12. CLIMATE CHANGE (NEW)

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12.1 INTRODUCTION

Global climate change is playing an increasingly important role in scientific and policy debates related to water management. The most consequential impacts of climate change on water resources in the United States are likely to occur in the mid-latitudes of the west, where the runoff cycle is largely determined by snow accumulation and subsequent melt patterns. It is well documented that the effects of warmer climates on the timing of runoff in these regions likely will shift a portion of spring and summer runoff to periods earlier in the year. Despite the high degree of regulation in many water supply systems throughout the western United States, the resultant effects of these shifts on runoff seasonality generally are considered to be undesirable, because the amount of water stored in snowpack can be substantial and, under normal (i.e., historical) conditions, this stored water is relied upon to augment low stream flows during the relatively dry summers.[1]

Developing evidence indicates global climate change will have a marked effect on water resources in California. More than 150 peer-reviewed scientific articles on climate and water issues in California have been published to date, with many more in preparation, addressing a range of considerations from proposed improvements in the downscaling of general circulation models to understanding how reservoir operations might be adapted to new conditions.[2] Rising temperatures and sea levels, and changes in hydrological systems are recognized as potential threats to California's economy, public health and environment. In addition to the need for better understanding of the potential implications associated with these changes, it also is recognized that more research is necessary to identify which systems are most vulnerable.[3]

Various gases in the Earth's atmosphere, classified as atmospheric greenhouse gases (GHGs), play a critical role in determining the Earth's surface temperature. Solar radiation enters Earth's atmosphere from space, and a portion of the radiation is absorbed by the Earth's surface. The Earth emits this radiation back toward space, but the properties of the radiation change from high-frequency solar radiation to lower-frequency infrared radiation. GHGs, which are transparent to solar radiation, are effective in absorbing infrared radiation. As a result, this radiation that otherwise would have escaped back into space is now retained, resulting in a warming of the atmosphere. This phenomenon is known as the greenhouse effect.

Among the prominent GHGs contributing to the greenhouse effect are carbon dioxide (CO_2), methane (CH_4), ozone (O_3), water vapor, nitrous oxide, and chlorofluorocarbons (CFCs). Human-caused emissions of these GHGs in excess of natural ambient concentrations are responsible for enhancing the greenhouse effect. Emissions of GHGs contributing to global climate change are attributable in large part to human activities associated with the industrial/manufacturing, utility, transportation, residential, and agricultural sectors.[4] In California, the transportation sector is the largest emitter of GHGs, followed by electricity generation.[5] A byproduct of fossil fuel combustion is CO_2. Methane, a highly potent GHG, results from offgassing associated with agricultural practices and landfills. Processes that absorb and accumulate CO_2, often called CO_2 "sinks," include uptake by vegetation and dissolution into the ocean.

As the name implies, global climate change is a global problem. GHGs are global pollutants, unlike criteria air pollutants and toxic air contaminants, which are pollutants of regional and local concern,

respectively. If California were a country, it would rank as the 12th to 16th largest emitter of CO_2 in the world. California produced 492 million gross metric tons of carbon dioxide equivalents in 2004.[6] Carbon dioxide equivalents is a measurement used to account for the fact that different GHGs have different potential to retain infrared radiation in the atmosphere and contribute to the greenhouse effect. This potential, known as the global warming potential of a GHG, is also dependent on the lifetime, or persistence, of the gas molecule in the atmosphere. For example, CH_4 is a much more potent GHG than CO_2. As described in the General Reporting Protocol of the California Climate Action Registry,[7] one ton of CH_4 has the same contribution to the greenhouse effect as approximately 21 tons of CO_2. Expressing GHG emissions in carbon dioxide equivalents takes the contribution of all GHG emissions to the greenhouse effect and converts them to a single unit equivalent to the effect that would occur if only CO_2 were being emitted. Consumption of fossil fuels in the transportation sector was the single largest source of California's GHG emissions in 2004, accounting for 40.7% of total GHG emissions in the state.[8] This category was followed by the electric power sector (including both in-state and out-of-state sources) (22.2%) and the industrial sector (20.5%).[9]

12.2 POTENTIAL IMPACTS TO ENVIRONMENTAL RESOURCES IN CALIFORNIA RESULTING FROM GLOBAL CLIMATE CHANGE

Since 1895, annual average air temperatures in California have increased by about 1.5 degrees Fahrenheit (°F), with minimum temperatures increasing at a rate almost twice as fast as the increase in maximum temperatures (approximately 2°F and 1°F per century, respectively). In most regions of the State, warming accelerated over the past three decades.[10] The annual minimum temperature averaged 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.[11]

With respect to California's water resources, the most significant effects of climate change have been changes to hydrology and sea level rise. Spring snowmelt from the Sierra Nevada to the Sacramento and San Joaquin Rivers has declined over the past century. Lower water volumes of snowmelt runoff indicate warmer winter temperatures. More precipitation falls as rain instead of snow and directly flows from watersheds before spring. As a result, the portion of runoff that occurs between April and June has declined by about 9 percent. In addition to its impacts on the State's water supply, reduced spring runoff can have adverse ecological impacts.[12,13,14,15] While no overall trend is discernible in statewide snow-water content (the amount of water stored in snowpack), a decreasing trend has been observed in the northern Sierra Nevada, and an increasing trend in the southern Sierra Nevada.[16] However, the average early spring overall snowpack in the Sierra Nevada has decreased by about 10 percent during the last century, a loss of approximate 1.5 million acre-feet (AF) of snowpack storage.[17] These changes have significant implications for water supply, flooding, aquatic ecosystems, energy generation, and recreation throughout the State.

12.3 KERN WATER BANK ANALYSIS

12.3.1 Regulatory Setting

12.3.1.1 Federal

U.S. Environmental Protection Agency "Endangerment" and "Cause or Contribute" Findings

On December 7, 2009, the U.S. Environmental Protection Agency (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 GHGs—CO_2, CH_4, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride—in the atmosphere threaten the public health and welfare of current and future generations.
- *Cause or Contribute Finding*: The combined emissions of these GHGs from new motor vehicles and new motor vehicle engines contribute to the GHG pollution that threatens public health and welfare.

United States Department of Energy pump efficiency regulations (10 CFR Part 429 and 431) become effective in the marketplace in 2020.

12.3.1.2 State

Senate Bill 97

Senate Bill (SB) 97, enacted in August 2007, recognizes climate change as a prominent environmental issue that requires analysis under the California Environmental Quality Act (CEQA). On December 30, 2009, the Natural Resources Agency adopted amendments to the CEQA Guidelines, as required by SB 97. These amendments provide guidance to public agencies regarding the analysis and mitigation of GHG emissions in draft CEQA documents. The amendments became effective March 18, 2010.

Senate Bills 1078, 107, and 350, and Executive Orders S-14-08, S-21-09, and B-30-15

SB 1078 (Chapter 516, Statutes of 2002) required retail sellers of electricity, including investor-owned utilities and community choice aggregators, to provide at least 20% of their supply from renewable sources by 2017. SB 107 (Chapter 464, Statutes of 2006) changed the target date to 2010. In February 2014, the California Public Utilities Commission reported that California's three largest investor-owned utilities (Pacific Gas & Electric Company [PG&E], Southern California Edison, and San Diego Gas & Electric Company) collectively provided 22.7% of their 2013 retail electricity sales using renewable sources and are continuing progress toward future 2020 requirements.[18]

Executive Order S-14-08 expanded the state's Renewable Portfolio Standard (RPS) to 33% renewable power by 2020. Executive Order S-21-09 directs the California Air Resources Board (CARB) under its Assembly Bill (AB) 32 authority to enact regulations to help the state meet its RPS goal of 33% renewable energy by 2020.

The 33%-by-2020 goal and requirements were codified in April 2011 with SB X1-2. This new RPS applies to all electricity retailers in the state, including publicly owned utilities, investor-owned utilities, electricity service providers, and community choice aggregators. Consequently, PG&E, which is the electricity provider for the KWB, must meet the 33% goal by 2020. Further, SB 350 (chapter 547, Statutes 2015) adopted in 2015 increases the RPS to 50% by 2030.

With respect to the state's overall GHG emission reduction goals, Executive Order B-30-15 established a California GHG reduction target of 40% below 1990 levels by 2030. The executive order aligns California's GHG reduction targets with those of leading international governments (the 28-nation European Union, for instance, set the same target for 2030 in October 2014).[19]

Department of Water Resources Greenhouse Gas Emissions Reduction Plan

The California Department of Water Resources' (Department's) Climate Action Plan (CAP), Phase 1: Greenhouse Gas Emissions Reduction Plan (GGERP), details the Department's progress and future plans for reducing GHG emissions consistent with the GHG emissions reduction targets established in AB 32, Executive Order S-3-05, and Department-specific policies. The GGERP also outlines the

Department's plan to monitor its progress and to reduce its emissions by over 80 percent below 1990 levels.[20]

The GGERP provides estimates of historical (going back to 1990), current, and future GHG emissions related to operations (e.g., energy use), construction (e.g., bulldozer), maintenance (e.g., flood protection facility upkeep), and business practices (e.g., Department office building related). The GGERP specifies aggressive 2020 and 2050 emission reduction goals and identifies a list of GHG emissions reduction measures that the Department will undertake to achieve these goals.

GHG emissions related to State Water Project (SWP) operations account for 98 percent of emissions from Department activities. The overwhelming majority of Department GHG emissions are emitted by non-hydroelectric-generation facilities which are needed to move water through the SWP, causing emissions of between 1.2 million and 4.1 million million metric tons of carbon dioxide equivalent per year (MT CO_2e/yr), with an average of 2.4 MT CO_2e/yr during 2007-2010. The GGERP does not take credit for the hydropower that the Department's facilities generate. Emissions related to construction represent the second largest source of GHG emissions from the Department's activities, but are less than 2 percent of the Department's total GHG emissions.

12.3.1.3 Local

In December 2009, the San Joaquin Valley Air Pollution Control District (SJVAPCD) adopted the *Final Staff Report Addressing Greenhouse Gas Emissions Impacts under the California Environmental Quality Act and Guidance for Valley Land-use Agencies in Addressing GHG Emission Impacts for New Projects under CEQA* (SJVAPCD GHG CEQA Guidance). The purpose of the guidance is to streamline the evaluation and significance determination process for projects within SJVAPCD's jurisdiction. The SJVAPCD GHG CEQA Guidance is described further below in Section 12.10.4, Standards of Significance.

12.3.2 Analytical Method

GHG emissions and potential climate change impacts were evaluated quantitatively and qualitatively. The analysis included operations and maintenance (O&M) activities for the KWB from 1995 to 2014 and future activities (i.e., 2015—2030). Construction emissions associated with planned KWB projects were also evaluated.

For construction and typical O&M activities, including operating on-road vehicles and off-road heavy-duty construction equipment, the SJVAPCD-approved model CalEEMod, Version 2013.2.2, and CARB's EMFAC2014 were used to quantify GHG emissions.[21,22] Assumptions similar to those used in Section 7.7, Air Quality, were also used to quantify GHG emissions from these on- and off-road fuel combustion sources.

The analysis of GHG emissions also evaluated several other emission sources associated with KWB O&M activities: prescribed burns, livestock grazing (enteric fermentation and manure management), and electricity consumption. For prescribed burns and livestock grazing, annual activity levels such as acres burned, number of livestock (i.e., heads), and livestock types (sheep or cattle) were provided by the Kern Water Bank Authority (KWBA). GHG emissions from burns and grazing were quantified using methods and emission factors from CARB's GHG emission inventory.[23]

Electricity-related GHG emissions were quantified using PG&E-specific electricity intensity emission factors, which account for the projected changes in PG&E's electricity production portfolio.[24] Because these PG&E-specific emission factors include only CO_2 emissions, statewide nitrous oxide and CH_4

emission factors from EPA's eGRID were used to calculate the carbon dioxide equivalent electricity emission factor.[25]

O&M activities vary from year to year as KWB cycles between periods of recharge (during which KWB consumes relatively little energy) and periods of recovery (during which KWB consumes relatively more energy); GHG emissions associated with O&M activities from 1995 to 2014 were calculated and presented in the analysis on as average annual basis.

12.3.3 Standards of Significance

The following standards of significance are based on Appendix G of the CEQA Guidelines. For purposes of this REIR, impacts on GHG emissions would be considered significant if KWB activities would:

- generate GHG emissions, either directly or indirectly, that may have a significant impact on the environment; or
- conflict substantially with an applicable plan, policy, or regulation adopted for the purpose of reducing GHG emissions.

12.3.3.1 SJVAPCD GHG CEQA Guidance

As stated in Appendix G, the significance criteria established by the applicable air quality management district may be relied on to make the above determinations. SJVAPCD has adopted guidance/policy documents for both land use development projects and stationary sources (the SJVAPCD GHG CEQA Guidance). The SJVAPCD has declined to set numerical standards below which a project would be determined not to have an impact. Instead, it has identified a number of Best Performance Criteria Standards (BPS) where a project's impact significance would be determined on the level of implementation of best performance standards that apply to commonly proposed land use development and/or stationary source projects that would achieve a 29% reduction from business-as-usual (BAU). Projects that implement all BPS are assumed to meet a standard of a GHG reduction of 29% of BAU and would have a less-than-significant impact. Projects that cannot implement all required BPS must demonstrate a 29% reduction from BAU to reduce GHG impacts to a less-than-significant level.[26]

This method of impact assessment is most applied to residential, commercial, and mixed-use development projects. It would not be directly applicable to a water banking project such as the KWB. Although KWB activities are more similar to a stationary source than a land use development project because of the infrastructure-like service and types of emission sources, it still does not fit into the typical stationary source that the SJVAPCD developed its guidance/policy to evaluate. Therefore, this analysis does not use the SJVAPCD GHG CEQA Guidance to evaluate the GHG emissions from KWB activities.

Water Sector Reductions

Where there is not an established GHG emissions threshold that would apply to projects, the California Air Pollution Control Officers Association suggests that lead agencies identify significance thresholds applicable to a proposed project that are supported by substantial evidence and linked with the AB 32 Climate Change Scoping Plan (Scoping Plan). The recent California Supreme Court ruling on the Newhall Ranch case (*Center for Biological Diversity v. Cal. Dept. of Fish & Wildlife* (2015) 62 Cal.4th 204), found that a statewide percent emission reduction (i.e., 29% below BAU) established by the Scoping Plan does not necessarily equate the same level of reductions for each individual emissions sector. Percent reductions and thresholds should be established specific to the emissions sector or land use type being analyzed as part of the environmental document.

Therefore, the Department considered analyzing and calculating a percent reduction for the water sector to achieve the emission reduction goals of the Scoping Plan. The Scoping Plan includes Measures W-1 to W-6 (described in more detail below) to collectively achieve approximately 4.8 million metric tons of CO_2e reductions in 2020, which would contribute to the State achieving its GHG emission reduction target.[27] The Scoping Plan does not assign a specific emission reduction percentage to the water sector as a whole or as to any individual component of the water sector. However, the Department has calculated that this would represent an approximate 13% reduction from the Scoping Plan's baseline emissions levels (i.e., 2002-2004 average) for the entire water sector (i.e., water-related electricity and natural gas emissions). Therefore, by directly targeting the water sector, achieving a 13% reduction from the KWB's 2002-2004 emissions levels could demonstrate that KWB activities achieve their fair-share emission reductions consistent with the emission reductions established for the water sector in the Scoping Plan. However, although this percent reduction (13%) represents a more sector- and project-specific reduction target than the SJVAPCD's statewide 29% reduction, the 4.8 million MT CO_2e reduction is calculated as a sum of all reductions achieved by implementation of Measures W-1 to W-6.

Most of the water sector-related measures would not apply to KWB activities. When only considering the one water-related Scoping Plan measure applicable to KWB (i.e., Measure W-3 projected to achieve 2.0 million MT CO_2e reductions), the percent reduction would be 6%. In addition, the Scoping Plan did not include the water sector emissions reductions in its accounting of reductions needed to achieve the 2020 target, in part because some of the reductions were seen as duplicative of emissions reductions accounted for in other sectors, most notably the energy sector.

Furthermore, KWB began their first water recovery operations in 2001-2002. Therefore, KWB pumps would have been operating near the peak of their efficiency during the 2002-2004 Scoping Plan baseline period. For most other sectors, it is typically expected that a 2002-2004 baseline would be less efficient than current day operations and therefore achieving a reduction beyond those levels would be possible. However, in the case of KWB, it is unlikely that any future operating levels, even with retrofits and rehabilitations for pumps, would operate at an efficiency above the 2002-2004 levels. DWR attempted to determine a baseline efficiency level established by a state, federal, or professional agency with expertise in pump efficiency that could be substituted as a benchmark level of efficiency for 2002-2004 and that reductions could have been measured against. However, the Department was unable to identify a current workable standard.

Thus, considering the uncertainty regarding how the emissions reductions of Measures W-1 to W-6 are applied to particular projects, and baseline level differences between KWB and statewide operations, this analysis does not use this type of percent reduction method to evaluate the GHG emissions from KWB activities.

Thresholds

Several agencies have developed "thresholds" that might be used to determine what level of GHG emissions would constitute as a significance impact. As described above, KWB is a unique project in that it does not fit in as a typical land use development or stationary source project. Nevertheless, to establish additional context when considering the magnitude of GHG emissions associated with KWB activities, this analysis considers the following GHG emissions thresholds developed by other entities:

- The Sacramento Metropolitan Air Quality Management District (SMAQMD) has adopted a threshold of 1,100 MT CO_2e/yr for construction-related GHG emissions.
- Air districts such as the SMAQMD and Bay Area Air Quality Management District (BAAQMD) have adopted GHG thresholds of significance for CEQA projects (i.e., 1,100 MT CO_2/yr) for the purpose of evaluating land use development projects (e.g., residential and commercial).

- Stationary sources that generate greater than 10,000 MT CO_2/yr may be required to participate in the cap-and-trade program through the Western Climate Initiative.[28]
- The BAAQMD has previously adopted 10,000 MT CO_2/yr as the significance threshold for operational GHG emissions from stationary--source projects.[29]
- CARB requires operators of selected facility types that generate GHG emissions exceeding 10,000 MT CO_2e/yr to comply with their Mandatory Reporting of Greenhouse Gas Emissions regulation.[30]
- The Council on Environmental Quality (CEQ) uses 25,000 MT CO_2e/yr as a level of GHG emissions over which a project must perform quantitative analysis of GHG emissions.[31]
- Facilities that generate greater than 25,000 MT CO_2e/yr are required to report their emissions as part of EPA's Mandatory Reporting of Greenhouse Gases.[32]

Methods of analysis and thresholds developed for land use development projects are not suitable to evaluate an infrastructure project such as the KWB. Other methods of analysis and thresholds of significance developed for stationary sources and emissions levels for reporting and/or cap-and-trade programs are also not directly applicable to KWB activities. Because of the unique nature of the KWB and its operations, with the exception of construction-related emission thresholds, existing methods of analysis and thresholds of significance (which were all developed for land use development projects and stationary source projects) are not suitable to evaluate its GHG emissions, but can provide context for the level of magnitude of GHG emissions generated.

For construction-related emissions, the SMAQMD annual threshold (i.e., 1,100 MT CO_2e/yr) will be considered the applicable threshold to evaluate KWB's future construction-related GHG emissions in the absence of similar standards. It is expected that construction-related emissions would be substantially similar regardless of the geographic area where they occur.

12.3.3.2 Consistency with Scoping Plan Water Sector Measures

Considering the lack of an appropriate quantitative threshold to evaluate KWB, for the purposes of this analysis, the GHG emissions from KWB activities will be evaluated for consistency with the Scoping Plan's GHG reduction target measures for the water sector. The Scoping Plan identifies six measures that would contribute to water-related GHG reductions required to meet the State's overall emissions reduction target. The water measures are listed below along with a description of their applicability to KWB activities:

- **Measure W-1 (Water Use Efficiency)**: KWB activities do not use water, but rather manage water by recharging, storing, recovering, and conveying water for the KWB participants. The efficiency of the KWB's "use" would be through how water is moved through KWB's system, which is addressed in Measure W-3 below. Measure W-1 is not applicable to KWB activities.
- **Measure W-2 (Water Recycling)**: KWB activities are not a user of water and therefore recycling KWB water would not be a feasible option. This measure is not applicable to KWB activities.
- **Measure W-3 (Water System Energy Efficiency)**: KWB activities move water through recharge, storage, and conveyance (canals and pipelines) facilities, many of which require energy input in the form of electricity to run water pumps. This measure is applicable to KWB activities.
- **Measure W-4 (Water Reuse Urban Runoff)**: KWB activities are not similar to land use development projects (i.e., residential or commercial) in an urban, suburban, or rural area. Urban runoff would not be applicable to KWB activities because essentially all KWB Lands

would be permeable, natural surfaces where infiltration can readily occur. This measure is not applicable to KWB activities.

- **Measure W-5 (Increase Renewable Energy Production)**: This measure was considered with regard to KWB activities. The KWB HCP/NCCP (Appendix 7.7a) permits specific uses for KWB Lands. With respect to water banking operations, KWBA may install, construct, repair, maintain, and operate water recharge, water recovery, and water conveyance facilities. Solar energy production is not one of the permitted uses. The Settlement Agreement precluded commercial development on the one area allowed for other development activities in the KWB HCP/NCCP. KWBA recently (May 2015) evaluated the feasibility of siting solar energy on the site and concluded that it was not feasible.[33] The results of a study by a private and independent solar design company (California Commercial Solar, Inc.) determined that although solar energy production is possible on the project site, based on the electricity load profile of KWB O&M activities, solar production would not directly offset KWB's energy demands on a consistent basis. In other words, based on the highly variable energy demands of KWB O&M activities (e.g., the main pump station's demand can vary by two magnitudes of order [from 65.8 megawatt-hours (MWh/yr) to 6,148 MWh/yr] between dry and wet years), solar energy production would only offset a portion of peak demands in some years and then would over-produce energy during low years.

  Based on the incompatible load profile to primarily use solar energy production on-site, it was concluded that solar energy should not be further pursued on KWB lands. In addition, solar energy production is not an expressly permitted use under the KWB HCP/NCCP, and land used for solar energy production would eliminate existing habitat benefits on those lands and potentially interfere with future recharge pond potential. The construction and operation of a solar facility on KWB Lands, including ancillary facilities such as roads and transmission lines to service the solar facility, could substantially affect the conservation value of the KWB. For these reasons, this measure is not feasible for KWB activities.

- **Measure W-6 (Public Good Charge)**: This measure was intended to affect water prices on a statewide level and was not designed to be implemented at an individual water provider level. In addition, this measure's GHG reductions are still listed as "To Be Determined" in the Scoping Plan. This measure is not applicable to KWB activities.

The First Update to the Climate Change Scoping Plan (2014) did not identify additional specific measures applicable to projects like KWB.[34] Therefore this analysis will review KWB's consistency with Measure W-3, the applicable water-related emission reduction measure from the Scoping Plan that applies to KWB, as the criterion to evaluate GHG impacts. Quantitative thresholds described above will be provided when possible for informational and contextual purposes.

12.3.4 Impact Analysis

12-1 KWB construction and operations/maintenance would generate GHG emissions that could potentially make a considerable contribution to a significant cumulative effect on climate change.

1996 – 2014

<u>Construction</u>

GHG emissions were generated by exhaust from a variety of sources during KWB facilities construction, such as heavy-duty construction equipment, haul trucks, material delivery trucks, and construction worker vehicles. Like air pollutant emissions, daily GHG emissions would vary depending on the type of construction activities planned for each day. For example, daily GHG emissions would be

greater during construction equipment-–intensive phases, such as site grading and excavation, than during less intensive phases, such as material delivery or construction inspections. However, unlike air pollutant emissions, which are evaluated on a local and regional basis, GHG emissions have global effects because of their long atmospheric lifetime and resulting long-term ability to continue contributing to climate change. Therefore, although construction activities and subsequent GHG emissions would be short-term and temporary, total GHG emissions were considered.

The 2007 DEIR and 2010 FEIR evaluated the KWB's construction-related air pollutant emissions during 1996–2003 and into the future. Those analyses determined the impact of construction-related air quality emissions was less than significant. Section 7.7, Air Quality, of this REIR which updates that evaluation, also determines that the impact of air pollutant emissions from planned KWB activities, including the Integrated Regional Water Management (IWRM) program (also called the Kern Water Bank Recharge and Recovery Project) and full build-out, would be less than significant, even when conservatively assuming that construction of all future planned facilities would occur simultaneously in the same year.

Construction emissions for KWB activities planned for future development from 2015 to 2030 are shown in Table 12-2. The types of KWB activities from 1996 through 2014 are essentially the same as those planned for future development. For example, KWB construction activities from 1996 through 2014 included recharge ponds, conveyance pipelines, wells, and maintenance, which are the same components of the planned future projects. The only fundamental difference is that the KWB Canal was previously constructed and no similar facility is proposed in the future. It is reasonable to assume that construction-related GHG emissions from 1996 to 2014 would also be similar in magnitude and intensity to the planned future construction emissions shown in Table 12-2, and would also fall below SMAQMD's construction-related threshold of significance. In addition, KWB-related construction emissions would be substantially less than any of the other contextual thresholds shown for GHG emissions.

Therefore, KWB construction activities did not result in a cumulatively considerable incremental contribution to the significant cumulative impact on climate change and this cumulative impact was ***less than significant***.

Mitigation Measures

None required.

Operations and Maintenance

KWBA's 1996–2014 O&M activities included the use of construction equipment and on-road vehicles, electricity consumption for water conveyance, prescribed burns, and livestock grazing. KWBA provided information about construction equipment and on-road vehicle usage for all years from 1996 through 2014, which was used with Kern County-–specific emission factors. The earliest year of O&M activities was used to obtain emission factors from CalEEMod and EMFAC, which would conservatively estimate O&M GHG emissions. For electricity-related emissions, PG&E-specific emission factors were used to estimate GHG emissions from KWBA–provided electricity consumption data. Lastly, acres burned and livestock types and heads for each year from 1996 through 2014 were provided by KWBA.

Table 12-1 presents the KWB's annual average O&M GHG emissions from 1996 through 2014.

As shown in Table 12-1, annual average O&M emissions could have been approximately 11,679 MT CO_2e with approximately 92% of operational emissions occurring from electricity consumption. The other O&M activities such as vehicle use, burns, and grazing account for approximately 0.3%, 5.0%,

TABLE 12-1

KERN WATER BANK OPERATIONS AND MAINTENANCE ANNUAL AVERAGE GREENHOUSE GAS EMISSIONS, 1996-2014

Operation and Maintenance Activity	Greenhouse Gas Emissions (MT CO_2e/yr)[1]
On- and Off-Road Vehicles	98
Electricity Consumption [2]	10,699
Prescribed Burns[1]	581
Grazing[1]	354
Total Annual Average O&M Emissions	11,732

Notes:

MT CO_2e/yr = metric tons of carbon dioxide equivalent per year; O&M = operations and maintenance

[1] Emissions shown for O&M activities represent *annual average* emissions from 1996 through 2014.

[2] Annual average emissions shown for electricity consumption are from data provided for a 5-year period from 2010 through 2014. Emissions were higher than previous years because 2010-2014 had prolonged periods of recovery; therefore the amount of annual emissions presented above represents a conservative estimate of average annual O&M activities.

Source: Data compiled by AECOM in 2015.

and 3.0% of total emissions, respectively. Annual average O&M emissions would have exceeded the cap-and-trade and stationary source thresholds of 10,000 MT CO_2e, but would have been less than the 25,000 MT CO_2e thresholds from CEQ and the EPA's Mandatory Reporting Rule.

During this time, KWBA was implementing its standard pump stations and water-well maintenance program, which includes pump repair every three to five pumping seasons, or as determined through pump and energy monitoring. This maintenance and monitoring program ensured that pumps were operating at average industry standards to achieve the optimal efficiency of KWB operations and costs. The servicing of pumps under this program minimized electricity consumption (and subsequent GHG emissions) needed for operations.

Therefore, KWB's 1996–2014 operational GHG emissions impact was ***less than significant***.

Mitigation Measures

None required.

2015 – 2030

Construction

Construction emission sources associated with proposed KWB activities from 2015 to 2030 would be similar to those described above for 1996–2014. KWBA provided project-specific information for the proposed IRWM program, which was also used to extrapolate construction parameters for future full buildout, which would have similar facilities. Table 12-2 presents the total GHG emissions associated with all proposed future KWB construction activities.

The KWB's total future construction-related GHG emissions would be approximately 973 MT CO_2e (Table 12-2), which assumes that all proposed future KWB activities would be constructed simultaneously. However, the proposed IRWM program would be constructed first and in separate years than full KWB build-out, such that annual emissions, in reality, would be lower than those shown in Table 12-2. Nevertheless, even if all future KWB construction activities proceeded simultaneously,

TABLE 12-2

KERN WATER BANK CONSTRUCTION-RELATED GREENHOUSE GAS EMISSIONS, 2015-2030

Construction Project	Greenhouse Gas Emissions (MT CO_2e)
IRWM Plan Project[1]	313
Proposed KWB Buildout[2]	661
Total Construction GHG Emissions[3]	**973**

Notes: GHG = greenhouse gas; MT CO_2e = metric tons of carbon dioxide equivalent

[1] The Integrated Regional Water Management (IRWM) Program Project's construction-related emissions were conservatively modeled assuming that all construction activities would occur in a single year and in the earliest possible construction year (2016).

[2] Proposed future KWB buildout construction-related emissions were conservatively modeled assuming that all construction activities would occur in a single year and in the earliest possible construction year (2016).

[3] Total construction emissions are used to evaluate future KWB facility construction emissions. In reality, these projects would not overlap and would not occur in the same year.

Source: Data compiled by AECOM in 2015.

anticipated construction-related GHG emissions during 2015-2030 would be less than the SMAQMD construction-related GHG threshold and substantially less than the listed contextual thresholds. Thus, construction of all proposed future KWB facilities would result in less construction emissions than any of the potential thresholds for GHG emissions. If added to the O&M annual emissions, the amortized construction emissions would be less than 50 MT CO_2e (less than 0.5%) and would not affect any significance determination for O&M activities.

Therefore, the KWB's 2015–2030 construction-related GHG emissions would not result in a cumulatively considerable incremental contribution to the significant cumulative impact on climate change and this cumulative impact would be ***less than significant***.

Mitigation Measures

None required.

Operations and Maintenance

The future O&M activities associated with KWB activities are anticipated to be similar to those shown in Table 12-1. Even with the addition of the KWB IRWM program and proposed future full buildout, O&M activities are not anticipated to increase substantially beyond the previous O&M levels. As shown in Table 12-1, annual 2015 KWB O&M activities would generate approximately 11,732 MT CO_2e, which would slightly exceed all but the highest contextual thresholds of significance presented in Standards of Significance. KWB's annual emissions would not exceed the CEQ quantitative analysis threshold (i.e., 25,000 MT CO_2e/yr) or EPA's Mandatory Reporting threshold (i.e., 25,000 MT CO_2e/yr).

After 2015, it is anticipated that turnover in the vehicle and equipment fleet and improvements to emissions technology would cause emission rates for vehicles and equipment to decrease over time. Electricity-related GHG emissions also would decrease as a result of statewide GHG reduction measures that would reduce electricity-related GHG emissions, such as the Renewable Portfolio Standard (see Senate Bills 1078 and 107 and Executive Orders S-14-08 and S-21-09) and Senate Bill 350. In addition, as PG&E continues to add renewable resources to its electricity portfolio, the GHG intensity of electricity used for O&M activities and overall electricity-related GHG emissions would

decrease. These emissions account for approximately 91% of the KWB's current (2015) annual GHG emissions.

Table 12-3 presents KWB's 2020 and 2030 GHG emissions with incorporation of emission reductions associated with projected vehicle and equipment fleet turnover and increased emissions technology, and required RPS discussed above.

TABLE 12-3

MITIGATED KERN WATER BANK OPERATIONS AND MAINTENANCE ANNUAL AVERAGE GREENHOUSE GAS EMISSIONS (2020 AND 2030)

Operation and Maintenance Activity	Year 2020 Emissions (MT CO_2e)[1]	Year 2030 Emissions (MT CO_2e)[1]
On- and Off-Road Vehicles	81	80
Electricity Consumption	8,977 [2]	6,714 [2]
Prescribed Burns	581	581
Grazing	354	354
Annual Average Future O&M Emissions	9,993	7,729
Annual Average 2015 O&M Emissions[3]	11,732	11,732
Percent Reduction from 2015 Baseline Levels[4]	**15%**	**34%**

Notes:

MT CO_2e = metric tons of carbon dioxide equivalent; O&M = operations and maintenance

[1] Emissions shown for 2020 and 2030 assume O&M activity levels of on- and off-road vehicles, electricity consumption, prescribed burns, and grazing stay similar to those in 2015.

[2] Electricity-related emissions in 2020 assume Pacific Gas & Electric Company (PG&E) achieves both the required 33% Renewable Portfolio Standard (RPS) emissions in 2020, and the required 50% RPS by 2030 as required by Senate Bill 350.

[3] Emissions represent current annual average KWB O&M activities' emissions levels as shown in Table 12-1.

[4] Percent reductions were calculated by comparing the year 2020 and 2030 emissions, which account for planned and projected statewide emissions reductions in the electricity and mobile source sectors, with existing annual average KWB O&M emissions levels. Therefore, calculated percent reductions are actual reductions from an existing 2015 baseline emissions level rather than a projected future (2020 or 2030) business-as-usual level.

Source: Data compiled by AECOM in 2016.

Taking into account currently approved and projected changes in vehicle and equipment fleet, and PG&E's electricity portfolio, GHG emissions associated with KWB's total O&M activities are anticipated to decrease by approximately 15% and 34% in years 2020 and 2030, respectively from 2015 emission levels (Table 12-3). These reductions would occur at a statewide level and would not require KWBA to implement any measures or actions.

In addition, the 2020 and 2030 future mass emission levels would be less than the contextual thresholds shown in the Standards of Significance section above. The only contextual thresholds that would be exceeded in future 2020 and 2030 years would be SMAQMD's construction and operational thresholds, which were developed to evaluate typical land use development projects, and not infrastructure projects such as KWB.

The quantitative analyses presented above provides context for KWB's O&M GHG emissions with respect to currently-established GHG thresholds of significance and the GHG emission reduction percentages achieved in future years. However, as described in Standards of Significance, this analysis will qualitatively evaluate whether KWB activities are consistent with Measure W-3, the applicable water-related emission reduction measure contained in the Scoping Plan. At the time of this analysis,

KWBA performs routine maintenance and monitoring of its pumps for O&M activities. Pumps are prioritized for retrofit, rehabilitation, and replacement as necessary based on monitoring data and current operations and pumping demands. Given that electricity consumption accounts for 91% of KWB's annual GHG emissions, purchasing electricity accounts for a large majority of KWB operational costs. Therefore, KWBA has an inherent financial incentive to operate pumps at an efficient level.

Existing KWBA monitoring and maintenance actions have achieved sizeable energy savings through pump retrofits and rehabilitations. In 2015 and 2011, KWBA retrofit and rehabilitation actions resulted in annual energy savings of approximately 3,546 MWh and 1,792 MWh, respectively.[35,36,37] These achieved energy savings in 2015 and 2011 represent approximately 6.4% and 3.2%, respectively, of KWB's total annual average electricity consumption. Furthermore, these energy savings resulted in annual emission reductions of approximately 633 MT CO_2e and 322 MT CO_2e in years 2015 and 2011, respectively.

Although KWB has historically and currently performs pump efficiency actions to monitor and maintain pumps at optimal working conditions, there is no formal mechanism to require these pump efficiency actions. Therefore, consistency with Scoping Plan Measure W-3 (Water System Energy Efficiency) cannot be tracked as part of an official plan or program approved by the KWBA Board of Directors. Thus, for the purposes of a conservative analysis, it is assumed that without a formal pump efficiency plan, the KWBA might not be consistent with the applicable water-related Scoping Plan measures (i.e., Measure W-3). KWB's 2015–2030 O&M GHG emissions could result in a cumulatively considerable incremental contribution to the significant cumulative impact on climate change and this cumulative impact could be ***potentially significant***.

Mitigation Measures

As shown above in Table 12-3, accounting for statewide reduction measures that would occur independently of KWB operations, O&M activities would achieve an approximate 15% and 34% reduction from 2015 levels by 2020 and 2030, respectively. In addition, these emissions levels would be below all of the contextual thresholds of significance except for SMAQMD's construction and operational GHG thresholds developed for land use development projects. Furthermore, with implementation of Mitigation Measure 12-1, a formal Pump System Energy Efficiency Plan (PSEEP) would ensure that O&M activities comply with the Scoping Plan's Measure W-3. Considering that statewide reduction measures would continue to reduce KWB's O&M GHG emissions, that future 2020 and 2030 emission levels would be less than most contextual thresholds, and that KWBA has adopted a formal pump efficiency program as part of Mitigation Measure 12-1, KWB's future O&M GHG emissions would not result in a cumulatively considerable incremental contribution to the significant cumulative impact on climate change.

KWBA is obligated to carry out the measures in Mitigation Measure 12-1 (see Section 7.0.4.3.2, 2016 KWBA Resolution). Therefore, impacts from KWB activities with regard to the cumulative impact on GHG emissions are ***less than significant, with mitigation.***

12-1 *KWBA will implement the following measures (2016 KWBA Resolution, Appendix 7.6b):*

a) ***Pump Efficiency Monitoring****: KWBA will conduct pump efficiency monitoring to ensure that all KWB pumps are monitored and evaluated at regular intervals during recovery periods.*

i. *Daily Pump Efficiency Monitoring: Pumps shall be monitored daily for their total water volume pumped (acre-feet [AF]) and electricity consumption (kilowatt-hours [kWh]), which will be used to calculate a daily energy efficiency value (i.e., kWh/AF).*

ii. *Pump Efficiency Software: Metro or an equivalent water system management program will be used to provide up-to-date and streamlined methods to analyze KWB's individual pump and total system efficiency.*

b) ***Pump Rehabilitation, Retrofits, and Replacement**: KWBA shall use data from the Pump Efficiency Monitoring component to strategically and actively rehabilitate, retrofit, and/or replace pumps as needed during recovery periods.*

i. *Pump Prioritization and Testing: Pump rehabilitation, retrofit, and replacement shall be prioritized by accounting for the relative efficiency of each pump with respect to the total pump system and water volume pumped through each pump. Data obtained from the Pump Efficiency Monitoring component shall be used to prioritize which pumps will be rehabilitated, retrofitted, and/or replaced. In addition efficiency testing by external entities if available (e.g., pump company, Pacific Gas & Electric Company [PG&E]) or other similar analysis will also be used for the prioritization process.*

ii. *Schedule: KWBA shall rehabilitate, retrofit, and/or replace pumps/wells at the earliest possible time without substantially disturbing ongoing O&M activities, but at a minimum will rehabilitate, retrofit, and/or replace at least an annual average of 5 pumps per year during a prolonged recovery period such as occurred between 2013 and 2016.*

c) ***Reporting**: KWBA will maintain a quarterly and annual reporting program that will be publicly available online. Annual reports will cover calendar years and be posted online by March 30 to cover the previous year. Quarterly reports will be posted online within 30 days of the end of each calendar quarter. The annual and quarterly reports will include, but are not limited to, the following components:*

i. *KWB O&M Totals: Total quarterly electricity consumption for recovery pumping activities along with total acre-feet recovered shall be provided online. A running total of the annual electricity consumption and acre-feet recovered by quarter shall also be provided.*

ii. *Pump Efficiency: A summary of the pump efficiency (kWh/acre-feet) for each of KWB's pumps will be provided quarterly. Similar to the KWB O&M Totals, a running annual average efficiency for each pump shall be provided. These data shall be used to identify the 5 pumps per year that will be rehabilitated, retrofitted, or replaced. If a pump/well is adjusted for depth, notes shall be made within the reports to explain these changes in pump efficiency.*

iii. *Electricity Efficiency Actions: Each report should include actions taken in the previous quarter to rehabilitate, retrofit, and/or replace pumps. Any other energy efficiency measures taken will be reported. When information is available from PG&E's Advanced Pumping Efficiency Program or other similar programs, annual electricity savings from these actions shall be included in the quarterly and annual reports to clearly show the electricity savings associated with rehabilitation, retrofit, and/or replacement actions. If annual energy savings cannot be determined through pre- and post-pump improvement testing, KWBA shall report the empirical annual energy savings (kWh/year) from these improvements in its annual reports.*

iv. *Identifying Next Steps: Each annual report will include the list of 5 or more pumps planned to be evaluated for potential rehabilitation, retrofit, or replacement during that year. If all five of the least efficient pumps are not scheduled for rehabilitation, retrofit, and/or replacement in the coming year, the annual report shall explain what KWB operation requires the pump to remain in service that year.*

d) ***Pump Compliance:*** *KWBA will only purchase new pumps that comply with United States Department of Energy pump efficiency regulations (10 CFR Part 429 and 431) when those regulations become effective in the marketplace in 2020.*

e) ***Future Increases in Technology and Emissions Standards:*** *KWBA shall actively consider replacing older pumps with new pumps with increased efficiency technology. All future requirements for pumps at the federal, state, and/or local level shall be complied with.*

12-2 Construction and operations/maintenance of the existing and proposed KWB activities could conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing greenhouse gas emissions.

Climate action plans developed to reduce GHG emissions have not considered projects such as the KWB. The KWB is not a typical stationary or land use development project with residential and commercial land uses. Rather, the KWB is a water infrastructure project that would provide water management facilities to recharge, store, pump, and distribute water. Therefore, typical climate action plans that focus on stationary sources, land use development, or transportation would not be applicable to KWB activities.

However, the quantitative emission reductions for the water sector established in the Scoping Plan have been used in Impact 12-1 to evaluate the KWB's operational GHG emissions. As shown above in Table 12-3, KWB activities would achieve fair-share emission reductions for the water sector. In addition, with respect to the Scoping Plan's GHG emission reduction strategies for the water sector, through implementation of Mitigation Measure 12-1, KWB activities would comply with the applicable Scoping Plan Measure W-3.

In addition to KWB's consistency with the Scoping Plan on a quantitative and qualitative basis, KWB activities would include operating existing facilities, and constructing and operating new planned facilities, to store groundwater during surplus years, which would then be recovered and conveyed to KWBA participants as needed. Although as shown in Tables 12-1 and 12-3, KWB's O&M activities require electricity to store, pump, and convey water, these water management energy needs would be less than those associated with other water supply alternatives such as desalination of sea water or brackish groundwater.[38] Therefore, KWB activities would manage and supply water at a lower energy intensity than potential future water supply systems and could help avoid potential increased energy consumption and subsequent GHG emissions.

Therefore, existing and proposed KWB activities have not and would not conflict with any applicable plans, policies, or regulations adopted for the purpose of reducing GHG emissions and impacts would be ***less than significant.***

<u>Mitigation Measures</u>

None required.

12.3.5 KWB's Role in Adapting to Climate Change

The end users of KWB water are susceptible to the effects of climate change, including decreasing precipitation rates, decreasing snowpack, and higher air temperatures which can lead to loss of water supply reliability. The KWBA constructs, operates, and maintains KWB infrastructure in Kern County to recharge and store water supply during wet years to supplement water demands during dry years. This operation helps to manage water supply variability and provide higher reliability for agricultural and/or urban water supplies.

Safeguarding California: Reducing Climate Risks[39] provides the high level strategic plan for how the State of California is planning and will continue to plan for and address the detrimental effects of climate change. Climate change projections indicate that California's precipitation may become even more erratic in the future—delivering very high volumes of precipitation in short periods of time, with longer and hotter dry periods in between. The water sector section of the Plan lays out the actions needed to prepare for climate risks to California water resources. Those actions include at least three strategies that are supported by the continued operation of the KWB:

- support regional groundwater management for drought resiliency,
- diversify local supplies and increase water use efficiency, and
- prepare California for hotter and dryer conditions and improve water storage capacity.

KWB activities would support these strategies by maintaining existing storage facilities and constructing new recharge and storage facilities (recharge ponds and wells) that increase the potential to store water during times of the year when water is available. Existing and additional water storage provides additional water supply during periods of drought and water shortage that are expected to increase in the future with climate change.

KWB's recharge and conservation facilities help stabilize water supply reliability in areas of critical agricultural and urban needs where water supply is limited but demand is high. KWB activities, therefore, help to counteract the detrimental impacts of climate change on water supply reliability. KWB activities would thus help enable the State's economy and populations to continue operating during droughts and impacts on water supply.

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