017) has shown that growing crops on peat soils that are flooded during most of the year, especially during the summer and early fall months, reverses subsidence and sequesters carbon. Tule wetlands not only stop the peat soils from subsiding but also reverse subsidence by accreting root mass which eventually yields soil production and sequesters carbon. Since 1997, DWR has constructed and studied three large-scale wetlands in the West Delta by monitoring the effects of growing tules, including land surface elevation changes and carbon sequestration. The data show that growing tules not only changed the surface elevation but also sequestered approximately 1–3 $mtCO_2e$ per acre per year of GHGs.

Beginning in 2008, DWR initiated research on growing rice on peat soils, and studies showed that while rice neither reversed nor sequestered carbon, it greatly reduced these deleterious rates. Growing rice did not result in accretion or subsidence, yielding a no-net ground elevation change and an emission of approximately 1 $mtCO_2e$ per acre per year.

In comparison, the areas used for agricultural purposes lose up to 0.5–2 inches of soil per year, mainly from the oxidation of peat soils. This oxidation results in the emission of GHG at a rate of approximately 6–10 $mtCO_2e$ per acre per year. Consequently, the total GHG reduction for growing tules on peat soils ranges from 7–13 $mtCO_2e$ per acre per year, and the net GHG reduction for growing rice is approximately 5–9 $mtCO_2e$ per acre per year.

DWR has constructed approximately 1700 acres of wetlands and 600 acres of rice fields. Using an average sequestration rate of 10 $mtCO_2e$ per acre per year for growing tules and an average rate of 7 $mtCO_2e$ per acre per year for growing rice, DWR currently sequesters approximately 21,000 $mtCO_2e$ of GHG per year. DWR also anticipates another 1,000 acres of wetlands coming online between 2020 and 2023, which would sequester an additional 10,000 $mtCO_2e$.

To be considered for the purposes of Update 2020, DWR's carbon sequestration activities under measure OP-6 must result in a real, permanent, quantifiable, verifiable, and additional reduction of GHG emissions, within the meaning of AB 32.

OP-7 Zero-Carbon Energy (SA)

In addition to procuring renewable energy under measure OP-3, DWR also considers procuring resources that have no GHG emission but are not currently defined as eligible renewable energy by the California Energy Commission, such as energy produced by large hydroelectric generators.

In October 2016, CDWR signed an agreement with Western Area Power Administration to purchase 3 MW of electric hydropower generated at the Hoover Dam. The contract is effective October 2017 through September 2067.

B. Construction Emissions Reduction Measures

The primary source of DWR's construction emissions is diesel-powered construction equipment. Large reductions in construction emissions are difficult to realize because there are currently no economical alternatives to diesel fuel for powering most construction equipment. Even so, DWR has adopted BMPs for construction and maintenance activities and made significant changes to its construction project specifications requirements that will lead to important reductions in construction emissions. In addition, improvements in statewide regulations governing construction equipment and fuel standards driven by AB 32 and other initiatives will also contribute to reduced emissions from construction activities. Because BMPs are often the result of regulations, the two are combined in measure CO-1.

CO-1 Construction BMPs and Regulations (PL)

Construction BMPs

DWR's BMPs for construction activities are aimed at reducing fuel consumption for construction equipment and transportation of construction materials, using renewable diesel that has zero GHG emission, reducing the amount of landfill material, and reducing emissions from the production of cement. The BMPs are divided into two categories: (1) Pre-Construction and Final Design and (2) Construction. A complete list of DWR's BMPs for construction and maintenance activities to reduce GHG emissions is in Appendix D.

Off-Road Diesel Vehicle Regulation

In 2007, CARB adopted the Off-Road Diesel Vehicle Regulation (13 CCR Section 2449 et seq.), which would significantly reduce emissions from off-road, non-agricultural, diesel vehicles with engines greater than 25 horsepower — the types of vehicles typically used in construction activities. The regulation required owners to replace the engines in their vehicles, apply exhaust retrofits, or replace the vehicles with new vehicles equipped with cleaner engines. The regulation also limited

vehicle idling and required compliance with sale disclosure and reporting and labeling requirements. The regulation restricts addition of older vehicles to the fleet, and requires fleets to reduce their emission by retiring, replacing, repowering older engines, or installing Verified Diesel Emission Control Strategies. As owners of fleets of construction, mining, and industrial vehicles upgrade the performance of their fleets to comply with the regulation, emissions from construction activities by DWR's contractors would be reduced correspondingly.

CARB Climate Change Scoping Plan and Regulations

The initial CARB Scoping Plan proposed a comprehensive set of actions designed to achieve the 2020 GHG emissions reductions required under AB 32. In May 2014, CARB approved the First Update to the Scoping Plan. In December 2017, CARB approved the 2017 Scoping Plan, which incorporated the State's new climate change goals under SB 32. Specific actions in the Scoping Plan that will impact DWR construction activities include low carbon fuel standard (Measure Transportation-2), tire inflation regulation (Measure Transportation-4), goods movement system-wide efficiency improvements (Measure Transportation-6), heavy-duty tractor truck regulation (Measure Transporation-7), commercial recycling (Measure Recycling and Waste-3), and greening new and existing State buildings (Measure Green Building-1).

In addition, other efforts by CARB to reduce air pollutant emissions through 2020 includes the Diesel Risk Reduction Plan and the State Implementation Plan. Measures in these plans are expected to accelerate the phase-in of cleaner technology for virtually all of California's diesel engine fleets including trucks, buses, construction equipment, and cargo handling equipment at ports.

Quantifying the emissions reductions that will result from implementation of these regulations is difficult and depends on many factors, including the

characteristics of DWR's construction projects in the future and the speed with which the regulations are adopted and implemented. But, because most of the construction emissions result from use of gasoline, diesel, and concrete, Update 2020 assumes that compared with 2014–2018 levels, construction emissions will be reduced by 20 percent by 2030 based on the following: California Low Carbon Fuel Standards require a 20 percent reduction in carbon intensity of diesel and gasoline fuels by 2030, and new cement manufacturing technologies are expected to reduce concrete CO_2 emissions by 20 percent or more.

C. Maintenance and Business Practices Emissions Reduction Measures

Maintenance emissions constitute a small part of DWR's GHG emissions footprint and few cost-effective measures exist for further reducing emissions from maintenance activities. Nevertheless, to improve the efficiency of maintenance operations, DWR will continue to implement BMPs for construction and maintenance activities (Appendix D) and to reduce emissions from vegetation management activities (Appendix E) to the extent possible. DWR also plans to reduce GHG emissions related to maintenance and business practices by continuing to implement the following measures:

MA-1 SF_6 (SA)

In 2011, CARB approved regulation that limits annual SF_6 emission from gas insulated switchgear (17 CCR Section 95350 et seq.). The annual emission limit, which is based on the percentage of the total name plate capacity of the non-hermetically sealed switchgear, started at 10 percent for 2011 and is reduced by 1 percent every year, resulting in a maximum emission limit of 1 percent in 2020.

To comply with regulation, DWR is tracking its SF_6 inventory, purchases, and transfers; calibrating its weighing scales; inspecting and controlling leaks, if any; maintaining all records required by the regulation; reducing the number of canisters; and training staff. CARB is proposing amendments to this regulation that will lower the emission limits to 0.6 percent by 2049 and require progressive phase out of SF_6 equipment. In response, DWR plans to replace its SF_6 switchgear with non-SF_6 switchgear as required and as technically and economically feasible.

MA-2 Utility Retail Renewable Program (SA)

DWR has been participating in Sacramento Municipal Utility District's (SMUD) commercial Greenergy program since 2010. In April 2018, DWR signed a new agreement with SMUD to continue participating in this program, which matches a customer's electricity needs with energy purchases from renewable and sustainable sources that do not emit GHG. DWR has committed to purchasing 11,004 MWh of SMUD Greenergy annually to serve DWR's business activities.

MA-3 Carbon Offset (CM)

In January 2010, DWR signed an agreement with SMUD to participate in its Commercial Carbon Offset Program, which allowed commercial customers to purchase carbon offsets from emissions generated through use of natural gas in the participants' business activities. DWR committed to purchasing 2,580 metric tons of carbon offsets each year for 10 years; however, these offsets were not eligible for credit in TCR. SMUD discontinued this program in 2016.

Although SMUD discontinued its carbon offset program, DWR will consider purchasing carbon offsets from other entities as needed to meet its GHG reduction goals. Carbon offsets purchased by DWR pursuant to Update 2020 must represent a real, permanent, quantifiable, verifiable, enforceable, and additional reduction of GHG emissions consistent with the requirements of AB 32, as set forth in Section 38562(d)(1) & (2) of the California Health & Safety Code. To that end, DWR may consider purchasing (1) offset credits from a project developed according to a CARB-approved Compliance Offset Protocol pursuant to Subarticle 13 of the Cap-and-Trade Regulation (17 CCR Section 95970 et seq.); (2) offset credits issued by a linked jurisdiction pursuant to Subarticle 12 of the Cap-and-Trade Regulation (17 CCR Section 95940 et seq.); (3) sector-based offset credits issued by an approved sector-based crediting program pursuant to Subarticle 14 of the Cap-and-Trade Regulation (17 CCR Section 95990 et seq.); or (4) offset credits issued by a CARB-approved registry or other reputable registry that issues carbon offset credits consistent with the requirements of AB 32 as set forth in Section 38562(d)(1) & (2) of the California Health and Safety Code, from projects developed within the State of California or from projects developed within the United States, if offset credits from California-based projects are not available or are not financially feasible.

MA-4 DWR Sustainability Initiatives (SA)

DWR's Sustainability Policy (DWR) guides DWR's decision-making and its business practices with the goal of making DWR a sustainability leader within State government and the California water community. DWR's sustainability initiatives (Appendix F), which have been updated to address Executive Order B-18-12, Executive Order B-30-15, and legislative mandates, include reducing energy and water use, waste and wastewater production, and carbon emissions. Additional information on DWR's sustainability initiatives are in the report titled "*Governor's Sustainability Roadmap*," which is published every two years at Green California Government Website (https://www.green.ca.gov/).

GHG emission reductions through sustainability initiatives are difficult to quantify. In addition, many of the activities reduce emissions from sources that are outside of DWR's emissions inventory, such as activities associated with employee commuting, which are attributed to the transportation sector of the economy. Thus, except for initiatives described in MA-5, GHG emission reductions from activities listed under this measure are assumed to be zero for purposes of achieving Update 2020 emissions reduction goals. Nevertheless, these activities contribute to the overall reductions in GHG emissions for both DWR and the wider economy.

MA-5 Retail Energy Reduction (SA)

DWR has 26 facilities, including visitor centers, storage facilities, and O&M centers, that total to approximately 490,000 square feet of building space. In response to EO B-18-12, which requires State agencies to reduce grid-based retail energy purchases for State-owned buildings by at least 20 percent by 2018 compared with a 2003 baseline, DWR took the following steps to meet the mandate:

In 2010, DWR began conducting energy audits of its buildings by analyzing use patterns and determining the cost-benefits of energy efficiency (EE) upgrade projects. As a result, DWR implemented twelve EE projects that included installation or upgrade of occupancy sensors; high efficiency lighting; electronic ballast; cooling towers; and heating, ventilation, and air conditioning (HVAC) systems. DWR also plans to upgrade or replace additional HVAC systems to further reduce grid-based retail energy use and

will quantify the emission savings in future plan update when project plans are more developed.

While the EE upgrade projects helped DWR reduce its retail energy use, ongoing extraordinary reconstruction work at Thermalito Pumping-Generating Plant added to the energy use. DWR expects this reconstruction work to be completed in 2020, at which time DWR's overall retail energy use will drop. Therefore, the GHG reduction attributed to this measure in Table 5 does not include the increased energy consumption from the reconstruction at Thermalito Pumping-Generating Plant. Annual reports on State agencies energy reduction and corresponding GHG emissions are available to the public at Green California Government Buildings (https://www.green.ca.gov/buildings).

Executive Order B-18-12 also requires State agencies to reduce environmental impacts by taking various measures to achieve ZNE compliance as follows:

- 50 percent of new construction and major renovations by 2020.
- 100 percent of new construction and major renovations by 2025.
- 50 percent of the total square footage of existing State-owned buildings by 2025.

To be ZNE compliant, a building or facility must meet a specified EE target and consume no more energy than it produces from renewable resources over the course of a year. DWR is working with the Department of General Services to reduce retail energy use at its field facilities to meet the required energy efficiency targets for ZNE. Once the energy efficiency targets are met, DWR will, consistent with OP-4, pursue measures to develop on-site renewable energy generation at those facilities to achieve ZNE status and will quantify the emission reductions in future plan update.

Photo 15 William Warne Powerplant

VII. Other Emissions and Emissions Reductions

Future DWR activities could potentially result in loss of natural sequestration capacity resulting from, for example, loss of forest area. Conversely, as noted in measure OP-6, DWR anticipates that future projects will likely involve significant environmental restoration activities resulting in increased sequestration of carbon by natural processes. The size and scope of potential future gains or losses of sequestration capacity are speculative and will be evaluated and quantified on a project-by-project basis. Changes in sequestration capacity will be clearly documented in project analyses and, to the extent possible, loss of sequestration capacity will be mitigated at the project level. Remaining emissions that cannot be mitigated at the project level and net increases in sequestration capacity that are not used to offset impacts at the project level will be accounted for comprehensively during plan monitoring and updates. DWR anticipates that projects that increase natural GHG sequestration capacity and lead to net increases in sequestration will offset loss of sequestration capacity caused by DWR activities.

Photo 16 Sherman Island County Park

Photo 17 Power Line Worker in Oroville

VIII. Historical and Projected Emissions

As committed to in the 2012 Plan, DWR has been monitoring its progress in meeting GHG reduction goals using a five-year running average. As shown in Table 7, DWR reduced its GHG emission to 76 percent below 1990 levels for the 2014–2018 period, which exceeded the 2012 Plan's goal of 50 percent below 1990 levels by 2020.

Table 7 also shows DWR's projected GHG emissions for 2030 and 2045 with implementation of the emissions reduction measures described above. These GHG emission projections also reflect DWR's assumptions regarding future SWP operations and electricity resources that will displace electricity currently purchased from unspecified sources from the CAISO market. Additional information regarding operations analysis and assumptions are provided in Appendix G.

These projections indicate that DWR anticipates exceeding its Mid-term Goal with a projected emission 82 percent below the 1990 level in 2030. In addition, DWR anticipates meeting its Long-term Goal by supplying 100 percent of its load with zero-carbon resources and achieving carbon neutrality by 2045.

Table 7 Historical & Projected Annual GHG Emissions ($mtCO_2e$)

Emission Source	1990 Baseline*	2014–2018 Average	2030	2045
Operations	2,692,000	536,508	461,500	0
Construction	28,200	115,751**	13,110	0
Maintenance & Business Practices	52,700	16,498	14,383	0
Total	2,746,000	668,758	488,993	0
% Reduction from 1990 Level	N/A	76%	82%	100%

Note:

* The 1990 baseline emission is the average of 1988–1992 emissions.

** Emission increased as a result of the Oroville Dam spillway repair in 2017 and 2018.

Photo 18 Antelope Valley

IX. Monitoring and Plan Updates

Update 2020 will be implemented over the next twenty-five years to meet GHG emissions reduction goals established for 2030 and 2045. As DWR implements the GHG emissions reduction measures described in Update 2020, DWR will also monitor its performance by annually quantifying emissions from all emissions sources. Because emissions from DWR's activities are prone to large variations from year to year, DWR will continue to monitor its GHG emissions using a five-year running average, which DWR has determined is sufficient to smooth out fluctuations in annual emissions while still showing the long-term trend.

Figure 4 shows the target emissions trajectory based on the 1990 baseline, the 2020 goal from the 2012 Plan, and the 2030 and 2045 goals from Update 2020. DWR will use this emissions trajectory to gauge progress toward achieving the emissions reduction goals. Emissions may periodically exceed the trajectory line indicating the need for more significant emissions cuts in future years or fall below the trajectory line indicating that larger than expected reductions have occurred.

If monitoring activities indicate that DWR will not meet its GHG emissions reduction goals, DWR will re-evaluate its GHG emissions reduction measures and may add additional measures as needed, revisit analysis of environmental impacts of projects undertaken in reliance on Update 2020, or take other action. DWR intends to update this plan in 2030 unless monitoring establishes that an earlier update is needed. As part of the update, DWR will evaluate its annual emissions during the preceding years to document the emissions reductions it has realized and include goals and projections for years beyond 2030.

Figure 4 DWR's Historic and Projected Annual Emissions

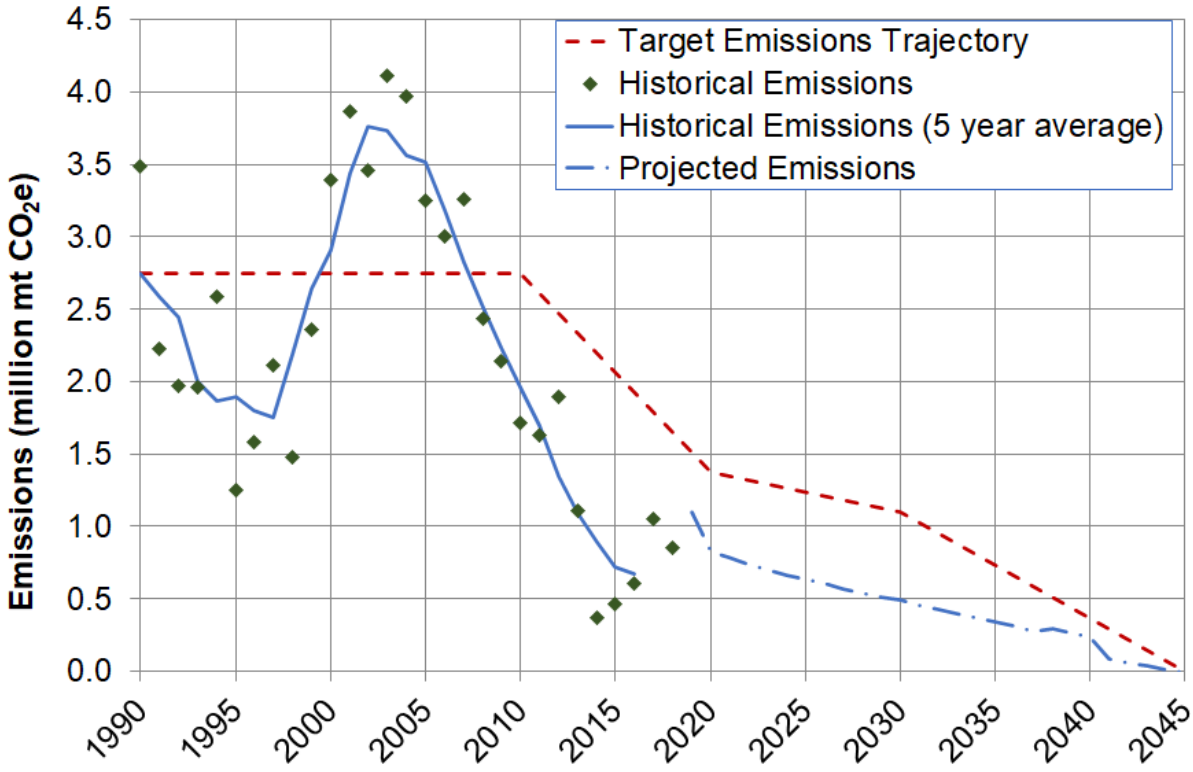


Photo 19 California Aqueduct

X. Future DWR Projects Use of Update 2020 for CEQA Purposes

Use of Update 2020 for Cumulative Impact Analyses of Future Projects

It is unlikely that any single project by itself could have a significant impact on climate change from its GHG emissions alone. Likewise, even the totality of DWR's activities would not be likely to have any measurable effect on global or local climate. However, the cumulative effect of human activities has been linked to quantifiable changes in the composition of the atmosphere, which in turn have been shown to be the main cause of global climate change (Intergovernmental Panel on Climate Change 2007). Though it would be impossible to directly link DWR's activities to measurable effects on climate, any substantial emissions of GHGs to the atmosphere could be seen as contributing to the existing and ongoing environmental impact of anthropogenic climate change. By implementing Update 2020, DWR will not only reduce its overall GHG emissions, but also contribute to meeting the statewide GHG emissions reduction target set in California's climate change legislation.

DWR uses Phase 1 of its Climate Action Plan, as revised pursuant to this 2020 Update, to streamline the CEQA cumulative impact analysis of GHG emissions for current and future DWR projects pursuant to CEQA Guidelines Sections 15064(h)(3), 15064.4(b)(3), 15130(d), and 15183.5. DWR approved the 2012 Plan following environmental review and adoption of a negative declaration. For the purposes of Update 2020, DWR prepared an addendum to the negative declaration pursuant to CEQA Guidelines Sections 15162(b) and 15164(b). In the addendum, DWR evaluated the changes to the 2012 Plan under this Update 2020 and changes in surrounding circumstances (including legislative, regulatory and market changes) and concluded that these changes would not cause any new significant environmental impacts that would require preparation of a subsequent negative declaration or an environmental impact report.

Later project-specific environmental documents for DWR projects that are covered by this Update 2020 may rely on the analysis and conclusions in

Update 2020 for the purposes of cumulative analysis of a project's GHG emissions. As required by CEQA Guidelines, environmental documents for later projects that rely on Update 2020 will "identify those requirements specified in [Update 2020] that apply to the project, and, if those requirements are not otherwise binding and enforceable, incorporate those requirements as mitigation measures applicable to the project." (CEQA Guidelines Section 15183.5(b)(2)). If there is substantial evidence that the effects of a project may be cumulatively significant regardless of project's compliance with the specified requirements in this Update 2020, DWR will prepare an Environmental Impact Report (EIR) for such a project (CEQA Guidelines Section 15183.5(b)(2)).

To show that the current or future project is consistent with this Update 2020 and that the cumulative impact analysis of DWR GHG emissions conducted for this Update 2020 analyzes and addresses the emissions for the proposed project, current and future projects relying on this Update 2020 must complete the following steps:

1. Identify, quantify, and analyze the GHG emissions from the proposed project and alternatives using a method consistent with that described in DWR internal guidance, "Guidance for Quantifying Greenhouse Gas Emissions and Determining the Significance of their Contribution to Global Climate Change for CEQA Purposes," as such guidance document may be revised.
2. Determine that construction emissions levels do not exceed the Extraordinary Construction Project threshold of either 25,000 $mtCO_2e$ for the entire construction phase of the project or 12,500 $mtCO_2e$ in any single year of construction.
3. Incorporate into the design or implementation plan for the project all project-level GHG emissions reduction measures listed in Chapter VI or explain why measures that have not been incorporated do not apply to the project.
4. Determine that the project does not conflict with DWR's ability to implement any of the specific project GHG emissions reduction measures listed in Chapter VI.
5. If implementation of the proposed project would result in additional energy demands on the SWP system of 15 GWh/year or greater, the project must obtain a written confirmation from the DWR SWP Power

and Risk Office stating that the Renewable Power Procurement Plan will be updated to accommodate the additional load resulting from the proposed project at such time as the proposed project is ultimately implemented.

Note: Individual projects that add 15 GWh/year of additional load to the SWP power portfolio could negatively affect DWR's ability to achieve its GHG emissions reduction goals if the procurement plan is not updated to accommodate the new demand. Projects that add less than 15 GWh/year of additional loads to the SWP power portfolio would only marginally affect emissions and would be unlikely to impede DWR's ability to meet its GHG emissions reduction goals.

An assessment form (Appendix C) will assist DWR in evaluating whether a future project's GHG emissions are addressed by the environmental analysis in this Update 2020 and therefore are entitled to streamlined review. Any project generating GHG emissions that is not eligible to use this Update 2020 for cumulative impacts analyses of later projects would require additional environmental review to analyze the project-specific cumulative GHG emissions impacts.

Coordination with Projects That Are Not Eligible to Rely on the Analysis in Update 2020

DWR does not rely on the analysis in this Update 2020 to streamline cumulative impacts analyses of current projects under CEQA for DWR projects for which GHG emissions are not analyzed and addressed in this Update 2020. Instead, as appropriate, DWR will develop project-specific GHG emissions analyses. If these project-specific GHG analyses indicate that the project will have a cumulatively considerable adverse environmental impact, the preparation of an EIR may be required for those specific projects. If those projects require mitigation for GHG emissions, DWR will develop and describe strategies specifically for those projects in the appropriate project-specific CEQA document.

Photo 20 DWR's Exhibit at the 2014 California State Fair

XI. References

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Appendix A. DWR Sustainability Policy

Department of Water Resources

Sustainability Policy

April 2009

Sustainability[1] of natural resources may be the defining issue of 21st century. It is the policy of the Department of Water Resources (DWR) to become a sustainability leader and ecosystem steward within State government and the California water community. DWR will do so by promoting, advocating, and facilitating sustainability practices throughout its business operations and the State Water Project (SWP). The department will consider sustainability and ecosystem stewardship in its current and future activities and plans and, in the context of technical feasibility and cost effectiveness, will make sustainability a criterion in all decision-making processes. Specifically, DWR will:

- Incorporate energy and water efficiency and conservation in all capital and renovation projects, as well as operations and maintenance activities, within budgetary constraints and programmatic requirements.
- Model state-of-the-art water use efficiency practices within State government, with a goal of reducing its per capita water consumption by at least 20 percent BY 2020.
- Maximize the use technically feasible and cost-effective clean and renewable energy sources for the SWP and DWR's business operations.

[1] The California Water Plan Update 2005 defines "sustainability" as "a specific resource that avoids complete depletion over a specified time horizon" and "the continued feasibility of specified economic activity over a specified time horizon, usually influenced by management and policy actions." In 2010, the California Climate Action Registry will become The Climate Registry.

- Track and report its greenhouse gas (GHG) emissions to the California Air Resources Board (CARB) and the California Climate Action Registry[2].
- Reduce its GHG emissions to at least 1990 levels by 2020, consistent with the goal set for State government leadership by CARB in the AB 32 Scoping Plan.
- Minimize the amount of waste sent to landfill by maximizing opportunities to reduce, reuse, and recycle materials.
- Develop sustainable business practices for its facilities, fleet, workplaces, procedures, and management decisions, through collaborative opportunities for sustainability with other State agencies and the water industry.
- Utilize its purchasing power to meet its sustainability objectives.
- Promote sustainability in its grantmaking processes.

With this commitment in mind, DWR will convene a standing, working group on sustainability, which will develop guidelines to implement this Sustainability Policy by April 2010. To ensure this policy's effectiveness, the department shall keep abreast of best practices for sustainability, monitor progress, and adjust this policy and its implementing guidelines as needed. Each February, the deputy directors for the SWP and Business Operations shall prepare an annual report regarding implementation progress, including any recommendations of changes, for the director's review.

[2] In 2010. The California Climate Action Registry will become The Climate Registry DWR 9045 (Rev 1/09).

Appendix B. Climate Change Related Laws, Regulations, and Policies

The tables below list key federal and State statutes, regulations, and policies that informed the analysis, goals, and strategies included in DWR's 2012 Greenhouse Gas Emissions Reductions Plan and Update 2020.

Table AppB-1 Key Federal Regulations

Federal Regulations	Date	Key Provisions
Clean Air Act.	Originally adopted in 1963 and subsequently amended.	The Clean Air Act is a comprehensive federal law that regulates air emissions from stationary and mobile sources and authorizes the U.S. Environmental Protection Agency (EPA) to establish National Ambient Air Quality Standards (NAAQS) to protect public health and public welfare and to regulate emissions of hazardous air pollutants. In 2009, the U.S. EPA issued a finding that GHG emissions pose a threat to public health and welfare and thus can be regulated under the Clean Air Act.
U.S. EPA GHG Reporting Program (GHGRP).	Originally adopted in 2009 and subsequently amended.	The federal GHGRP, codified in 40 CFR Part 98, requires reporting of GHG data and other relevant information from large GHG emission sources, fuel and industrial gas suppliers, and CO_2 injection sites in the United States.

Table AppB-2 California Statutes

Statutes	Date	Key Provisions
Senate Bill 1771 (Sher, Chapter 1018, Statutes of 2000).	September 2000.	Establishes the California Climate Action Registry (CCAR) to develop protocols for voluntary accounting and tracking of GHG emissions and directs the Registry to enable participating entities to voluntarily record their annual GHG emissions inventories.
Senate Bill 527 (Sher, Chapter 769, Statutes of 2001).	October 2001.	Requires the CCAR to adopt third-party verification metrics, develop GHG emissions protocols and qualify third-party organizations to provide technical assistance and certification of emissions baselines and inventories.
Assembly Bill 1493 (Pavley, Chapter 200, Statutes of 2002).	July 2002.	Directs the California Air Resources Board (CARB) to establish fuel standards for noncommercial vehicles that would provide the maximum feasible reduction of GHGs.
Senate Bill 1078 (Sher, Chapter 516, Statutes of 2002).	September 2002.	Establishes the California Renewables Portfolio Standard (RPS) Program[1] and requires electric utilities and other retail sellers of electricity under the jurisdiction of the California Public Utilities Commission (CPUC) to increase their total procurement of eligible renewable energy resources by at least 1% per year so that 20% of their retail sales are procured from eligible renewable energy resources by December 31, 2017; requires governing boards of local publicly owned electric utilities to be responsible for implementing and enforcing the RPS.

[1] DWR is not a retail seller of electricity and is not subject to the CPUC jurisdiction or the requirements of the California Renewable Portfolio Standard. (See Cal. Public Utilities Code Section 399.12(j)(4)(B).)

Statutes	Date	Key Provisions
Assembly Bill 32 (Núñez, Chapter 488, Statutes of 2006).	September 2006.	Requires the CARB to adopt a statewide GHG emissions limit equivalent to the statewide GHG emissions levels in 1990 to be achieved by 2020. Requires the CARB to adopt regulations to require the reporting and verification of statewide GHG emissions and to monitor and enforce compliance with this program.
Senate Bill 107 (Simitian, Chapter 464, Statutes of 2006).	September 2006.	Changes the RPS to require that at least 20% of the total electricity sold to retail customers in California per year be from eligible renewable resources by December 31, 2010.
Senate Bill 1368 (Perata, Chapter 598, Statutes of 2006).	September 2006.	Requires new energy contracts to meet a minimum standard for the rate of GHG emissions from energy generation.
Senate Bill 97 (Dutton, Chapter 187, Statutes of 2007).	August 2007.	Directs Governor's Office of Planning and Research to develop CEQA guidelines for the mitigation of GHG emissions or the effects of GHG emissions.
Senate Bill 85 (Chapter 178, Statutes of 2007).	August 2007.	Requires DWR to comply with the GHG emission standards adopted by the CPUC for a local publicly owned electric utility, to use reasonable, feasible, and cost-effective efforts to use energy efficiently, and to increase its use of renewable energy in its water operations and in its renegotiation of existing electricity contracts for retail end-use customers and local publicly owned electric utilities.
Senate Bill 375 (Steinberg, Chapter 728, Statutes of 2008).	September 2008.	Requires the CARB to develop regional GHG emission reduction targets for passenger vehicles; requires metropolitan planning organizations to include sustainable community strategies in their regional transportation plans.

Statutes	Date	Key Provisions
Senate Bill X1-2 (Simitian, Chapter 1, Statutes of 2011).	April 2011.	Increases the RPS requirements to an amount that equals at least 20% of the total electricity sold to retail customers in California per year by December 31, 2013, 25% by December 31, 2016, and 33% by December 31, 2020.
Senate Bill 605 (Lara, Chapter 523, Statutes of 2014).	September 2014.	Requires the CARB to complete a comprehensive strategy to reduce emissions of short-lived climate pollutants by January 1, 2016.
Assembly Bill 1482 (Gordon, Chapter 603, Statutes of 2015).	October 2015.	Requires the Natural Resources Agency, by July 1, 2017, and every three years thereafter, to update the State's climate adaptation strategy; requires State agencies to maximize specified objectives, including promoting the use of the climate adaptation strategy to inform planning decisions and ensure that State investments consider climate change impacts, as well as promote the use of natural systems and natural infrastructure, when developing physical infrastructure to address adaptation.
Senate Bill 350 (De León, Chapter 547, Statutes of 2015).	October 2015.	Establishes RPS targets to increase retail sales of renewable electricity to 50% by 2030 and double the energy efficiency savings in electricity and natural gas end uses by 2030. Requires the State to set GHG reduction planning targets through Integrated Resource Planning for load serving entities.
Senate Bill 32 (Pavley, Chapter 249, Statutes of 2016).	September 2016.	Establishes a statewide GHG emission reduction target of 40% below 1990 levels by 2030.
Assembly Bill 197 (Eduardo Garcia, Chapter 250, Statutes of 2016).	September 2016.	Requires the CARB to prioritizes direct GHG emission reductions from large stationary sources and mobile sources.
Senate Bill 1383 (Lara, Chapter 395, Statutes of 2016).	September 2016.	Establishes statewide reduction targets for short-lived climate pollutants.

Statutes	Date	Key Provisions
Senate Bill 1386 (Wolk, Chapter 545, Statutes of 2016).	September 2016.	Declares it the policy of the State that protection and management of natural and working lands is an important strategy in meeting the State's GHG reduction goals. Requires State agencies to consider protection and management of natural and working lands in establishing policies and making expenditures, and to implement this requirement in conjunction with the State's other strategies to meet its GHG emissions reduction goals.
Senate Bill 1425 (Pavley, Chapter 596, Statutes of 2016).	September 2016.	Requires the California Environmental Protection Agency to oversee the development of a registry for GHG emissions resulting from the water-energy nexus.
Assembly Bill 2800 (Quirk, Chapter 580, Statutes of 2016).	September 2016.	Requires State agencies to take into account the current and future impacts of climate change when planning, designing, building, operating, maintaining, and investing in State infrastructure; requires the Natural Resources Agency to establish a Climate-Safe Infrastructure Working Group for the purpose of examining how to integrate scientific data concerning projected climate change impacts into State infrastructure engineering, as prescribed.
Assembly Bill 398 (Eduardo Garcia, Chapter 135, Statutes of 2017).	July 2017.	Extends CARB's cap and trade program through December 31, 2030, and refines certain elements of this program.
Assembly Bill 262 (Bonta, Chapter 816, Statutes of 2017).	October 2017.	Requires the Department of General Services to establish, by January 1, 2019, a maximum acceptable global warming potential for each category of eligible materials and to update it every three years; requires an awarding authority to consider a product's global warming potential in awarding certain types of public contracts.

Statutes	Date	Key Provisions
Senate Bill 1668 (Friedman, Chapter 15, Statutes of 2018).	May 2018.	Requires the State Water Resources Control Board (SWRCB), in coordination with DWR, to adopt long-term standards for the efficient use of water and performance measures for commercial, industrial, and institutional water use and to establish certain water conservation standards.
Senate Bill 100 (De Leon, Chapter 312, Statutes of 2018).	September 2018.	Increases RPS requirements to achieve the 50% renewable resources target by December 31, 2026, and to achieve a 60% target by December 31, 2030. Declares a State policy that eligible renewable energy resources and zero-carbon resources supply 100% of retail sales of electricity to serve California end-use customers and electricity procured to serve all State agencies no later than December 31, 2045.

Table AppB-3 California Governor's Executive Orders

Executive Orders	Date	Key Provisions
Executive Order S-20-04.	December 14, 2004.	Directs State agencies to reduce energy use in State-owned buildings by 20% by 2015 and increase energy efficiency.
Executive Order S-03-05.	June 1, 2005.	Establishes GHG emission reduction targets of reducing emissions to the 1990 levels by 2020 and 80% below the 1990 levels by 2050; creates the Climate Action Team and directs the California Environmental Protection Agency to coordinate efforts in meeting the targets with the other State agencies.
Executive Order S-01-07.	January 18, 2007.	Establishes a goal of reducing carbon intensity of California's transportation fuels by 10% and directs the CARB to develop a Low Carbon Fuel Standard.
Executive Order S-13-08.	November 14, 2008.	Directs State agencies to plan for sea-level rise and climate impacts through coordination of the State Climate Adaptation Strategy.

Executive Orders	Date	Key Provisions
Executive Order S-14-18.	November 17, 2008.	Declares an RPS target of 33% by 2020.
Executive Order B-16-12.	March 23, 2012.	Directs State agencies to help accelerate the market for zero-emission vehicles (ZEVs) in California and establishes several milestones on the path toward 1.5 million ZEVs in California by 2025.
Executive Order B-18-12.	April 25, 2012.	Calls for significant reductions in State agencies' energy purchases and GHG emissions; includes a Green Building Action Plan, which provides additional details and specific requirements for the implementation of the Executive Order.
Executive Order B-30-15.	April 29, 2015.	Sets a GHG emissions target for 2030 at 40% below 1990 levels; requires the CARB to update the AB 32 Climate Change Scoping Plan in coordination with other State agencies; directs State agencies to take climate change into account in their planning and investment decisions.
Executive Order B-32-15.	July 17, 2015.	Directs State agencies to develop an integrated freight action plan by July 2016 to improve freight efficiency, transition to zero-emission technologies, and increase competitiveness of California’s freight system.
Executive Order B-48-18.	January 26, 2018.	Directing State agencies to meet a series of milestones toward a long-term target of 1.5 million zero-emission vehicles (ZEVs) on California’s roadways by 2025 and 5 million by 2030.
Executive Order B-55-18.	September 10, 2018.	Sets a goal of achieving carbon neutrality as soon as possible, and no later than 2045, and achieving and maintaining negative emissions thereafter.

Executive Orders	Date	Key Provisions
Executive Order N-10-19.	April 29, 2019.	Directs the California Natural Resource Agency in coordination with other State agencies to prepare a water resilience portfolio, reassess the priorities contained within the 2016 California Water Action Plan and projected update climate change impacts to California's water systems.

Table AppB-4 California Regulations and Regulatory Programs

California Regulations and Regulatory Programs	Date	Key Provisions
Renewable Portfolio Standard (RPS).	Originally adopted in 2002 and subsequently amended.	The California Energy Commission's (CEC) RPS regulations set renewable energy procurement requirements for the state's electricity retailers, pursuant to the targets set in State statutes and executive orders. The CEC is responsible for adopting regulations for the enforcement of RPS procurement requirements of public owned utilities. The California Public Utilities Commission (CPUC) implements and administers RPS compliance rules for California's investor-owned utilities, electric service providers and community choice aggregators.
Low Carbon Fuel Standards (LCFS).	Originally adopted in 2009 and subsequently amended.	CARB's LCFS regulations (17 CCR Section 95480 et seq.) are designed to reduce the carbon intensity (CI) of transportation fuels used in California.
Mandatory Greenhouse Gas Reporting Program.	Originally adopted in 2007 and subsequently amended.	CARB's Regulation for the Mandatory Reporting of GHG Emissions (MRR) (17 CCR Sections 95100–95157) applies to electricity generators, industrial facilities, fuel suppliers, and electricity importers and requires annual reporting and verification of emissions data.

California Regulations and Regulatory Programs	Date	Key Provisions
Cap-and-Trade Program.	Originally adopted in 2011 and subsequently amended.	CARB's cap-and-trade regulations establish a cap on GHG emissions and provide market-based compliance mechanisms to covered entities.
Regulation for Reducing Sulfur Hexafluoride (SF_6) Emissions from Gas Insulated Switchgear.	Adopted in 2010.	CARB's SF_6 regulation (17 CCR Section 95350 et seq.) limits annual SF_6 emission from gas insulated switchgear and requires switchgear owners to reach a 1 percent emission rate by 2020.
Building Energy Efficiency Standards.	Originally adopted in 2013 and subsequently amended.	The CEC's Building Energy Efficiency regulations set energy efficiency standards for new construction of, and additions and alterations to, residential and nonresidential buildings.
Scoping Plan.	Originally adopted in 2008 and subsequently updated.	CARB has a statutory obligation pursuant to AB 32 to develop and update a Scoping Plan that describes the approach California will take to reduce GHGs to achieve the State goals of reducing GHG emissions.
California's Climate Adaptation Strategy and Safeguarding California Plan.	Originally adopted in 2009 and subsequently updated.	The Safeguarding California Plan, developed by the California Natural Resources Agency in coordination with other State agencies, provides a holistic overview of California State government's current and planned efforts to address the ongoing and forthcoming impacts of climate change.

Appendix C. Assessment Form for Consistency with GHG Emissions Reduction Plan

For Projects Using Only Department of Water Resources (DWR) staff and Equipment[1]

This form is to be used by DWR project managers to document a DWR CEQA project's consistency with the DWR Greenhouse Gas Emissions Reduction Plan (GGERP). This form is to be used only when DWR is the Lead Agency and when only DWR staff and equipment are used to implement the project.

Project Name: _____

Environmental Document Type: _____

Manager's Name: _____

Manager's E-mail: _____

Division: _____

Office, Branch, or Field Division: _____

Short Project Description:
Project GHG Emissions Summary: ☐ All emissions from the project will occur as ongoing operational, maintenance, or business activity emissions and therefore have already been accounted for and analyzed in the GGERP. (This box must be checked if you are using this form. If you cannot check this box you must use a different form.)

[1] This form is recreated from form DWR 9785b.

Project GHG Reduction Plan Checklist:

☐ All Project Level GHG Emissions Reduction Measures have been incorporated into the design or implementation plan for the project (Project Level GHG Emissions Reduction Measures).

☐ All feasible Project Level GHG Emissions Reduction Measures have been incorporated into the design or implementation plan for the project and Measures not incorporated have been listed and determined not to apply to the proposed project (include as an attachment).

Project does not conflict with any of the Specific Action GHG Emissions Reduction Measures (Specific Action GHG Emissions Reduction Measures).

Would implementation of the project result in additional energy demands on the SWP system of 15 GWh/yr or greater?

☐ YES ☐ NO

If you answered Yes, attach a Renewable Power Procurement Plan update approval letter from the DWR SWP Power and Risk Office.

Is there substantial evidence that the effects of the proposed project may be cumulatively considerable notwithstanding the proposed project's compliance with the requirements of the DWR GHG Reduction Plan?

☐ YES ☐ NO

If you answered Yes, the project is not eligible for streamlined analysis of GHG emissions using the DWR GHG Emissions Reduction Plan. (See CEQA Guidelines, Section 15183.5, subdivision (b)(2).)

Based on the information provided above and information provided in associated environmental documentation completed pursuant to the above referenced project, the DWR CEQA Climate Change Committee has determined that the proposed project is consistent with the DWR Greenhouse Gas Reduction Plan and the greenhouse gasses emitted by the project are covered by the plan's analysis.

Project Manager Signature: _____ Date: _____
C4 Approval Signature: _____ Date: _____

Attachments:

☐ List and Explanation of excluded Project Level GHG Emissions Reduction Measures.

☐ Plan to update Renewable Energy Procurement Plan from DWR SWP Power and Risk Office.

Appendix D. Best Management Practices for Construction and Maintenance

In 2002, DWR developed standard specifications for contractors to follow when constructing projects. These specifications are designed to protect environmental resources, including air quality, at the project site. The contractor must meet all State and federal environmental statutes, rules, regulations, and policies enacted to protect the environmental resources and ensure that any significant environmental impacts of projects are identified and adequately mitigated. As part of this mitigation, contractors must develop and submit detailed plans including, but not limited to, an Air Quality Control Plan, a Traffic and Noise Abatement Plan, and a Fire Prevention and Control Plan.

In addition, the specifications require preventative maintenance measures to protect air quality and reduce emissions. These measures include, but are not limited to, performing maintenance in accordance with manufacturer's recommendations, ensuring the proper use of mufflers and filters, and defining and implementing maintenance schedules for each piece of construction equipment. The specifications also include the following Best Available Control Technology measures: (1) installation of high-pressure injectors; (2) use of reformulated diesel fuel; (3) use of Caterpillar pre-chamber diesel engines or equivalent; (4) substitute electrical equipment; (5) substitute clean natural gas-powered vehicles; and (6) reduce construction activities during Stage 2 alerts issued by local Air Pollution Control Districts where required.

Other air quality measures include scheduling of truck trips to reduce peak emissions, limiting the length of the construction workday, phasing of construction activities to minimize the amount of construction equipment operating during any given time period, and encouraging employees to participate in a ride share program.

The following measures are considered best management practices (BMPs) for DWR construction and maintenance activities. Implementation of these practices will reduce greenhouse gas (GHG) emissions from construction

projects by minimizing fuel use by construction equipment, reducing fuel consumption for transportation of construction materials, reducing the amount of landfill material, and reducing emissions from the production of cement.

Pre-Construction and Final Design

Pre-construction and Final Design BMPs are designed to ensure that individual projects are evaluated and their unique characteristics taken into consideration when determining if specific equipment, procedures, or material requirements are feasible and efficacious for reducing GHG emissions from the project. While all projects will be evaluated to determine if these BMPs are applicable, not all projects will implement all the BMPs listed below.

BMP 1.

Evaluate project characteristics, including location, project work flow, site conditions, and equipment performance requirements, to determine whether the specifications for the use of equipment with repowered engines, electric drive trains, or other high-efficiency technologies are appropriate and feasible for the project or specific elements of the project.

BMP 2.

Evaluate the feasibility and efficacy of performing on-site material hauling with trucks equipped with on-road engines.

BMP 3.

Ensure that all feasible avenues have been explored for providing an electrical service drop to the construction site for temporary construction power. When generators must be used, use alternative fuels, such as propane or solar, to power generators to the maximum extent feasible.

BMP 4.

Evaluate the feasibility and efficacy of producing concrete on site and specify that batch plants be set up on site or as close to the site as possible.

BMP 5.

Evaluate the performance requirements for concrete used on the project and specify concrete mix designs that minimize GHG emissions from cement production and curing while preserving all required performance characteristics.

BMP 6.

Limit deliveries of materials and equipment to the site to off peak traffic congestion hours.

Construction

Construction BMPs apply to all construction and maintenance projects that DWR completes or for which DWR issues contracts. All projects are expected to implement all Construction BMPs unless a variance is granted by the Division of Engineering Chief, Division of Operation and Maintenance Chief, or Division of Flood Management Chief, as applicable, and the variance is approved by the DWR CEQA Climate Change Committee. Variances will be granted when specific project conditions or characteristics make implementation of the BMP infeasible and where omitting the BMP will not be detrimental to the project's consistency with Update 2020.

BMP 7.

Minimize idling time by requiring that equipment be shut down after five minutes when not in use (as required by the State airborne toxics control measure [13 CCR Section 2485]). Provide clear signage that posts this requirement for workers at the entrances to the site and provide a plan for the enforcement of this requirement.

BMP 8.

Maintain all construction equipment in proper working condition and perform all preventative maintenance. Required maintenance includes compliance with all manufacturer's recommendations, proper upkeep and replacement of filters and mufflers, and maintenance of all engine and emissions systems in proper operating condition. Maintenance schedules shall be detailed in an Air Quality Control Plan prior to commencement of construction.

BMP 9.

Implement tire inflation program on jobsite to ensure that equipment tires are correctly inflated. Check tire inflation when equipment arrives on site and every two weeks for equipment that remains on site. Check vehicles used for hauling materials off site weekly for correct tire inflation. Procedures for the tire inflation program shall be documented in an Air Quality Management Plan prior to commencement of construction.

BMP 10.

Develop a project specific ride share program to encourage carpools, shuttle vans, transit passes and/or secure bicycle parking for construction worker commutes.

BMP 11.

Reduce electricity use in temporary construction offices by using high efficiency lighting and requiring that heating and cooling units be Energy Star compliant. Require that all contractors develop and implement procedures for turning off computers, lights, air conditioners, heaters, and other equipment each day at close of business.

BMP 12.

For deliveries to project sites where the haul distance exceeds 100 miles and a heavy-duty class 7 or class 8 semi-truck or 53-foot or longer box type trailer is used for hauling, a SmartWay[1] certified truck will be used to the maximum extent feasible.

BMP 13.

Minimize the amount of cement in concrete by specifying higher levels of cementitious material alternatives, larger aggregate, longer final set times, or lower maximum strength where appropriate.

BMP 14.

Develop a project specific construction debris recycling and diversion program to achieve a documented 50 percent diversion of construction waste.

BMP 15.

Evaluate the feasibility of restricting all material hauling on public roadways to off-peak traffic congestion hours. During construction scheduling and execution minimize, to the extent possible, uses of public roadways that would increase traffic congestion.

[1] The U.S. Environmental Protection Agency has developed the SmartWay truck and trailer certification program to set voluntary standards for trucks and trailers that exhibit the highest fuel efficiency and emissions reductions. These tractors and trailers are outfitted at point of sale or retrofitted with equipment that significantly reduces fuel use and emissions including idle reduction technologies, improved aerodynamics, automatic tire inflation systems, advanced lubricants, advanced powertrain technologies, and low rolling resistance tires. EPA Smartway (https://www.epa.gov/smartway).

Appendix E. Best Management Practices for Vegetation Management

The following measures are recommended BMP s for vegetation management on DWR-owned and managed properties. Implemented together, these practices will result in lower emissions and provide ancillary benefits to water quality and wildlife.

BMP 1

Avoid tillage and maintain vegetation on levees and other properties to the extent possible to maximize carbon sequestration and minimize negative air quality impacts associated with erosion of bare soils.

BMP 2

At construction sites, seed or plant native grasses and wildflowers in disturbed areas where feasible because those species will be best adapted to local conditions (drought, periodic inundation) and will often require minimal maintenance once established. Native vegetation also provides numerous benefits to wildlife species including habitat for important pollinators such as bees. Leaving the soil in a disturbed state after maintenance work can result in non-native weedy species quickly colonizing the site.

BMP 3

Reduce vegetation manipulation (mowing or spraying herbicides) when possible while maintaining proper function of the levee or property for its intended purpose. Mow vegetation if necessary, rather than applying herbicides. The application of herbicides on a large scale requires fuel consumption for repeated treatments and entails risks to wildlife and water quality.

BMP 4

If mowing is conducted, use fuel efficient mowers in proper working condition and minimize idling time by requiring that equipment be shut down after five minutes when not in use.

BMP 5

If herbicides are to be applied, use spot applications (preferably by hand) rather than broadcast spraying where feasible to reduce impacts to native vegetation, wildlife, and water quality.

BMP 6

Control nonnative weed species as soon as populations are found to prevent the need for more future extensive eradication efforts.

BMP 7

Carefully plan and schedule vegetation maintenance activities to minimize driving time and return trips to a site.

BMP 8

Reduce maintenance activities and water consumption by using mulch and native or drought-resistant plants, shrubs, and trees in landscaping around DWR facilities. When feasible, include requirements in landscaping contracts specifying the use of manual techniques such as rakes and weed removal by hand to the extent possible to reduce the use of gas-powered equipment and herbicides.

Appendix F. DWR Sustainability Policy Activities

Listed below are achievements and strategies to improve DWR's business practices.

Environmentally Preferable Purchasing (EPP) Practices — DWR participates in the EPP program, which promotes the purchase of recycled-content products (RCPs). RCPs typically require less total energy to produce than products made from virgin materials. These reductions will not be directly linked to emissions associated with DWR's emissions footprint but will contribute to overall reductions in worldwide emissions. DWR plans to improve the scope of the existing EPP to provide options for purchasing a wider range of products that provide environmental benefits.

Enterprise Content Management (ECM) — The ECM system will digitally store and manage DWR documents eliminating the need for physical document storage space. The ECM system is currently in the early stages of deployment. When fully implemented, the ECM system will reduce paper retention, thus reduce office space necessary for files. Long-term savings for reducing filing space, heating and cooling, and increasing labor efficiency will be gained once this system is completed. Specific energy savings from deployment of this strategy will be difficult to isolate; however, DWR hopes to realize energy savings and associated GHG emissions savings in the future by eliminating physical storage areas for documentation.

Fuel Replacement — Assembly Bill 236 (2007) requires the increased use of alternative fuels through the reduction or displacement of petroleum products in the State fleet based on the following benchmarks: (1) By January 1, 2012, a 10 percent reduction or displacement and (2) By January 1, 2020, a 20 percent reduction or displacement. This requirement is essentially met by the State Administrative Manual Section 3627, which mandates the use of renewable diesel in lieu of conventional diesel and biodiesel fuel for bulk transportation fuel purchases. DWR has replaced 70 percent of its diesel purchases with renewable diesel, thus reducing the greenhouse gases associated with diesel fuel.

Green Print and Podcasts — DWR promotes sustainability through quarterly "Green Print" articles posted through DWR's intranet and podcasts. The articles discuss strategies that staff can use both at work and at home to reduce their environmental impact.

Organics Recycling — Assembly Bill 1826 (2014) requires that State agencies recycle organic waste including green waste, lawn and landscaping waste, food waste, food-soiled paper, and non-hazardous wood waste. DWR will continue to implement organics recycling and help reduce landfill-related greenhouse gases such as methane.

Waste Diversion — Assembly Bill 2396 (2016), pursuant to Assembly Bill 1826, requires State agencies to reduce, recycle, or compost 75 percent of solid waste by 2020. DWR provides adequate receptacles, signage, education, staffing, and arrangement for recycling services consistent with existing recycling requirements for each office facility. DWR created a sustainability Green Award to promote waste reduction and recycling within DWR. The recipient of the award exhibits success and dedication to reducing waste in 18 primary categories and six hazardous waste material categories. The first award was presented in 2008.

Leadership in Energy and Environmental Design (LEED) Buildings — DWR completed its first LEED Platinum building in May 2015. DWR is also working with the Department of General Services to LEED certify a leased facility in Sacramento that will house satellite Division of Flood Management offices. The facility will be submitted for LEED Interior Construction (IC) Certification. LEED certification of DWR-owned and -leased buildings ensures that the buildings are constructed to the highest levels of energy and resource efficiency, contributing to reductions in DWR's emissions as well as emissions from the industrial sector.

Climate Adaptation — DWR integrates climate change into all planning and investment decisions by evaluating climate change risks to existing and planned facilities. DWR continues to evaluate the potential impacts of climate change on facilities and the impact of that change on the community. DWR promotes climate adaptation by utilizing natural infrastructure to protect existing facilities where feasible.

Transportation — DWR has implemented a payroll deduction transit pass program. This program allows DWR employees to pay for monthly transit passes through a pretax payroll deduction program. The program further encourages DWR employees to use public transportation, resulting in reductions in GHG emissions from daily commuting. DWR will continue to promote reducing business travel by use of technology such as teleconference centers, web casting, and online training.

Water Consumption — In compliance to Executive Order B-18-12, DWR has reduced water consumption by 42 percent compared with the 2010 baseline year. As of December 2018, DWR has saved 10.5 million gallons since the 2010 baseline year through the following actions: implemented drought-tolerant landscaping at DWR maintenance yards throughout the SWP, installed Smart technology sensors for landscape irrigation, and employed state-of-the-art water use efficiency practices. DWR continues to promote and implement energy and water efficiency and conservation in all capital and renovation projects, as well as operations and maintenance activities, within budgetary constraints and programmatic requirements.

Electric Vehicle (EV) Purchasing — Executive Order B-16-12 supplemented with Senate Bill 498 mandates that starting on July 1, 2017, the percentage of new light duty vehicles that must be Zero Emission Vehicles increases by 5 percent each year, reaching 25 percent by 2020 and 50 percent by 2025. DWR has added 15 Zero Emission Vehicles to its fleet and anticipates an additional four to comply with the 25 percent by 2020 mandate.

EV Charging Stations — DWR will provide EV charging stations in employee parking areas on new or renovated buildings as required. Both employee and fleet vehicle charging must be provided. State agencies must install electric vehicle charging stations to comprise a minimum of 5 percent of all workplace parking spaces at State-owned facilities mandated by Executive Order B-16-12.

Building Energy Efficiency — DWR continues to participate in utility-owned automated demand response programs to reduce retail energy usage during peak periods by installing smart controls on HVAC systems. Per Management Memo 14-09, DWR owned and leased data centers and server rooms greater than 200 square feet operate within the American Society of Heating,

Refrigerating and Air-Conditioning Engineers (ASHRAE) TC 9.9, Class A1–A4 guidelines.

Green Operations — DWR will implement various programs, including environmentally preferred purchasing, cleaning products and practices, HVAC operations, and indoor air quality.

Integrated Pest Management — DWR staff and contracted pest management companies will follow an integrated pest management strategy that focuses on long-term prevention of pest problems through monitoring for pest presence, improving sanitation, and using physical barriers and other nonchemical practices.

Renewable Energy — DWR will use clean on-site power generation and back-up power supplies, if economically feasible, for new or major renovated State buildings over 10,000 square feet. For facilities with available open land, DWR will consider large scale distributed generation. Renewable energy projects will accompany EO B-18-12's ZNE building targets.

Full Life Cycle Cost Accounting — DWR will take climate change into account in planning and investment decisions and employ full life-cycle cost accounting to evaluate and compare infrastructure investments and alternatives.

Appendix G. Operations Analysis and Assumptions

Historical operations emissions estimates (1988–2018) and projections of future operations emissions (2019–2045) in Update 2020 are based on data from DWR *Management of the State Water Project (Bulletin 132),* which is an annual report that documents the operation and management of the SWP. Most of the information used in Update 2020 comes from the Energy Generated and Purchased section of Bulletin 132, which provides the amount of electricity generated at DWR's hydroelectric generating plants, procured from other entities, sold to other entities, and consumed at DWR's pumping plants.

To estimate historical emission, either the amounts of electricity used to operate the SWP are multiplied by the emission factors of the applicable sources of electric energy, or the fuel used by the electric energy source is multiplied by the fuel emission factor following the methodology outlined in Update 2020. For projected emissions, the historical data and assumptions listed in Table AppG-1 are used to formulate projections of future electricity generation and consumption.

Table AppG-1 Projections and Assumptions

Variable	Projected Annual Amount and Assumption
Generation from DWR's hydroelectric facilities larger than 30 MW.	3,143 GWh based on the facilities' average generation during 2000–2018. This generation is unlikely to be affected significantly by regulatory constraints because most of it is upstream of the Delta.
Generation from DWR's hydroelectric facilities less than 30 MW.	146 GWh developed using the CALSIM-II operations model. Because many of these facilities are downstream of the Delta, they are affected by regulatory constraints that limit the amount and timing of water exports from the Delta.

Variable	Projected Annual Amount and Assumption
SWP load.	7,208 GWh based on the average operations from DWR's pumping facilities during 2000–2018. Because SWP load is directly related to the amount of water delivered south of the Delta, this number is strongly affected by regulatory constraints limiting the amount and timing of water exports from the Delta. CALSIM-II was used to model the amount of deliveries under a variety of hydrologic conditions with the regulatory constraints currently in place for water exports from the Delta.
Thermal generation.	394 GWh until 2040 from LEC.
GHG emissions from SWP reservoirs and tailraces.	Zero emission based on the following: CARB's determination that generation of hydroelectric power is excluded from the regulation for the purpose of AB 32 Mandatory GHG Accounting (CCR Section 95100 et seq.); EPA in its eGRID database (Environmental Protection Agency 2016) of emissions factors for electricity generating facilities also associates a zero emissions factor to hydroelectric power generation; and studies (Prairie et al. 2018; Deemer et al. 2016) suggest that net GHG emissions from SWP reservoirs are not substantial and are likely no higher than pre-development conditions.