

California Department of Water Resources



Climate Action Plan

Phase 1: Greenhouse Gas Emissions Reduction Plan



State of California
Edmund G. Brown Jr., Governor

California Natural Resources Agency
John Laird, Secretary for Natural Resources

Department of Water Resources
Mark W. Cowin, Director

Susan Sims

Chief Deputy Director

Kasey Schimke

Asst. Director Legislative Affairs

Ted Thomas

Acting Director Public Affairs

Cathy Crothers

Chief Counsel

Gary Bardini

Deputy Director
Integrated Water Management

Dale Hoffman-Floerke

Acting Deputy Director
Delta/Statewide Water Management

Kathie Kishaba

Deputy Director
Business Operations

John Pacheco

Acting Deputy Director
California Energy Resources Scheduling

Carl Torgersen

Deputy Director
State Water Project

Prepared under the supervision of

DWR CEQA Climate Change Committee

Chaired by

Katherine Spanos

John Andrew

Heidi Rooks

Prepared by

Andrew Schwarz

With assistance from

Mary Akens

Karen Enstrom

Lauma Jurkevics

Peggy Bernardy

Megan Fidell

Scott Kranhold

Erin Chappell

Rob Fill

Ben Lasarte

Holly Cronin

Bill Forsythe

John Yarbrough

John Engstrom

Veronica Hicks

Editorial review, graphics, and report production

Charlie Olivares

Abbreviations and Acronyms

AB	Assembly Bill
AQMD	Air Quality Management Districts
BAAQMD	Bay Area Air Quality Management District
BMP	Best Management Practices
CAAQS	California Ambient Air Quality Standards
CAISO	California Independent System Operator
CARB	California Air Resources Board
CAT	Climate Action Team
CCAR	California Climate Action Registry
CEC	California Energy Commission
CEQA	California Environmental Quality Act
CH ₄	methane
CPUC	California Public Utilities Commission
CO ₂	carbon dioxide
CO ₂ e	carbon dioxide equivalents
CVP	Central Valley Project
GHG	greenhouse gas
DWR	California Department of Water Resources
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)
FY	fiscal year (July 1 st -June 30 th)
HFC	hydrofluorocarbon
IPCC	Intergovernmental Panel on Climate Change
mtCO ₂ e	Metric Tons of Carbon Dioxide Equivalent
MWh	Megawatts hour
NAAQS	National Ambient Air Quality Standards
N ₂ O	nitrous oxide
NF ₃	nitrogen trifluoride
OPR	Office of Planning and Research
PARO	SWP Power and Risk Office
Plan	Greenhouse Gas Emissions Reduction Plan
PFC	perfluorocarbon
SB	Senate Bill
SF ₆	sulfur hexafluoride
SWP	State Water Project
SWPAO	State Water Project Analysis Office
SWPPP	State Water Project Power Portfolio

California Department of Water Resources

TCR The Climate Registry
WBCSD World Business Council for Sustainable Development
WRI World Resources Institute

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GREENHOUSE GAS EMISSIONS REDUCTION PLAN

Summary

The California Department of Water Resources (DWR) in an effort to reduce its impact on the environment and lead by example, has developed this Greenhouse Gas (GHG) Emissions Reduction Plan to guide its project development and decision making with respect to energy use and GHG emissions.

It is now clearly understood that these gases enhance the Earth's ability to absorb and retain the heat radiated from the sun. Increased concentrations of GHGs in the atmosphere are the principal cause of anthropogenic climate change. As the connection between GHG emissions and climate change has strengthened and California has established GHG policies and reduction goals, DWR has focused on its own GHG emissions and developed strategies to reduce its contribution to the global problem of climate change consistent with those policies and goals.

This GHG Emissions Reduction Plan (Plan) is the first Phase in DWR's Climate Action Plan and considers GHG emissions from all DWR activities. In this Plan, DWR details

- its progress and future plans for reducing GHG emissions consistent with the GHG emissions reduction targets established in Assembly Bill (AB) 32, Executive Order S-3-05, and DWR's own policies,
- the aggressive steps it will take to reduce its emissions by over 80% below 1990 levels, and
- the steps that it will take to monitor its progress toward achieving these reductions.

DWR estimates that its total GHG emissions in 1990 were nearly 3.5 million metric tons, roughly the equivalent of a coal fired power plant or 680,000 passenger cars. Most of these emissions were released as a result of generation of electricity used to move water through the State Water Project (SWP), which DWR owns and operates. Since 1990, DWR's GHG emissions have fluctuated due to hydrologic conditions, water demands, and energy resources. DWR GHG emissions peaked in 2003 at over 4.1 million metric tons per year.

This Plan shows how DWR will make substantial reductions in its GHG emissions in the near-term (present to 2020) and how it will continue to reduce emissions beyond 2020 to achieve its long-term (2050) GHG emissions reduction goals. To this end, this Plan lays out both near-term and long-term GHG emissions reduction goals to guide decision making through 2050:

- Near-term goal—reduce emissions by 50% below 1990 levels by 2020
- Long-term goal—reduce emissions by 80% below 1990 levels by 2050.

In order to meet these GHG emissions reduction goals, DWR has identified 11 GHG emissions reduction measures that it will implement (Table S-1). These 11 GHG emissions reduction measures

include DWR’s termination of its interest and associated delivery of electricity from a coal-fired power plant, efficiency improvements to DWR’s existing facilities, purchase and development of renewable and high efficiency electricity supplies, comprehensive improvements to DWR’s construction practices, and improvements to DWR’s business activities that will reduce GHG emissions. In total, these measures will reduce annual GHG emissions in 2020 by more than 1.1 million metric tons and by more than 2.5 million metric tons in 2050.

Table S-1. DWR GHG Reduction Measures

Measure	2020 Annual Emissions Reduction (mtCO₂e)	2050 Annual Emissions Reduction (mtCO₂e)
OP-1 Reid Gardner Power Termination	882,700	882,700
OP-2 Energy Efficiency Improvements	48,500	48,500+
OP-3 Renewable Energy Procurement Plan	157,320	1,573,200
OP-4 On-Site Renewable Generation	10	Unknown
OP-5 Lower Emissions Energy Resources	23,180	23,180+
OP-6 Carbon Sequestration Actions	Unknown	Unknown
CO-1 Construction Best Management Practices	580	Not quantified
CO-2 Statewide Equipment and Fuel Regulations	900	Not quantified
BP-1 SMUD Commercial Greenergy Program	960	960
BP-2 SMUD Carbon Offset Program	2,580	2,580
BP-3 Implement DWR Sustainability Initiatives	Not quantified	Not quantified
Total Annual Reductions	1,116,730	2,531,120

DWR has developed projections of future GHG emissions using these GHG emissions reduction measures and other important factors that affect DWR emissions such as assumptions about regulatory constraints and hydrologic conditions, water demands, and electricity market characteristics. These GHG emissions projections indicate that DWR will exceed both its long and short-term GHG

emissions reduction goals, reducing emissions in 2020 to just over 1 million metric tons (62% below 1990¹ levels) and in 2050 to just over 190,000 metric tons (93% below 1990 levels).

Based on the analysis provided in this Plan, DWR will

- realize substantially greater emissions reductions than the 2020 legislative and administrative targets for GHG emissions reductions established under AB 32 and Executive Order S-3-05 (reduce GHG emissions to 1990 levels),
- be able to achieve its own more aggressive goal of reducing GHG emissions from its own activities to 50% below 1990 levels by 2020, and
- be on track to meet or exceed the 2050 target for GHG emissions reductions established under Executive Order S-3-05 and DWR's own long-term goal (reduce GHG emissions to 80% below 1990 levels).

In addition to demonstrating DWR's progress toward and future plans for meeting California's GHG emissions reduction targets (articulated in AB 32 and Executive Order S-3-05), this Plan will also be used to streamline DWR's analysis for California Environmental Quality Act (CEQA) purposes of most future DWR projects' potential to contribute to the cumulative impact of increased GHG concentrations in the atmosphere. A CEQA Initial Study and Draft Negative Declaration analyzing the environmental effects of the Plan have been prepared and will be available for public review prior to adoption of the Plan and Negative Declaration.

¹ Because of variability in annual emissions, which is described in detail in section V of the Plan, DWR uses a 5-year average (1988-1992) as the benchmark emissions for 1990. This 5-year average is 2,746,000 metric tons.

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 environments. DWR pursues its mission through a wide array of activities. Some of the major activities performed by DWR include: (1) managing, operating, and maintaining the SWP; (2) maintaining approximately 1,600 miles of levees throughout the Central Valley of California; (3) reviewing, awarding, and managing several grant and local assistance programs; (4) planning, constructing, and managing a wide range of water supply, flood control, and environmental restoration projects throughout the state; and (5) regulating the safety of dams within DWR's authority throughout the state. Completing these activities can result in the release of GHGs, which have been identified by the State of California to be linked to anthropogenic climate change. This Plan provides an analysis of historical, current, and projected GHG emissions from DWR 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.

DWR has already initiated a number of actions aimed at reducing the level of GHGs emitted as a result of its activities, which are documented in the Plan. In addition, this Plan also identifies a number of additional actions to be implemented. While DWR has already taken several steps to reduce GHG emissions and improve the efficiency of its activities, this Plan, for the first time, lays out in one place DWR's commitment to achieve significant GHG emissions reductions across all of its activities.

This Plan also constitutes DWR's analysis of forecasted GHG emissions and GHG emissions reductions associated with certain future DWR projects and activities. Later DWR project-specific environmental documents, under certain circumstances, may rely upon this analysis in cumulative impacts analyses for GHGs (CEQA Guidelines section 15183.5, subdivisions (a)-(b)).

DWR is firmly committed to performing its mission while operating in a sustainable manner and practicing environmental stewardship through the principles outlined in DWR's Sustainability and Environmental Stewardship Policies (DWR, 2009 and DWR, 2011) and the DWR Sustainability Targets, which are presented in Appendix A. The DWR Sustainability Policy articulates DWR's intentions to minimize its impact on the environment and be a sustainability leader in State government and the water community. DWR's Sustainability Targets establish several specific goals for reducing water use, wastewater production, energy use, carbon emissions², and waste generation. This Plan provides the specific steps that DWR will take to achieve the carbon emissions reduction target set forth in DWR's Sustainability Targets, which are to:

- reduce GHG emissions from DWR activities by 50% below 1990 levels by 2020, and
- reduce GHG emissions from DWR activities by 80% below 1990 levels by 2050

² The DWR Sustainability Targets use the term "carbon emissions". In the context of this Plan, the term "carbon emissions" is synonymous with GHG emissions.

In addition, many of the activities described below as GHG emissions reduction measures for business practices are activities that have been formulated in response to and pursuant to achievement of the DWR Sustainability Policy.

This Plan, which addresses reduction of GHG emissions from DWR activities, is the first phase of DWR's Climate Action Plan. Future phases of the Climate Action Plan will address technical approaches for characterizing and analyzing the impacts of climate change on DWR activities (both existing and planned), and measures for resiliency and adaption to future conditions expected as a result of climate change.

This Plan 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, the SWP, or any other water supplier.

This Plan does not conflict with nor reduce, but rather complements, efforts by DWR to continually increase water use efficiency throughout the state. DWR is committed to leading water conservation efforts and to achieving the water conservation goals mandated in Senate Bill 7x-7: 20% reduction in statewide per capita urban water use by 2020. While this Plan will reduce the GHG emissions associated with water delivered through the SWP, it in no way reduces the necessity of efforts that must be taken 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.

A. Background

Global Warming and Greenhouse Gas Emissions

Global warming is the name given to the increase in the average temperature of the Earth's near-surface air and oceans since the mid-20th century and its projected continuation. Warming of the climate system is now considered to be unequivocal (Intergovernmental Panel on Climate Change [IPCC], 2007) with global average surface temperature increasing by more than 1°F during the last 100 years and most of that warming occurring in the last 30 years. The Earth's surface is currently warming at a rate of about 0.29°F/decade or 2.9°F/century (IPCC, 2007).

The causes of this warming have been identified as both natural processes and as the result of human actions. The IPCC concludes that variations in natural phenomena, such as solar radiation and volcanoes, produced most of the warming from pre-industrial times to 1950 and actually had a small cooling effect afterward. However, after 1950, increasing GHG concentrations resulting from human activity, such as fossil fuel burning and deforestation, have been responsible for most of the observed temperature increase. These basic conclusions have been endorsed by more than 45 scientific societies and academies of science, including all of the national academies of science of the major industrialized countries. Since 2007, no scientific body of national or international standing has maintained a dissenting opinion.

Increases in the concentrations of GHGs in the Earth's atmosphere are thought to be the main cause of human-induced climate change. GHGs naturally trap heat by impeding the exit of infrared radiation that results when incoming ultraviolet solar radiation is absorbed by the Earth and re-radiated as infrared radiation. Some GHGs occur naturally and are necessary for keeping the Earth's surface warm enough to be inhabitable. However, increases in the concentrations of GHGs in the atmosphere during the last hundred years have increased the amount of reflected solar radiation that is absorbed by the Earth's atmosphere, intensifying the natural greenhouse effect and resulting in the increase of global average temperature.

The principal GHGs associated with anthropogenic emissions are carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), sulfur hexafluoride (SF₆), perfluorocarbon (PFC), nitrogen trifluoride (NF₃), and hydrofluorocarbon (HFC) (Health and Safety Code, section 38505, subdivision (g); CEQA Guidelines, section 15364.5). Water vapor is also an important GHG, in that it is responsible for trapping more heat than any of the other GHGs. However, water vapor is not a GHG of concern with respect to anthropogenic activities and emissions. Each of the principal GHGs associated with anthropogenic climate warming has a long atmospheric lifetime (one year to several thousand years). In addition, the potential heat trapping ability of each of these gases vary significantly from one another. CH₄ for instance is 23 times more potent than CO₂, while SF₆ is 22,200 times more potent than CO₂ (IPCC, 2001). Conventionally, GHGs have been reported as "carbon dioxide equivalents" (CO₂e). CO₂e takes into account the relative potency of non-CO₂ GHGs and converts their quantities to an equivalent amount of CO₂ so that all emissions can be reported as a single quantity.

The primary man-made processes that release these GHGs include: 1) burning of fossil fuels for transportation, heating and electricity generation, which release primarily CO₂; 2) agricultural practices, such as livestock grazing and crop residue decomposition and application of nitrogen fertilizers, that release CH₄ and N₂O; and 3) industrial processes that release smaller amounts of high global warming potential gases, such as SF₆, PFCs, and HFCs. Deforestation and land cover conversion have also been identified as contributing to global warming by reducing the Earth's capacity to remove CO₂ from the air, altering the Earth's albedo or surface reflectance, allowing more solar radiation to be absorbed, and causing carbon that has been sequestered in soil to be emitted to the atmosphere.

In 2006, the California Air Resources Board (CARB) issued the California Greenhouse Gas Inventory Emissions and Sinks: 1990-2004 (CARB, 2006). This inventory reports GHG emissions from out-of-state electricity used in California along with in-state generation of GHG emissions and estimates of future emissions trends using fuel demand and other forecast data from the California Energy Commission's *2005 Integrated Energy Policy Report*. CARB's inventory estimated total 2004 GHG emissions for California at 492 million metric tons of CO₂e (mtCO₂e) and estimated 1990 California emissions to be 427 million mtCO₂e. CARB also estimated 2020 total GHG emissions for California at 596 million mtCO₂e, assuming no mitigation actions are taken to reduce future emissions (CARB, 2008). In June 2011, CARB updated its 2020 GHG emissions projection for the State, finding that the emissions growth trajectory had slowed significantly due to the implementation of mitigation measures and economic conditions and that 2020 emissions would only reach 506 million mtCO₂e (CARB, 2011).

Global Climate Trends and Associated Impacts

The rate of increase in global average surface temperature during the last hundred years has not been constant. The last three decades have warmed at a much faster rate – on average 0.32°F per decade. Eleven of the 12 years from 1995 to 2006, rank among the 12 warmest years in the instrumental record of global average surface temperature (going back to 1850) (IPCC, 2007).

During this same period of increased global warming, many other changes have occurred in other natural systems: sea levels have risen on average 1.8 mm/yr; precipitation patterns throughout the world have shifted, with some areas becoming wetter and others drier; tropical cyclone activity in the North Atlantic has increased; peak runoff timing of many glacial and snow fed rivers has shifted earlier; and numerous other shifts in climate have been observed. Though it is difficult to prove a definitive cause and effect relationship between global warming and other observed changes to natural systems, there is high confidence in the scientific community that some of these changes are a direct result of increased global temperatures (IPCC, 2007).

California Climate Trends and Associated Impacts

Maximum (daytime) and minimum (nighttime) temperatures are increasing almost everywhere in California but at different rates. The annual *minimum* temperature average over all of California has increased 0.33°F per decade during the period 1920 to 2003, while the average annual *maximum* temperature has increased 0.1°F per decade (Moser, *et al.*, 2009).

With respect to California's water resources, the most significant impacts of global warming have been changes to the water cycle and sea level rise. Over the past century, the precipitation mix between snow and rain has shifted in favor of more rainfall and less snow (Mote et al., 2005; Knowles, 2006). Snow pack in the Sierra Nevada, which serves as an important natural reservoir, is also melting earlier in the spring (Kapnick and Hall, 2009) leading to reduced water availability later in the year when demand is high. The average early spring snowpack in the Sierra Nevada has decreased by about 10% during the last century, a loss of 1.5 million acre-feet of snowpack storage (DWR, 2008). These changes have significant implications for water supply, flooding, aquatic ecosystems, energy generation, and recreation throughout the state. During the same period, sea levels along California's coast rose 7 inches (DWR, 2008). Sea level rise associated with global warming will continue to threaten coastal lands and infrastructure, increase flooding at the mouths of rivers, place additional stress on levees in the Sacramento-San Joaquin Delta, cause saltwater intrusion into freshwater supplies, and will intensify the difficulty of managing the Sacramento-San Joaquin Delta as the heart of the state's water supply system.

B. Regulatory and Administrative Actions Addressing Greenhouse Gas Emissions Reductions

Nationally and in California, several 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 are provided in Appendix B. However, for the purposes of this Plan, a few state

regulations and administrative actions are particularly important because they help form the GHG emissions reduction targets set in this Plan. These regulations and administrative actions are described below.

Executive Order S-3-05

In 2005, California 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 includes the following GHG emissions reduction targets for California:

By 2010, reduce GHG emissions to 2000 levels.

By 2020, reduce GHG emissions to 1990 levels.

By 2050, reduce GHG emissions to 80% below 1990 levels.

The final emissions reduction target of 80% below 1990 levels would put the state's emissions in line with estimates of the required worldwide reductions needed to bring about long-term climate stabilization and avoidance of the most severe impacts of climate change (IPCC, 2007)(CARB, 2008).

The Global Warming Solution Act of 2006

In 2006, California passed the California Global Warming Solutions Act (also known as Assembly Bill Number 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—reduce GHG emissions to 1990 levels by 2020. AB 32 also identifies 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 mtCO₂ equivalents of GHGs. And in 2008, CARB adopted the 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.

The Scoping Plan also recommended 39 measures that were developed to reduce GHG emissions from key sources and activities while improving public health, promoting a cleaner environment, preserving our natural resources, and ensuring that the impacts of the reductions are equitable and do not disproportionately impact low-income and minority communities. These measures also put the state on a path to meet the long-term 2050 goal of reducing California's GHG emissions to 80% below 1990 levels. The measures in the approved Scoping Plan are now in place including revised mandatory reporting regulations which took effect January 1, 2012 and cap and trade regulations which took effect January 1, 2012 with enforceable compliance obligations beginning in 2013.

This Plan is also responsive to AB 32's directive that State agencies reduce emissions from activities under their own jurisdiction.

2010 CEQA Guideline Amendments

The 2010 CEQA Guideline amendments were added primarily to implement the Legislature's directive in Senate Bill (SB) 97, passed in 2008, requiring the Governor's Office of Planning and Research to prepare, develop, and transmit to the California Natural Resources Agency guidelines for the mitigation of GHG emissions or the effects of GHG emissions (See Public Resources Code, section 21083.05, subdivision (a)). The CEQA Guidelines assist in complying with CEQA's existing requirements (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 (FSOR) p. 2).

Specifically, the additional sections and the modified ones within the CEQA Guidelines clarify how traditional CEQA analyses apply more specifically to GHG emissions. Other changes clarify existing law that may apply both to the analysis of GHG emissions, as well as more traditional CEQA analyses (FSOR, p. 13). A number of the changes refer to use of GHG emissions reduction plans.

For the analysis and mitigation of GHGs, the CEQA Guidelines provide significant clarification in section 15064, subdivision (h)(3) adding "plans or regulations for the reduction of GHG emissions" to the list of example plans and programs that a lead agency may rely on in support of a determination that a "project's incremental contribution to a cumulative effect is not cumulatively considerable." This additional language explicitly acknowledges the potential for a lead agency to adopt such a plan to address a wide range of activities that emit GHGs and to allow for streamlined CEQA review in cumulative impacts analyses of later projects.

The FSOR states:

[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)

Also, the additions made to the CEQA Guidelines authorize lead agencies to use the plans in the cumulative impacts analyses of later projects (CEQA Guidelines section 15130, subdivision (d), and 15183.5, subdivisions (a)-(b); see also FSOR, Thematic Responses, pp. 90-91.)

The use of a GHG emissions reduction plan in complying with the CEQA Guidelines and the relationship to this Plan is discussed in more detail below.

C. Purpose and Need for the Plan

Both the scientific community and the State of California have unequivocally stated that climate change and the anthropogenic GHG emissions that are driving changes in the climate (beyond the

natural fluctuations that have historically occurred) pose “serious threat(s) to the economic well-being, public health, natural resources, and the environment of California” (AB 32).

DWR operates the SWP, maintains existing facilities and implements numerous new water supply, flood control, and ecosystem restoration projects each year. As a part of each of these activities DWR is continuously working to minimize its contribution to climate change causing GHG emissions. DWR has already taken a number of steps to reduce GHG emissions from its activities. However, several of those steps have never been formally adopted as policies and the benefit of the improvements have never been quantified. Thus, this Plan provides the first department-wide accounting of historical, current, and estimated future GHG emissions. In addition, the development of this Plan has facilitated the review of all DWR GHG emissions-producing activities and has resulted in a number of new measures for further reducing GHG emissions. The Plan also provides the first comprehensive listing and accounting of the policies and procedures DWR is employing to reduce GHG emissions.

Addressing GHGs at the department-wide level provides DWR with a broader range of emissions reduction measures. In addition, this comprehensive approach allows DWR to look at the totality of its emissions and identify the activities that hold the greatest opportunities for GHG emissions reductions. GHGs typically circulate in the atmosphere for long periods of time (many persist for decades or more). In this context, DWR can achieve the greatest level of emissions reductions with the least cost by addressing GHG emissions reductions at this comprehensive level.

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. The CEQA Guidelines encourage agencies to work within the context of a plan or mitigation program that provides specific requirements that will avoid or substantially lessen the cumulative problem within the geographic area in which a project is located.

Guidance from CARB in the Scoping Plan also encourages comprehensive GHG reduction planning by private companies and State agencies and departments. DWR has reviewed this guidance and finds that this Plan is consistent with programmatic GHG reduction planning and the individual GHG reduction measures outlined by CARB in the Scoping Plan. This Plan draws heavily upon the measures outlined in the Scoping Plan and has incorporated those measures which apply to DWR’s activities.

II. Plan Scope

This Plan analyzes and addresses current and future DWR activities that emit GHGs. This includes (1) ongoing operations of the SWP³, which are primarily power purchases (operational); (2) typical construction activities performed by DWR or its contractors (construction); (3) maintenance activities performed on DWR owned or operated facilities (maintenance); and (4) DWR’s business practices

³ Emissions from operation of the SWP include emissions generated as a result of power used for contract water deliveries, environmental water deliveries, water transfers, and all other water moved through the SWP system.

(business practices). The Plan also analyzes and addresses a small group of specific types of activities performed by the Central Valley Flood Protection Board (CVFPB) for which DWR serves as the construction manager. Geographically, these activities could occur anywhere DWR has or will perform activities. DWR's activities predominantly take place at SWP facilities operated by DWR, DWR's four field offices, four regional offices, headquarters facilities located around Sacramento, flood protection facilities operated and maintained by DWR located throughout the Central Valley, and DWR's two Flood Maintenance Yards. Purchases of electricity to operate DWR facilities could occur anywhere throughout the state of California or outside of California. GHG emissions resulting from the generation of electricity that is used to power DWR facilities, regardless of the location of that generation, are included in DWR's GHG emissions inventory and are analyzed and addressed by the Plan.

While this Plan analyzes and addresses emissions generated as a result of typical construction activities that are consistent with historical activities, it does not analyze future DWR construction activities that are significantly larger than historical activities. Section V.B. provides additional information about these types of projects, called Extraordinary Construction Projects, and how DWR will address their emissions.

The Plan 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. Nor does the Plan analyze the United States Bureau of Reclamation's coordinated operations of the Central Valley Project (CVP) facilities. While operation of CVP facilities is coordinated with SWP operations, DWR does not have authority over the CVP operations.

It is possible that DWR activities which involve land use conversion or disturbance of vegetation could potentially result in increased land cover emissions or decreases of natural sequestration capacity. Prediction of these types of activities as part of this Plan would be speculative at this time; these activities thus will have to be evaluated and quantified on a project-by-project basis. Emissions from these types of activities are addressed separately from other types of emissions in Section IX-Other Emissions and Emissions Reductions.

III. Goals of the Plan

This Plan is comprehensive in nature and describes GHG emissions from the 4 general categories of activities performed by DWR: (1) operations, (2) construction, (3) maintenance, and (4) business practices. Each of these emissions sources differs in important ways. As such, the methodology for estimating historical and current emissions and the measures for reducing these emissions are different. DWR has combined the information and analyses for each emission type in order to:

- document DWR's progress towards reducing its GHG emissions consistent with the GHG emissions reduction targets established in AB 32 and EO S-3-05 and
- provide DWR's analysis of forecasted GHG emissions and GHG emissions reductions associated with most future DWR projects and activities. This analysis will then be analyzed

under CEQA to determine whether this Plan reduces the impact of GHG emissions from future DWR activities that are analyzed in the Plan to a less than significant level. If DWR finds, after its CEQA analysis, that the Plan reduces the impact of future activities on GHG emissions to a less than significant level, DWR may rely on the analysis in the Plan to streamline cumulative impacts analyses of later project-specific environmental documents consistent with CEQA Guidelines, section 15183.5, subdivision (b)(2).

This Plan also includes performance monitoring and a schedule for regular Plan updates. If monitoring activities indicate that DWR will not meet the GHG emissions reduction goals established in this Plan, DWR, during regular Plan updates, will re-evaluate its GHG emissions reduction measures. At that time, DWR may add additional measures as needed to meet the GHG emissions reduction goals established in this Plan, or take other action.

IV. GHG Emissions Reduction Goals

A. Near-Term (2020) GHG Emissions Reduction Goal

DWR has established the following near-term GHG emissions reduction goal (Near-Term Goal) to help meet and exceed legislative and administrative targets and assist in putting the state on a GHG emissions trajectory that is consistent with global climate stabilization:

Reduce GHG emissions to 50% below 1990 levels by 2020.

This Near-Term Goal is intended to ensure that DWR's activities are consistent with AB 32 and the Scoping Plan, and EO S-3-05 which DWR has determined to be the applicable law, plan, and policy adopted for the purpose of reducing GHG emissions for California. This Near-Term Goal is also consistent with the Carbon Reduction Goal established by DWR in its Sustainability Targets (50% reduction below 1990 levels by 2020).

This Near-Term Goal will ensure that future reductions in GHG emissions from DWR activities will meet and exceed the statewide emissions reduction levels called for in AB 32 and EO S-3-05, thus ensuring that DWR has substantially contributed towards achieving the statewide GHG emissions reduction targets. AB 32 calls for statewide emissions reductions that would return statewide total emissions back to 1990 levels by 2020. As DWR's current emissions are already below 1990 levels, setting DWR's Near-Term Goal at 50% below 1990 ensures that DWR's GHG emissions will remain on a downward trajectory. This is an extremely aggressive and ambitious goal that depends on a number of uncertain variables including financing, new technology development and availability, energy market conditions, and regulatory and hydrologic conditions. Despite these unknowns, DWR is committed to achieving this substantial reduction in its GHG emissions by 2020 and is implementing the measures discussed in this Plan which DWR expects will accomplish its Near-Term Goal.

B. Long-Term (2050) GHG Emissions Reduction Goal

DWR is also committed to making steadily deeper reductions in GHG emissions beyond 2020. DWR has established the following long-term GHG emissions reduction goal (Long-Term Goal) to help meet administrative targets in 2050:

Reduce GHG emissions to 80% below 1990 levels by 2050.

Consistent with EO S-3-05, DWR has established a Long-Term Goal of reducing GHG emissions by 80% below 1990 levels by 2050. This Long-Term Goal is equally aggressive and ambitious and will require significant improvements in construction and maintenance equipment, significant expansion of renewable energy sources, and improvements in building efficiencies. Future Plan updates will analyze the additional GHG emissions reductions for each type of emission and the measures needed to achieve this Long-Term Goal. Throughout this Plan, GHG emissions estimates are provided for 2050 where appropriate data exists to support expert judgment. However, these are estimates only and are subject to change in future Plan updates.

V. GHG Quantification

A. Historical, Current, and Future Emissions

The following section shows how DWR has identified and analyzed projected GHG emissions resulting from DWR projects. DWR identifies four separate categories of anticipated activities as follows: (1) operational; (2) construction; (3) maintenance; and (4) business practices. This section shows how DWR measures the GHG emissions from each of these categories. Section VII identifies GHG emissions reduction measures for these categories and Section VIII provides quantified projections of GHG emissions for these categories after implementation of the GHG emissions reduction measures. Section IX identifies other types of emissions and emissions reductions that may occur but that are difficult to quantify at this time.

In order to establish DWR's historical, current, and future GHG emissions and its GHG emissions reduction goals, DWR has determined that a total emissions approach is most appropriate. The total emissions approach calculates the total GHG emissions from DWR's activities. Alternatively, because of the annual variability of DWR GHG emissions and the relationship between that variability and the amount of water delivered each year (as discussed under the Operations Emissions section below), DWR considered using a performance standard/efficiency approach based on GHG emissions per acre-foot of water delivered. Both gross emissions reductions and improvements in efficiency are important ways to measure reductions in GHG emissions. DWR has analyzed its emissions trajectory using the GHG emissions reduction goals described above (i.e., gross emissions reductions) and alternative GHG emissions reduction goals based on GHG emissions per acre-foot of water delivered (achieving 50% below 1990 levels of GHG efficiency in 2020 and 80% below 1990 levels of GHG efficiency in 2050). This analysis showed that the trajectory of GHG emissions reductions and the overall emissions reductions would be nearly identical irrespective of which type of GHG emissions reduction goal was used. The efficiency GHG emissions reduction goal (i.e., GHG emissions/acre-foot of water delivered)

was eventually rejected because improvements in per unit efficiency could not ensure continued overall reductions in GHG emissions and could potentially be inconsistent with achieving the statewide GHG emissions reductions targets.

Since 2007, DWR has been inventorying and quantifying emissions from most of its activities. DWR has been a member of the California Climate Action Registry (CCAR) and has earned Climate Action Leader status by reporting and verifying (through a third-party audit) its GHG emissions for 2007, 2008, and 2009. In 2010, CCAR emissions reporting transitioned to The Climate Registry (TCR), a North America-wide registry. Since 2010, DWR has reported its GHG emissions to TCR and will continue reporting to TCR or its successor.

Since 2008, an internal DWR committee has reviewed all DWR environmental documents with regard to GHG emissions and has used these reviews to develop methodologies for estimating the construction, operations, and maintenance emissions from all proposed projects on which DWR acts as the lead agency under CEQA. Also, DWR has analyzed its long-term power purchase contracts for the SWP to identify contracts which disproportionately contribute to emissions on a CO₂e/Megawatt hour (MWh) of electricity basis.

Methodology for Calculating Historical, Current, and Future Emissions

Historical Emissions: Prior to 2007, DWR only tracked data on energy usage, but did not calculate the associated GHG emissions from its activities. Emissions associated with the operation of the SWP are emitted primarily from power plant generated electricity purchased to move water through the system. For historical emissions associated with power purchases to operate SWP facilities, data is available to develop reliable estimates of historical emissions. However, for construction, maintenance, and business activities, estimating historical emissions (prior to 2007) is very expensive, time consuming, and subject to high margins of error. Of these three emissions sources, only construction may add a material contribution to DWR's total current GHG emissions. Construction contributes slightly more than 1% of total DWR GHG emissions, business practices contribute slightly more than 0.5% of total DWR GHG emissions, and maintenance contributes less than 0.5% of total DWR GHG emissions. The remaining 98% comes from operations. Additional effort has, therefore, been expended to quantify and analyze the magnitude of GHG emissions from historical DWR operations and construction activities going back to 1990. Additional effort has not been expended to estimate emissions from maintenance or business practice activities prior to 2007; instead DWR has assumed that emissions from these activities have been at current levels since 1990. DWR considers this to be a conservative assumption based on improved efficiencies of these activities over time

Current and Future Emissions: Current emissions (2007-2010) for operations, maintenance, and business activities are being tracked and reported as part of DWR's annual (third-party verified) submissions to climate registries (2007-2009 to CCAR and 2010 to TCR). Construction emissions from DWR's current and future activities will be tracked differently because the CCAR and TCR reporting protocols do not include emissions from construction activities when these activities are undertaken by companies outside of the reporting entity's organizational or operational boundary. Methods for calculating and tracking current and future emissions from construction activities are described below.

Operational Emissions Calculations

Historical operational emissions (prior to 2007) are estimated using historical electricity use information. DWR has maintained detailed data on the amount of electricity it generates each year at SWP facilities, the amount of electricity needed each year to operate the system, and the sources of power for purchased electricity. These data have been used to develop estimates of GHG emissions resulting from the generation of electricity purchased to run the SWP.

For this Plan, operational emissions have been calculated to count only electricity that is used to serve load at SWP facilities. Power purchased by DWR and subsequently sold to other power users has been removed from the calculation. (Further explanation of why DWR purchases excess power and how this calculation is made is provided in the Calculation of Operational Emissions section below.) The current operational emissions reported here differ from emissions reported by DWR to CCAR from 2007 to 2009 and TCR in 2010 because of both the CCAR and TCR conventions on reporting emissions for all power purchased by a reporting entity regardless of whether that power was subsequently sold to a different end user and the default factor used for unspecified power used in the CCAR and TCR filings. Both of these are discussed in more detail in the following paragraphs.

Reporting conventions: From 2007-2009 DWR submitted third-party verified emissions inventories of its activities to CCAR. These emissions inventories include operational emissions from the SWP. For these submissions, DWR followed CCAR's General and Power/Utility reporting protocols. In 2010, DWR submitted an emissions inventory of its activities to TCR. CCAR and TCR reporting protocols do not allow DWR to subtract the excess electricity it purchases (and subsequently sells to other power providers) from the total amount of electricity that it purchases and generates. This results in DWR reporting emissions from electricity that it has not actually used and therefore, the emissions estimate as calculated for CCAR and TCR filings overestimates the actual emissions resulting from DWR activities. This discrepancy may to some extent be alleviated by recent changes to the electricity market in California and DWR will strive to make its reporting of GHG emissions to climate registries and pursuant to this Plan consistent to the extent possible. However, there remains a possibility that there will be discrepancies between future GHG emissions reported to climate registries and those calculated pursuant to monitoring of this Plan.

Default Factor: In addition reporting conventions, emissions from the operation of the SWP reported to CCAR and TCR have in the past used the U.S. Environmental Protection Agency (EPA) Emissions and Generation Resource Integrated Database (eGrid) default emissions factor for the CAMX subregion⁴ (0.399 mtCO₂e/MWh) as recommended by CCAR for estimating the emissions from power purchases from unspecified sources. This factor is appropriate for some types of analysis; however, DWR has determined that for the purposes of calculating emissions from wholesale power purchases for the SWP Power Portfolio (SWPPP)

⁴ The CAMX subregion covers most of California and does not extend beyond the border of the state (eGrid2006 Version 2.1 (April 2007)).

it is more appropriate to use an alternative factor—0.437mtCO₂e/MWh⁵. This factor comes from the Mandatory GHG Emissions Reporting regulations. (California Code of Regulations, title 17, division 3, chapter 1, subchapter 10, section 95111). The eGrid CAMX default emissions factor is an overall weighted average of resource emissions factors for all resources in the CAMX subregion⁶. The Mandatory GHG Emissions Reporting factor for unspecified power is slightly higher reflecting the reality in the wholesale electricity market that many resources, especially cleaner, more efficient resources, are contractually tied to serving load from a specific energy user. This power is thus not actually available to energy users taking general unspecified power from the grid. In fact, energy users taking general unspecified power from the grid are left with a mix of power produced by higher emitting sources. It is, therefore, more appropriate for DWR to use the default Mandatory GHG Emissions Reporting factor to account for the unspecified power that it purchases from the California Independent System Operator (CAISO) spot market or other contracts for power where the source(s) of generation are not explicitly specified.

Construction Emissions Calculations

Construction activities have not been tracked as part of DWR's CCAR or TCR submissions because the CCAR and TCR protocols only track emissions associated with activities that are within the organizational or operational boundaries of the reporting entity (CCAR, 2009)(TCR, 2008). Because DWR contracts out construction activities, these activities fall outside of DWR's organizational and operational boundaries. DWR intends for this Plan to analyze and address all activities that it performs or causes to be performed; thus, construction emissions are included in DWR's emissions inventory for the purposes of this Plan. This convention ensures that the analysis provided in this Plan includes the potential impacts from future construction projects that may rely on the analysis in this Plan to streamline future project-specific environmental review under CEQA.

As stated above, limited historical data have been maintained on construction activities relating to GHG emissions. However, DWR does maintain a database of its construction projects. This database contains information about the characteristics of each project, including value (in dollars), construction duration, year of construction, and short project description. Over 450 projects are listed in the database between 1990 and 2010. DWR has constructed a large number of projects; however, all of the projects fall into one of 11 general project types listed below in Table 1.

⁵ California Code of Regulations, title 17 division 3, chapter 1, subchapter 10, section 95111 identifies 0.428 mtCO₂e/MWh of electricity as the appropriate default emissions factor for accounting for power for which the source is unspecified or unknown. DWR has added a 2% transmission loss factor to arrive at a total default emissions factor for unspecified power of 0.437 mtCO₂e/MWh. The methodology for calculating this number has also been used by CARB to calculate this value for all years 1990-2009. In estimates of historical emissions for years 1990-2009, DWR has used the specific emissions rate for that year in its calculations.

⁶ <http://www.epa.gov/ttn/chief/conference/ei18/session5/rothschild.pdf>

Table 1. DWR Construction Project Types

1.	Building	Includes a wide range of building construction, repair, and retro-fit activities involving minimal heavy equipment
2.	Earthwork	Involves work with predominantly heavy equipment
3.	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
4.	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
5.	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
6.	Maintenance 3	Includes a wide range of maintenance activities. such as dredging and sediment removal that typically require the use of heavy equipment
7.	Other	Includes a wide range of other miscellaneous projects that would not require the use of high emissions equipment or machinery
8.	Pipeline	Involves significant amounts of earthwork, but also involves large amounts of time constructing and placing piping or other linear construction materials
9.	Pumping Plant	Involves some earthwork, but also involves large amounts of time constructing structures and other appurtenances
10.	Roads	Includes all road and bridge projects
11.	Storage Basin	Involves large amounts of earthwork, paving, and dewatering, typically using very large equipment

In order 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. Each of the projects in the sample was analyzed in detail using daily contractor reports from the job to determine the number of pieces and the types of equipment that were on the job each day. Emissions rates from CARB's OFFROAD2007 database for applicable construction equipment were used to develop emissions estimates for each of the projects in the sample set. These emissions estimates were then used to develop eleven GHG intensity factors (metric tons of CO₂e per week of construction⁷), one intensity factor for each of the 11 construction project types listed in Table 1.

⁷ DWR experimented with several different types of intensity factors to determine which provided the best results. Because duration of construction is closely correlated with factors that influence emissions such as length of time heavy equipment is operating, it was determined to provide the best results. Intensity factors related to project cost were considered but rejected because of correlation problems on projects that had very high cost materials or labor.

The appropriate emissions intensity factor was then applied to each of the more than 450 construction projects in the database. Total construction GHG emissions estimates for each year 1990-2008⁸ were then developed by summing the total of all projects initiated in a given year.

These emissions estimates are considered to be the best estimate of historical construction emissions. Although these estimates are based on multiple assumptions and limited data and likely have error factors, DWR considers these estimates to be an adequate (and the only available) approximation of the magnitude and trend of historical GHG emissions from DWR construction activities.

Analysis of construction emissions from ongoing and proposed future projects is being done as part of DWR's CEQA analysis and documentation for each project (since 2008), 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.

Maintenance and Business Activity Emissions Calculations

DWR fuel and retail energy use records for years prior to 2007 are not assembled or organized in a manner that would allow analysis. Therefore, developing estimates of historical emissions levels for these activities would be costly and time consuming. In addition, based on data from DWR's CCAR submissions from 2007, 2008, and 2009, maintenance and business activity emissions do not contribute substantially to DWR's annual emissions GHG footprint. DWR believes that its maintenance and business activities in 2007-2009 were likely of similar type and quantity to its maintenance and business activities from 1990-2007. On average, each of these emissions sources constitutes about 0.5% of DWR's total emissions footprint. Thus, historical emissions for maintenance and business activities are assumed to be consistent with current levels for each activity, respectively. This assumption is conservative because it likely over estimates historical emissions levels as DWR currently maintains more facilities and has more employees than it did in 1990.

Summary of Historical, Current, and Future Emissions Estimates

As described above, a variety of methodologies were required to develop emissions estimates. Table 2 below summarizes the methodologies used to calculate historical emissions and that is/will be used to calculate current and future emissions from each source.

⁸ Years 2009 and 2010 were not calculated because the majority of projects initiated in those years have not been completed and data on the duration of construction were not available.

Table 2. Emissions Calculation methodologies

Emission Source	Historical Emissions	Current and Future Emissions
Operations	Electricity Usage Data	CCAR/TCR Submissions (using modified methodology)/ Electricity Usage Data
Construction	Analysis/judgment	Project Review and Analysis
Maintenance	Assumed to be at current levels	CCAR Submissions/TCR Submissions
Business Activities	Assumed to be at current levels	CCAR Submissions/TCR Submissions

B. Emissions Inventory

For each of the 4 primary activity areas, DWR has developed an emissions inventory documenting the historical and current levels of emissions from DWR activities.

Operations Emissions

The overwhelming majority of DWR GHG emissions are emitted by non-hydroelectric-generation facilities which are needed to move water through the SWP. Typically the SWPPP constitutes about 98% of all emissions from DWR activities, causing emissions of between 1.2 million and 4.1 million mtCO₂e per year.

The SWP is comprised of 20 pumping plants, 5 hydroelectric power plants, 4 pumping generating plants, 32 storage facilities (reservoirs and lakes), and about 700 miles of aqueducts and pipelines, which deliver water to 25 million Californians, 750,000 acres of farmland, and provide environmental benefits. The SWP has contracts with 29 SWP water contractors to deliver water up to a maximum amount of approximately 4.2 million acre-feet (MAF)⁹ per year. In addition, the SWP delivers water known as “Article 21 water” when extra water is available (this water is sometimes called “surplus” water). Further, DWR delivers transfer water which usually involves moving water (SWP water or non-SWP water supplies) through the system from one water user who has forgone use of the water to another water user. (Parties involved in transfers are often, but need not be, SWP water contractors.) On average over the last 20 years, the SWP has delivered a total of about 3.5MAF of water per year including all contract deliveries, “surplus” water, and transfer water.

Delivery of water through the SWP system both consumes and generates electricity. Pumping water through the SWP system annually consumes 3.4-9.9 million MWh of electricity (about 5.9 million

⁹ Contract amounts, called “Table A” amounts, are measured in acre-feet, are not guaranteed to be delivered, and many times are not delivered. Deliveries may be curtailed for a variety of reasons including regulatory, environmental, or supply availability (See The State Water Project Reliability Report 2009). For example, in 2009, SWP delivered only 1.66 MAF of water because of supply availability and regulatory constraints.

MWh per year on average). This amount depends on how much water is conveyed and to where the water is conveyed. The SWP system also generates electricity as water is released from dams and flows downhill through pipelines and hydroelectric generating turbines. However, this does not mean that DWR uses all of the power it generates to operate the SWP. In fact, DWR attempts to provide grid reliability services by operating the SWP to maximize the amount of energy generated when the statewide demand is highest, not when DWR's own demand is highest. Historically, about two-thirds of DWR's generated electricity is sold into the California electricity market through CAISO to be used during peak demand periods. Conversely, DWR aims to schedule its consumption of electricity (primarily the operation of pumps) to the maximum extent possible during off-peak demand periods. This coordinated operation of SWP facilities plays an important role in smoothing out daytime and nighttime demand for electricity throughout California and reduces overall GHG emissions from electricity generation in California. 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.

DWR uses a portfolio of energy resources to make up the difference in energy between the electricity that SWP facilities generate and the amount of electricity needed to run the SWP. The composition of the SWPPP varies throughout the year and from year to year, but SWPPP's electricity sources can generally be categorized as one of the following:

- Generation from large hydroelectric generation facilities either owned by DWR or provided to DWR by contract;
- Generation from other renewable generation facilities, including small hydroelectric, owned by DWR or provided to DWR by contract;
- Generation from thermal generation facilities, such as Reid Gardner, a coal fired generation facility, and other combined cycle gas fired power plants that are owned by DWR or provided to DWR by contract;
- Energy purchased by DWR from unspecified sources through contract –as part of an energy exchange agreement, or as part of a bilateral contract for energy; or
- Energy purchased by DWR from the forward or real-time CAISO markets.

Calculation of SWP Operational Emissions

Each energy resource within the portfolio has an emissions rate associated with it. Table 3 below shows several of the energy resources typically used in the SWPPP and their associated emissions rates.

Table 3. Emissions rates for typical SWPPP electricity generating sources.

Generation Resource	GHG Emissions Rate	Emissions Factor Reference
Large Hydroelectric Generation	0 mtCO ₂ e/MWh	CARB regulations for AB 32 Mandatory Reporting of GHG Emissions
Small hydroelectric and other renewable	0 mtCO ₂ e/MWh	CARB regulations for AB 32 Mandatory Reporting of GHG Emissions
Reid Gardner Unit #4	1.116 mtCO ₂ e/MWh	11 year average of emissions rates as reported in eGrid plant data
Spot Purchases made through CAISO Integrated Forward Market	0.437 mtCO ₂ e/MWh	Mandatory GHG Emissions Reporting regulations (California Code of Regulations Title 17 Division 3, Chapter 1, Subchapter 10, Section 95111)
Bi-lateral agreement or exchange for power from a specific resource	Resource specific emissions rate	eGrid2010 Ver. 1.0 plant data
Bi-lateral agreement with specific counterparty (no specific resource)	Counterparty's portfolio emissions rate (as reported in eGrid or to TCR)	eGrid2010 Ver. 1.0 owner based data

In order to calculate the total emissions from DWR operations, the individual emissions rates for each resource and the amount of energy from each resource are used to calculate a weighted average emissions rate for the entire portfolio. Total emissions from operation of the SWP are calculated by multiplying the portfolio emissions factor by the net energy consumed by DWR to operate the SWP pumps. The entire process is depicted in Figure 1. This method of calculating emissions accounts for the reality that generation sources are dynamic and that the coordinated operations of the California electric power grid blurs the connection between electricity generation and corresponding load.

Because of DWR's operation of the SWP to maximize electricity generation during high statewide electricity demand periods and maximize pumping operations during statewide low demand periods, the total amount of energy generated and purchased by DWR exceeds the amount of electricity actually used by DWR. The methodology depicted in Figure 1 shows how DWR calculates a weighted average emissions factor based on its entire portfolio of resources, and then uses that weighted average emissions factor to calculate its total emissions by multiplying the weighted average emissions rate by the SWP pump load.

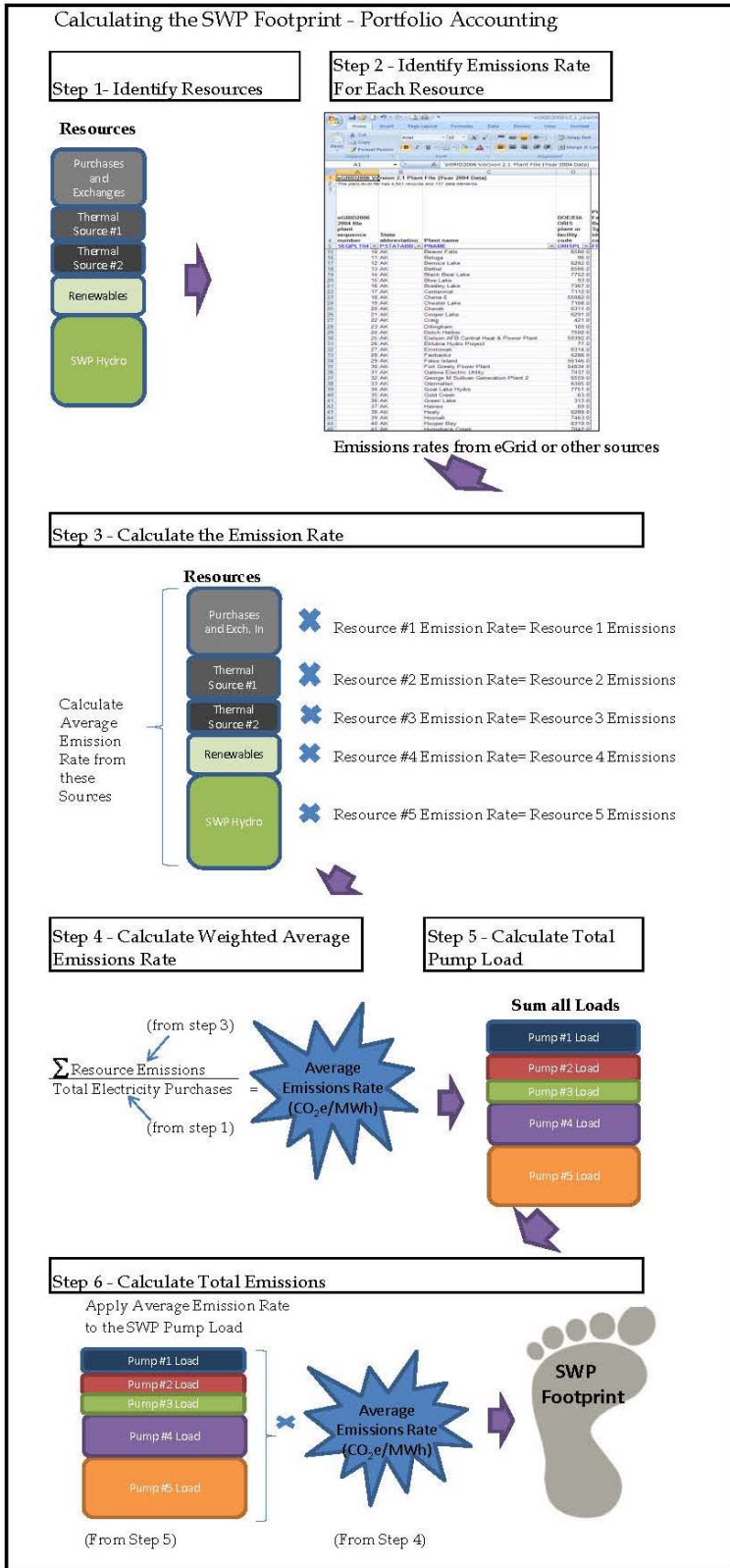


Figure 1. Calculating the SWP Emissions Footprint

GHG Emissions from SWP Reservoir Surfaces and Tailraces

As noted above the SWP includes 32 storage facilities and 5 hydroelectric facilities. In the past several years research has indicated that the surfaces of some reservoirs may be emitting or absorbing GHGs at material rates as a result of diffusion of CO₂ and CH₄ from the water into the atmosphere or from the atmosphere into the water. In addition, as stored water passes through hydroelectric turbines GHGs that had been dissolved in the water come out of solution and are released to the atmosphere. These types of emissions could represent sources or sinks of emissions from DWR’s facilities; however, there are several factors that are not yet fully understood and that make it difficult to adequately quantify emissions rates from DWR’s storage facilities.

These factors have been identified in both the absorption and emission of GHGs from reservoirs and other aquatic systems. In general, organic inputs, soil type and vegetation inundated, water quality parameters (dissolved oxygen, CO₂, and CH₄, temperature, pH), and duration of inundation have all been found to affect the GHG absorption and emissions characteristics of aquatic systems.

In addition to these factors, natural aquatic systems have been shown to be the primary pathway in the global carbon cycle for transmitting carbon sequestered at the watershed level back to the atmosphere, into sediment deposition, or as dissolved carbon to the

oceans (Cole et al., 2007). Thus, even if emissions from the surface and tailraces of reservoirs could be accurately quantified, it would not be clear if the emission of GHGs by the reservoir was changing the actual flux of emissions or if the reservoir was only changing the temporal or spatial absorption and release of those emissions. Because rivers are significant GHG emissions pathways, it would be necessary to compare pre-reservoir watershed emissions with post-reservoir watershed emissions to determine the effect of the reservoir.

Without extensive research and monitoring of DWR's facilities, DWR can rely only on existing data on similar facilities to estimate the impact of its facilities. Fifty-nine hydropower reservoirs, natural lakes, and rivers in the western and southwestern U.S. have been sampled to date (Soumis et al., 2004). This sampling shows that some reservoirs in California, Oregon, and Washington are GHG sinks while others have gross emissions equal to or less than natural lakes and rivers of the region (Tremblay et al., 2005). These studies suggest that net GHG emissions from SWP reservoirs are not substantial and are likely no higher than pre-development conditions.

Further, CARB has determined that, for the purpose of AB 32 Mandatory GHG Accounting, generation of hydroelectric power shall be excluded from the regulation¹⁰. The EPA in its eGrid database (EPA, 2010) of emissions factors for electricity generating facilities also associates a zero emissions factor to hydroelectric power generation.

In light of all of these considerations, DWR has not quantified emissions from the surfaces of its surface storage facilities or from the tailraces of its hydroelectric facilities.

Historical Variability in SWP Emissions

SWP operational emissions exhibit substantial year-to-year variation as shown in Figure 2, Annual SWP Emissions 1990-2010. The variability of SWP emissions is caused by fluctuations in two important variables: 1) the amount of energy consumed; and 2) the composition of the resource portfolio. The first variable, amount of energy consumed, is directly related to how much water is delivered and to where that water is delivered. The amount of water delivered depends on a number of factors, including water availability, environmental regulation, carryover storage (amount of water in storage at the beginning of the year), water delivery requests, and predicted future conditions. In general, as the amount of water delivered increases, the amount of energy required to move that water also increases.

¹⁰ California Code of Regulations, title 17, division 3, chapter 1, subchapter 10, article 2, section 95100

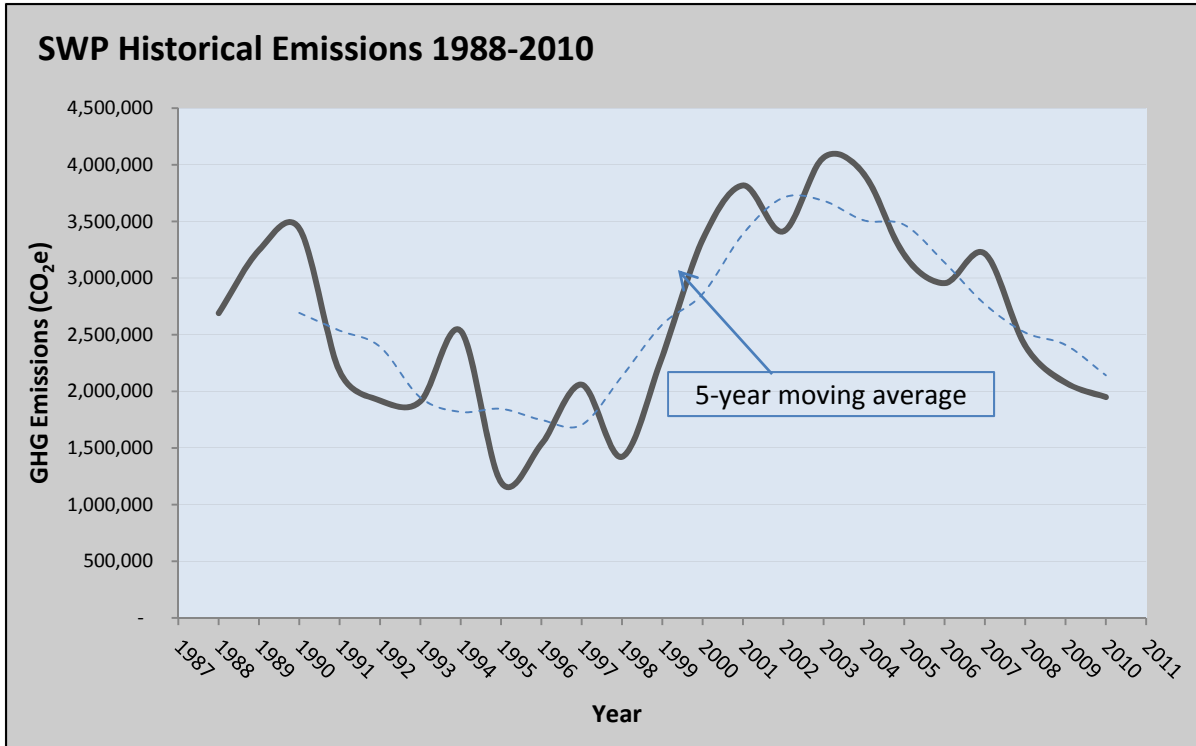


Figure 2. Annual SWP Emissions 1988-2010 (see Table 4 for values)

However, little or no energy is required to deliver water to some locations while others require substantial energy to pump water over mountains. For example, water deliveries to the northern Sacramento Valley arrive by gravity with little or no pumping, while delivering water to the southern end of the state requires 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). While the amount of water delivered is the single largest factor in determining the amount of energy needed, the location of water delivery also contributes significantly to the overall demand for energy to move water across the state. In Figure 2 below, the large jump in emissions from 1998-2000 was driven predominantly by significant increases in the amount of water delivered.

The second factor identified above as contributing to the variability of SWP emissions, composition of the power resource portfolio, also fluctuates. These fluctuations result in changes to the *rate* of emissions (mtCO₂e/MWh) that is multiplied by the total pump load required to operate the SWP (Step 4 in Figure 1). Changes in the composition of the resource portfolio may result in much higher or lower emissions per MWh of energy use. As noted in Table 3, DWR uses a wide range of energy sources in its portfolio. The emissions rates from these sources vary considerably from 0 mtCO₂e/MWh to 1.1 mtCO₂e/MWh. Again, hydrologic variability has a significant effect on the amount of GHG-free energy generated by DWR's hydroelectric resources. In very wet years, DWR generates additional electricity as water is released from dams and runs through hydroelectric generating units. However, in wet years DWR also delivers more water requiring more pumping. In dry years, less water is released

and less energy is generated, forcing DWR to turn to other electricity generation sources for its energy. However, in dry years DWR typically delivers less water and, therefore, requires less energy to operate the system. The relationship among hydrologic conditions, electricity generation, pump load, and water deliveries is complex and produces a variety of results depending on numerous factors—sometimes resulting in higher emissions and sometimes resulting in lower emissions. Figure 3 below, shows how the annual portfolio of SWP resources varies by water year type. Note that the years are arranged by water year type, not chronologically.

The total amount of energy in DWR’s portfolio of resources (the combined amount of energy generated and purchased) during a year has always exceeded the energy required to operate DWR’s pumps during a year. This occurs in part because the operation of DWR’s generation facilities and the operation of DWR’s pumps often do not coincide on an hourly or seasonal basis. This hourly and seasonal mismatch is balanced through sales to the market or purchases from it. The energy from each of these purchases and the associated emissions become part of the resource portfolio.

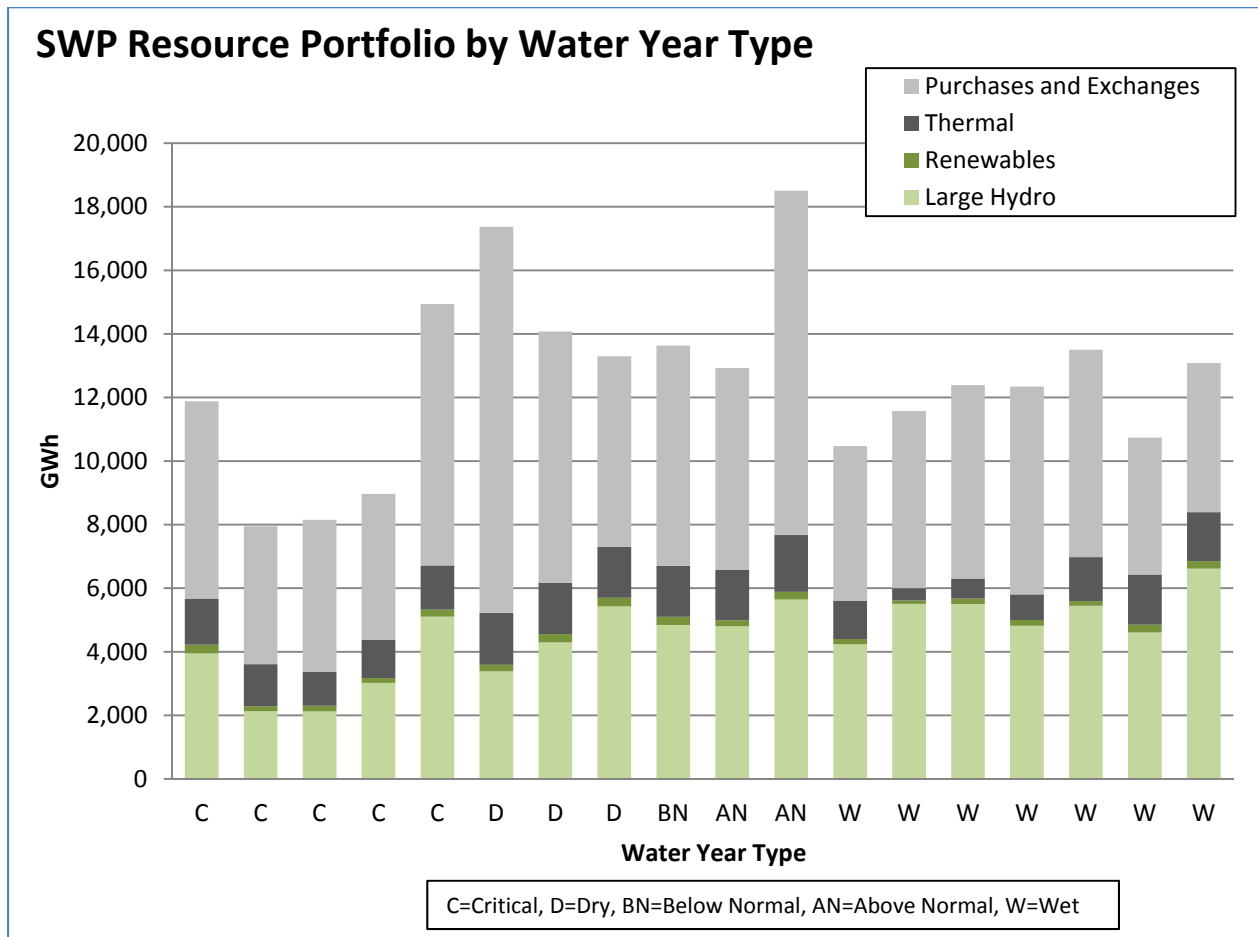


Figure 3. SWP Resource Portfolio Composition by Water Year Type
 Source: DWR-SWP Power and Risk Office.

The mismatch between DWR's portfolio of resources and DWR's pump need is also due in part to DWR's process of forecasting its energy needs months or even years in advance and then entering into contracts to purchase needed energy based on those forecasts. As DWR's forecasts change through time,¹¹ DWR often resells its future rights to purchase energy when the current forecast indicates that DWR will not need the energy. This has historically resulted in numerous transactions that increase the size of the resource portfolio but that have no effect on the actual operations or energy consumed by the SWP. The implementation in 2009, of the Market Redesign and Technology Upgrade (MRTU) to the CAISO electricity grid (described in more detail below) has nearly eliminated most of these excess purchases and subsequent sales, and has significantly streamlined DWR's energy purchasing, resulting in somewhat lower emissions.

Analysis of 19 years of available data from DWR's SWP Analysis Office is presented in Table 4 and Figure 4. These graphics show the variation in emissions versus water deliveries. The table and figure show water conveyed, pump load, and emissions from 1990 to 2009. These data show that the amount of water conveyed is the dominant factor in the amount of energy required and the emissions associated with energy generation to operate the system; however, it is clear that this does not explain all of the variability. This additional variability comes from the composition of the resource portfolio including the amount of hydroelectric power DWR is able to generate, temporary outages of SWP facilities or power suppliers, and changes in the location of water deliveries.

SWP Emissions Trends

The SWP pump load is unique amongst utility loads in that it does not exhibit continual growth over time. Typical utilities see a steadily increasing load as the population they serve grows. However, because the amount of water that can be delivered through the SWP is hydrologically and contractually limited and subject to institutional constraints, the SWP load does not exhibit a strong or consistent long-term growth trend, though the SWP did exhibit some growth in deliveries between 1990-2004 as SWP contractors increasingly requested their full contract allocations.

¹¹ Changes in forecasts of SWP operations are quite common. Forecasts of SWP operations will change through time because of changes in expectations about numerous factors including: hydrology, planned and unplanned maintenance, water demand from customers, the volume of water held in storage from year to year, environmentally driven changes in operations, or the operations of other water projects (such as the CVP) that share facilities with DWR.

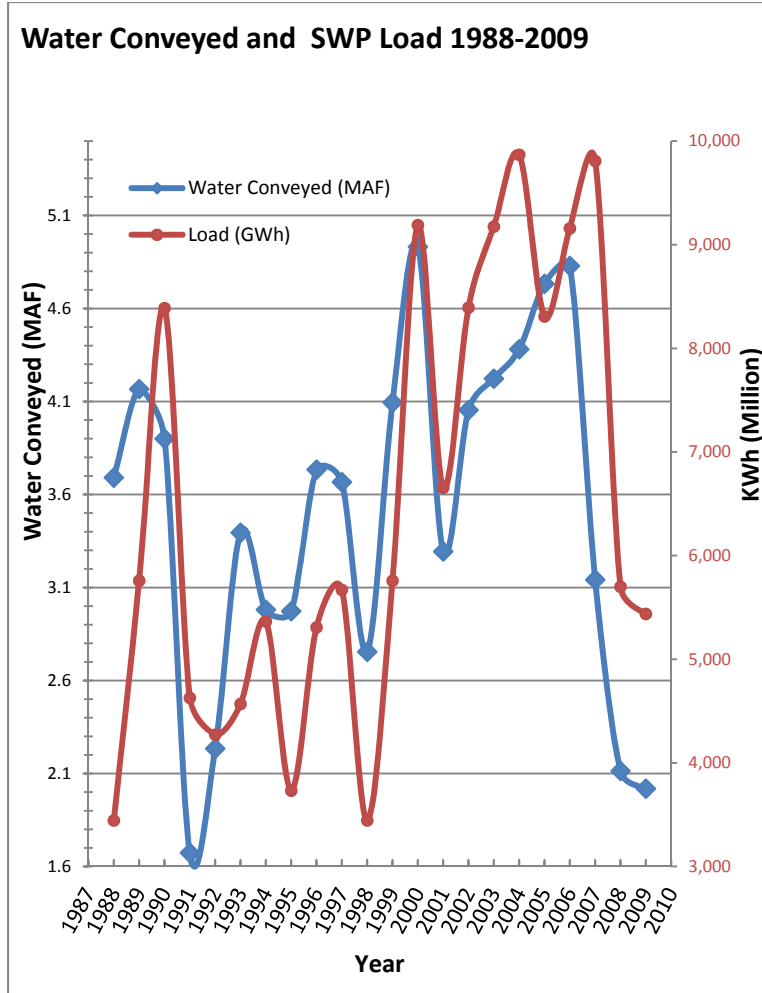


Table 4. Water conveyed, energy purchased, and emissions 1988-2009

Year	Water Conveyed ¹² (MAF)	Load (GWh)	Emissions (million mtCO ₂ e)
1988	3.691	3,445	2.69
1989	4.167	5,758	3.25
1990	3.900	8,388	3.44
1991	1.674	4,628	2.17
1992	2.234	4,273	1.92
1993	3.395	4,569	1.91
1994	2.981	5,365	2.53
1995	2.973	3,732	1.20
1996	3.734	5,308	1.53
1997	3.667	5,670	2.06
1998	2.755	3,445	1.42
1999	4.095	5,758	2.31
2000	4.932	9,190	3.34
2001	3.294	6,655	3.82
2002	4.054	8,394	3.41
2003	4.223	9,175	4.06
2004	4.381	9,868	3.92
2005	4.733	8,308	3.20
2006	4.829	9,158	2.95
2007	3.142	9,808	3.21
2008	2.114	5,700	2.40
2009	2.019	5,438	2.08

Figure 4. Water Conveyed and SWP Load 1988-2009

One aspect of SWP energy use, which has seen some growth in recent years and may continue to increase, is energy associated with non-SWP water being moved through the SWP system. DWR facilitates transferring of water between water users by moving or “wheeling” water through SWP facilities when excess capacity exists. Water transfers take place when a water right holder decides to transfer some or all of its water to another party either permanently or more commonly for a specified duration of time. Especially in dry years, water is transferred between water rights holders that can forgo use of their water for a period of time to water purchasers who need additional water during times of shortage. Typically, water transfers have involved the movement of water from agricultural users in the Sacramento and San Joaquin valleys to urban water providers in southern California. Wheeling of water through the SWP system increases the SWP’s energy use and GHG emissions. The financial costs of the additional electricity are paid by the individual water users involved in the transfer; however, the increase in emissions is associated with the SWP as a whole. The rate of water transfers has

¹² Includes Table A and Article 21 water deliveries, and water transfers.

generally been increasing and has contributed to increases in SWP energy demand. Between 2006 and 2010, movement of non-SWP water through the SWP system accounted for less than 2% of total water deliveries. As part of DWR’s wheeling services for non-SWP water, emissions associated with this movement of water through the SWP system are analyzed and addressed by this Plan.

In addition to the changes in location of delivery, a significant change in the California energy market has changed the way DWR plans for future electricity needs and the way it purchases electricity to fulfill its energy needs. On April 1, 2009 CAISO implemented MRTU¹³. MRTU is an initiative to upgrade the efficiency of energy dispatch and improve the current wholesale electricity market system through new market features and advanced computer software technology. This effort fundamentally changed the California energy market. The effect of MRTU on SWPPP GHG emissions is not yet fully known. DWR will need to function under the new system for a variety of water year types, from very dry to very wet, in order to fully analyze the impacts of MRTU. However, based on data from 2010, the first full year of operations under the MRTU, it appears that MRTU will significantly reduce DWR GHG emissions. The MRTU will not fundamentally reduce the actual amount of energy DWR consumes to run the SWP; however, it will likely reduce DWR’s emissions from excess energy purchases that are subsequently sold, which will have the effect of reducing DWR’s portfolio emissions rate and will thereby reduce DWR’s total SWP operations emissions¹⁴. Additional analysis of the effect of MRTU on SWP operational emissions is provided in Appendix G.

As described above, emissions from operation of the SWP fluctuate from year-to-year for a variety of reasons. Because of these fluctuations, DWR has defined its 1990 operational emissions as the average of emissions during the five years around 1990 (1988-1992). Note that DWR’s operational emissions in year 1990 were higher than all of the other years around 1990, thus using the 5-year average results in a lower level of emissions being used to establish DWRs GHG emissions reduction goals i.e., using a 5-year average results in greater reductions in future emissions.

Operational Emissions Summary

Activity	1990 Emissions (mtCO₂e)	1990 Emissions Average 1988-1992 (mtCO₂e)	Current Emissions Average 2007-2010¹⁵ (mtCO₂e)
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¹³ http://www.cpuc.ca.gov/PUC/energy/wholesale/01a_cawholesale/MRTU/

¹⁴ MRTU facilitates a higher level of overall grid efficiency in electricity transactions and dispatch of generating resources and reduces the amount of electricity that DWR purchases (in advance of expected loads) and subsequently sells (when actual load ends up being less than expected). These types of transactions have historically increased the overall emissions rate for the SWPPP by adding emissions from higher emissions sources.

¹⁵ The “Current Emissions” period is the period for which third-party verified emissions registry data is available.

Total DWR Operational Emissions	3,436,000	2,692,000	2,410,000
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Construction Emissions

DWR performs a range of construction activities on an annual basis. In aggregate, these construction activities, initiated and completed as individual projects, represent the second largest source of GHG emissions from DWR activities; however, these emissions are only a little more than 1% of DWR’s total GHG emissions. While the GHG emissions from an individual construction project could be considered limited and short-term, the combined GHG emissions from all DWR construction activities are also similar to a long-term source of annual emissions.

Historical records indicate that DWR constructs on average about 20-25 projects per year, though this number fluctuates widely. Generally, these projects range in cost from a few hundred thousand dollars to tens of millions of dollars in value, and occasionally DWR engages in projects that are much larger in scale. Past examples of very large projects include: construction of Oroville Dam (1957-67), the other original facilities of the SWP (1960-74), and more recently the Coastal Branch Extension to the California Aqueduct (1991-1997). These large construction projects far exceed the level of construction activity of typical DWR projects. Because a future project of this magnitude could have a significant impact on the level of emissions generated by DWR construction activity and because the implementation of these projects is infrequent and difficult to predict, the construction emissions from these very large projects—termed “Extraordinary Construction Projects”—are not analyzed in this Plan and will not be eligible to use this Plan to streamline the cumulative impacts analysis of later projects under CEQA. For these types of projects a cumulative GHG emissions analysis would have to be performed on a project-specific basis for CEQA purposes.

The following construction emissions thresholds have been developed in order to distinguish between typical construction projects that are analyzed and addressed under this Plan and Extraordinary Construction Projects whose construction emissions are not analyzed or addressed under this Plan.

A construction project will be considered to be an Extraordinary Construction Project, and the GHG impacts from the construction activities will, therefore not be eligible to rely on this Plan for streamlined CEQA review if either:

- a) The project emits more than 25,000 mtCO₂e in total during the construction phase of the project; or**
- b) The project emits more than 12,500 mtCO₂e 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 mtCO₂e level of emissions is used because it represents the total level of emissions released from all DWR 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. It is important to note that a project of this magnitude would likely span multiple years of construction and would, thus, contribute these emissions over several years. The 12,500 mtCO₂e 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 done for this Plan. Construction emissions that exceed either of these thresholds are, therefore, not analyzed or addressed under this Plan and future projects which exceed these thresholds will not be eligible to rely on the analysis in this Plan for later, project-specific cumulative impacts analyses under CEQA. For projects where construction emissions exceed this threshold, a project-specific impacts analysis for construction GHG emissions following the CEQA Guidelines and DWR policy may need to be conducted. Depending on the results of the impacts analysis, the project may need to consider mitigation for potential impacts. Operational, maintenance, and business practice emissions associated with a project whose construction emissions exceed the Extraordinary Construction Project threshold could still rely on the analysis in this Plan to streamline later, project-specific cumulative impacts analyses under CEQA provided that the Extraordinary Construction Project meets all other consistency requirements of this Plan as detailed in section XII.

Analysis of past DWR construction activity indicates that these Extraordinary Construction Projects have occurred only periodically over the past 50 years, and only one such project has been constructed in the past 20 years (the Coastal Branch Extension). However, a small number of very large projects are currently being investigated by DWR and its partner agencies. These projects would likely be large enough to be considered Extraordinary Construction Projects and construction impacts of these types of projects would not be able to rely on the analysis in this Plan to streamline later project-specific cumulative impacts analyses under CEQA.

Historical Construction Emissions

DWR's construction activities during the past 20 years are estimated to have resulted in approximately 500,000 mtCO₂e being emitted to the atmosphere. Analysis of construction emissions from 1990-2008 indicate that GHG emissions from DWR construction activities have fallen incrementally during this period. Annual construction emissions in the early 1990's were around 28,000 mtCO₂e. This emissions level fluctuated significantly throughout the 1990's and then decreased substantially after 2000. Emissions levels between 2000 and 2008 have been relatively stable and, for the most part, have remained less than 26,000 mtCO₂e per year. This represents a decrease in emissions of approximately 16% from early 1990's levels. Figure 5 shows GHG emissions from DWR construction activities (1990-2008)¹⁶.

The reductions in DWR construction emissions since 1990, as shown in this analysis, are predominantly the result of reductions in overall construction activity by DWR. This analysis does not capture reductions in emissions that may have been realized over the past 20 years that are the result of improvements in equipment efficiency, more stringent environmental restrictions, and improvements to DWR's standard specifications for construction contracts. Each of these improvements has likely contributed to reducing actual emissions from construction activities. But to be conservative, these reductions have not been captured in the historical construction emissions estimates presented in Figure 5.

¹⁶ Five-year running averages are used here to smooth out large fluctuations in construction emissions and because estimates for individual years may have large error factors.

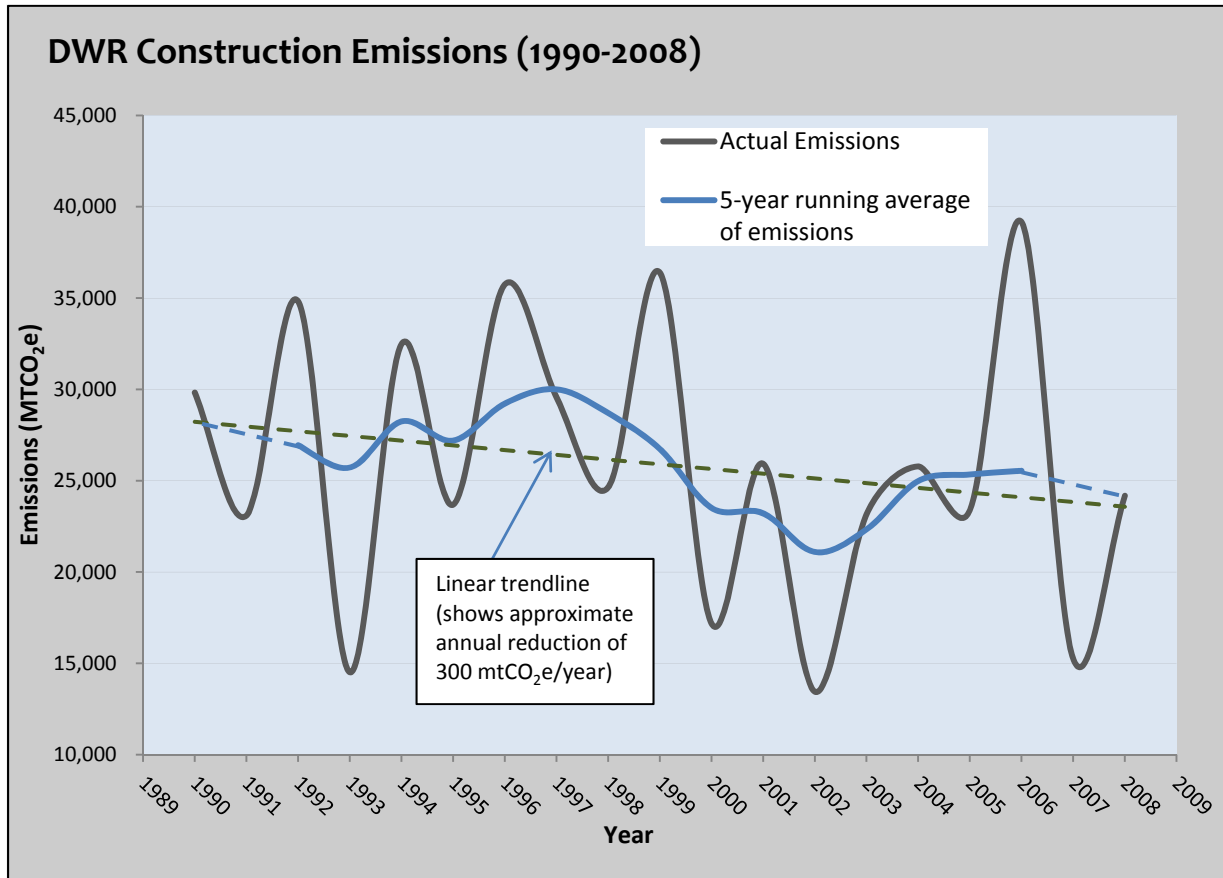


Figure 5. DWR Construction Emissions 1990-2008

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, DWR construction experts state that larger, more powerful equipment has become more readily available resulting in large earthwork projects being able to be completed more efficiently. Based on analysis conducted for this Plan, earthwork projects constitute approximately 25% of DWR’s projects and more than 50% of emissions from construction activities. Pipeline and storage basin projects are estimated to contribute 10% and 11%, respectively, to DWR’s construction emissions and also involve substantial amounts of work with large earthwork equipment. Thus, modest increases in the efficiency of earthwork equipment 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 have also become much more stringent in both California and the United States over the last 20 years. It is very likely that

environmental regulations, such as the federal Clean Air Act, targeting ambient air quality improvements and reductions of sulfur content in fuels have had secondary benefits of reducing emissions of GHGs. 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 projects 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 would have resulted in ancillary reductions in GHG emissions. Additional information on changes in environmental regulation can be found in Appendix C.

DWR Standard Contract Specifications. DWR has substantially improved its standard contract specifications since 1990. In 2002, DWR developed standard specifications for contractors to follow when constructing projects. 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, 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) installing high-pressure injectors; 2) using reformulated diesel fuel; 3) using Caterpillar pre-chamber diesel engines or equivalent; 4) substituting electrical equipment; 5) substituting natural gas-powered vehicles; 6) substituting gasoline-powered equipment with catalytic converters; and 7) reducing construction activities during Stage 2 alerts 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.

As with overall improvements in construction equipment efficiency and increased stringency of environmental regulations, DWR's improved construction specifications have undoubtedly resulted in better, more efficient construction practices. These improved practices and the resulting emissions reductions are impossible to quantify given the available historical data. However, given that construction emissions levels have fallen approximately 16% since 1990

based solely on activity and that construction equipment and practices have significantly improved since 1990, DWR asserts that its actual emissions levels for the projects analyzed and addressed by this Plan are and will remain well below 1990 levels, even if construction activity were to increase substantially in the coming years.

Current methods for calculating emissions from future construction projects should show emissions reductions from the overall improvements in construction equipment efficiency, increased stringency of environmental regulations, and DWR’s improved construction specifications. Thus, future accounting of construction GHG emissions should validate the assumption that current (and future) construction GHG emissions levels are well below 1990 levels. If future data proves this assumption to be erroneous, DWR will re-evaluate its analysis and consider additional GHG emissions reduction measures to ensure that the emissions reduction goals are met.

Construction Emissions Summary

Activity	1990 Emissions (mtCO₂e)	Current Emissions (mtCO₂e)
Total Construction Emissions	28,200*	23,600*

**Based on trendline analysis of emissions estimates 1990-2008¹⁷.*

Maintenance Emissions

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 this Plan, maintenance activities are defined as activities that are performed by DWR staff or California Conservation Corps personnel to maintain proper operation and function of facilities under DWR’s jurisdiction. This definition excludes activities that could be considered “maintenance” but are performed by private companies under contract to DWR. (All activities performed by private contractors under contract to DWR are analyzed and addressed in the construction emissions section of this Plan.) This distinction is made to facilitate accounting for emissions from these activities. Emissions estimates for maintenance activities come from internal accounting of fossil fuel purchases using the methodology developed by CCAR General Reporting Protocol 3.1. DWR has documented and reported emissions to CCAR for

¹⁷ As noted in Section V.A of this Plan DWR construction emissions have been estimated using a number of assumptions and extrapolations. In addition, construction emissions fluctuate significantly from year to year depending on the specific projects under construction. Because of these factors, DWR has established benchmarks for historical (1990) and current emissions from construction activities by using the trendline value at 1990 as the estimated construction emissions in 1990 and the trendline value at 2008 as the current level of construction emissions.

2007, 2008, and 2009 and has used data from these submissions to estimate its annual maintenance emissions. In 2010, DWR reported its emissions to TCR; however, because of difficulties with the transition from CCAR to TCR, DWR did not report maintenance emissions to TCR in 2010. DWR will resume reporting of maintenance emissions with its 2011 emissions inventory report.

DWR does not have sufficient data from years prior to 2007 on which to accurately estimate historical maintenance emissions. However, maintenance activities have remained fairly consistent during the last 20 years, and DWR estimates that historical emissions dating back to 1990 were likely similar to today's levels. While new facilities have been added to DWR's jurisdiction, creating new maintenance activities and new emissions, at the same time changes in practice and equipment have reduced maintenance emissions. For example, remote monitoring and operational systems, also known as Supervisory Control and Data Acquisition (SCADA) 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. Wide implementation of SCADA systems for monitoring and operating DWR facilities has likely eliminated substantial emissions associated with maintenance activities.

In addition, DWR recently replaced twenty 40-year-old diesel engine generators that provide emergency power supplies to critical facilities. All of the generators meet or exceed applicable EPA Mobile Off-Highway Standards, which were not in place when the original generators were manufactured. Fifteen of the 20 new generators run on liquid petroleum gas (LPG), which releases 14% fewer CO₂ emissions than diesel (U.S. Energy Information Administration, 2011). These LPG generators also do not require as much maintenance or the periodic burning off of unused fuel, thus avoiding additional emissions. It is difficult to calculate the reduction in emissions from replacement of these units because DWR does not have detailed records for fuel consumption or emissions from the original generators; however, this is just one example of how improvements in equipment and procedures have likely offset any increase in maintenance emissions from addition of new facilities.

DWR continues to investigate further equipment improvements and will likely replace nearly 100 diesel engine generators over the next several years. 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.

Analysis of emissions data from 2007-2009 indicate that maintenance emissions constitute a very small portion of DWR's annual emissions, typically accounting for less than one third of one percent of annual emissions. Because maintenance emissions constitute such an immaterial portion of total emissions, DWR will focus its resources on other sources of emissions that provide greater opportunity for reductions and constitute larger contributions to DWR's GHG impact. Nonetheless, all DWR projects will be required to reduce maintenance emissions to the extent possible and, when appropriate, adopt applicable Best Management Practices (BMP) from DWR's list of BMPs for construction and maintenance activities (Appendix D). No additional specific GHG emissions reduction measures for maintenance activities have been proposed as part of this Plan.

Below is a summary of typical activities that DWR completes to maintain flood protection and SWP facilities.

Flood Protection Maintenance Activities

DWR has responsibility for maintaining and operating specific channels, levees, and structures associated with the Sacramento River Flood Control Project (SRFCP). DWR does not maintain the entire SRFCP area. DWR only maintains portions of the SRFCP where no local maintaining agency exists or where the local maintaining agency has failed to adequately perform maintenance. Figures 6 and 7 below, show the SRFCP area. Levees that are maintained by DWR are highlighted in red, channels that are maintained by DWR are highlighted in blue, and specific features and facilities maintained by DWR are labeled and called out with appropriate symbols (see legend on figure).

Flood Protection Maintenance Activities can be broken up into three main categories: routine maintenance activities, small erosion repairs, and sediment removal projects. The majority of flood maintenance activities performed by DWR are considered routine maintenance activities. Routine maintenance work on the flood protection system is required 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 Activities

Routine maintenance activities are performed by DWR's Sacramento and Sutter Maintenance Yards. These activities include: 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 doing other work necessary to maintain the functional and structural integrity of the SRFCP.

Equipment used for routine maintenance activities include 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.

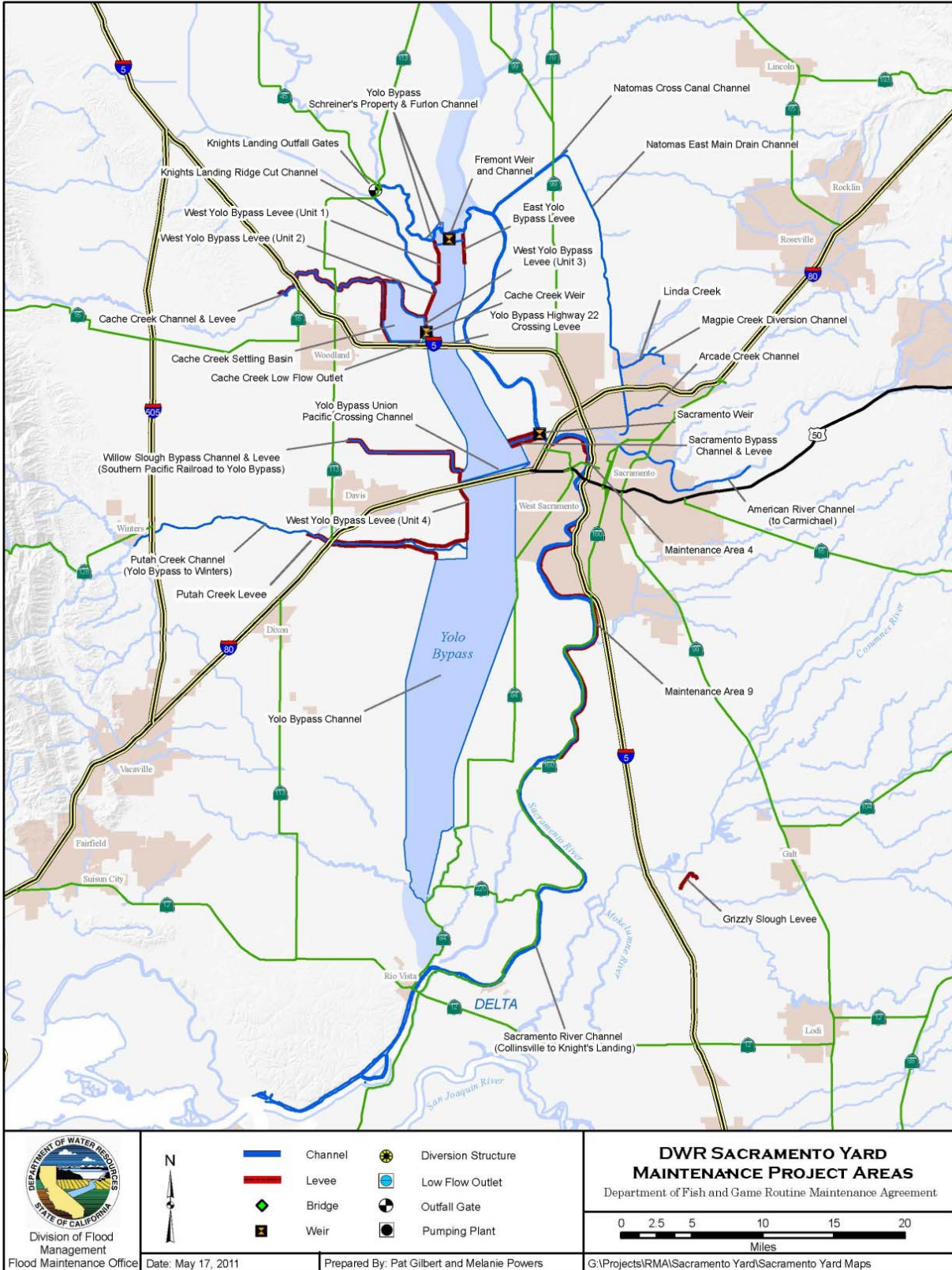


Figure 6. SRFCP Sacramento Yard Maintenance Area

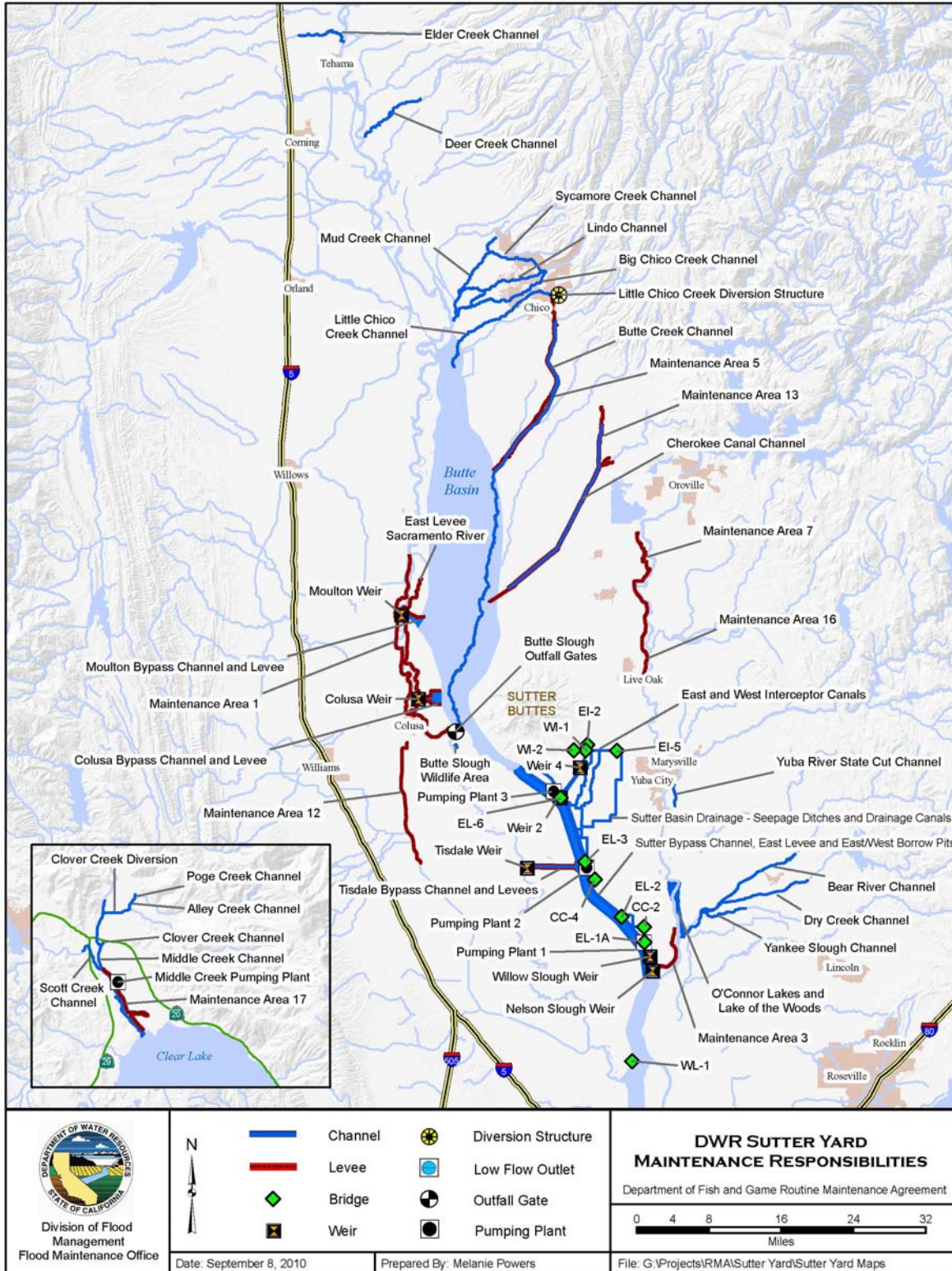


Figure 7. SRFCP Sutter Yard Maintenance Area

Small Erosion Repairs

DWR also 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 activity. 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 projects occur periodically, as well, but are performed by private companies under contract to DWR and are analyzed and addressed under the Construction section of this Plan.

In addition to these maintenance activities, DWR also produces a small amount of GHG emissions from 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 Emissions

SWP maintenance is conducted by the Oroville, Delta, San Luis, San Joaquin, and Southern field offices. Each field office holds maintenance responsibilities for the SWP facilities within its region. SWP facilities include dams, reservoirs, conveyance channels, weirs, pumping plants, siphons, pipelines and channel turnouts (connections or appurtenances), as well as the lands that surround these facilities.

SWP maintenance activities can be broken down into 4 main categories: landscaping and weed control, annual equipment and facilities inspection and maintenance, additional routine activities performed annually as needed, and 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: spraying of chemical vegetation killers and mechanical removal of debris, brush, and overgrowth and

mowing along right of way, turnouts, conveyance structures, spoil banks, reservoir and forebay shorelines, weir approaches, snow survey sites, dam toe drains, and fence lines.

Annual Equipment and Facilities Inspection and Maintenance

The following equipment is inspected and maintained on an annual basis: standby generators, cranes, safety equipment, relays, sensors, remote communication and operation equipment, landscape irrigation systems, log booms, discharge valves, surge tanks, flumes, and siphon housings. In addition, electrical equipment, including switch gear (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, 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, pump refurbishment activities, improvements to dock facilities, installation of barge anchors along conveyance and water storage structures, fence repairs, erosion control and repair activities, 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

The SWP 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, vector 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.

Maintenance Emissions Summary

Activity	1990 Emissions (mtCO₂e)	Current Emissions Average 2007-2009 (mtCO₂e)
Flood Maintenance Emissions	NA	1,380
SWP Maintenance Emissions	NA	6,791
Total maintenance emissions	8,171*	8,171

*Assumed to be at current levels.

Emissions from the burning of vegetation from levees have not been included in the emissions calculations above. Burning of grasses and vegetation from levees converts biomass into CO₂ and water vapor which is released to the atmosphere. This process does not release carbon stored in fossil fuels and only moves carbon from within the carbon cycle from one form to another.

Consistent with guidance from the CARB, burning of biomass is not included in DWR’s emissions inventory. The following estimates of the magnitude of the emissions from levee vegetation burning are provided for informational purposes. Resources available for evaluating the emissions of burning vegetation are extremely variable and dependant on many characteristics of the material being burned (i.e. moisture content, density, species, etc.). Because DWR does not have this level of information for the areas it has burned or will burn, calculations have been performed using a generalized scenario for burn conditions. DWR estimates that it burns vegetation off of approximately 2,000 acres of levee each year. CO₂ emissions from these activities result in approximately 160 mtCO₂e being released to the atmosphere.

Business Practice Emissions

Business practice emissions include all emissions attributable to the day-to-day administrative and personnel operations of DWR, including the heating and cooling of buildings used by DWR (including field offices and maintenance yards), electricity purchases to run buildings used by DWR (including building space that is owned by others and leased to DWR), and business travel by DWR employees (does not include commuting between residences and offices.)

Estimates for business practice emissions come from internal accounting of gasoline and natural gas purchases for fleet vehicles, metered electricity purchases, metered natural gas purchases, and air travel purchases. DWR has documented and reported emissions to CCAR since 2007 and has used data from these submissions in estimating its annual business practice emissions. In 2010, DWR reported its emissions to TCR; however, because of difficulties with the transition from CCAR to TCR, DWR did

not report business practice emissions to TCR in 2010. DWR will resume reporting of business practice emissions with its 2011 emissions inventory report.

Business practice emissions represent only a fraction of total average annual DWR emissions; between 2007 and 2009 these emissions constituted about two thirds of one percent of DWR’s total emissions. Because these emissions appear to be a source of growing importance and because there are several potential ways for DWR to reduce business practice emissions, DWR will take appropriate steps to ensure that even these relatively minor emissions are minimized to the extent possible.

Activity	1990 Emissions (mtCO₂e)	Average Emissions 2007-2009 (mtCO₂e)
Mobile Combustion and Travel	NA	2,315
Non SWP power purchases	NA	14,491*
Stationary combustion	NA	719*
Total Business Practice Emissions	17,525**	17,525

*Includes purchased electricity and stationary combustion (typically burning of natural gas) from Field Offices and Maintenance Yards

**Assumed to be at current levels

Overall Emissions Summary

	Operational Emissions (mtCO₂e)	Construction Emissions (mtCO₂e)	Maintenance Emissions (mtCO₂e)	Business Practices (mtCO₂e)	Total Annual Emissions (mtCO₂e)
Estimated 1990 Emissions	2,692,000 [†]	28,200 [†]	8,200 ^{†††}	17,500 ^{†††}	2,746,000
Estimated Current Average Annual Emissions	2,410,000 ^{††††}	23,600 ^{††}	8,200 ^{†††}	17,500 ^{†††}	2,459,000

[†]Average of 1988-1992 emissions

^{††} Based on trendline analysis of emissions estimates 1990-2008

^{†††} Assumed to be at current levels

^{††††} Based on average of 2007-2010 emissions

VI. Quantified DWR GHG Emissions Reduction Goals

Using the data presented in Table 5 above and the DWR GHG emissions reduction goals established in section IV of this Plan, DWR has quantified the emissions levels associated with the DWR GHG reduction goals below in Table 6. These emissions quantities will be compared with actual emissions from DWR activities during future Plan monitoring and updating (described in Section XII).

Emissions reduction goals for 2050 are provided to illustrate DWR’s long-term intentions to further reduce GHG emissions in line with the emissions reductions called for in EO S-03-05. However, the 2050 emissions reduction goal may be revised in future Plan updates based on information available at the time.

Table 6. Quantified Emissions Levels and Emissions Reduction Goals (mtCO₂e)						
	Operational Emissions	Construction Emissions	Maintenance Emissions	Business Practices	Total Annual Emissions	Total Emissions Reduction (from current)
Estimated 1990 Emissions	2,692,000	28,200	8,200 [†]	17,500	2,746,000	N/A
Estimated Current Average Annual Emissions	2,410,000	23,600	8,200	17,500	2,459,000 (10% below 1990 levels)	N/A
2020 Emissions Reduction Goal	<i>N/A</i>	<i>N/A</i>	<i>N/A</i>	<i>N/A</i>	1,373,000 (50% below 1990 levels 44% below current levels)	1,086,000
2050 Emissions Reduction Goal	<i>N/A</i>	<i>N/A</i>	<i>N/A</i>	<i>N/A</i>	549,000 (80% below 1990 levels 77% below current levels)	1,910,000

DWR’s 2020 Emissions Reduction Goal of less than 1.4 million mtCO₂e will reduce DWR’s total GHG emissions by 44% below current levels. For illustration purposes, this level of reduction meets and exceeds the level of GHG emissions reduction that has been suggested by the California Climate Action Team (CAT) for State agencies—30% reduction by 2020—and is more than twice what might be considered DWR’s share of the GHG emissions reductions from the water sector called for in the Scoping Plan¹⁸.

¹⁸ The Scoping Plan lists 6 GHG emissions reduction measures for the water sector (not all of which apply to DWR’s activities) for a total of 4.8 million mtCO₂e. DWR has estimated that total water sector emissions under the Scoping Plan baseline condition (average of 2002-2004 emissions) were 36.3 million mtCO₂e. Thus, the combined effect of the 6 water sector measures would result in a 13% reduction in total water sector emissions. DWR accounts for approximately 7% of total water sector emissions. 7% of the 4.8 million mtCO₂e emissions

VII. GHG Emissions Reduction Measures

DWR has developed the following GHG emissions reduction measures, summarized below in Table 7 and described in detail in subsections A, B, and D of this section. These are the measures that DWR will implement in order to achieve GHG emissions reductions in accordance with meeting DWR's GHG emissions reduction goals. These measures have been developed 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. Each of these measures describes actions that DWR will take to meet its GHG emissions reduction goals, however, the extent to which each individual measure is implemented and the timing of implementation may vary somewhat depending on market conditions, available technology, and other factors.

The GHG emissions reduction measures are broken into 3 categories: specific actions, project level, and conditional measures. Specific actions are measures that will be done 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. Project level measures are actions that must be incorporated into future projects that will rely on the analysis in this Plan for streamlining of cumulative impacts analyses of later project-specific environmental documents under CEQA. Conditional measures are actions 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 conditional 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 this Plan. A future project need only show that it has incorporated the project level measures and that the project does not conflict with DWR's ability to implement any of its specific action measures.

For each of the GHG emissions reduction measures described below, an "SA" for specific action, a "PL" for project level, or a "CM" for conditional measure has been placed next to the title of the emissions reduction measure. These classifications denote whether DWR intends to implement the measure as a stand-alone project or series of projects, on a project by project basis, or as a conditional or potential project measure. Where possible, the estimated level of GHG emissions reduction has been calculated for each measure and will be tracked in future Plan updates to determine if expected levels of reduction are being achieved. However, for a few of the measures, the magnitude of the GHG emissions reduction is not readily quantifiable and future reductions will not be directly attributable to a specific action. A qualitative description of how DWR expects the measure to reduce emissions is provided in these cases.

DWR's efforts to reduce GHG emissions will not stop in 2020. Instead, DWR will continue to reduce its GHG emissions beyond 2020 and will continue to make deep reductions in order to achieve its Long-Term Goal. In some cases, DWR has already enacted measures that extend beyond 2020. DWR has included expected emissions reductions from each measure through 2050 in an effort to document efforts it has already made toward further reductions beyond 2020.

reduction would therefore be approximately 350,000 mtCO₂e. DWR's projected emissions reduction of 1 million mtCO₂e is more than twice this amount.

	Measures	Description	2020 Annual Emissions Reduction- mtCO₂e	2050 Annual Emissions Reduction- mtCO₂e
1.	OP-1 Reid Gardner Power Termination (SA)	Termination of DWR's ownership interest in Unit #4 of the Reid Gardner Power Station in Nevada and substituting foregone electrical power with other less GHG intensive electricity supplies	882,700	882,700
2.	OP-2 Energy Efficiency Improvements (SA)	Increasing energy efficiency of pumps and turbines throughout the SWP system through design, construction, and refurbishment methods	48,500	48,500+
3.	OP-3 Renewable Energy Procurement Plan (SA)	Increasing the proportion of energy used to run the SWP with energy supplies from renewable sources	157,320	1,573,200
4.	OP-4 On-Site Renewable Generation (SA)	Exploring ways to develop renewable energy on land DWR owns.	10	Unknown
5.	OP-5 Lower Emissions Energy Resources (SA)	Establishment of contracts for or ownership of high efficiency energy resources.	23,180	23,180+
6.	OP-6 Carbon Sequestration Actions (CM)	Implementing environmental restoration activities that have the potential to improve sequestration of carbon by natural processes	Unknown	Unknown
7.	CO-1 Construction BMPs (PL)	Implementing practices aimed at minimizing fuel consumption by construction equipment and transportation of materials, reducing the amount of landfill material, and reducing emissions from cement production	580	Not quantified
8.	CO-2 Statewide Equipment and Fuel Regulations (PL)	GHG emissions reductions achieved by compliance with current and anticipated air quality regulations	900	Not quantified
9.	BP-1 SMUD Commercial Greenergy Program (SA)	Purchasing 259,000 kilowatt hours (kWh) each month for the next ten years of SMUD Greenergy	960	960
10.	BP-2 SMUD Carbon Offset Program (SA)	Purchasing 2,580 mt of carbon offsets each year for the next ten years for DWR emissions generated through DWR business activities	2,580	2,580

11.	BP-3 DWR Sustainability Initiatives (SA)	Identifying, measuring, and implementing specific business practices to reduce consumption of energy and other resources	Not quantified	Not quantified
	TOTAL		1,116,730	N/A

+ indicates that the emissions reductions for these measures are expected to be at least as large as the quantity listed but would likely be higher.

A. Operations Emissions Reduction Measures

The operation of the SWP involves the balancing of a broad range of demands and constraints to determine how much water is delivered, to where, and when. This Plan and the GHG emissions reductions measures detailed below are not intended to influence the quantity of water delivered, location of delivery, or the timing of that delivery. Instead, this Plan and the operations emissions reduction measures below focus on reducing the emissions *rate* for energy generation used to operate the SWP and improving the efficiency of SWP pumping and generating facilities. DWR does not anticipate large increases in energy needed to operate the SWP, thus, reducing DWR’s emissions *rate* will result in significant overall emissions reductions. The measures presented below are extremely aggressive and will likely result in very significant reductions in the emissions for energy associated with operation of the SWP. DWR has developed the following 6-pronged approach to reducing emissions from operations.

OP-1 Termination of Power Supplies from Reid Gardner Power Station (SA)

Since 1979, DWR has held a partial interest in Unit #4 of the Reid Gardner Power Station. Reid Gardner is a coal-fired power plant in Moapa, Nevada¹⁹ that currently supplies up to 235 MW of capacity to the SWP. Electricity from the plant produces disproportionately high amounts of GHGs as compared to other SWP electricity generation sources. Emissions from Reid Gardner for electricity delivered to DWR have typically been over 1.5 million mtCO₂e per year (30%-50% of total DWR operational emissions). Between 1997 and 2007, the average emissions rate from Reid Gardner for electricity supplied to DWR has been 1.116 mtCO₂e/MWh. This is more than twice the emissions rate associated with the general pool electricity from the integrated California market.

DWR has committed to divesting its interest in Reid Gardner Unit #4. DWR plans to cease receiving electricity from the power station in July 2013. Thereafter, SWP power procurement efforts will focus on procuring cleaner less GHG-intensive sources. Termination of power supplies from Reid Gardner Power Station and procurement of cleaner, less-GHG intensive sources as an alternative to Reid

¹⁹ While emissions from Reid Gardner occur in Nevada, these emissions have been accounted for under DWR’s CCAR and TCR emissions inventories. In addition, because this power is imported into California, CARB also accounts for these emissions in the California emissions inventory.

Gardner power will result in a sustained net GHG emissions reduction of approximately 882,700 mtCO₂e per year.

This action is consistent with the AB 32 Scoping Plan, which references the expiration of Reid Gardner and other coal power plant contracts and replacement with less-GHG emitting sources as a strategy to reduce coal-based power generation by approximately 10,000 GWh (9.7 million mtCO₂e) by 2020 (CARB, 2008-Appendix C at C-95 to C-96).

DWR’s divestiture reduces the amount of coal-fired power used to meet California electricity demand, reduces GHG emissions for California, and moves the State toward achieving the AB 32 GHG emissions reduction goals²⁰. This action also promotes the State’s policy of reducing California GHG emissions from high GHG emitting power plants²¹.

Measure	Annual GHG Emission Reduction
OP-1 Termination of Power Supplies from Reid Gardner Power Station	882,700 mtCO ₂ e/ year

OP-2 Energy Efficiency Improvements (SA)

DWR will continue to implement a comprehensive plan to increase the energy efficiency of pumps and turbines throughout the SWP system. By improving pumping and generating efficiencies, DWR will minimize energy needs and maximize energy generated.

DWR is continuously evaluating the performance of its 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 is striving to maintain and improve the first-in-class energy efficiency of each hydroelectric and pumping unit in the SWP system.

Ongoing efforts on 6 generating units at the Hyatt Power Plant and 4 pump units at the A.D. Edmonston Pumping Plant were completed in 2011. This energy efficiency improvement increases the efficiency in each unit by as much as 6.5% with several units reaching efficiency levels of 95%. The

²⁰ DWR recognizes that termination of electricity deliveries from Reid Gardner may not result in a reduction to global GHG emissions, as another electricity user may take delivery of the electricity. However, as a strategy for meeting California’s GHG emissions reduction targets as outlined in AB 32 and EO S-3-05, termination of electricity deliveries from Reid results in measurable reductions in GHG emissions attributable to DWR and the State of California.

²¹ Senate Bill 1368, signed into law in 2006, requires all power resources, for which a load-serving entity or public-owned utility is signing a long-term baseload power supply contract, to meet GHG emissions performance standards. DWR is subject to this standard under Water Code Section 142.

combined energy savings of these improvements will result in a reduction of 48,500 mtCO₂e per year (DWR, 2010).

The GHG emissions reduction shown below under OP-2 includes only energy efficiency improvements that DWR has already committed to. Thus, this is a conservative estimate of the efficiency improvements that will be made between now and 2020 or 2050. DWR expects to implement several additional energy efficiency projects during this period, including replacement of up to 7 additional pumps at A.D. Edmonston Pumping Plant. If implemented, the new pumps would improve the efficiency of pumping operations by 83,000 MWh per year, resulting in an additional emissions reduction (above and beyond the reduction described above) of around 27,000 mtCO₂e/year.

Measure	Annual GHG Emission Reduction
OP-2 Energy Efficiency Improvements	48,500 mtCO ₂ e/ year

OP-3 Renewable Energy Procurement Plan (SA)

The Renewable Energy Procurement Plan is DWR’s plan for incrementally reducing GHG emissions of the SWP by increasing the proportion of energy used to run the SWP that is procured from renewable energy supplies and reducing the use of thermal generation. Electricity resources purchased under DWR’s Renewable Energy Procurement Plan will meet state policy on renewable energy resources, as generally defined by law and the California Energy Commission’s Renewable Resource Eligibility Guidebook.

The table below shows DWR’s plan for reducing GHG emissions by increasing the annual amount of renewable energy that it will purchase in future years. In each year, additional renewable energy is purchased, adding to the previous year’s total, i.e., Year 1 = 36 GWh, Year 2 = 36 GWh + 36 GWh from year 1, Year 3 = 36 GWh + 72 GWh from prior years. The Renewable Energy Procurement Plan is based on achievement of DWRs Long-Term Goal and used a long-term average of emissions over a 20-year period since 1990 and forecasted power requirements to develop the schedule of renewable resource procurements. The Renewable Energy Procurement Plan is designed to incrementally reduce GHG emissions from operation of the SWP so that total operational emissions fall to 80% below 1990 levels by 2050. DWR structured the Renewable Energy Procurement Plan to be more than adequate to meet its Near-Term Goal for 2020. The reason for this approach is that it will enable DWR to initiate renewable procurement in the short-term and expand that procurement as the renewable energy market matures. This approach will also provide the smoothest ramp up of renewable power procurement as a base to build on in order to meet its projected Long-Term Goal for 2050. DWR will monitor emissions trends and modify the schedule for procurement of renewable energy, as necessary, to meet its Near-Term and Long-Term Goals.

It should be noted that the renewable energy purchased through the Renewable Energy Procurement Plan will, for the most part, offset energy that is currently purchased from unspecified sources or other

sources of power that have disproportionately high rates of emissions per MWh of energy supplied. These purchases are in addition to power purchased to make up for divestiture of DWR’s interest in Reid Gardner Unit #4 (OP-1).

The table below represents DWR’s plan for progressive procurement of renewable resources, actual procurement of renewable resources may occur in larger or smaller tranches of renewable procurements and may not exactly follow the timing indicated in the table below. Further, long-range projections indicate that DWR may not need to procure all 3,600 GWh of electricity per year to meet its Long-Term Goal in 2050. Procurement of renewable energy will be guided by the procurement plan outlined below but may vary according to market availability and level of resources needed to meet GHG emissions reduction goals.

OP-3 Renewable Energy Procurement Plan	Annual Increase in Renewable Energy Procurement Rate	End of Period Portfolio Target	Annual Emissions Reduction at End of Period
2010-2020	36 GWh/yr	360 GWh	157,320 mtCO ₂ e/yr
2021-2030	72 GWh/yr	1,080 GWh	471,960 mtCO ₂ e/yr
2031-2040	108 GWh/yr	2,160 GWh	943,920 mtCO ₂ e/yr
2041-2050	144 GWh/yr	3,600 GWh	1,573,200 mtCO ₂ e/yr

OP-4 On-Site Renewable Energy Development on DWR Land and Facilities (OM)

In addition to purchasing renewable energy under the Renewable Energy Procurement Plan, DWR is exploring ways it can develop renewable energy on buildings and lands that it owns. These activities will include investigations of distributed generation interconnected through DWR’s retail load at DWR locations, such as administration buildings, visitor centers, and parking lots and wholesale renewable energy development on DWR lands. An example of implementation of this measure is DWR’s ongoing partnership with the University of California to explore the feasibility of installing photovoltaic generating capacity along the California Aqueduct and other facilities on DWR lands. DWR and the University of California have already entered into a joint development agreement to build a 10 to 20 MW photovoltaic project on property owned by DWR that is adjacent to an existing pumping plant in southern California. DWR also plans on participating with the Department of General Services in their Power Purchase Agreement contracts being solicited in 2012. DWR has identified approximately 1-2 MW of photovoltaic projects on DWR facilities related to the Department of General Services Power Purchase Agreement. Opportunities for renewable energy development on DWR land and facilities will be subject to safety, emergency, and environmental considerations and will be subordinate to DWR’s primary purpose of flood control and water supply delivery. Even with these restrictions, DWR is optimistic about opportunities to develop renewable energy adjacent to DWR facilities while preserving the ability of DWR to safely maintain its operations.

DWR has conservatively estimated the GHG emissions reductions from on-site renewable energy generation and therefore the estimated GHG emissions reductions from this measure remain quite small at this time. However, if pilot projects prove the efficacy of this type of project, significant additional GHG reductions could be realized in the future. DWR intends to more fully explore this GHG emissions reduction measure in future Plan updates.

Measure	Annual GHG Emission Reduction
OP-4 On-Site Renewable Energy Generation	10 mtCO ₂ e/year

OP-5 High-Efficiency Energy Resources (SP)

In addition to pursuing renewable resources to meet the need for SWP electricity demands, DWR will also pursue development of contracts for or ownership of high-efficiency non-renewable power resources. Power resources developed under this measure will be higher efficiency than the default efficiency level for unspecified electricity in California (California Code of Regulations, title 17 division 3, chapter 1, subchapter 10, section 95111).

DWR is currently in the process of developing a resource under this measure. DWR has a partial ownership interest (33.5%) in the Lodi Energy Center which is currently under construction. The Lodi Energy Center is expected to be completed in July 2012 and begin supplying up to 304,000 MWh of electricity to DWR in 2012 and up to 500,000 MWh thereafter. Lodi Energy Center is a high-efficiency, combined-cycle, gas-fired power plant located in Lodi, California. This state-of-the-art plant features fast ramp-up and ramp-down capabilities which can support and back-up intermittent renewable energy supplies on the California electricity grid. The estimated GHG emissions efficiency of the Lodi Energy Center is 361 mtCO₂e/GWh, which is 16% more efficient than the default efficiency level for unspecified electricity in California (428 mtCO₂e/GWh), and is 34% more efficient than the Emissions Performance Standard established by Senate Bill 1367 (California Public Utilities Code, division 4.1, chapter 3). High-Efficiency energy resources will contribute to reducing DWR emissions by reducing DWR’s need to purchase electricity from unspecified sources on the CAISO grid.

Measure	Annual GHG Emission Reduction
OP-5 High-Efficiency Energy Resources	23,180 mtCO ₂ e/year

OP-6 Carbon Sequestration Actions (OM)

Future DWR projects will likely involve environmental restoration activities. While it is possible that some of these activities may add to the emissions of GHGs, many of these environmental restoration activities will increase the sequestration of carbon by natural processes. In these cases GHGs are being

removed from the atmosphere. Calculation of the quantities of GHGs removed and accounting for this sequestration value is an evolving science with many unknowns and uncertainties. DWR will use state-of-the-science methodologies to calculate long-term GHG sequestration values on a project-by-project basis. Carbon sequestration may be an ancillary or secondary benefit of future DWR projects. It is not possible to accurately calculate the level to which carbon sequestration actions will be implemented in the future. However, project elements, such as riparian, wetland, and tidal marsh habitats, are consistent with DWR’s Sustainability and Environmental Stewardship Policies (DWR 2009)(DWR 2011) and have been shown to sequester significant amounts of CO₂. DWR expects that carbon sequestration actions will be undertaken on a number of future projects. See Section IX for more discussion on carbon sequestration.

Measure	Annual GHG Emission Reduction
OP-6 Carbon Sequestration Actions	Not quantified

Operational Emissions Reduction Summary (mtCO₂e)

Emissions Reduction Measure	2020 Annual Emissions Reduction	2050 Annual Emissions Reduction
OP-1 Reid Gartner Power Termination	882,700	882,700
OP-2 Energy Efficiency Improvements	48,500	48,500+
OP-3 Renewable Energy Procurement Plan	157,320	1,573,200
OP-4 On-Site Renewable Generation	10	10+
OP-5 High-Efficiency Energy Resources	23,180	23,180+
OP-6 Carbon Sequestration Actions	Unknown	Unknown
Total Quantified Reductions	1,111,710	2,527,580

+ Indicates that 2050 annual emissions reductions from these measures are expected to be at least as large as the indicated reduction figure but are likely to be significantly larger.

B. Construction Emissions Reduction Measures

The primary source of DWR’s construction emissions is due to operation of diesel powered construction equipment. Large reductions in construction emissions are extremely difficult to realize because there are currently no economical alternatives to diesel fuel for powering most construction equipment. However, 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.

For the purposes of this Plan, construction projects are defined as construction, maintenance, or refurbishment work performed on DWR facilities by an outside contractor and which are not Extraordinary Construction Projects. Work performed by DWR staff is not included in this emissions category, instead emissions from work performed by DWR staff are analyzed and addressed under operations and maintenance emissions.

CO-1 Best Management Practices (PL)

DWR’s BMPs for construction activities are a comprehensive list of practices aimed at minimizing fuel usage 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. The BMP are broken into two categories: Pre-Construction and Final Design, and Construction.

A complete list of DWR’s Best Management Practices for Construction and Maintenance Activities to Reduce Greenhouse Gas Emissions is in Appendix D.

DWR has developed a rough estimate of the emissions reductions resulting from implementation of these BMPs by using data from EPA (2007) and other sources.

Measure	Annual GHG Emission Reduction
CO-1. Construction Best Management Practices	580 mtCO ₂ e/year

CO-2 Improved Statewide Equipment and Fuel Regulations (PL)

Off-Road Diesel Vehicle Regulation

In 2007, CARB adopted the Off-Road Diesel Vehicle Regulation (California Code of Regulations, title 13, article 4.8, chapter 9) which, when fully implemented, 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, required sales disclosure requirements, and reporting and labeling requirements. The first compliance date for large fleets was March 1, 2010; however, amendments have been made several times to extend the deadlines. When the regulation is fully implemented, owners of fleets of construction, mining, and industrial vehicles will have to upgrade the performance of their vehicle fleets to comply with the regulation.

DWR’s construction emissions will be reduced because construction contractors and equipment suppliers that DWR uses to complete its construction activities will be subject to this regulation. As DWR’s contractors upgrade their fleets, emissions from construction activities will be reduced on DWR construction jobs.

CARB Climate Change Scoping Plan Regulations

The Scoping Plan proposes a comprehensive set of actions designed to achieve the 2020 GHG emissions reductions required under AB 32. While some of the regulations will not be implemented until later, when they do take effect, they will likely result in reduced emissions from DWR construction activities. 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), the heavy-duty tractor truck regulation (Measure Transportation-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 will reduce air pollutant emissions through 2020, including the Diesel Risk Reduction Plan and the 2007 State Implementation Plan. Measures in these plans will result in the accelerated 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 very difficult and depends on many factors including the characteristics of DWR construction projects in the future and the speed with which the regulations are adopted and implemented.

DWR has estimated the emissions reduction from its construction activities by making assumptions about how each of the Scoping Plan measures would impact DWR construction activities and attempting to quantify the reductions that each measure would cause.

Measure	Annual GHG Emission Reduction
CO-2 Statewide Equipment and Fuel Regulations	900 mtCO ₂ e/year

Construction Emissions Reduction Summary (mtCO₂e)

Emissions Reduction Measure	2020 Annual Emissions Reduction	2050 Emissions Reduction
CO-1 Construction Best Management Practices	580	Unknown
CO-2 Statewide Equipment and Fuel Regulations	900	Unknown
Total Quantified Reductions	1,480	0

C. Maintenance Emissions Reduction Measures

DWR has determined that maintenance emissions constitute a very small part of DWR’s GHG emissions footprint. In addition, very few cost effective measures exist for further reducing emissions from maintenance activities. Therefore, DWR has not established GHG emissions reduction measures specifically for maintenance operations. In an effort to improve the efficiency of maintenance operations, DWR will implement BMPs for construction and maintenance activities (Appendix D) to the extent possible when performing maintenance activities. In addition, DWR has developed BMPs to reduce emissions from vegetation management activities. Appendix E contains DWR’s BMPs for Vegetation Management Activities and additional resources for vegetation and land management.

D. Business Practice Emissions Reduction Measures

BP-1 Participate in SMUD Commercial Greenergy Program (SA)

In January 2010, DWR signed an agreement with the Sacramento Municipal Utility District (SMUD) to participate in its commercial Greenergy program. The program matches a customer’s electricity needs with Greenergy purchases from renewable sources for use on the SMUD power system. Greenergy power sources are renewable and sustainable and do not require the release of GHGs from burning of fossil resources. DWR has committed to purchasing 259,000 kWh of SMUD Greenergy each month for the next 10 years. This commitment will ensure that at least 3.1 GWh of DWR’s electricity usage for business activities will be served by zero emissions renewable electricity sources.

BP-1 SMUD Commercial Greenergy Program	960 mtCO ₂ e/year
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BP-2 Participate in SMUD Carbon Offset Program (SA)

In January 2010, DWR signed an agreement with SMUD to participate in its Commercial Carbon Offset Program. The program allows commercial customers to purchase carbon offsets from emissions generated through use of natural gas in the business activities of the participant. Offset purchases fund SMUD projects that follow the Climate Action Reserve Protocols for carbon offset projects. DWR has committed to purchasing 2,580 mt of carbon offsets each year for the next 10 years.

BP-2 SMUD Carbon Offset Program	2,580 mtCO ₂ e/year
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BP-3 Implement the DWR Sustainability Policy (SA)

The DWR Sustainability Policy (DWR, 2009) was approved by the Director on April 22, 2009 to guide all of 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. The initial policy was followed by quantified sustainability targets in September 2010. The Sustainability Policy supports DWR’s efforts to reduce GHG emissions and the GHG emissions reduction measures outlined in this Plan, and fully integrates DWR’s multipronged approach to responsible

resource management and ecosystem stewardship. Several of the elements of the Sustainability Policy are briefly described below and a detailed description of DWR's past, current, and planned future efforts to implement the Sustainability Policy are provided in Appendix F.

Carbon Reduction

- Track and report GHG emissions to both regulatory agencies such as the CARB as well as voluntary reporting to the appropriate carbon registry
- Maximize the use of technically feasible and cost-effective clean and renewable energy sources for the SWP and business operations

Target:

- Reduce GHG emissions to 50% below 1990 levels by 2020
- Reduce GHG emissions to 80% below 1990 levels by 2050
- Progressively acquire 360 GWh of electricity from renewable resources by 2020

Water Use Efficiency

- Model state-of-the-art water use efficiency practices
- Incorporate recycled wastewater into facilities when technically feasible and cost effective

Target: reduce per capita water consumption by at least 20% by 2020

Waste Reduction and Recycling

- Maximize opportunities to reduce, reuse, and recycle materials

Target: Divert 50% of waste stream by 2020

Business Services and Purchasing

- Develop sustainable business practices for its facilities, fleet, workplaces, procedures, and management decisions
- Utilize purchasing power to meet sustainability objectives
- Promote sustainability in its grant making processes

Energy Efficiency

- 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
- Implement cost-effective building energy efficiency upgrades in existing buildings, using available low-cost loans, bonds and other available funding. Provide EV charging stations in employee parking areas of all new or renovated buildings, and in other existing buildings, when feasible

Target:

- Reduce grid based energy demand by 20% by 2015 meeting Executive Order S-20-04

- Ensure Energy Star purchasing to reduce energy use

BP-3 Implementation of Sustainability Initiatives	Status
<ul style="list-style-type: none"> • Target: Divert 50% of waste stream by 2020 	<ul style="list-style-type: none"> • Ongoing. This is a statutory requirement that DWR has been routinely meeting since 2003.
<ul style="list-style-type: none"> • Reduce grid based energy demand by 20% by 2015 	<ul style="list-style-type: none"> • Ongoing. The Department of General Services has compiled energy use data from all state departments for 2003 and 2010, including DWR. During this time, DWR’s grid-based electricity use decreased 0.3% and gas use decreased 18.8%. DWR replaced lighting and upgraded heating and cooling equipment in several of its facilities. Retro commission of heating and cooling systems at facilities that were not upgraded was also completed in 2011. Additional improvements will be targeted by working with the Department of General Services.
<ul style="list-style-type: none"> • Ensure Energy Star purchasing to reduce energy use 	<ul style="list-style-type: none"> • Ongoing. Energy Star certification is required for all purchasing performed by DWR’s Purchasing Office.
<ul style="list-style-type: none"> • Incorporate energy and water efficiency and conservation into capital and renovation projects, and operations and maintenance activities. 	<ul style="list-style-type: none"> • Ongoing. DWR is building all new facilities and facility renovations to Leadership in Energy and Environmental Design Standards (LEED). An example of this initiative is DWR’s target of LEED Gold for its new Southern Division Field Office. This project includes a photovoltaic system, ground source heat pump system, and electric car charging systems.

Activities that have been implemented or will be implemented under BP-3 will reduce GHG emissions from DWR business practices. Reducing the amount of electricity purchased to operate buildings and the amount of fuel purchased to transport employees to meetings and to and from work, reducing waste generation, and increasing recycled materials content in purchased equipment will all help reduce GHG emissions. However, some of these improvements are very difficult to quantify for GHG emissions reductions and would require significant expense to accurately determine the savings being realized. In addition, many of the activities actually reduce emissions from sources that are outside of DWR’s emissions inventory, such as those from employee commuting, are not attributed to DWR directly. Instead, they are attributed to the individual employee, or more generally, to the transportation sector of the economy. Thus, reductions in GHG emissions from activities listed under BP-3 that are not identified elsewhere in this Plan as GHG Reduction Measures are not quantified and are assumed to be zero for purposes of achieving DWR GHG emissions reduction goals. However, these activities are important and are contributing to overall reductions in GHG emissions for both DWR and the wider economy.

BP-3 Implement DWR Sustainability Initiatives	Not Quantified
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Business Practice Emissions Reduction Summary (mtCO₂e)

Emissions Reduction Measure	2020 Emissions Reduction	2050 Emissions Reduction
BP-1 SMUD Commercial Greenergy Program	960	960
BP-2 SMUD Carbon Offset Program	2,580	2,580
BP-3 Implement DWR Sustainability Initiatives	Not quantified	Not quantified
Total Quantified Reductions	3,540	3,540

VIII. Projected Emissions and Emissions Reductions

DWR’s total quantified emissions reductions (reductions directly associated with the emissions reduction measures detailed in Section VII above) and projected emissions in 2020 and 2050 are shown below in Table 7. Quantified emissions reductions total nearly 1,120,000 mtCO₂e and demonstrate the specific measures that DWR will employ to reduce emissions. Implementation of the GHG emissions reduction measures will reduce DWR emissions by 51% from 1990 levels and 45% below current levels. However, DWR projects that its emissions in 2020 will be even lower than indicated by the GHG emissions reduction measures.

DWR has used the GHG emissions reduction measures, and other important factors that affect DWR emissions to project future emissions. In Table 7 below, estimates of projected future emissions also reflect the changes in the operation of the California electricity market since the implementation of MRTU in 2009 (discussed above in section V.B). The GHG emissions projections in Table 7 also reflect DWR’s projections of future water deliveries, which include assumptions about regulatory constraints and hydrologic conditions. These projections indicate that DWR will exceed its GHG emissions reduction goals and will achieve GHG emissions reductions of 61% below 1990 levels in 2020 and will be able to achieve and surpass its Long-Term GHG emissions reduction goal in 2050. Additional information and explanation of DWR’s future emissions projections is provided in Appendix G.

Table 7. DWR Projected Emissions 2020 and 2050 (mtCO₂e)

	Current Emissions	Total Quantified Emissions Reductions 2020 (from Current)	Projected Emissions 2020²²	Total Quantified Emissions Reductions 2050 (from current)	Projected Emissions 2050
Operational Emissions	2,410,000	1,111,710	998,000	2,527,580	180,500
Construction Emissions	23,600	1,480	22,100	Not Quantified	7,000
Maintenance Emissions	8,200	0	8,200	Not Quantified	2,500
Business Activity Emissions	17,500	3,540	14,000	3,540	1,500
TOTAL	2,459,000	1,116,730	1,042,300	N/A	191,500
Reduction From 1990 Levels		51%	62%		93%

IX. Other Emissions and Emissions Reductions

As noted in Section II. Plan Scope, future DWR activities could potentially result in loss of natural sequestration capacity due to, for example, loss of forest area. Conversely, as noted in Section VII, GHG emissions reduction measures, OP-5 Carbon Sequestration Actions, 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

²² Projected emissions include quantified emissions reductions from the 11 GHG emissions reductions measures as well as projections of electricity resources and operations. These projections of electricity resources and operations include development of new electricity delivery contracts and/or development of new DWR electricity resources that will displace electricity previously purchased from unspecified sources from the CAISO grid. These new electricity resources may have lower GHG emissions rates and are projected to also contribute to reducing DWR’s projected emissions.

capacity and lead to net increases in sequestration will offset loss of sequestration capacity caused by DWR activities.

X. Monitoring and Plan Updates

DWR’s Plan will be implemented over the next forty years in order to meet significant GHG emissions reduction goals established for 2020 and 2050. As DWR implements the GHG emissions reduction measures detailed in this Plan, it will monitor its performance annually by quantifying emissions from each of the 4 emissions sources. As described in previous sections of this Plan, both operational and construction emissions from DWR activities are prone to large variations from year to year. It will, therefore, be necessary to gauge progress toward achieving the goals and actual achievement of the goals in the context of these annual fluctuations. Therefore, monitoring of DWR performance toward meeting its GHG emissions reduction goals will be done using a five-year running average of total emissions. DWR has determined that a 5-year period is typically sufficient to smooth out fluctuations in annual emissions while still exposing the long-term trend in annual emissions. Using 5-year running averages of annual emissions DWR will be able to determine if emissions are on track to meet the GHG emissions reduction goals.

Figure 9 shows the emissions trajectory created by interpolating between current emissions levels and the 2020 and 2050 GHG emissions reduction goals. This emissions trajectory will be used to gauge progress toward achieving the emissions reduction goals.

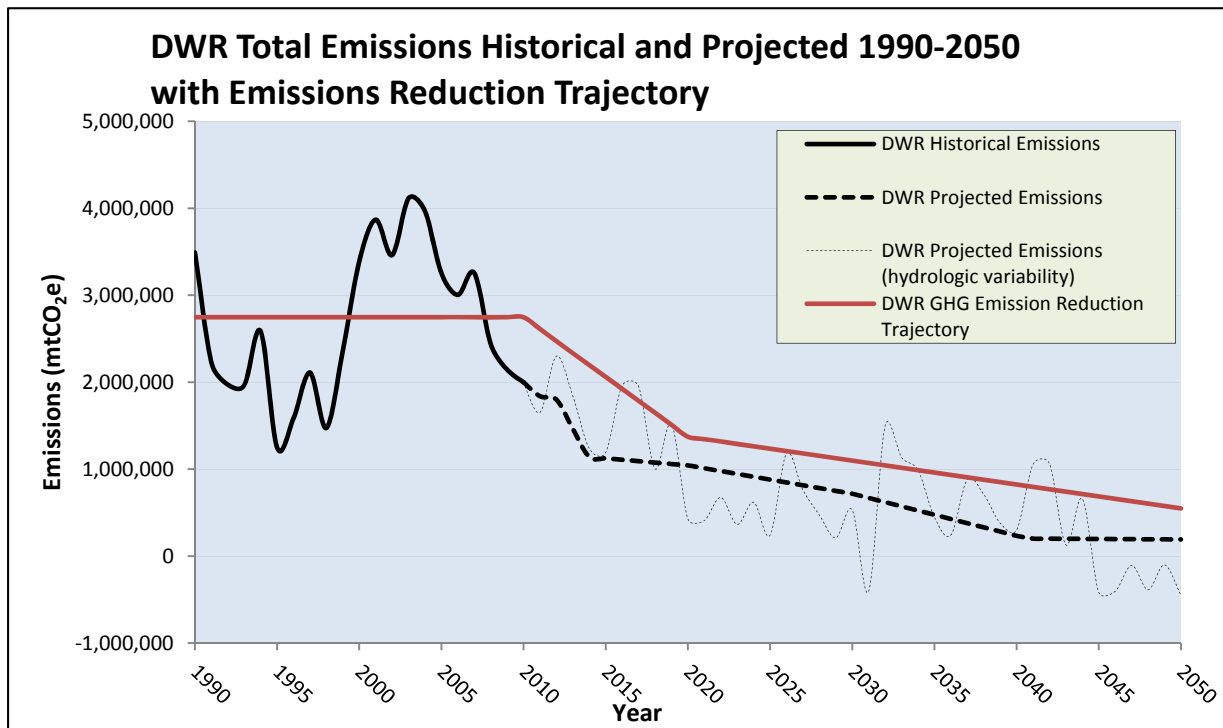


Figure 9. DWR Total Emissions 1990-2050 with GHG Emissions Reduction Trajectory

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 to meet the GHG emissions reduction goals established in this Plan, may revisit analysis of environmental impacts of projects undertaken in reliance on this Plan, or take other action. DWR intends to update this Plan in or around 2020, unless monitoring establishes that an earlier update is required. As part of the Plan update, DWR will evaluate its annual emissions during the preceding years to document the emissions reductions it has realized. Part of the update will also include goals and projections for years beyond 2020.

XI. Use of the Plan for Demonstrating Compliance with Legislative and Regulatory GHG Emissions Reduction Targets

DWR has established GHG emissions reduction goals (Section IV.B and VI) for 2020 and 2050 that will ensure that DWR has reduced its GHG emissions consistent with the GHG emissions reductions called for by legislation, regulation, and state policy. These goals will guide DWR's decision-making with respect to GHG emissions reductions.

An emissions reduction trajectory²³ has been developed to gauge annual GHG emissions reductions and determine whether DWR is on track to meet its GHG emissions reduction goals. In Figure 9, the red line shows DWR's emissions reduction trajectory. This line identifies the annual reductions that would be expected in each year to put DWR on track to achieve its GHG emissions reduction goals. The dashed black lines show DWR's projected GHG emissions—the thick dashed line shows projected emissions based on expected average conditions and the thin dashed line shows projected emissions with potential hydrologic variability based on historical conditions. This graphic shows how DWR expects to achieve its GHG emissions reduction goals in 2020 and 2050. Future Plan updates will provide more detailed analyses of emissions projections, goals, and emissions reduction measures beyond 2020.

²³ The emissions reduction trajectory shown in Figure 9 establishes a guide to monitor progress toward meeting the targets. Emissions may periodically exceed the trajectory line indicating the need for more significant emissions cuts in future years or fall below the trajectory lines indicating that larger than expected reductions have occurred.

XII. Future DWR Projects' Use of Plan for CEQA purposes

A. Use of this Plan for Cumulative Impact Analyses of Future Projects

It is unlikely that any single project by itself could have a significant impact on climate change due to 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 clearly 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 (IPCC, 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 human-caused climate change. DWR, by implementing this Plan, will help contribute to meeting the statewide GHG emissions reduction target set in AB 32 and reduce its overall GHG emissions.

DWR intends to use this Plan to streamline the CEQA cumulative impact analysis of GHG emissions for future DWR projects. Consistent with section 15130, subdivisions (b)-(d), and section 15183.5, subdivisions (a)-(b) of the CEQA Guidelines, after being adopted in a public process following environmental review, DWR may rely on and incorporate by reference the analysis and conclusions in this Plan when analyzing a project's cumulative impacts to climate change and GHG concentrations in the atmosphere.

DWR, when incorporating this plan by reference for future projects, must also "... identify those requirements specified in the [Plan] 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, subd. (b)(2)).

If there is substantial evidence that the effects of a particular project may be cumulatively considerable notwithstanding the project's compliance with the specified requirements in this Plan, DWR will prepare an Environmental Impact Report for the project (CEQA Guidelines section 15183.5, subd. (b)(2)).

As stated in CEQA Guidelines section 15183.5, subdivision (b)(1), a plan for the reduction of GHG emissions that can be used in a CEQA analysis should include the following elements. Each element below is followed by the Section number where the element is discussed in this Plan.

- (A) Quantify greenhouse gas emissions, both existing and projected over a specified time period, resulting from activities within a defined geographic area. (Plan, Section I.)
- (B) Establish a level, based on substantial evidence, below which the contribution to greenhouse gas emissions from activities covered by the plan would not be cumulatively considerable. (Plan, Sections IV, VI, and IX.)

- (C) Identify and analyze the greenhouse gas emissions resulting from specific actions or categories of actions anticipated within the geographic area. (Plan, Sections V and IX.)
- (D) Specify measures or a group of measures, including performance standards that substantial evidence demonstrates, if implemented on a project-by-project basis, would collectively achieve the specified emissions level. (Plan, Section VII.)
- (E) Establish a mechanism to monitor the plan's progress toward achieving the level and to require amendment if the plan is not achieving specified levels. (Plan, Section X.)
- (F) Be adopted in a public process following environmental review.²⁴

In order to show that a future project is consistent with this Plan and that the cumulative impact analysis of DWR GHG emissions conducted for this Plan analyzes and addresses the emissions for the proposed project, any future project that would rely on this Plan 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 25,000 mtCO₂e for the entire construction phase of the project nor do they exceed 12,500 mtCO₂e 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 Section VII 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 Section VII.
- 5) If implementation of the proposed project would result in additional energy demands on the SWP system of 15 GWh/yr²⁵ or greater the project must get written confirmation from the DWR SWP Power and Risk Office stating that the Renewable Power Procurement Plan

²⁴ DWR will perform public environmental review as required prior to adoption of this Plan.

²⁵ 15 GWh/yr is approximately 40% of the energy that will be purchased in years 2010-2020 as part of the Renewable Energy Procurement Plan. It has been determined that individual projects that add this amount of additional load to the SWPPP 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 additional loads to the SWPPP of less than 15 GWh/yr would only marginally affect emissions and would be unlikely to impede DWR's ability to meet its GHG emissions reduction goals.

will be updated to accommodate the additional load resulting from the proposed project at such time as the proposed project is ultimately implemented.

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

B.Coordination with Projects That Are Not Eligible to Rely on the Analysis in this Plan

DWR will not rely on the analysis in this Plan for streamlining of cumulative impacts analyses of later projects under CEQA for DWR projects whose GHG emissions are not analyzed and addressed in this Plan. 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, strategies will be developed specifically for those projects and will be described in the appropriate project-specific CEQA document.

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Appendix A. DWR Sustainability Policy and Sustainability Targets Memoranda

State of California California Natural Resources Agency

M e m o r a n d u m

Date: April 22, 2009

To: All DWR Employees

From: Department of Water Resources

Subject: Sustainability Workgroup

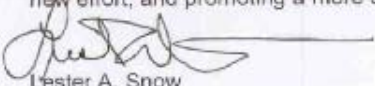
As we celebrate Earth Day this year, the Department of Water Resources (DWR) must resolve to carry out its mission in a more sustainable manner, by minimizing its impact on the environment and reducing its greenhouse gas (GHG) emissions. DWR is already responding to the Governor's Climate Change Initiative (Executive Order S-03-05), Green Building Initiative (Executive Order S-20-04), the Global Warming Solutions Act (AB 32), and State Agency Recycling and Waste Diversion (AB 75) requirements by making changes to the Department's business operations and the State Water Project.

We must now build upon these existing efforts to become a sustainability leader within State government and the California water community. These changes will not only make us better stewards of the environment, but should also yield long-term cost savings to State taxpayers through reduced operations and maintenance costs, as well as provide healthier and more productive work environments for staff and visitors. Overall, sustainability must be integrated into every aspect of DWR's work.

DWR's goals and measures for ecosystem stewardship and sustainability will be achieved through implementation of DWR's new Sustainability Policy (attached). Implementation of the policy will explicitly consider technical feasibility and cost-effectiveness of changes, utilize environmental management systems, and focus on the following business areas:

- Climate Protection Practices;
- Ecosystem Stewardship;
- Sustainable Business Operations;
- Greening Facilities;
- Greening Fleet;
- Recycling and Waste Management; and
- Environmentally Preferable Procurement.

With this memo, I am creating a Sustainability Workgroup, under the leadership of John Engstrom and Dale Hoffman-Floerke, to collaboratively develop the guidelines for implementing the new Sustainability Policy, informed by industry best practices, by no later than April 2010. Please join me in supporting John and Dale in this exciting new effort, and promoting a more sustainable future for DWR.


Lester A. Snow
Director

DWR 0045 (Rev. 1/08)

**Department of Water Resources
Sustainability Policy
April 2009**

Sustainability¹ 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% by 2020;
- Maximize the use of technically feasible and cost-effective clean and renewable energy sources for the SWP and DWR's business operations;
- Track and report its greenhouse gas (GHG) emissions to the California Air Resources Board (CARB) and the California Climate Action Registry²;
- 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; and
- 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.

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 a specified economic activity over a specified time horizon, usually influenced by management and policy actions".

² In 2010, the California Climate Action Registry will become The Climate Registry.

Memorandum

Date: **SEP 20 2010**
To: All DWR Employees

From: Department of Water Resources
Subject: Sustainability Targets

Over the past two years, the Department of Water Resources (DWR) has made notable progress in carrying out its mission in a more sustainable manner, by minimizing its impacts on the environment and reducing its greenhouse gas (GHG) emissions. DWR's goals and measures for ecosystem stewardship and sustainability will be achieved through implementation of DWR's Sustainability Policy signed in April, 2009.

As we build on this effort to be a sustainable leader within State government and the California water community, we must now establish clear and measurable targets to accomplish these goals. As part of that implementation, I am establishing the following initial sustainability targets for DWR, specifically for the environmental aspects of water, wastewater, energy, carbon, and waste:

- *Water* - 20 percent reduction in per employee water use by 2020;
- *Wastewater* - Incorporate recycled wastewater into facilities when technically feasible and cost-effective;
- *Energy* - Progressive acquisition of 360 GWh of renewable energy resources by 2020; reduce grid-based retail energy demand 20 percent by 2015; ensure Energy Star purchasing;
- *Carbon* - 50 percent reduction below 1990 levels by 2020; 80 percent reduction below 1990 levels by 2050; and
- *Waste* - 50 percent diversion from waste stream by 2020.

The Department's Sustainability Workgroup will work with individual DWR organizations to assist in meeting these targets. The Workgroup will also annually review these targets and issue a report card on our progress towards meeting these targets every April.


Mark W. Cowin
Director

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

Federal Climate Change Laws, Policies, and Plans

U.S. Environmental Protection Agency (EPA) Mandatory Greenhouse Gas Reporting Rule

On September 22, 2009, EPA released its final Greenhouse Gas Reporting Rule. The reporting rule is a response to the federal fiscal year (FY) 2008 Consolidated Appropriations Act (H.R. 2764; Public Law 110-161), that required EPA to develop "... mandatory reporting of greenhouse gases above appropriate thresholds in all sectors of the economy..." The reporting rule applies to most entities that emit 25,000 metric tons of CO₂e or more per year. Since 2010, facility owners have been required to submit an annual GHG emissions report with detailed calculations of facility GHG emissions. The reporting rule also mandates recordkeeping and administrative requirements in order for EPA to verify annual GHG emissions reports.

EPA Endangerment and Cause and Contribute Findings

On December 7, 2009, the EPA Administrator signed two distinct findings regarding GHGs under Section 202(a) of the Clean Air Act:

Endangerment Finding: the current and projected concentrations of the six key well-mixed GHGs—CO₂, CH₄, N₂O, HFCs, PFCs, and SF₆—in the atmosphere threaten the public health and welfare of current and future generations.

Cause or Contribute Finding: found combined emissions of these well-mixed GHGs from new motor vehicles and new motor vehicle engines contribute to the GHG pollution, which threatens public health and welfare.

State Climate Change Laws, Policies, and Plans

Executive Order S-3-05

Executive Order (EO) S-3-05 made California the first state to formally establish GHG emissions reduction goals. EO S-3-05 includes the following GHG emissions reduction targets for California:

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

The final emissions target of 80% below 1990 levels would put the state's emissions in line with estimates of the required worldwide reductions needed to bring about long-term climate stabilization and avoidance of the most severe impacts of climate change (IPCC, 2007).

EO S-3-05 also dictated that the Secretary of the California Environmental Protection Agency coordinate oversight of efforts to meet these targets with the Secretary of the Business, Transportation and Housing Agency; Secretary of the Department of Food and Agriculture; Secretary of the Resources Agency; Chairperson of the Air Resources Board (CARB); Chairperson of the Energy Commission; and the President of the California Public Utilities Commission. This group was subsequently named the Climate Action Team (CAT).

As described in the EO, the CAT has submitted biannual reports to the governor and State Legislature describing progress made toward reaching the targets. The CAT finalized its second biannual report (2009) on the effects of climate change on California's resources in May, 2010.

The Global Warming Solutions Act of 2006

In 2006, California passed the California Global Warming Solutions Act of 2006 (Assembly Bill 32; Health & Safety Code, division 25.5, sections 38500, *et seq.*, or AB 32). AB 32 further details and puts into law the mid-term GHG emissions reduction target established in EO S-3-05—reduce GHG emissions to 1990 levels by 2020. AB 32 also identifies CARB as the State agency responsible for the design and implementation of emissions limits, regulations, and other measures to meet the target.

The statute presents the schedule for each step of the regulatory development and implementation.

By June 30, 2007, CARB had to publish a list of early-action GHG emissions reduction measures.

Prior to January 1, 2008, CARB had to identify the current level of GHG emissions by requiring statewide reporting and verification of GHG emissions from emitters and identify the 1990 levels of California GHG emissions.

And by January 1, 2010, CARB had to adopt regulations to implement the early-action measures

In December 2007, CARB approved the 2020 emissions limit (1990 level) of 427 million metric tons of CO₂ equivalents of GHGs. The 2020 target requires the reduction of 169 million metric tons of CO₂e, or approximately 30% below the state's projected "business-as-usual" 2020 emissions of 596 million metric tons of CO₂e.

Also in December 2007, CARB adopted mandatory reporting and verification regulations pursuant to AB 32. The regulations became effective January 1, 2009, with the first reports covering 2008 emissions. The mandatory reporting regulations require reporting for major facilities, those that generate more than 25,000 metric tons/year of CO₂e. CARB has met all of the statutorily mandated deadlines for promulgation and adoption of regulations.

Climate Change Scoping Plan

On December 11, 2008, pursuant to AB 32, CARB adopted the Climate Change Scoping Plan (Scoping Plan). This plan outlines how emissions reductions will be achieved from significant sources of GHGs via regulations, market mechanisms, and other actions. Six key elements, outlined in the scoping plan, are identified below to achieve emissions reduction targets:

- Expanding and strengthening existing energy efficiency programs, including building and appliance standards;
- Achieving a statewide renewable energy goal of 33%;
- Developing a California cap-and-trade program that links with other Western Climate Initiative partner programs to create a regional market system;
- Establishing targets for transportation-related GHG emissions for regions throughout California, and pursuing policies and incentives to achieve those targets;
- Adopting and implementing measures pursuant to existing State laws and policies, including California's clean car standards, goods movement measures, and the Low Carbon Fuel Standard; and
- Creating targeted fees, including a public goods charge on water use, fees on high global warming potential gases, and a fee to fund the administrative costs of the State's long-term commitment to AB 32 implementation.

The Scoping Plan also recommended 39 measures that were developed to reduce GHG emissions from key sources and activities while improving public health, promoting a cleaner environment, preserving our natural resources, and ensuring that the impacts of the reductions are equitable and do not disproportionately impact low-income and minority communities. These measures also put the state on a path to meet the long-term 2050 goal of reducing California's GHG emissions to 80% below 1990 levels.

Executive Order S-13-08

Executive Order (EO) S-13-08, issued November 14, 2008, directs the California Natural Resources Agency, DWR, OPR, California Energy Commission, State Water Resources Control Board, Department of Parks and Recreation, and California's coastal management agencies to participate in a number of planning and research activities to advance California's ability to adapt to the impacts of climate change. The order specifically directs agencies to work with the National Academy of Sciences to initiate the first California Sea Level Rise Assessment and to review and update the assessment every 2 years after completion; to assess the vulnerability of the California transportation system to sea level rise; and to develop a California Climate Adaptation Strategy.

California Climate Adaptation Strategy

In cooperation and partnership with multiple state agencies, the 2009 California Climate Adaptation Strategy summarizes the best known science on climate change impacts in 7 specific sectors (public health, biodiversity and habitat, ocean and coastal resources, water management, agriculture, forestry, and transportation and energy infrastructure) and provides recommendations on how to manage those threats.

Table AppB-1 below provides a summary of State laws, policies, and plans that address climate change. Several additional laws, policies, and plans not described above, are included in the table.

Table AppB-1. Summary of State laws, Policies, and Plans that address climate change

Legislation/ Policy Name	Signed into Law/ Ordered	Description	Relevance for DWR
SB 1771	09/2000	Establishes California Climate Registry to develop protocols for voluntary accounting and tracking of GHG emissions.	In 2007, DWR began tracking and reporting its GHG emissions using the California Climate Action Registry Protocol.
AB 1493	07/2002	Directs ARB to establish fuel standards for noncommercial vehicles that would provide the maximum feasible reduction of GHGs.	Reduces GHG emissions from noncommercial vehicle travel.
EO S-20-04	07/2004	Commits State agencies, departments, and other entities under the direct executive authority to reducing grid-based energy purchases by 20%.	Reduces energy consumption from State owned buildings.
SB 1078, 107, EO S-14-08, SB 2x (2011)	09/2002, 09/2006, 11/2008, 1/2011	Establishes renewable energy mandates and goals as a percentage of total retail energy supplied in the State.	Reduces GHG emissions from retail electrical power.
EO S-3-05, AB 32	06/2005, 09/2006	Establishes statewide GHG emissions reduction mandates and targets; biennial science assessment reporting on climate change impacts and adaptation and progress toward meeting GHG emissions reduction goals.	Requires projects to be consistent with the statewide GHG emissions reduction plan. Reports will provide information for climate change adaptation analysis.

California Department of Water Resources

SB 1368 ²⁶	9/2006	Establishes GHG emissions performance standards for base load electrical power generation.	Requires new energy contracts to meet a minimum standard for the rate of GHG emissions from energy generation.
EO S-1-07	01/2007	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.	Reduces GHG emissions from transportation activities.
SB 97	08/2007	Directs OPR to develop guideline amendments for the analysis of climate change in CEQA documents.	Requires climate change analysis in all CEQA documents.
SB 375	09/2008	Requires metropolitan planning organizations to include sustainable community strategies in their regional transportation plans.	Reduces GHG emissions associated with housing and transportation.
EO S-13-08	11/2008	Directs the California Natural Resources Agency to work with the National Academy of Sciences to produce a California Sea Level Rise Assessment Report. Directs the CAT to develop a California Climate Adaptation Strategy.	Provides information for climate change adaptation analysis.
DWR Sustainability Policy	4/2009	Creates an internal DWR policy on sustainability and sets up a sustainability workgroup to develop guidelines for implementing the policy.	Directs overall improvement in the sustainability of DWR activities.
California Climate Adaptation Strategy	12/2009	Establishes climate change adaptation strategies for seven specific sectors of California's resources.	Provides project planners with broad strategies for adapting to the potential impacts of climate change.

²⁶ Water Code Section 142 requires DWR to comply with SB 1368

Appendix C. Additional Information on Improvements to Environmental Regulations and DWR Procedures

State and Federal Air Quality Regulations Federal Clean Air Act

Enacted by Congress in 1970 the Clean Air Act (CAA) defined the EPA's responsibilities for protecting and improving air quality and the stratospheric ozone layer and provided the states with a comprehensive planning framework. The CAA was amended in 1990 to address threats from acid rain, urban air pollution, and toxic air emissions, schedule the phase-out of ozone-depleting chemicals consistent with the Revised Montreal Protocol, establish a national permit program, and improve the enforcement program. Specifically, the new law encouraged the use of market-based principles, provided a framework for the use of alternative clean fuels to meet standards, promoted the use of low sulfur coal and natural gas, cut dependency on oil imports through reduction in energy waste and creating a market for clean fuels, and promoted energy conservation.

California Clean Air Act

The California Clean Air Act (CCAA) was signed into law in 1988, providing California with a comprehensive framework for how air quality would be managed for the next 20 years. The CCAA identified the State's air quality goals, regulatory strategies, and standards for measuring progress. It required air districts to meet ambient air quality standards for ozone, carbon monoxide, sulfur dioxide, and nitrogen dioxide by the earliest practicable date. Under the law, attainment plans were required by July 1991 for air districts that were in violation of these standards.

Changes to California Air Quality Regulations

Since the enactment of the CCAA in 1988 and the CAA amendments in 1990, the California Air Resources Board (CARB) has adopted new standards to reduce toxic emissions from heavy-duty diesel trucks and construction equipment. Since the passage of the CCAA, CARB began addressing new standards for diesel fuel used in large diesel engines along the following timeline:

1993: Enacted standards to reduce diesel particulate emissions

2001: Enacted standards to reduce diesel soot and smog forming emissions by 90% starting with the 2007 model year

2003: Adopted standards to reduce the amount of sulfur in diesel fuel by 95%. California made the switch to the new ultra low sulfur diesel in 2006

2008: Enacted regulation that required the installation of diesel exhaust filters or engine replacement and the installation of fuel efficient tires and aerodynamic devices on trucks; CARB provided \$8.2 million in incentives for cleaner diesel engines in several air districts; other funding through AB 118 provided \$48 million to clean up diesel emissions from ~420,000 trucks and buses and Proposition 1B provided \$5.6 million to the San Joaquin Valley Air Pollution Control District to retrofit older, dirtier diesel fuel trucks with diesel particulate filters or replace engines

2009: Adopted the Low Carbon Fuel Standard to diversify fuels used in transportation to reduced GHG emissions

CARB began addressing new standards for diesel powered equipment with the approval of a comprehensive plan to reduce harmful particulate matter emissions in 2000. In 2007 CARB adopted a regulation to significantly reduce emissions from off-road, non-agricultural, diesel vehicles with engines greater than 25 horsepower by requiring owners to replace vehicles with those equipped with cleaner engines, replacing engines, or applying exhaust retrofits. The regulation also has limits vehicle idling, sales disclosure requirements, and reporting and labeling requirements. The first compliance date for large fleets was March 1, 2010; however, amendments have been made several times to extend the deadlines and provide additional credits. Specifically, in February 2010, CARB released a regulatory advisory stating that the board will consider additional amendments to this regulation to delay enforcement on the fleet upgrades due to continuing effects of the economy on industries, particularly the construction industry, and because CARB currently lacks authority from the EPA to enforce this portion of the regulation. However enforcement will continue for the idling limits, sales disclosure, and reporting and labeling requirements.

CARB Scoping Plan

The Scoping Plan proposes a comprehensive set of actions designed to achieve the 2020 greenhouse gas emissions limit required under AB 32. Many of the actions will help DWR meet the AB 32 targets by 2020. For construction equipment, actions include requiring retrofits to improve fuel efficiency, vehicle hybridization, and adopting a low carbon fuel standard. In addition, other efforts by the CARB will reduce air pollutant emissions through 2020 including the Diesel Risk Reduction Plan and the 2007 State Implementation Plan. Measures in these plans will result in the accelerated 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.

Regional Air Quality Management Districts

Air Quality Management Districts (AQMD) are county or regional governing authorities that are responsible for assuring that the National and California Ambient Air Quality Standards (NAAQS and CAAQS, respectively) are attained and maintained within their district boundaries. Each AQMD is responsible for developing and implementing an air quality plan; therefore, projects occurring within the AQMD boundaries must meet the requirements of the plan. To meet the new State regulations AQMD are beginning to incorporate GHG emissions into their air quality plans.

Bay Area Air Quality Management District (BAAQMD)

In part, the BAAQMD is responsible for preparing plans for attaining and maintaining air quality standards, adopting and enforcing rules and regulations, and assisting local governments in addressing climate change. To help meet these responsibilities the district adopted the Bay Area 2010 Clean Air Plan. The Clean Air Plan is a comprehensive plan to improve air quality and protect public health by addressing multiple pollutants, including GHGs. The plan developed a strategy that will reduce emissions and decrease ambient concentrations of harmful pollutants, safeguard public health, and reduce GHG emissions.

In June 2010, the BAAQMD also released the Bay Area Air Quality Management District CEQA Guidelines to assist lead agencies in air quality analysis and promote sustainable development in the region (BAAQMD, 2010). The guidelines provide thresholds of significance, reference material, and assessment methods, and mitigation measures for operation and construction-related impacts for projects undertaken within the District (Table AppC-1).

Table AppC-1. BAAQMD Air Quality CEQA Thresholds of Significance*

Pollutant	Construction-Related	Operational-Related	
		Average Daily Emissions (lb/day)	Maximum Annual Emissions (tpy)
Criteria Air Pollutants and Precursors (Regional)	Average Daily Emissions (lb/day)	Average Daily Emissions (lb/day)	Maximum Annual Emissions (tpy)
ROG	54	54	10
NO _x	54	54	10
PM ₁₀	82 (exhaust)	82	15
PM _{2.5}	54 (exhaust)	54	10
PM ₁₀ /PM _{2.5} (fugitive dust)	Best Management Practices	None	
Local CO	None	9.0 ppm (8-hour average), 20.0 ppm (1-hour average)	
GHGs - Projects other than Stationary Sources	None	Compliance with Qualified GHG emissions reduction Strategy OR 1,100 MT of CO ₂ e/yr OR 4.6 MT CO ₂ e/SP/yr (residents+employees)	
GHGs - Stationary Sources	None	10,000 MT/yr	
Odors	None	5 confirmed complaints per year averaged over three years	
CEQA = California Environmental Quality Act; CO = carbon monoxide; CO ₂ e = carbon dioxide equivalent; GHGs = greenhouse gases; lb/day = pounds per day; MT = metric tons; NO _x = oxides of nitrogen; PM _{2.5} = fine particulate matter with an aerodynamic resistance diameter of 2.5 micrometers or less; PM ₁₀ = respirable particulate matter with an aerodynamic resistance diameter of 10 micrometers or less; ppm = parts per million; ROG = reactive organic gases; SO ₂ = sulfur dioxide; SP = service population; tons/day = tons per day; tpy = tons per year; yr= year.			

*It is the Air District's policy that the adopted thresholds apply to projects, for which a Notice of Preparation is published, or environmental analysis begins, on or after the applicable effective date. The adopted CEQA thresholds are effective June 2, 2010.

San Joaquin Air Pollution Control District (SJAPCD)

Like the BAAQMD, the SJAPCD is responsible for preparing plans for attaining and maintaining air quality standards, adopting and enforcing rules and regulations, and assisting local governments in addressing climate change. In August 2008 the SJAPCD Board adopted a Climate Change Action Plan which called for the development of CEQA guidance documents for addressing GHG emissions in CEQA documents, including GHG emissions in the existing emissions inventory, administering voluntary GHG emissions reduction agreements, and to investigate the development of a GHG banking program.

In December 2009 SJAPCD adopted “*Guidance for Valley Land-use Agencies in Addressing GHG Emission Impacts for New Projects under CEQA*” and established a District policy for “*Addressing GHG Emission Impacts for Stationary Source Projects Under CEQA When Serving as the Lead Agency*.” In these documents SJAPCD adopted an approach to streamline the process of determining significance using performance based standards, known as Best Performance Standards (BPS). Projects that implement BPS would be found to have a less than cumulatively significant impact. Projects not implementing BPS would need to have reduced or mitigated GHG emissions by 29%, consistent with the targets established in the scoping plan, to find a less than cumulatively significant impact. For traditional stationary source projects, BPS includes equipment type, equipment design, and operational and maintenance practices for the identified service, operation, or emissions unit class and category. For development projects, BPS includes project design elements, land use decisions, and technologies that reduce GHG emissions.

Sacramento Metropolitan Air Quality Management District (SMAQMD)

In 2006, the SMAQMD Board of Directors adopted the Climate Change Protection Program (CCPP) to address climate change within the context of the District's air quality mission. The CCPP includes outreach and education, data collection and analysis, and provides support to reduce GHG emissions within the district. District staff began working on several elements of the CCPP including the creation of a GHG emissions bank, and a program to facilitate GHG mitigation for CEQA, an enhanced reporting system in 2008.

Like both the BAAQMD and SJAPCD, SMAQMD developed CEQA Guidance for addressing GHG in CEQA documents. The report, *Guide to Air Quality Assessment in Sacramento County*, was published in December 2009 and provides recommendations on determining thresholds of significance and provides best management practices for construction activities, land-use projects, and stationary source facilities. In the report the district recommends that thresholds of significance for GHG emissions should be related to the AB 32 GHG emissions reduction goals. In addition, the report provides a list of recommended measures specifically related to reducing GHG emissions from construction activities.

These measures are considered BMPs and should be quantified where feasible. The measures include: 1) improve fuel efficiency from construction equipment including minimizing idling time, maintain equipment, and using equipment with new technologies; 2) perform on-site hauling with trucks equipped with on-road engines (if found to be less emissive); 3) use ARB approved low carbon fuel; 4) encourage and provide carpools, shuttle vans, transit passes, and/or secure bicycle parking; 5) reduce electricity use in construction offices; 6) recycle or salvage non-hazardous debris (goal of at least 75% by weight); 7) use locally sourced or recycled materials (goal of at least 20%); 8) minimize amount of concrete or utilize a low carbon concrete option; 9) produce concrete on –site, if less emissive; 9) use SmartWay certified trucks for deliveries and equipment transport; and 10) develop a plan for efficient water use for dust control.

Air Quality Considerations in CEQA’s air quality regulations have changed since 1990, the air quality considerations in CEQA have also changed. These changes are seen in the comparison of the CEQA Checklist for Air Quality, but more significantly with the addition of new considerations related to climate change starting in 2010 found in the CEQA Checklist for GHG Emissions (Table AppC-2).

Table AppC-2. CEQA Checklist questions 1990 and 2010

1990 Air Quality Checklist	2010 Air Quality Checklist	2010 GHG Emissions Checklist
Substantial air emissions or deterioration of ambient air quality?	Conflict with or obstruct implementation of the applicable air quality plan?	Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?
The creation of objectionable odors?	Violate any air quality standard or contribute substantially to an existing or projected air quality violation?	Conflict with applicable plan, policy, or regulation adopted for the purpose of reducing the emissions of greenhouse gases?
Alteration of air movement, moisture, or temperature, or any change in climate, either locally or regionally?	Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non- attainment under an applicable federal or state ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors)?	
	Expose sensitive receptors to substantial pollutant concentrations?	
	Create objectionable odors affecting a substantial number of people?	

DWR Standard Specifications for Construction Contracts

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, 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 APCDs where required.

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

Appendix D. Best Management Practices for Construction and Maintenance Activities to Reduce Greenhouse Gas Emissions

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 usage 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 BMPs

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 specifications of 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 BMPs

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 the Greenhouse Gas Reduction Plan.

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 [Title 13, Section 2485 of the California Code of Regulations]). 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 SmartWay²⁷ certified truck will be used to the maximum extent feasible.

²⁷ 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

- 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% 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.

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.

Appendix E. Best Management Practices for Vegetation Management Activities to Reduce Greenhouse Gas Emissions

The following measures are recommended best management practices (BMPs) for vegetation management on DWR-owned and managed properties. Implemented together, these practices will result in lower emissions produced by DWR as well as 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 since 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 also 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 native or drought-resistant plants, shrubs, and trees and mulch 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.

Some useful resources for vegetation (including weed) management

Best Management Practices for Vegetation Management:

http://www.lacountywma.org/publications/WeedBMP_lo_res_WebVersion.pdf [LA County Weed Management Area - 2005]

Yellow Starthistle Management Guide: <http://www.cal-ipc.org/ip/management/yst.php>

Encycloweedia: http://www.cdfa.ca.gov/phpps/ipc/encycloweedia/encycloweedia_hp.htm

[CA Dept of Food and Agriculture noxious weed gallery and data sheets]

Use of Fire as a Tool for Controlling Invasive Plants: <http://www.cal-ipc.org/ip/management/fire.php>

Vegetation Management and other Land Use Best Management Practices

The following references were used to develop vegetation BMPs for the DWR Climate Action Plan.

L.A. County Weed Management Area Document “Best Management Practices for Vegetation Management”

http://www.lacountywma.org/publications/WeedBMP_lo_res_WebVersion.pdf [June 2005]

Best Practices Handbook for Roadside Vegetation Management: - 2008-2020

<http://www.lrb.org/pdf/200820.pdf> [Minnesota Dept of Transportation]

Backyard Conservation and Best Management Practices Education and

Implementation Project: http://www.ice.ucdavis.edu/nrpi_docs/pdf/nrpi-09337.pdf [Tahoe Resources Conservation District project to reduce nonpoint source pollution from private parcels; facilitates and promotes the installation of Best Management Practices on private parcels with goal of reducing sediment and nutrient loading into Lake Tahoe]

Best Management Practices for Use with Vegetation Treatment Methods:

http://www.blm.gov/pgdata/etc/medialib/blm/nm/field_offices/rio_puerco/kktr_plan.Par.7781.File.dat/APPENDIX%20C%20BMPs.veg.table.pdf [BLM guidelines]

Hedgerows for California Agriculture – A Resource Guide:

<http://www.caff.org/Hedgerow.pdf> [Community Alliance with Family Farmers – 2004]

Best Management Practices for Vegetation Management:

http://www.lacountywma.org/publications/WeedBMP_lo_res_WebVersion.pdf [LA County Weed Management Area - 2005]

A Green Approach to ROW Management: http://www.ivmpartners.org/tci_greenivm.pdf
[Tree Care Industry Magazine – February 2010]

Ecosystem-Specific Best Management Practices
http://www.wildlifehc.org/RightofWay/BMP_ecosystems.cfm [Wildlife Habitat Council website]

Quantifying the Change in Greenhouse Gas Emissions due to Natural Resource Conservation Practice Application in Indiana:
http://www.in.nrcs.usda.gov/pdf%20files/Indiana_Final_Report.pdf [USDA/NRCS - February 2002]

The Use of Best Management Practices (BMPs) in Urban Watersheds:
<http://www.epa.gov/nrmr1/pubs/600r04184/600r04184.pdf> [US EPA - September 2004]

Appendix F. DWR Sustainability Policy Activities

Important achievements have already been made toward implementation of DWR's Sustainability Policy to improve DWR's business practices:

- **Environmentally Preferable Purchasing (EPP) Practices-** The Purchasing Services Office held purchasing workshops to update DWR buyers about the EPP program and why it is in the best interest for DWR to utilize this opportunity. The purchases are reportable in many cases under the mandated goals outlined in the Public Contract Code (PCC) ([12153-12320](#)) for buying recycled-content products (RCPs). The goal of this effort is to increase the purchase of RCPs.
- **RCPs typically require less total embodied energy²⁸ than products made from virgin materials.** Purchasing materials with lower embodied energy will contribute to reductions in overall industrial energy use. These reductions will not be directly linked to emissions associated with DWR's emissions footprint but will contribute to overall reductions in worldwide emissions.
- **Enterprise Content Management System (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.

- **Green Print and Podcasts-** Staff have promoted sustainability through quarterly "Green Print" articles posted through AquaNet, DWR's intranet and podcasts. The articles discuss strategies that staff can utilize both at work and at home to reduce their environmental impact.

Each of the strategies discussed in "Green Print" and on the podcasts educates DWR staff on ways to reduce their energy, fuel, and water use. Changes in staff behavior will have a positive, though difficult to quantify, impact on both DWR's emissions as well as statewide emissions that account for energy use in people's homes and emissions from commute transportation.

- **Green Award for Reduction of Waste -** A DWR sustainability award was created to promote waste reduction and recycling within DWR. The recipient of the award exhibits success and

²⁸ Embodied energy is the commercial energy (fossil fuels, nuclear, etc) that was used in the work to make any product, bring it to market, and dispose of it. Embodied energy is an accounting methodology which aims to find the sum total of the energy necessary for an entire product lifecycle. This lifecycle includes raw material extraction, transport, manufacture, assembly, installation, disassembly, deconstruction and/or decomposition.

dedication to reducing waste in 18 primary categories and 6 hazardous waste material categories. The first award was presented in 2008.

- Leadership in Energy and Environmental Design (LEED) Buildings- DWR is currently constructing a new SWP Southern Field Headquarters Building. The project is designed to be the first LEED Gold building constructed by DWR, and is scheduled to be completed in 2012. 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.

- 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.

In addition, a number of additional strategies have been identified and are in the process of being developed and implemented.

- DWR will continue to promote the EPP program and will improve the scope of the existing EPP to provide options for purchasing a wider range of products that provide environmental benefits.
- DWR will increase its efforts to reduce, reuse, recycle, and rethink in all areas of DWR's daily business activities. DWR will look at continuing to increase its waste reporting metrics under SB 1016 by using annual waste disposal as a factor when evaluating program implementation.
- DWR will 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.
- DWR will promote ways to reduce employee business travel for meetings by use of technology such as teleconference centers or web casting. In addition, training webinars and other online training opportunities will be investigated to reduce training commutes for employees.

Appendix G. Additional Operational GHG Emissions Information

The DWR Greenhouse Gas Emissions Reduction Plan (Plan) includes estimates of historical greenhouse gas (GHG) emissions (1988-2006), estimates of current GHG emissions (2007-2010), and projections of future DWR operational GHG emissions (2011-2050). These estimates and projections have been developed using observed data from historical operations, assumptions about past and future conditions, expert judgment, and complex operational models. This Appendix explains and documents the data, assumptions, judgments and models used to generate the GHG operational emissions estimates and projections provided in sections V and VIII of the Plan. In addition, this Appendix provides additional analysis of future emissions showing how operational projections would look if alternative assumptions or judgments had been made.

Operational Emissions Estimates and Projections

Historical operational emissions estimates (1988-2006), current operational emissions estimates (2007-2010), and projections of future operational emissions (2011-2050) in the Plan are all based on the same dataset—DWR Management of the State Water Project (Bulletin 132). This annual report documents the operation and management of the State Water Project (SWP). Most of the information used in the Plan comes from the Energy Generated and Purchased section. This section provides the total amount of electricity generated at each one of DWR’s hydroelectric generating facilities, the amount of electricity delivered to DWR from any power plants DWR owns, the amount of electricity purchased and exchanged-in from other generators, the amount of electricity sold or exchanged-out to other energy users, and the amount of electricity consumed at each one of DWR’s pumping stations.

Historical and Current Emissions Estimates

These data were used in estimates of historical GHG emissions to identify the amount and source of all electricity used to operate the SWP in each year. The amount of electricity was then multiplied by the appropriate emissions factor for the source see Table AppG-1 below. The SWP Power Portfolio weighted emissions rate and total DWR operational emissions were calculated following the methodology outlined in section V of the Plan.

Table AppG-1. Electricity resource emissions rates

Resource	Emissions Rate Applied (mtCO ₂ e/GWh)
SWP Hydroelectric Generating Stations	0

Reid Gardner Unit #4	1.116 ²⁹
All other sources	California Air Resources Board default factor for unspecified electricity purchases (ranges from 437 to 670)

Future Emissions Projections

These historical electricity generation and use data were used to formulate projections of future electricity generation and use. As with all projections of future conditions, several assumptions have been made about future conditions and behavior. These assumptions are listed in Table AppG-2 below.

Table AppG-2. Emissions projections assumptions

Unknown	Assumption
Future amount of hydroelectricity that will be generated from DWR’s large hydroelectric facilities in each future year.	4,073 GWh: Average of hydroelectricity that was generated at DWR’s large hydroelectric facilities in all years 1986-2010. Because these facilities are upstream of the Delta the amount of hydroelectric generation is not likely to be affected significantly by regulatory constraints.
Future amount of hydroelectricity that will be generated from DWR’s small hydroelectric facilities in each future year.	219 GWh: Developed using CALSIM-II operations model. Because many of these facilities are downstream of the Delta, they are affected by regulatory constraints limiting the amount and timing of water exports from the Delta.
Future use of electricity from Reid Gardner Unit #4.	900 GWh: DWR estimates that it will only take delivery of 900 GWh of electricity from Reid Gardner in 2011 and 2012 and will cease deliveries from Reid Gardner in mid-2013. Historically DWR has taken more than 900 GWh of electricity from Reid Gardner, however, current market conditions are reducing the economic competitiveness of coal fired power, these conditions are expected to persist through 2013, when DWR will cease receiving electricity from Reid Gardner.
Future purchases of electricity	Varies: The California Independent System Operator

²⁹ This number is calculated based on the average of emissions factors for available years (1997-2007).

	(CAISO) Market Redesign and Technology Upgrade (MRTU) has fundamentally changed the way DWR schedules and purchases resources to meet its load demands. Because of MRTU, DWR transacts to meet its net load, versus pre-MRTU when DWR was required to balance its hourly load and resource schedules.
Future SWP load	7,023 GWh: Developed using the CALSIM-II operations model and 2007-2010 data. 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.
Future emissions rates from thermal generating plants owned by DWR	1116/361 mtCO ₂ e/GWh: DWR is currently projecting the use of two thermal generating plants in which DWR holds an ownership interest—Reid Gardner (2011-2013) and Lodi Energy Center (2013-2050, currently under construction). For Reid Gardner, DWR will continue to use the emissions rate used for historical emissions estimates (1116 mtCO ₂ e/GWh). For Lodi Energy Center, DWR will use the emissions rate listed in the California Energy Commission Application for Certification of Lodi Energy Center: 08-AFC-10 (361 mtCO ₂ e/GWh).
Future emissions rates from unspecified power purchases	437 mtCO ₂ e/GWh: For power purchased from the CAISO spot market or real-time forward market, it is not possible to know where the electricity was generated and thus it is impossible to apply a generator specific emissions rate to the electricity purchases. For these net energy purchases and any other electricity resources for which the specific emissions rate is not known, DWR will apply the default emissions rate for unspecified power (428 mtCO ₂ e/GWh) plus the transmission loss rate (2%) resulting in a default emissions rate of 437 mtCO ₂ e/GWh. This number comes from the Mandatory GHG Emissions Reporting regulations (California Code of Regulations Title 17 Division 3, Chapter 1, Subchapter 10, Section 95111). DWR uses this number for all unspecified purchases from 2011-2050. If this number is updated in future regulations, DWR will update its

	projections.
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Market Redesign and Technology Upgrade

In 2009, CAISO implemented MRTU which fundamentally changed the way DWR schedules and purchases electricity resources. MRTU is an initiative to upgrade the efficiency of energy dispatch and improve the current wholesale electricity market system through new market features and advanced computer software technology.

Prior to MRTU, DWR was responsible for providing a balanced load and generation schedule for each day and hour of operations. As discussed in detail in Section V of the Plan, this process resulted in DWR purchasing electricity in excess of its needs. And because DWR operates the SWP to produce electricity when it is needed most by the grid and use electricity when overall grid demand is low, DWR sold much of its clean hydropower to other users and then purchased additional GHG emitting resources for use during the times that it operates its pumps.

Under the MRTU system, DWR does not contract with other generators for energy (at least not to the same degree that it did prior to MRTU), nor does it have to schedule resources coincident with its load demands. Instead, DWR makes its generators available to the market for grid reliability, and the market chooses to dispatch based on DWR's bids, and the economics of the entire grid. For DWR's pumploads, it bids its pumps into the market which get dispatched based on DWR's bids and market economics. This new process is much more efficient and alleviates the need for DWR to purchase excess electricity and the need to be concerned with the timing of generation and load.

The net result of the MRTU is that it significantly streamlines the way DWR accounts for emissions from its electricity generation and use. Prior to MRTU DWR had a significantly larger portfolio of resources than it needed to serve its pump load. Under MRTU, DWR's load demand is exactly balanced with the resources it purchases. However, MRTU in effect blurs the line between generator and load user.

DWR's operation of the SWP hydroelectric generating facilities is no less integral to the operation of the California electric grid under the MRTU than it was prior to MRTU. DWR continues to provide an important service to the California grid by operating to generate electricity and serve load when demands are highest and operating its electricity consuming pumps when demand for electricity is lowest.

From an emissions accounting point of view, MRTU basically reduces the need for DWR to more accurately forecast the hourly load and resource balance, and instead focus on running pumps and generators when they are independently most optimal for DWR and the grid. The effect of this is that (in most cases) the SWP's power portfolio weighted emissions rate goes down as fewer dirtier resources are needed and the SWP can rely more heavily on its own hydroelectric generation.

Since 2010, and continuing into the future under the MRTU, DWR has and will calculate its operational emissions by calculating the amount of emissions released at DWR electricity generating

facilities, including thermal or other power plants in which DWR holds interests or contracts for electricity delivery and emissions from electricity purchased from the CAISO grid to make up the difference between SWP generation and SWP energy use. This convention ensures that DWR can show an emissions benefit when it contracts for or enters into ownership agreements with renewable power generating facilities. Conversely, this procedure will show higher emissions if DWR were to contract for or enter into an ownership agreement for electricity generated from high GHG emitting sources.

Because the shift in electricity and emissions accounting related to MRTU are changes in the way emissions are accounted for and may not result in real emissions reductions³⁰, DWR has performed an analysis of its emissions that attempts to remove the effect of MRTU. For this analysis, DWR has reconstructed its historical emissions as if the MRTU had been in place during the entire historical and current emissions analysis period (1988-2010). In this reconstruction, DWR ignores all purchases and exchanges for electricity that it actually made in these years and instead calculates the amount of electricity it would have had to purchase from the CAISO market to meet the balance of SWP pump load less DWR electricity generation. Then DWR uses the same methodology for calculating GHG emissions that it used in 2010 and will use in the future under MRTU to convert electricity to emissions.

The analysis, shown below in Figure G-2, demonstrates that DWR's 1990 Emissions (average 1988-1992) would have been 2,420,000 mtCO₂e, about 300,000 mtCO₂e less than under pre-MRTU conditions. Current emissions (2007-2010) would have been 2,270,000 mtCO₂e. DWR's 2020 emissions are projected to be 1,042,000 mtCO₂e (no change from previous analysis). Therefore, without considering emissions reductions caused by MRTU, DWR will still realize substantial emissions reductions below its 1990 emissions (54% reduction) and its current emissions (51% reduction).

³⁰ It is likely, through market efficiencies and better scheduling of the most efficient and lowest emissions electricity generating facilities that MRTU has actually reduced overall emissions from electricity generation in California.

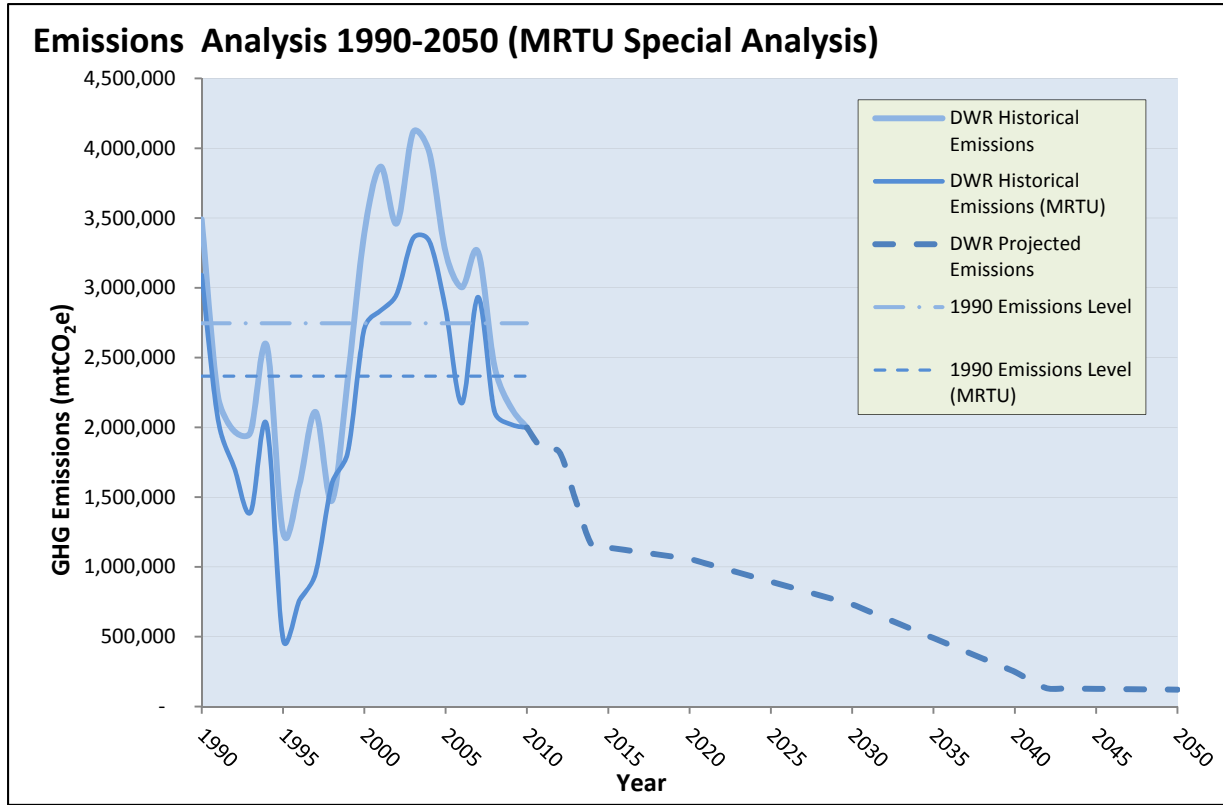



Figure G-1. Emissions Analysis 1990-2050

Appendix H. Checklist and Assessment Form for Consistency and Compliance with GHG Emissions Reduction Plan

DWR GHG Emissions Reduction Plan Consistency Determination Form



California Department of Water Resources
1416 9th Street
Sacramento, CA 95814
dwr.climatechange.water.ca.gov
www.water.ca.gov/climatechange

Project Name:

Environmental Document type:

Manager's Name:

Division:

Short Project Description:

Project GHG Emissions Summary

Total Construction Emissions	<input style="width: 90%; height: 20px;" type="text"/>	mtCO ₂ e
Maximum Annual Construction Emissions	<input style="width: 90%; height: 20px;" type="text"/>	mtCO ₂ e
Project SWP Operational Emissions (annual)	<input style="width: 90%; height: 20px;" type="text"/>	mtCO ₂ e/year
Project Maintenance Emissions (annual)	<input style="width: 90%; height: 20px;" type="text"/>	mtCO ₂ e/year
Project Business Activity Emissions (annual)	<input style="width: 90%; height: 20px;" type="text"/>	mtCO ₂ e/year

Project GHG Reduction Plan Checklist

Inventory and quantify the GHG emissions from the proposed project and alternatives. (Included as attachment)

Total project construction emissions do not exceed 25,000 mtCO₂e for the entire construction phase nor do they exceed 12,500 mtCO₂e in any single year of construction.

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

Or

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

California Department of Water Resources

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

Yes No

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

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

Yes No

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?

If 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:**
**C4 Approval
Signature:**

	Date: <input style="width: 50px;" type="text"/>
	Date: <input style="width: 50px;" type="text"/>

Attachments:

- GHG Emissions Inventory
- 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